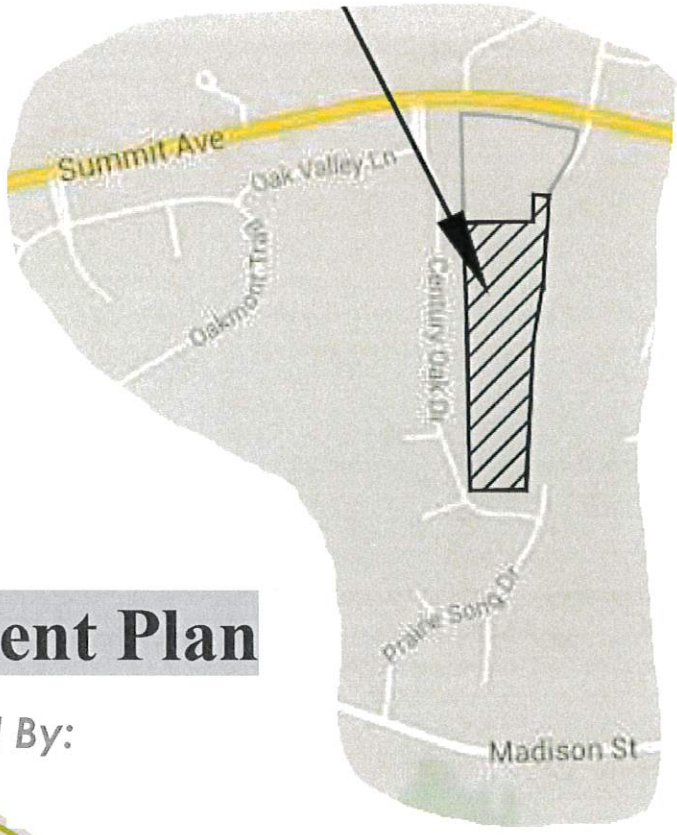
Prairie Song Villas

A Condominium Community

Prairie Song Drive
City of Waukesha
Waukesha County, WI



Storm Water Management Plan

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Submittal Date:
November 11, 2019

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Introduction

The Villas at Prairie Song is a proposed 20-unit condominium community comprised of Ten (10) two-unit buildings situated around a private cul-de-sac connected to Prairie Song Drive, on approximately 8 acres of land located immediately north and east of the Welsh Oaks and Oakmont subdivisions, respectively.

The property was previously planned to be part of the Capernwray PUD, which was approved in 2008 and identified duplex multi-family in the vicinity of this site. Although the Capernwray project did not move forward to construction, and each of the several properties within it may develop separately, this project provides illustrations for how it can integrate with future development on these other properties.

The subject site is bordered by the Oakmont subdivision to the west and Welsh Oaks subdivision to the south. The northern portion of the site contains INRA woodlands that will be preserved as part of this development. One property east of the site is the West Reserve at Fiddler's Creek condominium community. Immediately north of this site is undeveloped land that is currently being proposed as a townhome development entitled Townhomes at Prairie Song.

This storm water management plan sets the following goals: 1) convey site runoff to an adequate downstream collection area; 2) promote infiltration through the use of rain gardens and infiltration areas to reduce post-development runoff volume to the extent practicable; 3) ensure that the post-development peak flow rates are less than the existing peak flow rates; and 4) ensure that the post-development peak flow rates discharging to the Welsh Oaks subdivision are less than the existing peak flow rates.

From this engineer's design work on Welsh Oaks, we know that the Welsh Oaks subdivision was designed to receive storm water runoff from this proposed site. Therefore, the primary discharge point for this development will be south, to the public storm sewer installed in the Welsh Oaks subdivision. The proposed peak rate will be reduced to the existing conditions that currently drain to this subdivision from the subject site and tributary areas upstream of the site. The Welsh Oaks storm water management plan has been included in the appendices for reference. The benefits of this storm water management to the neighboring developments are: 1) Remove storm water runoff flows to the West Reserve at Fiddler's Creek condominium community; 2) No increase to 100-year peak flows to the Welsh Oaks subdivision; and 3) Reduced saturation of the rear yard swale in lots 21 – 23 of Welsh Oaks through direct connection of the proposed outlet pipe to the field inlet in the public storm sewer easement.

Owner

The owner and responsible entity for installation and maintenance of the storm water management practices is:

Bielinski Commercial, Inc.
1830 Meadow Lane, Suite A
Pewaukee, WI 53072
Contact: John Donovan
(262) 548-5570

Design Requirements

The following design standards have been used to develop the storm water management plan for the *Courtyards at Prairie Song*:

- City of Waukesha Stormwater Management Ordinance – Chapter 32
- Wisconsin Department of Natural Resources (WDNR) Technical Standards, NR 151 and NR 216.
- Summary of design requirements:
    - Peak Discharge: Peak flow rates from the post-development site shall be reduced to less than the corresponding event under existing conditions for the 2, 10, and 100-year storm events.
    - Water Quality (Total Suspended Solids): Reduce, to the maximum extent practicable, the total suspended solids load by 80%, based on an average annual rainfall, as compared to no runoff management controls.
    - Infiltration: Infiltrate runoff in accordance with one of the following (Residential): i) Infiltrate runoff volume so that the post-development volume shall be at least 90% of the pre-development infiltration volume, based on average annual rainfall – or – ii) Infiltrate 25% of the post-development runoff volume from the 2-year, 24-hour design storm with a type II distribution.

Analysis Overview

Existing and post development stormwater runoff conditions for the Villas at Prairie Song have been analyzed for**:** runoff volume, peak volume, discharge, pond storage capacity required, outlet structures and storm sewer system requirements. The software package used for modeling and analysis was Hydraflow© 2007 Version 9.23 by Intelisolve. Hydraflow uses NRCS methods to generate runoff and pond routing hydrographs. Hydraflow's capabilities include: modeling simple or complex drainage basins, combining hydrographs to determine runoff and storage requirements, analyzing interconnected detention basins and detention basin and outlet structure sizing.

The computer model analyzed the two, ten, one hundred-year storm events. TR-55 Type II rainfall distribution is used. The necessary hydrographs were generated to determine the stormwater runoff rates, depths and volumes for pre & post development conditions. This information is used to calculate detention basin size and outlet requirements.

The rainfall depths for the 24-hour duration storm are:

Rainfall Depths for 24-Hour Storm Duration

(per Sec. 38-206)

1-year	2-year	10-year	100-year
2.40	2.70	3.81	6.18

Run-off curve numbers for the onsite areas were determined using the requirements outlined in the NRCS TR-55 Manual and City and WDNR standards. The existing soils on the site are silt loams, with Type D Hochheim Silt Loam (HmC2 & HmB2) present across the majority of the development's tributary area,

with some St. Charles Silt Loam (ScB) (Type B) and Mayville Silt Loam (MoB) & Theresa silt loam (Type C).

The following describes the curve numbers assigned for composite calculations:

Curve Numbers:	Impervious Area (Rooftop, Pavement, Sidewalk, Etc.),	CN = 98
	Grass/Open Space in Good Condition: Type "B" Soil,	CN = 61
	Grass/Open Space in Good Condition: Type "C" Soil,	CN = 71
	Grass/Open Space in Good Condition: Type "D" Soil,	CN = 78
	Woods in Good Condition: Type "B" Soil,	CN = 55
	Woods in Good Condition: Type "C" Soil,	CN = 70
	Woods in Good Condition: Type "D" Soil,	CN = 77

Existing Site Description & Drainage Summary

Description

The existing drainage analysis identifies the areas tributary to this development site. The drainage controls created by the upslope Oakmont Subdivision are accurately reflected in these drainage boundaries.

The site is divided in to three (3) onsite drainage areas and three (3) offsite drainage areas; they are:
E-1: The 0.589-acre northern portion of the development site which drains north to an existing kettle (EX. K-1).
E-2: The 1.709 acre eastern and central part of the development site that drains east/southeast and ultimately flows downhill directly to the West Reserve at Fiddler's Creek condominium development. *This area potentially contributes to the drainage challenges experienced by the downstream condominium neighbors.*
E-3: The 2.650-acre west/southwest portion of the site draining south directly to the Welsh Oaks subdivision. This area corresponds to Area OS-1 in the Welsh Oaks storm water report and is a more accurate representation of the actual drainage boundary based on field topography.
OS-1: The 2.220-acres of north woodlands that drains to an existing kettle (EX. K-1) (shallow depression) on the southern edge of the INRA woodland area. The existing kettle has been modeled in both the existing and proposed condition to reflect the detention/ infiltration provided and resulting reduced runoff rates.
OS-2: The 0.655-acres of north woodlands, along the eastern property line, that drains south through the development site.
OS-3: The 0.167-acres of meadow, along the eastern property line, that drains southwest through the development site.
OS-4 (E-2 Courtyards): The 1.321-acres of meadow and woodlands, located north of the proposed site. This is an offsite drainage area that currently drains through the proposed development site. This area is also planned to be developed in the future, as a separate project.

The following is a summary of the existing conditions analysis.

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	------	0.406	0.540	-------	-------	1.094	-------	-------	2.448	E-1
2	SCS Runoff	------	1.277	1.661	-------	-------	3.231	-------	-------	6.961	E-2
3	SCS Runoff	------	1.152	1.560	-------	-------	3.304	-------	-------	7.610	E-3
4	SCS Runoff	------	0.100	0.192	-------	-------	0.784	-------	-------	2.897	OS-1
5	SCS Runoff	------	0.010	0.025	-------	-------	0.173	-------	-------	0.848	OS-2
6	SCS Runoff	------	0.169	0.219	-------	-------	0.420	-------	-------	0.905	OS-3
7	SCS Runoff	------	0.492	0.730	-------	-------	1.795	-------	-------	4.564	OS-4 (E-2 Courtyards)
9	Combine	1, 4, 7,	0.914	1.326	-------	-------	3.278	-------	-------	8.904	INFLOW TO K-1
10	Reservoir	9	0.000	0.000	-------	-------	0.105	-------	-------	4.387	EX. K-1
12	Combine	3, 5,	1.153	1.572	-------	-------	3.466	-------	-------	8.457	TOTAL TO WELSH OAKS SUB.
13	Combine	2, 3, 5, 6, 7, 10,	2.816	3.794	-------	-------	8.088	-------	-------	19.16	EX TOTAL FLOW

Post-Development Site Description & Drainage Summary

Description

The proposed development utilizes a treatment train of storm water practices to maximize infiltration, control drainage and improve drainage for the surrounding neighbors. The development includes a series of two (2) rain gardens and one (1) existing kettle along the western perimeter to control woodland and rear yard runoff, one (1) rain garden on the eastern perimeter to control and redirect eastern runoff, and one (1) wet pond located along the southern perimeter which provides an overall water quality and rate control for the entire site. The southern perimeter wet pond will collect site runoff and provide controlled discharge to the Welsh Oaks storm sewer system. The discharge rates from the development are reduced and discharges in such a way to minimize discharge to Welsh Oaks. These rates have been set to the existing discharge rates currently discharging to the Welsh Oaks Subdivision.

All three (3) proposed rain gardens are designed to have less than 12" of temporary ponding in the 100-year event, in conformance with City requirements.

The following sections describe the proposed drainage areas for this development.

Proposed Drainage Areas

Area P-1 includes the rear yards and roofs within the development site. This area drains directly to the modified existing kettle (PR K-1).
Area P-2 includes the rear yards and roofs within the development site. This area combines with the discharge from Kettle PR K-1 before entering rain garden RG-2.

Area P-3 includes the rear yards and roofs within the development site. This area combines with the discharge from rain garden RG-2 before entering rain garden RG-3.
Area P-4 includes the rear yards and roofs along the eastern side of the development site. This area drains directly to rain garden RG-4.
Area P-5 includes the road and central portion of the development that drains via surface drainage and storm sewer directly to the southern wet pond (POND P-5).
OS-1: The 2.220-acres of north woodlands that drains to an existing kettle (EX. K-1) (shallow depression) on the southern edge of the INRA woodland area. The existing kettle has been modeled in both the existing and proposed condition to reflect the detention/ infiltration provided and resulting reduced runoff rates.
OS-2: The 0.655-acres of north woodlands, along the eastern property line, that drains south through the development site.
OS-3: The 0.167-acres of meadow, along the eastern property line, that drains southwest through the development site.
OS-4 (E-2 Courtyards): The 1.321-acres of meadow and woodlands, located north of the proposed site. This is an offsite drainage area that currently drains through the proposed development site. This area is also planned to be developed in the future, as a separate project. At the time of the future development the proposed discharge from this site should be managed to limit runoff to the south to existing discharge rates.

Proposed Drainage Summary

The following provides a summary of the peak discharge rates for the proposed drainage areas and rain gardens. Please refer to the attachments for additional information.

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	
15	SCS Runoff	------	0.341	0.419	-------	-------	0.728	-------	-------	1.418	P-1
16	SCS Runoff	------	0.424	0.561	-------	-------	1.130	-------	-------	2.532	P-2
17	SCS Runoff	------	0.246	0.307	-------	-------	0.552	-------	-------	1.114	P-3
18	SCS Runoff	------	0.976	1.221	-------	-------	2.190	-------	-------	4.414	P-4
19	SCS Runoff	------	3.506	4.226	-------	-------	7.003	-------	-------	13.05	P-5
21	Combine	4, 7, 15,	0.849	1.205	-------	-------	2.907	-------	-------	7.869	Inflow to PR K-1
22	Reservoir	21	0.000	0.000	-------	-------	0.000	-------	-------	3.154	PR K-1
23	Combine	5, 16, 22	0.424	0.563	-------	-------	1.198	-------	-------	4.059	Inflow to RG-2
24	Reservoir	23	0.051	0.113	-------	-------	0.867	-------	-------	4.008	RG-2
25	Combine	17, 24	0.246	0.307	-------	-------	1.400	-------	-------	4.271	Inflow to RG-3
26	Reservoir	25	0.188	0.273	-------	-------	1.379	-------	-------	4.267	RG-3
27	Reservoir	18	0.566	0.920	-------	-------	2.081	-------	-------	4.310	RG-4
28	Combine	6, 19, 26, 27	3.621	5.027	-------	-------	10.58	-------	-------	21.94	Inflow to P-5
29	Reservoir	28	0.825	1.543	-------	-------	3.422	-------	-------	7.797	P-6 (Total Discharge)

Descriptions & Summaries of Storm Water Practices

Proposed Kettle K-1

Proposed Kettle K-1 is located at the northern end of the development site. It receives water from drainage areas OS-1 and P-1. This kettle will infiltrate small rain events and will ultimately discharge to Rain Garden RG-2.

The following provides a summary of this Kettle:

- Top of Berm = 114.00
- Overflow Weir = 112.5
- 100-year = 113.24
- Bottom = 110.00

Rain Garden RG-2

Located on the northwestern side of the development. It receives runoff from drainage area P-2 and discharge from proposed Kettle K-1. This rain garden promotes infiltration of rear yard and rooftop runoff, allowing for up to 1.0' of ponding in the 100-year event. The bottom of the rain garden is top dressed with 3" of Purple Cow Organics Biofiltration Media (or equal) and planted with a Prairie Moon Nursery Infiltration Basin seed mix (or similar).

The following provides a summary of this rain:

- Top of Berm = 111.00
- Overflow = 110.05
- 100-year = 110.34
- Bottom = 109.50

Rain Garden RG-3

A shallow rain garden area located along the western property line that is the last stop for the western treatment train of rain gardens, and ultimately overflows to Wet Pond P-5. This rain garden receives discharge from rain garden RG-2 and drainage area P-3. Rain garden RG-3 promotes infiltration of rear yard and rooftop runoff, allowing for up to 1.0' of ponding in the 100-year event. The bottom of the rain garden is top dressed with 3" of Purple Cow Organics Biofiltration Media (or equal) and planted with a Prairie Moon Nursery Infiltration Basin seed mix (or similar).

The following provides a summary of this rain garden:

- Top of Berm = 110.00
- Overflow = 109.00
- 100-year = 109.30
- Bottom = 108.50

Rain Garden RG-4

A shallow rain garden area in the eastern portion of the development that receives runoff from drainage area P-4. This rain garden promotes infiltration of rear yard and rooftop runoff, allowing for up to 1.00' of ponding in the 100-year event. The bottom of the rain garden is top dressed with 3" of Purple Cow Organics Biofiltration Media (or equal) and planted with a Prairie Moon Nursery Infiltration Basin seed mix (or similar).

The following provides a summary of this rain garden:

- Top of Berm = 103.00
- Overflow = 102.10
- 100-year = 102.45
- Bottom = 101.50

Wet Pond P-5

Wet Pond P-5 is located at the southern end of the site and receives runoff from drainage area P-5 as well as discharge from RG-3 & RG-4. This stormwater management facility promotes water quality and reductions to release rates leaving the site. This pond will have a 5' deep permanent pool with a 10' wide, 1.0' deep, safety shelve.

The following provides a summary of this Wet Pond:

- Top of Berm = 99.50
- Overflow = 98.50
- Top of 3' dia. Riser = 98.45
- 5" Orifice = 93.50
- (2) 6" Orifices = 94.80
- 15" Outlet Pipe = 90.00
- 100-year = 98.42
- 10-year = 96.18
- 2-year = 95.14

Infiltration

The proposed storm water management plan is designed to meet the City of Waukesha and WDNR NR151.124(1)(b)1.a goal of infiltrating 90% of the predevelopment infiltration volume, based on an average annual rainfall.

The following is the supporting infiltration calculations:
Pre-Development Runoff Volume (based on the site being undeveloped as modeled in WinSLAMM):
53,036 c.f.

Post-Development Runoff Volume after Infiltration/Outfall Controls:
86,278 c.f.

Infiltration Volume:
Pre-Development = (29.02"/12 x 7.990 ac. x 43,560 s.f./ac) – 53,036 c.f. = 788,651 c.f.
Post-Development = (29.02"/12 x 7.990 ac. x 43,560 s.f./ac) – 86,278 c.f. = 755,409 c.f.
(Note that 29.02" is the average annual amount of rain in a given year.)

755,409/788,652 = 0.958 = 95.8% (post-development infiltration volume > 90% pre-development = OK)

Total Site Release Rates

The proposed site release rates have been designed to comply with two objectives, which are: 1) total peak rates shall be less than existing peak rates; and 2) peak rates shall be equal to or less than the rates currently discharging to the Welsh Oaks storm sewer. **The latter is the most restrictive and applicable and is therefore utilized as the post-development discharge objective.** A summary of the applicable release rates is provided in the following table.

Site Discharge Summary

Storm Event (year)	Total Proposed Release Rate (cfs)	Total Existing Release Rate to Welsh Oaks (cfs)	Total Existing Release Rate from site (cfs)
2	**1.543**	**1.572**	3.794
10	**3.422**	**3.466**	8.088
100	**7.797**	**8.457**	19.160

* Total Peak Runoff Rates are based on the addition of the peak discharge rates from the associated hydrographs at the peak time for the site; due to varying peak times, the total discharge rates are not a direct summation of the peak rates for each. Refer to the attached calculations for additional information.

This table verifies that the Storm Water Management Plan meets the City of Waukesha Storm Water Management requirements by reducing the post-developed flow rates to less than the Allowable Release Rates.

Water Quality – TSS Reduction

The proposed development contains three (3) rain gardens, a modified kettle infiltration area and a final wet pond to provide water quality improvements. The rain gardens and infiltration area have been designed to allow for temporary ponding for direct infiltration, which will bring the water quality to upwards of 100% over an average annual year. The water quality calculations employ the method of pollutant trading, where the infiltration basins function at greater than 80% TSS reduction to offset the 0% TSS reduction from the undetained area. The table below illustrates that the development, which accounts for the undetained runoff, meets the 80% TSS reduction requirement.

SLAMM Results – Prairie Song Villas November 4, 2019			
Rain file: Milwaukee WI 1969.RAN Model Run Start Date: 03/28/69 Model Run End Date: 12/06/69	Runoff Volume	Particulate Solids Concentration	Particulate Solids yield
	(cu ft)	(mg/L)	(lbs)
Total Without Controls	123,737	111.2	858.8
Total After Outlet Controls	86,276	29.68	159.9
Percent Reduction:	N/A	N/A	**81.38%**

Conclusion

The proposed development plan for the Villas at Prairie Song condominium meets and exceeds the storm water management requirements of the City of Waukesha and WDNR NR 151 and adheres to the storm water discharge rates assigned to it by the Welsh Oaks subdivision. The proposed development incorporates four (4) rain gardens, utilizes a natural kettle infiltration area, and includes a final infiltration basin to maximize infiltration and reduce runoff volumes to the extent practicable. The development will also result in improved storm water drainage conditions for the West Reserve at Fiddler's Creek condominium community, since site runoff currently tributary to its southern cul-de-sac will be infiltrated and/or ultimately connected to the Welsh Oaks storm sewer.

Storm Water Maintenance Agreement

A storm water maintenance agreement will be created and recorded for this development to outline the function, operation and maintenance requirements of the storm water practices described herein.

APPENDIX 1

Soils Map & Geotechnical Report

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT

For the

Proposed Prairie Song Residential Development
Koenig Property
North of Century Oak Drive and Prairie Song Drive
Waukesha, Wisconsin

Prepared for:

Bielinski Homes
1830 Meadow Lane, Suite A
Pewaukee, WI 53072

Prepared by:

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, Wisconsin 53189
Phone (262) 521-2125
Fax (262) 521-2471

PSI Report Number: 00521251-2

June 10, 2015

psi Information To Build On
Engineering • Consulting • Testing

Timothy M. Leonard, E.I.T.
Staff Engineer
Geotechnical Services

Paul J. Koszarek, P.E.
Department Manager
Geotechnical Services

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Information To Build On

Information To Build On
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June 10, 2015

Bielinski Homes
1830 Meadow Lane, Suite A
Pewaukee, WI 53072

Attn: Mr. Harry Bielinski
Owner

Re: Preliminary Geotechnical Exploration Report
Proposed Prairie Song Residential Development
Koenig Property
Waukesha, Wisconsin
PSI Report No. 00521251-2

Dear Mr. Bielinski:

Professional Service Industries, Inc. (PSI) is pleased to transmit our Preliminary Geotechnical Exploration Report for the proposed Prairie Song Residential Development to be located on the Koenig property to the north of the intersection of Century Oak Drive and Prairie Song Drive in Waukesha, Wisconsin. This report includes the results of field and laboratory testing, as well as preliminary recommendations for footings, floor slabs, pavements and storm water areas for the planned project.

PSI appreciates the opportunity to perform this Geotechnical Study and looks forward to continuing our participation during the design and construction phases of this project. If you have questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Timothy M. Leonard, E.I.T
Staff Engineer
Geotechnical Services

Paul J. Koszarek, P.E.
Department Manager
Geotechnical Services

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PROJECT INFORMATION

Project Authorization

The following Table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI):

DOCUMENT AND REFERENCE NUMBER	DATE	SOURCE OF REQUEST	AUTHOR OR AGENT & TITLE
PSI Proposal Number: PO-052-128731R2	4/13/2015	PSI	Mr. Paul J. Koszarek, P.E. Mr. David M. Barndt, P.E.
Notice to Proceed	4/7/2015	Bielinski Homes	Mr. Harry Bielinski

Project Description

PSI understands that the project consists of a new residential development on an approximate 8.4 acre partially wooded vacant parcel located to the north of the intersection of Century Oak Drive and Prairie Song Drive in Waukesha, Wisconsin. This project is in the preliminary stages of development; however, PSI understands that this parcel is planned to be developed with 13 buildings that contains 2 condominiums in each building and an access roadway leading into a cul-de-sac. Due to the preliminary nature of the project, final grading is not yet known, however this report is based on rough grading for the pavements and building pads not exceeding 5 feet. The following Table lists the material and information provided for this project:

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Preliminary Storm Water Management Plan	Mr. Josh Pudelko, M.S., P.E. Trio Engineering	4/24/2015
Overall Concept Plan	Mr. Josh Pudelko, M.S., P.E. Trio Engineering	4/15/2015

Additional site work will include the construction of two infiltration ponds and six rain gardens. One infiltration pond will be located along the eastern portion of the site and the remaining infiltration pond will be located near the southeast corner of the site. The six rain gardens will be located along the western portion of the property. The depth to the bottom of the ponds and rain gardens have not been determined at the time of this report; however, PSI anticipates the bottom of the ponds and rain gardens will be within 8± feet and 5± feet of existing grade, respectively.

The geotechnical recommendations presented in this report are based on the available project information and the materials described in this report. If the noted information is incorrect, subsurface please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site and develop preliminary geotechnical design criteria regarding footings, floor slabs, pavements and storm water areas for the proposed project. Subgrade preparation recommendations and construction considerations are also provided. PSI's scope of services included drilling a total of seven soil test borings, select laboratory testing, and preparation of this geotechnical report.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project site is located on a partially wooded vacant parcel located to the north of the intersection of Century Oak Drive and Prairie Song Drive in Waukesha, Wisconsin. The parcel measures approximately 8.4 acres in size and is currently used for agricultural purposes. The site is partially wooded along the northern portion of the property. Six buildings and one rain garden are proposed to be located within the wooded areas. The project site is bounded to the west by residential properties and Century Oak Drive and to the north by a heavily wooded area. The site is bounded to the east by a partially wooded area and residential properties and bounded to the south by residential properties and the intersection of Century Oak Drive and Prairie Song Drive. The site slopes from the north to the south with approximately 25± feet of relief within the area for the proposed development. The Latitude and Longitude for the site is approximately 43.018278°N and 88.295128°W, respectively.

Subsurface Conditions

The subsurface conditions were explored with seven soil test borings (K-1 through K-7). The borings were completed within the proposed development area and were completed to depths in the range of 20 to 30 feet beneath existing grade. The following table depicts the general location, elevation and completed depth of the borings:

BORING NO.	GENERAL LOCATION	ELEVATION OF BORING (FEET LOCAL)	DEPTH OF BORING BENEATH EXISTING GRADE (FEET)
K-1	NW Portion of Site	113	20
K-2	NE Portion of Site	123	20
K-3	SW Portion of Site	108	20
K-4	SE Portion of Site	106	20
K-5	SWC Rain Garden	100	30
K-6	SEC Infiltration Pond	101	30
K-7	Eastern Infiltration Pond	105	30

The borings were located in the field by a representative of PSI based on the concept plan provided by Trio Engineering. The boring elevations were determined by plotting the boring locations on the concept plan that included a topographic survey provided by Trio Engineering. The boring elevations should be considered accurate to within about 3± feet. The attached Boring Location Plan shows the approximate locations of the borings. The borings were advanced utilizing hollow-stem auger drilling methods and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures.

Representative soil samples were obtained from the soil borings and were returned to PSI's laboratory where they were visually classified using the Unified Soil Classification System (USCS) as a guideline. Further, PSI conducted limited laboratory testing on select soil samples to aid in identifying and describing the physical characteristics of the soils and to aid in defining the site soil stratigraphy. The results of the field exploration and laboratory tests were used in PSI's engineering analysis and in the formulation of our engineering recommendations.

Based on the soil boring data, the subsurface soil profile generally consisted of a surficial layer of topsoil underlain by native sand soils to the termination depth of the borings. The surficial layer of topsoil varied in thickness from 3 to 12 inches. The native sand soils beneath the surficial topsoil were observed with varying amounts of silt and gravel contents throughout the borings. The moisture contents of the native sand soils ranged from 2% to 10%, indicating a moist soil condition. The "N-Values" within the native sand soils were observed in the range of 13 to greater than 50 blows per foot (bpf), indicating a medium dense to very dense relative soil density but typically observed in the range of 28 to greater than 50 bpf.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations.

Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not discarded during classification or altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Information

Groundwater was observed during drilling operations within three borings at depths ranging from 10½ to 18 feet beneath existing ground surface. The following table depicts the highest observed water level at each of the borings where groundwater was observed.

Boring Number	Surface Elevation (Ft. Local)	Depth of Highest Groundwater Level Observed (ft.)	Approximate Elevation of Groundwater Observed (ft. Local)
K-1	113	10.5	102.5
K-6	101	18	83
K-7	105	15.5	89.5

The seasonal high groundwater level is indicated by soil colorization and mottling in the soil. Based on the absence of soil mottling within the borings, the observed groundwater levels observed in Borings K-1, K-6 and K-7 are considered the seasonal high groundwater levels.

Due to the mostly granular nature of the native soils in which the groundwater was observed, it is likely that the observed groundwater level is indicative of the long-term groundwater table for this site. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the Borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.

EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

There is one primary geotechnical related concern at this site, which will mainly affect earthwork operations for this project. The following summarizes this concern:

1) ***Due to the granular nature of the native soils, compaction of the granular building foundation subgrade should be performed upon completion of excavation activities to redensify the soils.***

The existing granular subgrade soils are very easily loosened during excavation, and will require proper compaction to achieve the strengths necessary for the allowable bearing capacity recommended and the recommended subgrade modulus.

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

Site Preparation

Prior to the placement of new fill or preparation of the construction area subgrade, PSI recommends that the existing surficial organic matter, trees including root bulbs, frozen soils and topsoil be removed from within and a minimum of 10 feet beyond the building pads and pavement areas. Unsuitable soils encountered should be selectively undercut and/or stabilized in place. A representative of a qualified geotechnical engineer should determine the need for and depth of removal or stabilization at the time of construction.

After stripping the surficial materials and excavating to the proposed subgrade level, the building and pavement subgrades should be proofrolled. The proofroll should be conducted prior to placement of new fill to raise site grades. The subgrade should be proofrolled with a fully-loaded tandem axle dump truck or rubber tired vehicle of similar size and weight, typically a 9 tons/axle truck where cohesive soils are present and a large vibratory steel drummed roller where granular soils are present. Soils that are observed to rut or deflect excessively under the moving load (typically > 1"), should be undercut and replaced with properly compacted engineered fill. The proofrolling and undercutting activities should be documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather.

Within the structural areas, PSI recommends that the existing soils be proofcompacted using a large (greater than 4 foot diameter) smooth drum roller with a minimum of 10 passes in two perpendicular directions. Areas that are observed to be unstable during this process should be undercut and the sandy soils reused to backfill the overexcavation. The proofcompacting and undercutting activities should be documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 95 percent of the maximum dry density and within 3 percent of the optimum moisture content as obtained by the modified Proctor test ASTM D1557. The depth of scarification should not be less than 6 inches below the surface. Drying or wetting of the subgrade soils, typically to within 3% of the optimum moisture content, may be advised to facilitate compaction.

After subgrade preparation and observation have been completed, placement of new fill required to obtain proposed site grades may begin. The first layer of fill should be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped and scarified subgrade soils. Engineered fill materials should be free of organic or other deleterious materials, have a maximum particle size less than 3 inches. Clay fills

should have a liquid limit less than 45 and plasticity index less than 25 and greater than 11. If a fill soil has Atterberg limits outside of those recommended then the fill properties should be reviewed by the geotechnical engineer prior to use as an engineered fill. Engineered fill should be compacted to at least 95 percent of modified Proctor maximum dry density as determined by ASTM Designation D 1557.

Fill should be placed in maximum lifts of 8 inches of loose material and should be compacted within the range of 3 percentage points below to 3 percentage points above the optimum moisture content value. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be tested by a representative of a qualified geotechnical engineer prior to placement of subsequent lifts. The compacted engineered fill should extend 10 feet beyond the edges of building area.

Preliminary Foundation Recommendations

The following is a general overview of the subsurface conditions for the site, as it relates to foundation analysis, and can be used in preliminary site planning. It is recommended that a more in-depth investigation be conducted prior to construction for individual structures when the design details are known in order to provide site specific design recommendations.

Based on the preliminary study, buildings at the proposed site could be supported upon a conventional shallow column and continuous wall foundation system. For preliminary design considerations, if the footings are placed at normal frost depth and bearing upon suitable natural soils, foundations could be designed for a maximum net allowable soil bearing pressures varying from 3,000 pounds per square foot (psf) to 4,000 psf, depending upon location and depth.

Exterior footings and footings in unheated areas should be located at a depth of at least 48 inches below the final exterior grade to provide adequate frost protection. If the buildings are to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then the footings and concrete should be adequately protected from freezing.

Engineered fill must be placed in maximum lifts of eight inches of loose material and should be compacted to within 3% of the optimum moisture content value as determined by the modified Proctor test (ASTM D1557). If water is to be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be observed and tested by a representative of PSI prior to placement of subsequent lifts. The lateral extent of the overexcavation of any poor soil and subsequent placement and compaction of engineered fill should be equal to or greater than the depth of overexcavation below finished floor elevation.

Preliminary Floor Slab Recommendations

The following is a general overview of the subsurface conditions for the site, as it relates to floor slab analysis, and can be used in preliminary site planning. It is

recommended that a more in-depth investigation be conducted prior to construction for individual structures when the design details are known in order to provide site specific design recommendations.

Based on the building pads being prepared as recommended within the Site Preparation Section of this report, the building floor slabs could be supported upon the native sand soils or upon properly placed engineered fill. PSI recommends that a subgrade modulus (k) of 225 pounds per cubic inch (pci) be used for design considerations, based on a 12 inch diameter plate load test. However, depending on how the slab loads are applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$k_s = k\,(\frac{B+1}{2B})^2$ for cohesionless soil

where: k_s= coefficient of vertical subgrade reaction for loaded area,
k= coefficient of vertical subgrade reaction for 113 square inches area
B= width of area loaded, in feet

PSI recommends that a minimum four-inch thick free draining granular mat be placed beneath the floor slab to enhance drainage. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with tile, wood, carpet, or other moisture sensitive products or equipment, as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill must be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The floor slabs must have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage. In addition, where the slab will be supporting live loads, such as from moving vehicles like fork lifts, joints must be keyed, dowelled, or otherwise prepared to permit proper load transfer.

Seismic Site Class

The 2009 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soils type (i.e. depth of soil and strata types). Based on the estimated density of the soils observed within the boring locations, **Site Class "C"** is recommended.

Preliminary Pavement Recommendations

The subgrade soils located below the surficial topsoil within the project area are anticipated to consist of native sand soils. The following subgrade parameters are recommended for pavement design considerations:

AASHTO Soil Classification	Material	SSV	DGI	Subgrade Reaction Modulus, k (pci)	Resilient Modulus, M_R (psi)	CBR	Frost Index
A-2-4	I-Well Sorted	4.8	8	225	4,300	5	F-3

Note: The above parameters were estimated based upon the soil classification and boring information and were not measured in the laboratory.

Engineered fill added to raise grades must have design values at least equal to or greater than listed above. The CBR value given above has been estimated. For less conservative CBR values, PSI recommends that actual CBR tests be performed on each type of material, including the proposed base course material. Preparation of the existing ground surface and construction of the new subgrade and pavements should be in accordance with the Wisconsin Department of Transportation Standard Specifications (Standard Specifications).

If new granular base course is used for minor grade changes and replacement of existing base course, it should consist of well-graded crushed stone meeting the requirements from Section 305 of the Standard Specifications for a 1¼" dense graded base. The granular base course material should be placed and compacted to a minimum of 95% of maximum density as determined by modified Proctor (ASTM D 1557) according to Section 301.3.4.3 of the Standard Specifications. Also, a representative of a qualified geotechnical engineer must test the base course material prior to, and during, placement.

Asphaltic binder and surface courses should meet the requirements from Section 460 of the Standard Specifications. Asphaltic courses should be placed and compacted to the minimum required density contained within the above mention section. An adequate number of in-place density tests should be performed during construction to document the placement compaction.

Pavements should be sloped to provide positive surface drainage. Water should not be allowed to pond on or adjacent to the pavement as this could saturate the subgrade and cause premature pavement deterioration. The granular base course should be protected from water inflow along drainage paths. Additionally, the granular base course should extend at least one foot beyond the edges of the pavement to allow water that enters the base stone a path for exit. **PSI recommends where site grades are pitching toward the pavement edge that an edge drain be used in order to minimize additional water from entering the granular base course layer thus causing subgrade base failure and heaving. Edge drains should be sloped to the nearest storm sewer.**

PSI recommends using a fill expansion factor for the materials observed within our borings of 1.11. If the excavation below subgrade (EBS) materials are used for non-structural embankments, PSI recommends using an EBS reduction factor of 0.9.

Infiltration Characteristics of Subsurface Soils and Stormwater Pond Recommendations

Generally, the subsurface soil conditions within the borings performed for the storm water ponds consisted of Sandy Loam (SL), Loamy Sand (LS) and Sand (S) which extended to the termination depth of the borings. Field infiltration testing was not requested at the time of field exploration. However, for preliminary design purposes the following table provides estimates of design infiltration rates for different soil textures and is based on Table 2, Design Infiltration Rates for Soil Textures Receiving Storm Water, from the Site Evaluation for Storm Water Infiltration, DNR Code 1002. The infiltration rates published by the Natural Resources Conservation Service (NRCS) which are used by the DNR to determine if the soils are exempt from infiltration are also listed.

SOIL TEXTURE	DNR 1002 TABLE 2, DESIGN INFILTRATION RATE WITHOUT MEASUREMENT (IN/HOUR)	NRCS INFILTRATION RATES (IN/HOUR)
Coarse sand or coarser (COS)	3.60	>20
Loamy coarse sand (LCOS)	3.60	>20
Sand (S)	**3.60**	**>20**
Loamy sand (LS)	**1.63**	**6.3-20.0**
Sandy loam (SL)	**0.50**	**2.0-6.3**
Loam (L)	0.24	0.63-2.0
Silt loam (SIL)	0.13	0.63-2.0
Sandy clay loam (SCL)	0.11	0.63-2.0
Clay loam (CL)	0.03	0.63-2.0
Silty Clay loam (SICL)	0.04	0.63-2.0
Sandy clay (SC)	0.04	0.63-2.0
Silty clay (SIC)	0.07	0.06-0.20
Clay (C)	0.07	0.06-0.20

Based on the bottom of the ponds and rain gardens being with 8± feet of existing grade, the soils located at the bottom of the proposed ponds would be Sandy Loam (SL), Loamy Sand (LS) and Sand (S) soils. The Sandy Loam (SL), Loamy Sand (LS) and Sand (S) soils are **not** considered to be **exempt** from infiltration according to section NR151.12(5)(c)6.a of the Wisconsin Administration Code due to the infiltration rate of the soil being greater than 0.6 inches per hour. According to Table 2 of the DNR Code 1002, the design infiltration rate without measurement for a Sandy Loam and Loamy Sand soils are 0.50 and 1.63 inches per hour, respectively. The design infiltration rate without measurement for the Sand (S) soils observed in Boring K-6 to a depth of approximately 13 feet beneath existing grade is 3.60 inches per hour.

The seasonal high groundwater level is indicated by soil colorization and mottling in the soil. Based on the absence of soil mottling within the borings performed for the proposed infiltration ponds and rain gardens, the observed groundwater levels observed in Borings K-6 and K-7 are considered the seasonal high groundwater levels at depths beneath existing grade of 18 feet and 15½ feet, respectively.

According to NR 151, a minimum of a 3-foot thick layer of material that contains more than 20% fines or a minimum of a 5-foot thick layer that contains more than 10% fines must be in place between the bottom of the infiltration practice and seasonal high groundwater for the pond to be designed as an infiltration basin. If less than 3 feet or 5 feet of the material described above is between the bottom of the pond and the seasonal high groundwater level, the pond must be designed as a wet detention basin, and a liner must be installed as described in the following paragraph. The soils observed within the borings on this project have been bolded in the table. It should be noted that more accurate and possibly somewhat higher, design infiltration rates can be obtained by performing in-situ tests such as a double-ring infiltrometer test. PSI recommends that the bottom of the infiltration system be observed by a representative of a qualified geotechnical engineer at the time of construction to verify soil types.

If the ponds are designed to be detention basins, it will require a full liner in order for it to effectively hold water for an extended period of time. If a natural clay liner is used, PSI recommends that it be placed at a minimum of 2 feet in thickness and have a minimum liquid limit of 25 and plasticity index above 12. An additional 1 foot of soil should be used on top of the compacted clay liner to protect it from desiccation and plant intrusion. The fill should be placed in loose lifts not to exceed 8 inches in thickness and compacted to a minimum of 95% of the material's maximum laboratory dry density determined in accordance with ASTM D698 standard Proctor. The materials should be placed and compacted at moisture contents varying from 0 to 3% above the material's optimum moisture content determined in accordance with the above ASTM procedure.

Concerning embankment slopes, it is PSI's opinion that properly constructed slopes as steep as 2 horizontal to 1 vertical would generally be stable, but would be susceptible to erosion and difficult to maintain or construct with rubber tired mowing or grading equipment. Therefore, embankment slopes of 3 horizontal to 1 vertical or flatter are recommended.

CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI will not accept responsibility for conditions that deviated from those described in this report, nor for the performance of the foundation or pavement if we are not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather Related Concerns

Water should not be allowed to collect in the foundation excavation, on floor slab or pavement areas, or on prepared subgrades during or after construction. Areas should be sloped to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of buildings, beneath floor slabs, and within pavement areas. The

grades should be sloped away from buildings and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Control of surface water will also be critical during initial earthwork operations. As the site is filled to proposed grade, steps should be taken to control surface waters from rain events. This can be accomplished by providing adequate sloping of the surface so as to sheet drain any surface waters away from the construction areas. Temporary drainage trenches or swales could also be used to control surface waters. This will help prevent ponding and softening of fills that were previously placed and properly compacted.

Drainage and Groundwater Concerns

Groundwater was observed during drilling operations within three borings at depths ranging from 10½ to 18 feet beneath existing ground surface. Due to the mostly granular nature of the native soils in which the groundwater was observed, it is likely that the observed groundwater level is indicative of the long-term groundwater table for this site. Based upon these observations, groundwater-related problems are not anticipated for the proposed construction. If minor groundwater seepage is encountered during excavation, it is anticipated that it can be handled by simple means such as pumping from sumps or the use of perimeter trenches to collect and discharge the water away from the work area. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.

Excavations

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Utilities Trenching

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed to meet the project specifications for the engineered fill of this project. Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6 inch loose lifts and compacted to a minimum of 95 percent of the maximum dry density achieved by the modified Proctor test. The backfill soil should be moisture conditioned to be within 3± percent of the optimum moisture content as determined by the modified Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90 percent compaction criteria with respect to the modified Proctor.

Compaction testing should be performed for every 200 cubic yards of backfill placed or each lift within 200 linear feet of trench, whichever is less. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria. The geotechnical engineer can also specify a relative density specification for clean granular materials. The granular backfill material should be compacted to achieve a relative density greater than 75 percent or as specified by the geotechnical engineer for the specific material used.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools that geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free, and more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations, presented in the preceding section, constitute PSI's professional estimate of the necessary measures for the proposed structure to perform according to the proposed design based on the information generated and reference during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

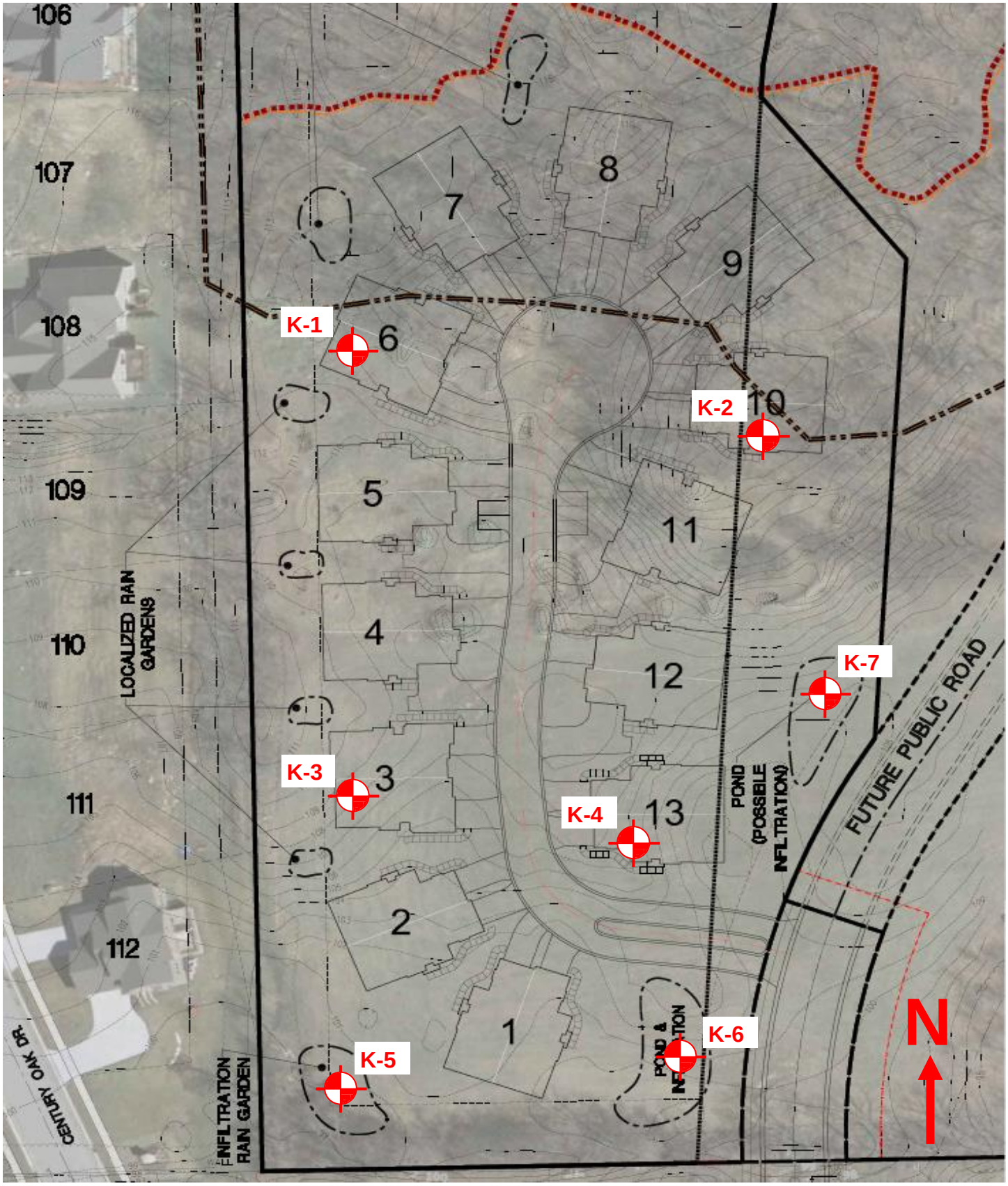
The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by others. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Bielinski Homes for the proposed Prairie Song Residential Development on the Koenig Property in Waukesha, Wisconsin.

APPENDIX

BORING LOCATION PLAN
LOG OF BORINGS
LABORATORY RESULTS
SOIL EVALUATION-STORM FORMS
USDA CLASSIFICATION CHARTS
GENERAL NOTES



psi Information To Build On Engineering • Consulting • Testing	**Project Name:** Prop. Prairie Song Development **Project Location:** Koenig Property Waukesha, Wisconsin	**Boring Location Plan**
821 Corporate Court **Waukesha, Wisconsin 53189**	**PSI Project #:** 00521251-2	

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-1

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: NW Portion of Site

WATER LEVELS
While Drilling 10.5 feet
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 113 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (5"± Thick)	OL		26	
				Brown Silty Sand With Gravel, Moist to Wet, Dense to Very Dense				
		1	10			N=50/4"	5	
110								
		2	12			7-20-12 N=32	5	
	5							
		3	6			9-25-24 N=49	4	
105								
		4	18			9-17-17 N=34	7	
	10				SM			
		5	18			14-25-25 N=50	6	
100								
		6	6			N=73/3"	6	
	15							
		7	0			N=50/2"		
95								
		8	0			N=50/2"		
	20			End of Boring at 20'				
				Cave In at 8'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/29/15
Date Boring Completed: 4/29/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-2

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: NE Portion of Site

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 123 ft

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft / STRENGTH, tsf	Additional Remarks
	0					Topsoil (3"± Thick)	OL		35		
				1	18	Brown Silty Sand With Gravel, Wet, Medium Dense to Dense	SM	9-14-14 N=28	9		
120				2	15			5-32-17 N=49	8		
	5			3	12	Light Brown Poorly Graded Sand With Rock Fragments, Dense	SP	29-29-20 N=49	2		
115				4	0	Brown Silty Sand With Gravel, Moist, Very Dense		N=50/4"	10	>>	
	10			5	2			N=50/3"	10	>>	
110				6	1		SM	N=50/2"	6	>>	
	15			7	1			N=50/2"		>>	
105				8	0			N=50/1"		>>	
	20					End of Boring at 20'					

Cave In at 8'

Moisture: 0, 25, 50
PL / LL
Qu / Qp: 0, 2.0, 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/29/15
Date Boring Completed: 4/29/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-3

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: SW Portion of Site

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 108 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (12"± Thick)	OL		29	
		1	18	Light Brown Silty Sand With Gravel, Moist, Dense to Very Dense		9-10-23 N=33	6	
105		2	18			20-22-23 N=45	6	
	5	3	8			22-34-22 N=56		
100		4	18			23-32-34 N=66	4	
	10	5	18		SM	20-25-26 N=51	7	
95		6	18			18-20-22 N=42	8	
	15	7	2			N=50/2"		
90		8	9			N=50/3"	4	
	20			End of Boring at 20'				
				Cave In at 12'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: JF
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Small ATV
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-4

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: SE Portion of Site

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 106 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (11"± Thick)	OL		21	
105		1	18	Brown Silty Sand With Gravel, Moist, Medium Dense to Very Dense		13-9-9 N=18	7	
		2	18			31-16-18 N=34	9	
	5							
100		3	10			16-20-28 N=48	3	
		4	18		SM	38-25-20 N=45	8	
	10							
95		5	3			27-31-25 N=56	9	
		6	0			N=50/1"		
	15							
90		7	18			30-28-32 N=60	8	
		8	5	Light Yellowish Brown Poorly Graded Sand With Gravel, Moist, Very Dense	SP	24-34-33 N=67		
	20			End of Boring at 20'				
				Cave In at 13'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50

STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: JF
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Small ATV
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-5

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: SWC Rain Garden

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 100 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (11"± Thick)	OL		22	
		1	7	Light Brown Silty Sand With Gravel, Moist, Dense to Medium Dense		18-15-17 N=32		
95	5	2	18			35-20-30 N=50	4	
		3	18		SM	20-22-25 N=47	4	
90	10	4	18			15-12-16 N=28	5	
		5	18	Light Brown Silty Sand, Some Gravel, Moist, Dense		11-20-19 N=39	9	
		6	18		SM	11-25-24 N=49	7	
85	15	7	18	Light Brown Poorly Graded Sand With Gravel, Trace Silt, Moist, Dense to Very Dense		17-27-30 N=57	4	>>
		8	18			20-33-25 N=58	3	>>
80	20	9	18			26-26-19 N=45	4	
		10	1		SP	N=50/1"	4	>>
75	25							
		11	3			N=96/3"	3	>>
70	30			End of Boring at 30'				
				Cave In at 10'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 30.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: JF
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Small ATV
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-6

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: SEC Infiltration Pond

WATER LEVELS
While Drilling 18 feet
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 101 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
100	0			Topsoil (11"± Thick)	OL		21	
		1	18	Brown Poorly Graded Sand, Trace Silt and Gravel, Moist, Medium Dense to Very Dense		6-6-8 N=14	5	
		2	18			12-11-14 N=25	5	
95	5	3	4		SP	25-25-20 N=45		
		4	18			10-14-11 N=25	4	
90	10	5	12			N=68/4"	3	>>
		6	18	Light Grayish Brown Poorly Graded Sand With Rock Fragments, Moist, Very Dense	SP	21-36-26 N=62	5	>>
85	15	7	18	Brown Silty Sand With Gravel, Moist to Very Moist, Very Dense to Medium Dense		20-37-40 N=77	5	>>
		8	18			25-29-26 N=55	7	>>
80	20	9	0		SM	36-20-22 N=42		
		10	8			27-11-12 N=23	3	
75	25	11	0	Light Yellowish Brown Poorly Graded Sand With Gravel, Trace Silt, Moist, Very Dense	SP	N=50/3"		>>
		12	4			N=50/4"	2	>>
	30			End of Boring at 30'				
				Cave In at 11'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50

STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 30.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: JF
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Small ATV
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING K-7

PSI Job No.: 00521251-2
Project: Proposed Prairie Song Development
Location: Koenig Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: Eastern Infiltration Pond

WATER LEVELS
While Drilling 15.5 feet
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
				Surface Elev.: 105 ft			
	0			Topsoil (6"± Thick)	OL		19
		1	18	Reddish Brown Silty Sand With Gravel, Moist, Medium Dense	SM	9-7-6 N=13	10
		2	12	Brown Coarse Gravel With Well Graded Sand, Trace Silt, Moist, Medium Dense to Dense		8-11-9 N=20	4
100	5	3	12		GPS	12-11-16 N=27	4
		4	12			11-15-17 N=32	4
95	10	5	18	Brown Silty Sand With Gravel, Moist to Wet, Dense to Medium Dense		13-15-21 N=36	7
		6	18			17-21-29 N=50	7
90	15	7	18		SM	5-10-15 N=25	10
		8	18			14-19-20 N=39	8
85	20	9	18	Dark Brown Poorly Graded Sand, Trace Gravel, Moist, Medium Dense to Dense	SP	15-18-12 N=30	6
		10	18	Light Grayish Brown Poorly Graded Sand With Rock Fragments, Moist, Dense	SM	16-15-24 N=39	4
80	25	11	12	Brown Silty Sand With Gravel, Moist, Dense to Medium Dense		13-17-20 N=37	5
		12	15		SM	15-16-21 N=37	4
75	30			End of Boring at 30'			
				Cave In at 9'			

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50

STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Additional Remarks

Completion Depth: 30.0 ft
Date Boring Started: 4/29/15
Date Boring Completed: 4/29/15
Logged By: DP
Drilling Contractor: PSI, Inc.

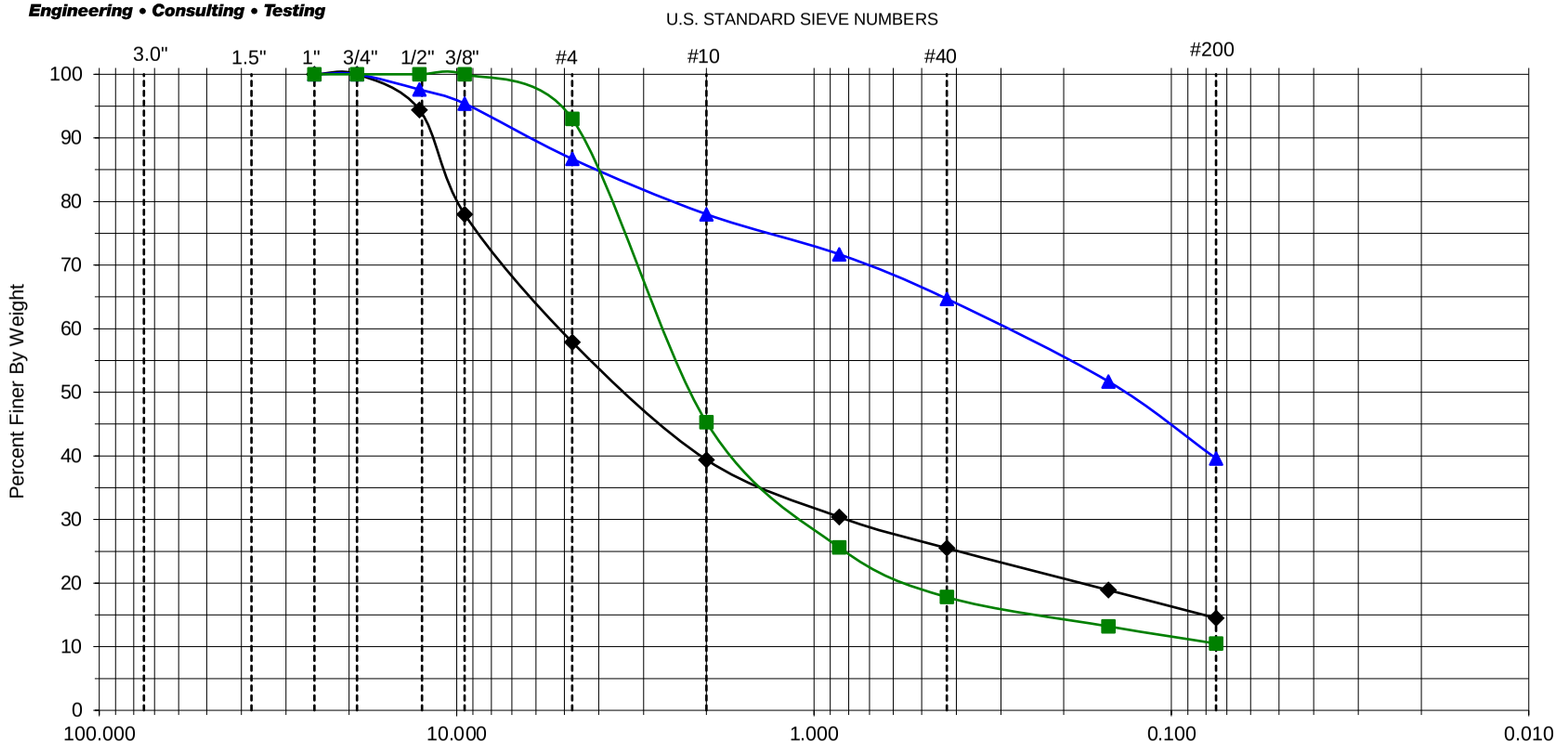
Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.018262°
Longitude: 88.295018°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Information To Build On
Engineering • Consulting • Testing

REPORT OF PARTICLE-SIZE ANALYSIS OF SOIL



ASTM Classification		
Gravel	Sand	Fines (Silt and Clay)

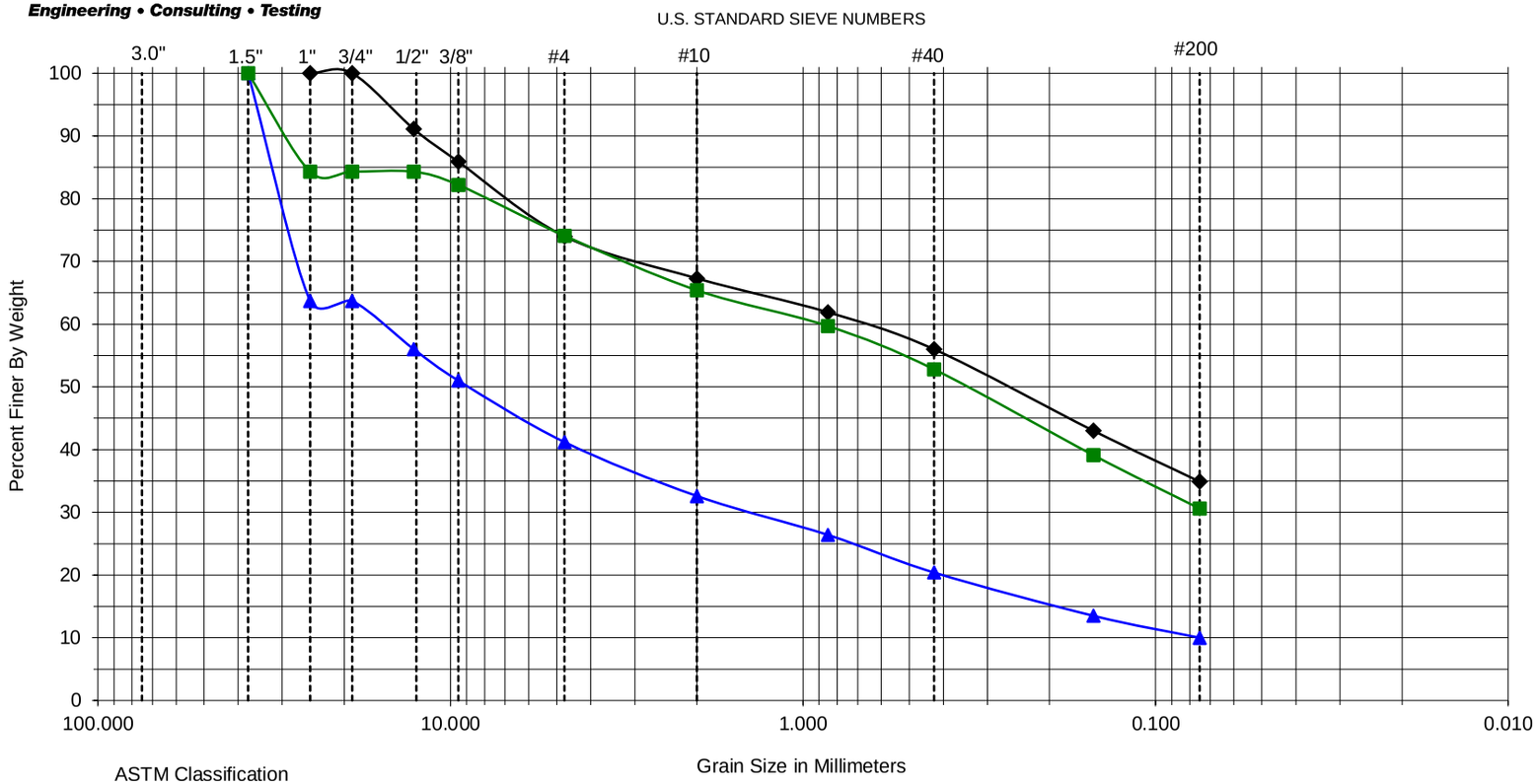
Key	Boring No.	Depth	Classification	%Gravel	%Sand	%Fines
◆	K-5	8.5-10'	Silty Sand with Gravel	42.1	43.4	14.5
▲	K-5	11-12.5'	Silty Sand, Some Gravel	13.3	47.1	39.6
■	K-6	8.5-10'	Poorly Graded Sand, Trace Silt and Gravel	7.0	82.5	10.5

Prairie Song Development - Koenig Property | File No. **00521251-2**

Professional Service Industries ● 821 Corporate Court ● Waukesha, WI 53189 ● 262-521-2125 ● 262-521-2471 (Fax)

psi Information To Build On
Engineering • Consulting • Testing

REPORT OF PARTICLE-SIZE ANALYSIS OF SOIL



ASTM Classification		
Gravel	Sand	Fines (Silt and Clay)

Key	Boring No.	Depth	Classification	%Gravel	%Sand	%Fines
◆	K-6	18.5-20'	Silty Sand with Gravel	26.0	39.1	34.9
▲	K-7	6-7.5'	Coarse Gravel with Well Graded Sand, Tace Silt	58.8	31.2	10.0
■	K-7	11-12.5'	Silty Sand with Gravel	25.9	43.5	30.6

Prairie Song Development - Koenig Property | File No. | **00521251-2**

Professional Service Industries ● 821 Corporate Court ● Waukesha, WI 53189 ● 262-521-2125 ● 262-521-2471 (Fax)

Wis. Dept. of Safety and Professional Services
Division of Safety and Buildings

SOIL EVALUATION - STORM

In accordance with SPS 382.365 and 385, Wis. Adm. Code

Attach complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not be limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and BM referenced to nearest road.

Please print all information

Personal information you provide may be used for secondary purposes (Privacy Law, s. 15.04 (1) (m).

County	
Waukesha	
Parcel I.D.	
Reviewed by	Date

Property Owner	Property Location ____ 1/4 S ____ T ____ N R ____ E		
Property Owner's Mailing Address	Lot #	Block #	Subd. Name or CSM#
City / State / Zip Code / Phone Number ( )	☒ City ☐ Village ☐ Town Waukesha		Nearest Road Prairie Song Drive

Drainage area _____ ☐ sq. ft. ☐ acres
Optional:
Test Site Suitable for (check all that apply)

☐ Irrigation ☐ Bioretention trench ☐ Trench(es)
☐ Rain garden ☐ Infiltration Pond ☐ Reuse
☐ infiltration trench ☐ Retention Pond ☐ Other _____

Hydraulic Application Test Method:

☒ Morphological Evaluation
☐ Double-Ring Infiltrometer
☐ Other (specify) _____

K-5 Obs. # ☒ Boring ☐ Pit Ground surface elev. 100 Depth to limiting factor ___ in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate Inches/Hr
A	11	10YR3/3	NONE	C	3,CO	MFR	A	---	0.07
C	126	10YR5/4	NONE	LS	0,M,SG	ML	G	25	1.63
C	186	10YR5/4	NONE	SL	0,M,SG	ML	G	25	0.50
C	360	10YR5/4	NONE	LS	0,M,SG	ML	G	30	1.63

K-6 Obs. # ☒ Boring ☐ Pit Ground surface elev. 101 Depth to limiting factor ___ in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate Inches/Hr
A	11	10YR2/2	NONE	C	3,CO	MFR	A	---	0.07
C	156	10YR5/8	NONE	S	0,M,SG	ML	G	20	3.60
C	186	10YR7/2	NONE	LS	O,M,SG	ML	G	40	1.63
C	306	10YR5/4	NONE	SL	0,M,SG	ML	G	20	0.50
C	360	10YR7/3	NONE	LS	0,M,SG	ML	G	30	1.63

CST/PSS Name (Please Print)	Signature	CST/PSS Number
Timothy M. Leonard, E.I.T.		1263311
Address	**Date Evaluation Conducted**	**Telephone Number**
821 Corporate Court, Waukesha, Wisconsin 53189	5/18/2015	262-521-2125

Wis. Dept. of Safety and Professional Services
Division of Safety and Buildings

SOIL EVALUATION - STORM

In accordance with SPS 382.365 and 385, Wis. Adm. Code

Attach complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not be limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and BM referenced to nearest road.

Please print all information

Personal information you provide may be used for secondary purposes (Privacy Law, s. 15.04 (1) (m).

County Waukesha	
Parcel I.D.	
Reviewed by	Date

Property Owner	Property Location ____ 1/4 S ____ T ____ N R ____ E		
Property Owner's Mailing Address	Lot #	Block #	Subd. Name or CSM#
City / State / Zip Code / Phone Number ( )	☒ City ☐ Village ☐ Town Waukesha		Nearest Road Prairie Song Drive

Drainage area _____ ☐ sq. ft. ☐ acres
Optional:
Test Site Suitable for (check all that apply)

☐ Irrigation ☐ Bioretention trench ☐ Trench(es)
☐ Rain garden ☐ Infiltration Pond ☐ Reuse
☐ infiltration trench ☐ Retention Pond ☐ Other _____

Hydraulic Application Test Method:

☒ Morphological Evaluation
☐ Double-Ring Infiltrometer
☐ Other (specify) _____

K-7 Obs. #

☒ Boring
☐ Pit

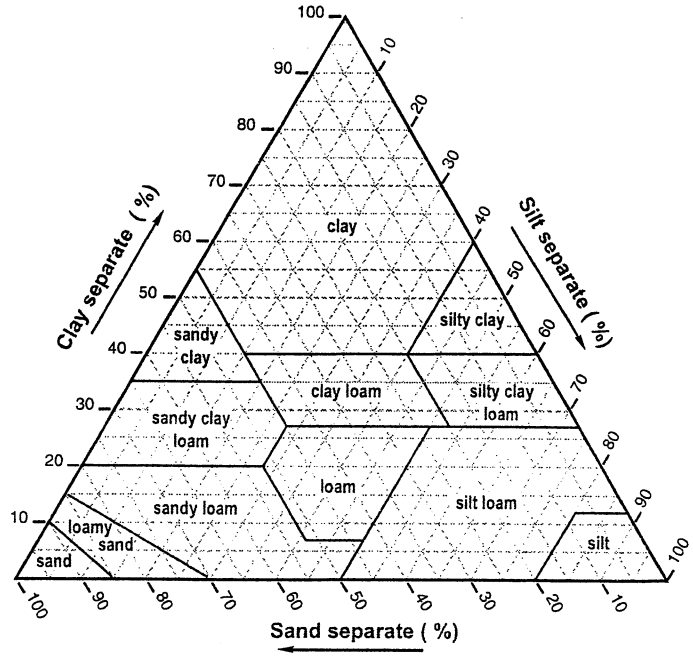
Ground surface elev. 105 Depth to limiting factor ___ in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate Inches/Hr
A	6	10YR3/3	NONE	C	3,CO	MFR	A	---	0.07
C	36	10YR4/4	NONE	LS	0,M,SG	ML	G	5	1.63
C	126	10YR4/4	NONE	LS	0,M,SG	ML	G	55	1.63
C	246	10YR5/4	NONE	SL	0,M,SG	ML	G	20	0.50
C	276	10YR3/3	NONE	LS	0,M,SG	ML	G	5	1.63
C	306	10YR7/2	NONE	S	0,M,SG	ML	G	30	3.60
C	360	10YR5/3	NONE	SL	0,M,SG	ML	G	20	0.50

CST/PSS Name (Please Print)	Signature	CST/PSS Number
Timothy M. Leonard, E.I.T.		1263311
Address	Date Evaluation Conducted	Telephone Number
821 Corporate Court, Waukesha, Wisconsin 53189	5/18/2015	262-521-2125

Texture Triangle:

Fine Earth Texture Classes (——)



TEXTURE MODIFIERS - Conventions for using "Rock Fragment Texture Modifiers" and for using textural adjectives that convey the "% volume" ranges for **Rock Fragments - Size and Quantity**.

Fragment Content % By Volume	Rock Fragment Modifier Usage
< 15	No texture adjective is used (noun only; e.g., *loam*).
15 to < 35	Use adjective for appropriate size; e.g., *gravelly.*
35 to < 60	Use "very" with the appropriate size adjective; e.g., *very gravelly.*
60 to < 90	Use "extremely" with the appropriate size adjective; e.g., *extremely gravelly.*
≥ 90	No adjective or modifier. If ≤ 10% fine earth, use the appropriate noun for the dominant size class; e.g., *gravel.* Use **Terms in Lieu of Texture.**

(SOIL) TEXTURE

This is the numerical proportion (percent by weight) of sand, silt, and clay in a soil. Sand, silt, and clay content is estimated in the field by hand (or quantitatively measured in the office/lab by hydrometer or pipette) and then placed within the texture triangle to determine **Texture Class**. Estimate the **Texture Class**; e.g., *sandy loam*; or **Subclass**; e.g., *fine sandy loam* of the fine earth (≤ 2 mm) fraction, or choose a **Term in Lieu of Texture**; e.g., *gravel.* If appropriate, use a **Textural Class Modifier**; e.g., *gravelly silt loam.*

NOTE: **Soil Texture** encompasses only the fine earth fraction (≤ 2 mm). **Particle Size Distribution** (PSD) encompasses the whole soil, including both the fine earth fraction (≤ 2 mm; weight %) and rock fragments (> 2 mm; volume %).

TEXTURE CLASS

Texture Class or Subclass	Code	
	Conv.	NASIS
Coarse Sand	cos	COS
Sand	s	S
Fine Sand	fs	FS
Very Fine Sand	vfs	VFS
Loamy Coarse Sand	lcos	LCOS
Loamy Sand	ls	LS
Loamy Fine Sand	lfs	LFS
Loamy Very Fine Sand	lvfs	LVFS
Coarse Sandy Loam	cosl	COSL
Sandy Loam	sl	SL
Fine Sandy Loam	fsl	FSL
Very Fine Sandy Loam	vfsl	VFSL
Loam	l	L
Silt Loam	sil	SIL
Silt	si	SI
Sandy Clay Loam	scl	SCL
Clay Loam	cl	CL
Silty Clay Loam	sicl	SICL
Sandy Clay	sc	SC
Silty Clay	sic	SIC
Clay	c	C

TEXTURE MODIFIERS - *(adjectives)*

ROCK FRAGMENTS: Size & Quantity [1]	Code		Criteria: Percent (By Volume) of Total Rock Fragments and Dominated By (*name size*): [1]
	Conv.	PDP/ NASIS	
ROCK FRAGMENTS (> 2 mm; ≥ Strongly Cemented)			
Gravelly	GR	GR	≥ 15% but < 35% gravel
Fine Gravelly	FGR	GRF	≥15% but < 35% fine gravel
Medium Gravelly	MGR	GRM	≥15% but < 35% med. gravel
Coarse Gravelly	CGR	GRC	≥ 15% but < 35% coarse gravel
Very Gravelly	VGR	GRV	≥ 35% but < 60% gravel
Extremely Gravelly	XGR	GRX	≥ 60% but < 90% gravel
Cobbly	CB	CB	≥ 15% but < 35% cobbles
Very Cobbly	VCB	CBV	≥ 35% but < 60% cobbles
Extremely Cobbly	XCB	CBX	≥ 60% but < 90% cobbles
Stony	ST	ST	≥ 15% but < 35% stones
Very Stony	VST	STV	≥ 35% but < 60% stones
Extremely Stony	XST	STX	≥ 60% but < 90% stones
Bouldery	BY	BY	≥ 15% but < 35% boulders
Very Bouldery	VBY	BYV	≥ 35% but < 60% boulders
Extremely Bouldery	XBY	BYX	≥ 60% but < 90% boulders
Channery	CN	CN	≥ 15% but < 35% channers
Very Channery	VCN	CNV	≥ 35% but < 60% channers
Extremely Channery	XCN	CNX	≥ 60% but < 90% channers
Flaggy	FL	FL	≥ 15% but < 35% flagstones
Very Flaggy	VFL	FLV	≥ 35% but < 60% flagstones
Extremely Flaggy	XFL	FLX	≥ 60% but < 90% flagstones
PARAROCK FRAGMENTS (> 2 mm; < Strongly Cemented) [2, 3]			
Parabouldery	PBY	PBY	(same criteria as bouldery)
Very Parabouldery	VPBY	PBYV	(same criteria as very bouldery)
Extr. Parabouldery	XPBY	PBYX	(same criteria as ext. bouldery)
etc.	etc.	etc.	(same criteria as non-para)

[1] The "Quantity" modifier (e.g., *very*) is based on the total rock fragment content. The "Size" modifier (e.g., *cobbly*) is independently based on the largest, dominant fragment size. For a mixture of sizes (e.g., *gravel and stones*), a smaller size–class is named only if its quantity (%) sufficiently exceeds that of a larger size–class. For field texture determination, a smaller size-class must exceed 2 times the quantity (vol. %) of a larger size class before it is named (e.g., 30% gravel and 14% stones = *very gravelly*, but 20% gravel and 14% stones = *stony*). For more explicit naming criteria see NSSH-Part 618, Exhibit 618.11(Soil Survey Staff, 2001b).

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,⧩ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

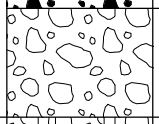
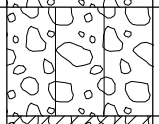
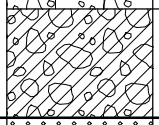
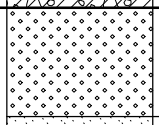
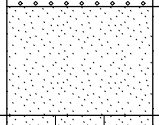
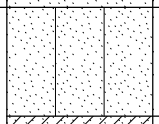
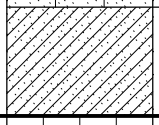
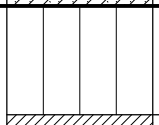
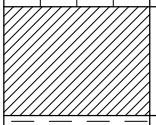
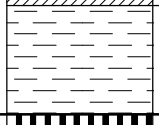
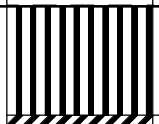
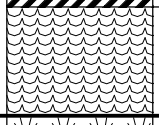
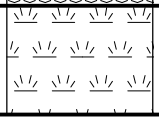
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

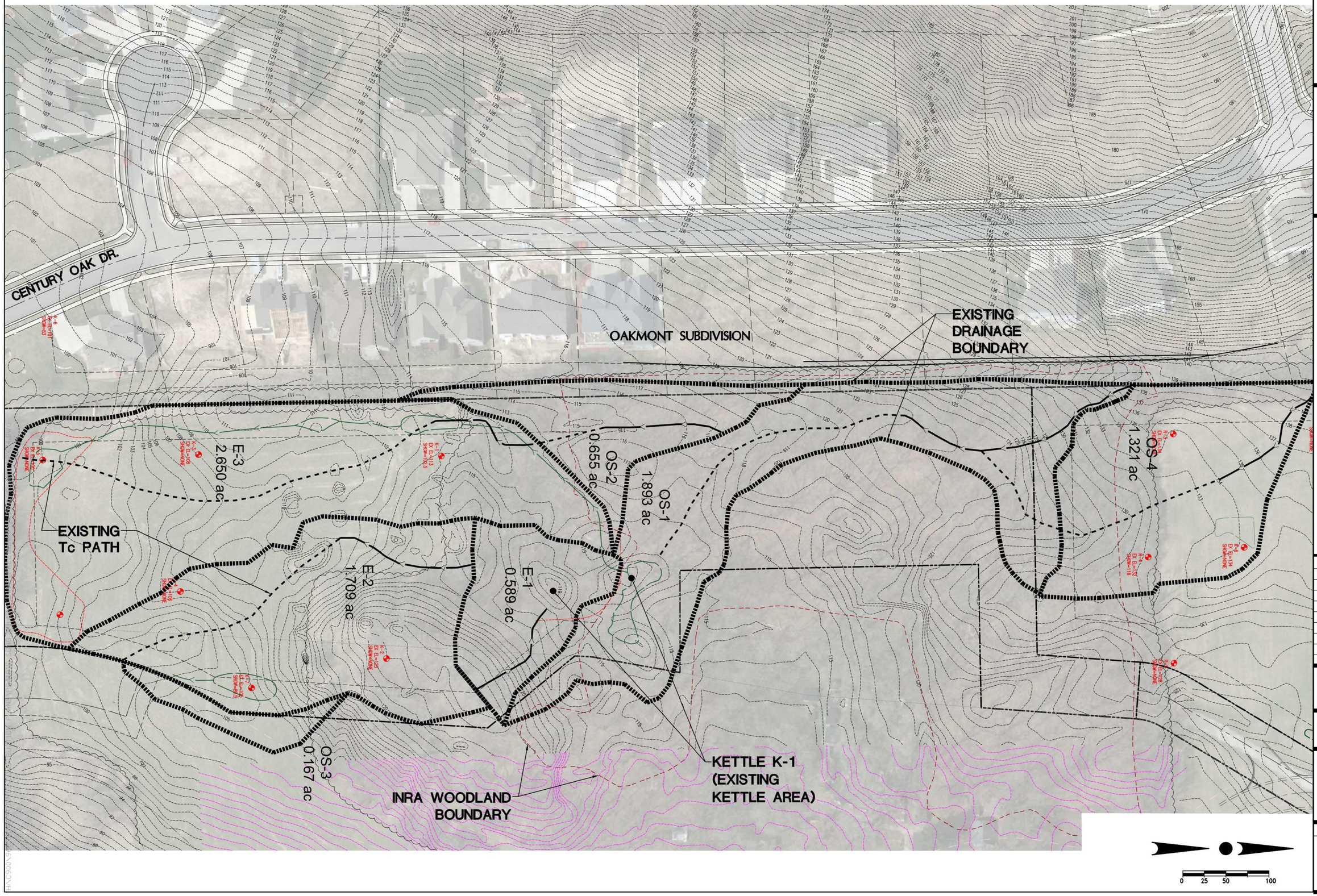
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

psi

APPENDIX 2

Existing & Proposed Drainage Area Maps



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PRAIRIE SONG VILLAS
CITY OF WAUKESHA, WISCONSIN
BY: BIELINSKI COMMERCIAL, LLC.
1830 MEADOW LN, SUITE A
PEWAUKEE, WI 53072

REVISION HISTORY

DATE	DESCRIPTION
11/08/19	CITY SUBMITTAL

DATE:
NOVEMBER 8, 2019

JOB NUMBER:
01006

DESCRIPTION:
EXISTING DRAINAGE MAP

SHEET
D1.0

CENTURY OAK DR.

RAIN GARDEN RG-3

RAIN GARDEN RG-2

OAKMONT SUBDIVISION

PROPOSED DRAINAGE BOUNDARY

FUTURE PRAIRIE SONGS COURTYARDS DEVELOPMENT (FOR REFERENCE ONLY)

PROPOSED SHEET FLOW Tc PATH (TYP.)

PROPOSED CONCENTRATED FLOW Tc PATH (TYP.)

PROPOSED KETTLE K-1

INRA WOODLAND BOUNDARY

WET POND P-5

RAIN GARDEN RG-4

FUTURE PUBLIC ROAD

P-5 2.853 ac

P-3 0.270 ac

P-2 0.562 ac

P-4 0.982 ac

P-1 0.281 ac

OS-1 1.893 ac

OS-2 0.655 ac

OS-3 0.167 ac

OS-4 1.321 ac

0 25 50 100

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DATE	DESCRIPTION
11/08/19	CITY SUBMITTAL

DATE:
NOVEMBER 8, 2019

JOB NUMBER:
01006

DESCRIPTION:
PROPOSED DRAINAGE MAP

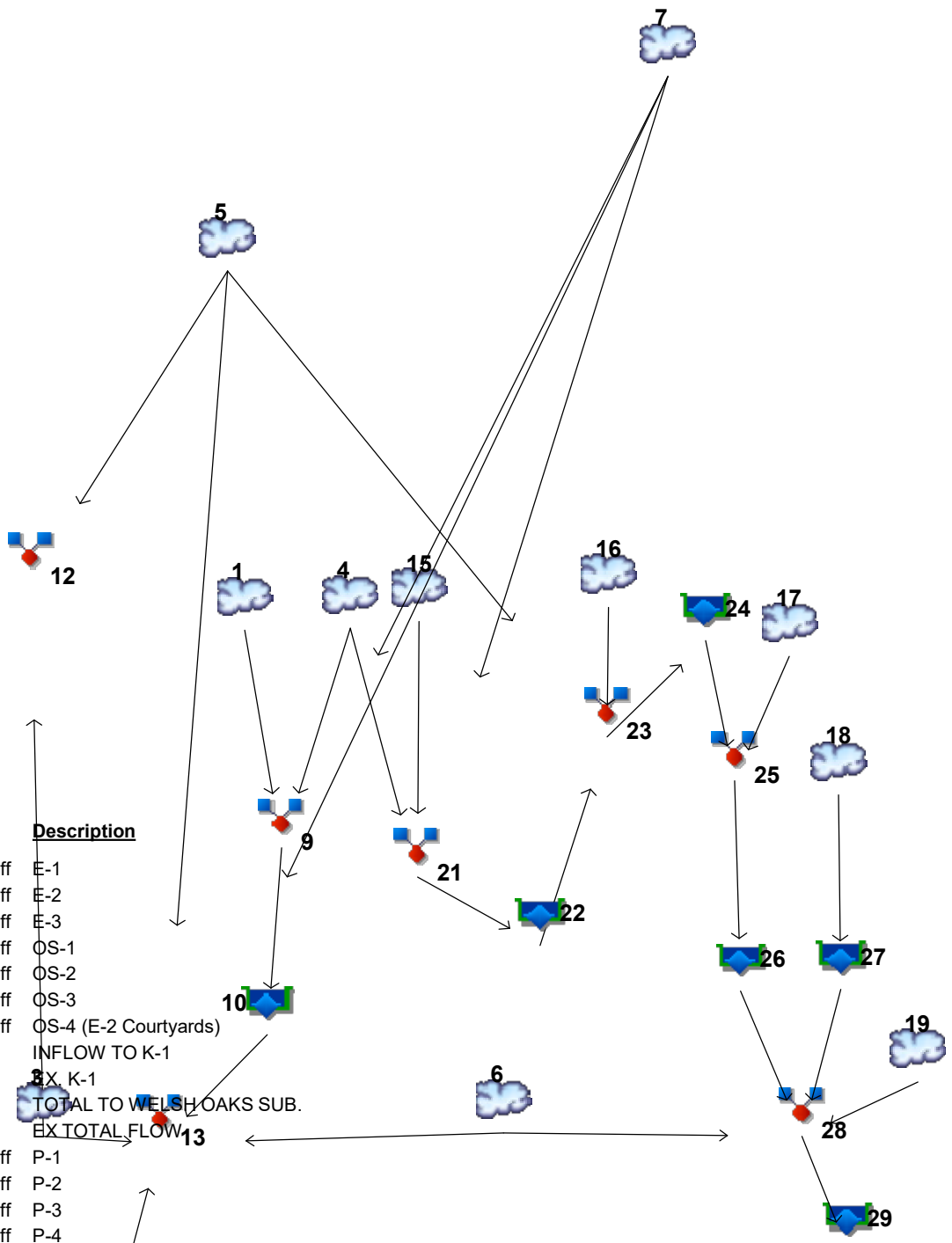
SHEET
D1.1

APPENDIX 3

Hydraflow Calculations

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	E-1
2	SCS Runoff	E-2
3	SCS Runoff	E-3
4	SCS Runoff	OS-1
5	SCS Runoff	OS-2
6	SCS Runoff	OS-3
7	SCS Runoff	OS-4 (E-2 Courtyards)
9	Combine	INFLOW TO K-1
10	Reservoir	EX. K-1
12	Combine	TOTAL TO WELSH OAKS SUB.
13	Combine	EX TOTAL FLOW
15	SCS Runoff	P-1
16	SCS Runoff	P-2
17	SCS Runoff	P-3
18	SCS Runoff	P-4
19	SCS Runoff	P-5
21	Combine	Inflow to PR K-1
22	Reservoir	PR K-1
23	Combine	Inflow to RG-2
24	Reservoir	RG-2
25	Combine	Inflow to RG-3
26	Reservoir	RG-3
27	Reservoir	RG-4
28	Combine	Inflow to P-5
29	Reservoir	P-6 (Total Discharge)

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	0.406	0.540	-------	-------	1.094	-------	-------	2.448	E-1
2	SCS Runoff	------	1.277	1.661	-------	-------	3.231	-------	-------	6.961	E-2
3	SCS Runoff	------	1.152	1.560	-------	-------	3.304	-------	-------	7.610	E-3
4	SCS Runoff	------	0.100	0.192	-------	-------	0.784	-------	-------	2.897	OS-1
5	SCS Runoff	------	0.010	0.025	-------	-------	0.173	-------	-------	0.848	OS-2
6	SCS Runoff	------	0.169	0.219	-------	-------	0.420	-------	-------	0.905	OS-3
7	SCS Runoff	------	0.492	0.730	-------	-------	1.795	-------	-------	4.564	OS-4 (E-2 Courtyards)
9	Combine	1, 4, 7,	0.914	1.326	-------	-------	3.278	-------	-------	8.904	INFLOW TO K-1
10	Reservoir	9	0.000	0.000	-------	-------	0.105	-------	-------	4.387	EX. K-1
12	Combine	3, 5,	1.153	1.572	-------	-------	3.466	-------	-------	8.457	TOTAL TO WELSH OAKS SUB.
13	Combine	2, 3, 5, 6, 7, 10,	2.816	3.794	-------	-------	8.088	-------	-------	19.16	EX TOTAL FLOW
15	SCS Runoff	------	0.341	0.419	-------	-------	0.728	-------	-------	1.418	P-1
16	SCS Runoff	------	0.424	0.561	-------	-------	1.130	-------	-------	2.532	P-2
17	SCS Runoff	------	0.246	0.307	-------	-------	0.552	-------	-------	1.114	P-3
18	SCS Runoff	------	0.976	1.221	-------	-------	2.190	-------	-------	4.414	P-4
19	SCS Runoff	------	3.506	4.226	-------	-------	7.003	-------	-------	13.05	P-5
21	Combine	4, 7, 15,	0.849	1.205	-------	-------	2.907	-------	-------	7.869	Inflow to PR K-1
22	Reservoir	21	0.000	0.000	-------	-------	0.000	-------	-------	3.154	PR K-1
23	Combine	5, 16, 22	0.424	0.563	-------	-------	1.198	-------	-------	4.059	Inflow to RG-2
24	Reservoir	23	0.051	0.113	-------	-------	0.867	-------	-------	4.008	RG-2
25	Combine	17, 24	0.246	0.307	-------	-------	1.400	-------	-------	4.271	Inflow to RG-3
26	Reservoir	25	0.188	0.273	-------	-------	1.379	-------	-------	4.267	RG-3
27	Reservoir	18	0.566	0.920	-------	-------	2.081	-------	-------	4.310	RG-4
28	Combine	6, 19, 26, 27	3.621	5.027	-------	-------	10.58	-------	-------	21.94	Inflow to P-5
29	Reservoir	28	0.825	1.543	-------	-------	3.422	-------	-------	7.797	P-6 (Total Discharge)

Hydrograph Summary Report

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

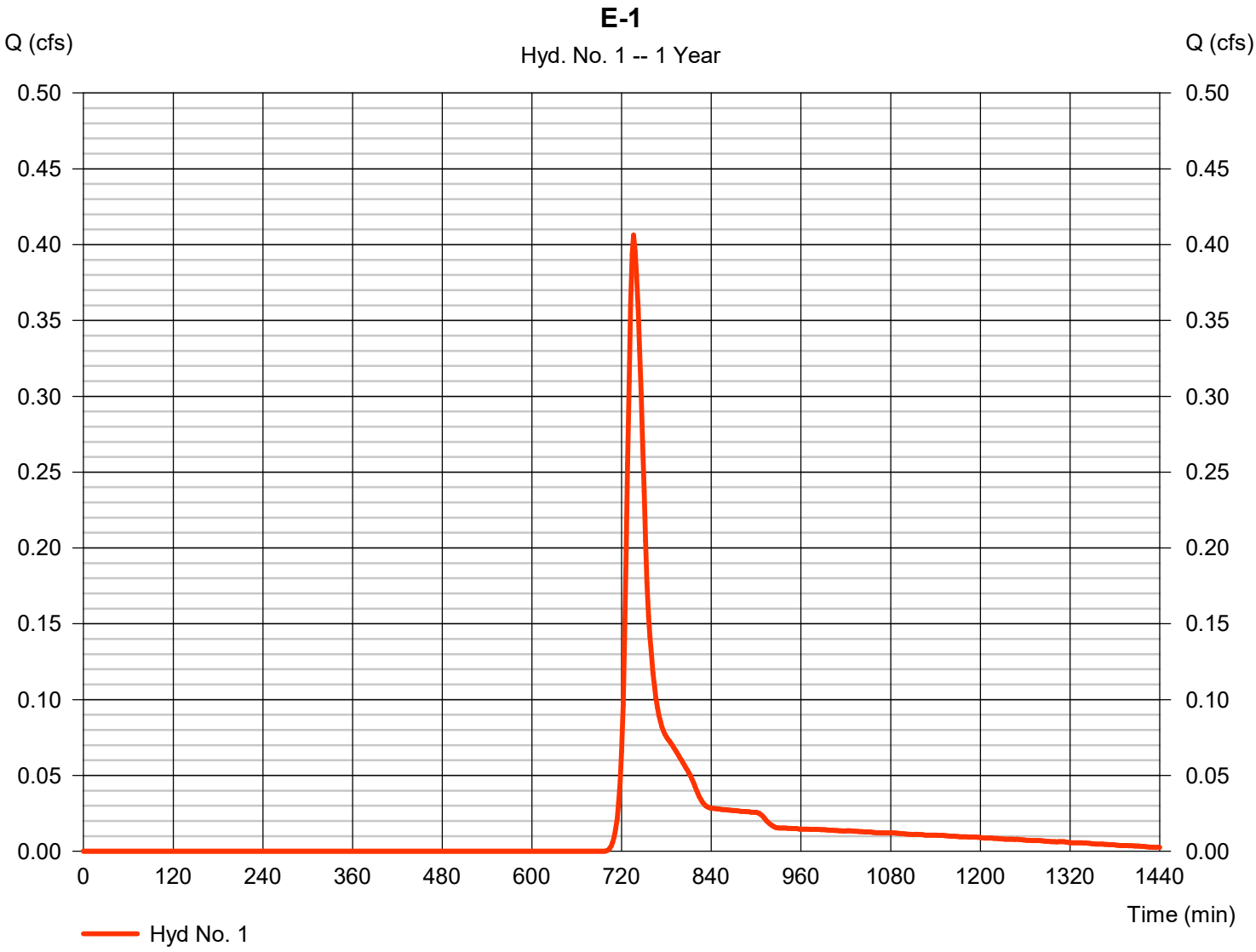
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.406	2	736	1,357	------	------	------	E-1
2	SCS Runoff	1.277	2	738	4,571	------	------	------	E-2
3	SCS Runoff	1.152	2	748	5,639	------	------	------	E-3
4	SCS Runoff	0.100	2	770	1,009	------	------	------	OS-1
5	SCS Runoff	0.010	2	798	157	------	------	------	OS-2
6	SCS Runoff	0.169	2	732	453	------	------	------	OS-3
7	SCS Runoff	0.492	2	738	1,958	------	------	------	OS-4 (E-2 Courtyards)
9	Combine	0.914	2	736	4,325	1, 4, 7,	------	------	INFLOW TO K-1
10	Reservoir	0.000	2	944	0	9	112.13	3,932	EX. K-1
12	Combine	1.153	2	748	5,796	3, 5,	------	------	TOTAL TO WELSH OAKS SUB.
13	Combine	2.816	2	742	12,778	2, 3, 5, 6, 7, 10,	------	------	EX TOTAL FLOW
15	SCS Runoff	0.341	2	736	1,060	------	------	------	P-1
16	SCS Runoff	0.424	2	734	1,263	------	------	------	P-2
17	SCS Runoff	0.246	2	740	893	------	------	------	P-3
18	SCS Runoff	0.976	2	738	3,357	------	------	------	P-4
19	SCS Runoff	3.506	2	740	12,518	------	------	------	P-5
21	Combine	0.849	2	736	4,027	4, 7, 15,	------	------	Inflow to PR K-1
22	Reservoir	0.000	2	772	0	21	111.02	2,775	PR K-1
23	Combine	0.424	2	734	1,420	5, 16, 22	------	------	Inflow to RG-2
24	Reservoir	0.051	2	810	487	23	110.02	756	RG-2
25	Combine	0.246	2	740	1,379	17, 24	------	------	Inflow to RG-3
26	Reservoir	0.188	2	750	995	25	109.02	317	RG-3
27	Reservoir	0.566	2	754	1,987	18	102.19	1,314	RG-4
28	Combine	3.621	2	738	15,952	6, 19, 26, 27	------	------	Inflow to P-5
29	Reservoir	0.825	2	786	14,800	28	94.88	7,690	P-6 (Total Discharge)

Hydrograph Report

Hyd. No. 1

E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.406 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	1,357 cuft
Drainage area	=	0.589 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.00 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 1

E-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 135.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 8.10		0.00		0.00		
Travel Time (min)	**= 16.99**	**+**	**0.00**	**+**	**0.00**	**=**	**16.99**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

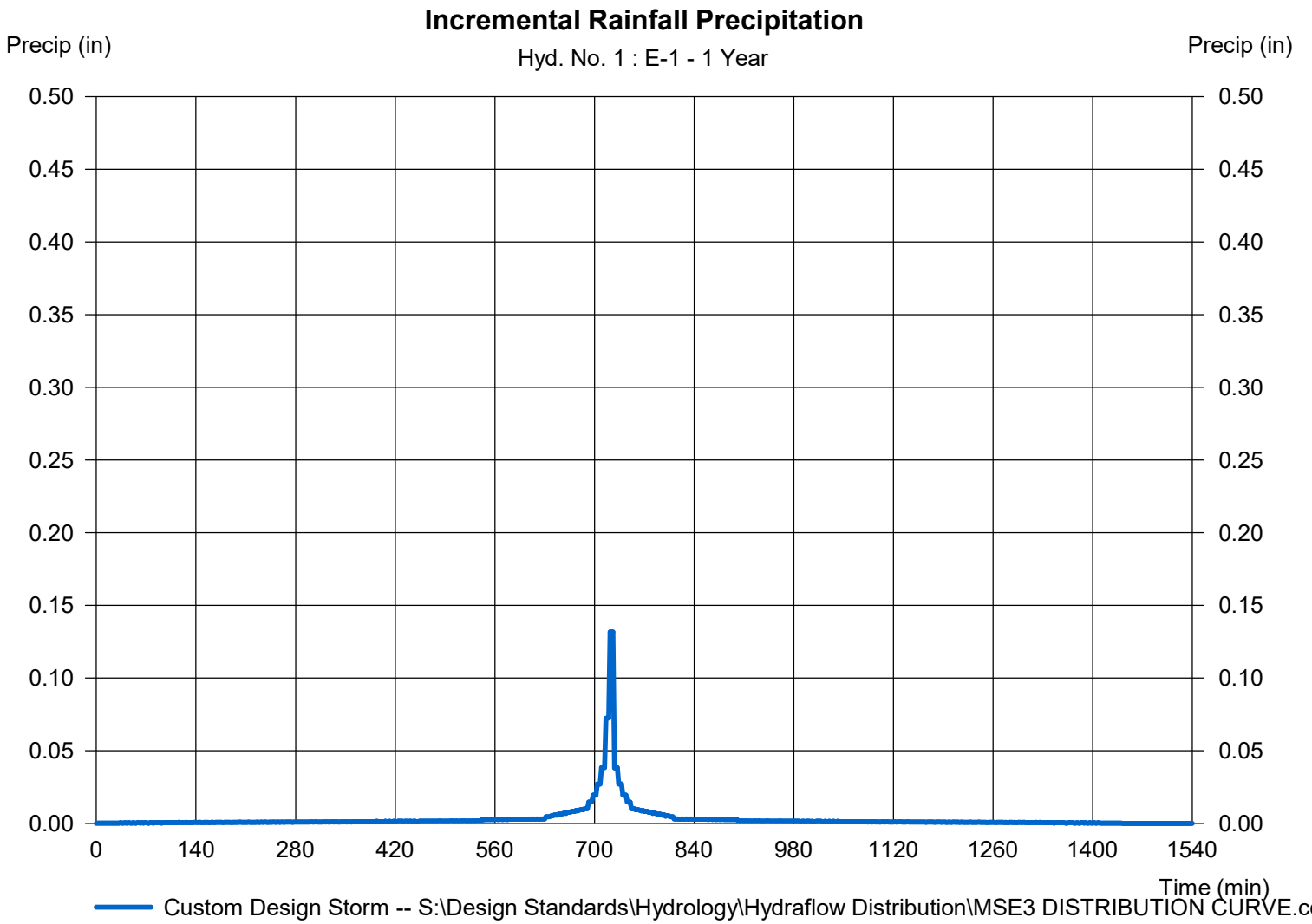
Total Travel Time, Tc ..... 17.00 min

Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



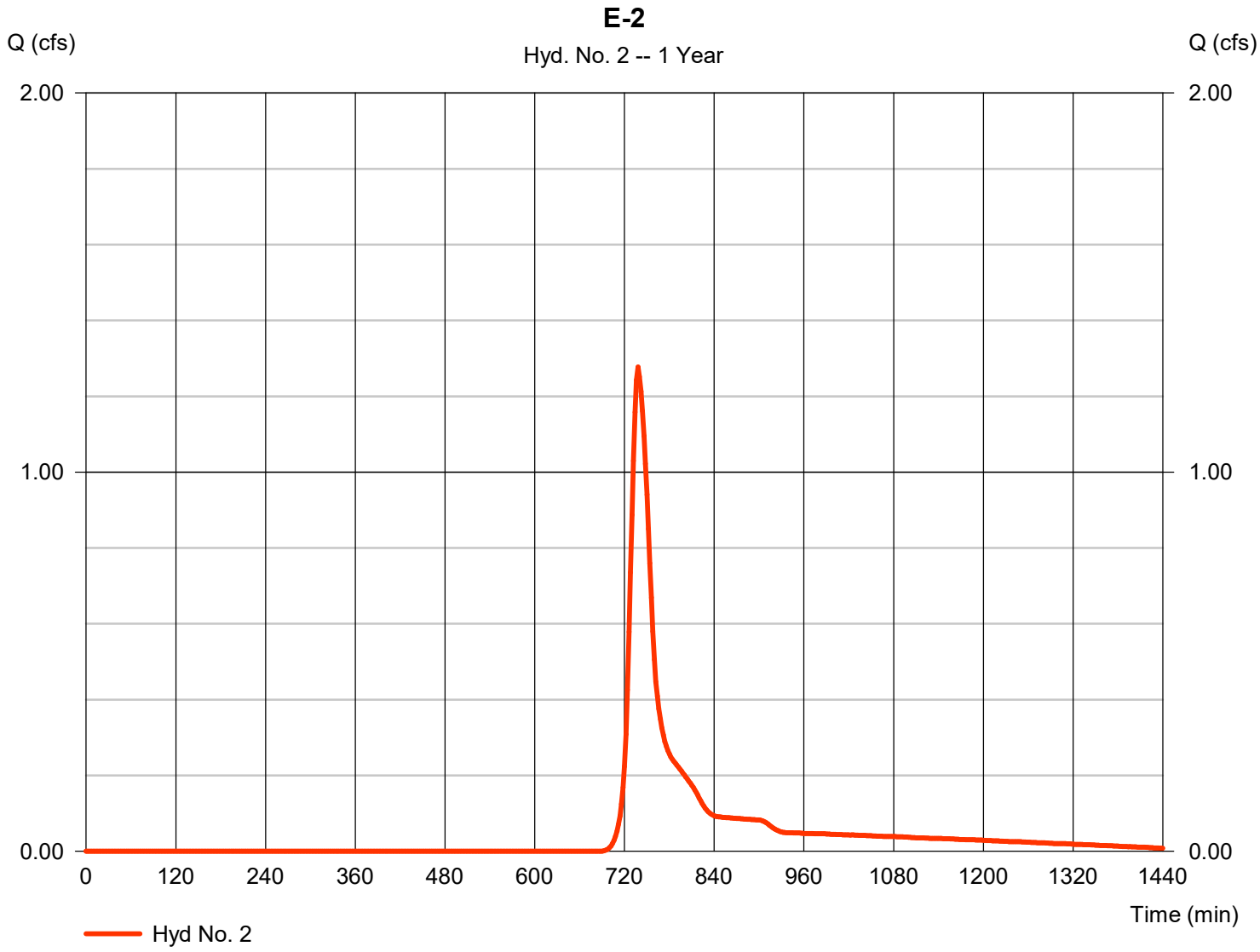
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 2

E-2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.277 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 4,571 cuft
Drainage area	= 1.709 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 2

E-2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.240		0.011		
Flow length (ft)	= 55.0		105.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 4.50		5.70		0.00		
Travel Time (min)	**= 10.48**	**+**	**10.63**	**+**	**0.00**	**=**	**21.10**
Shallow Concentrated Flow							
Flow length (ft)	= 300.00		0.00		0.00		
Watercourse slope (%)	= 2.50		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.55		0.00		0.00		
Travel Time (min)	**= 1.96**	**+**	**0.00**	**+**	**0.00**	**=**	**1.96**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

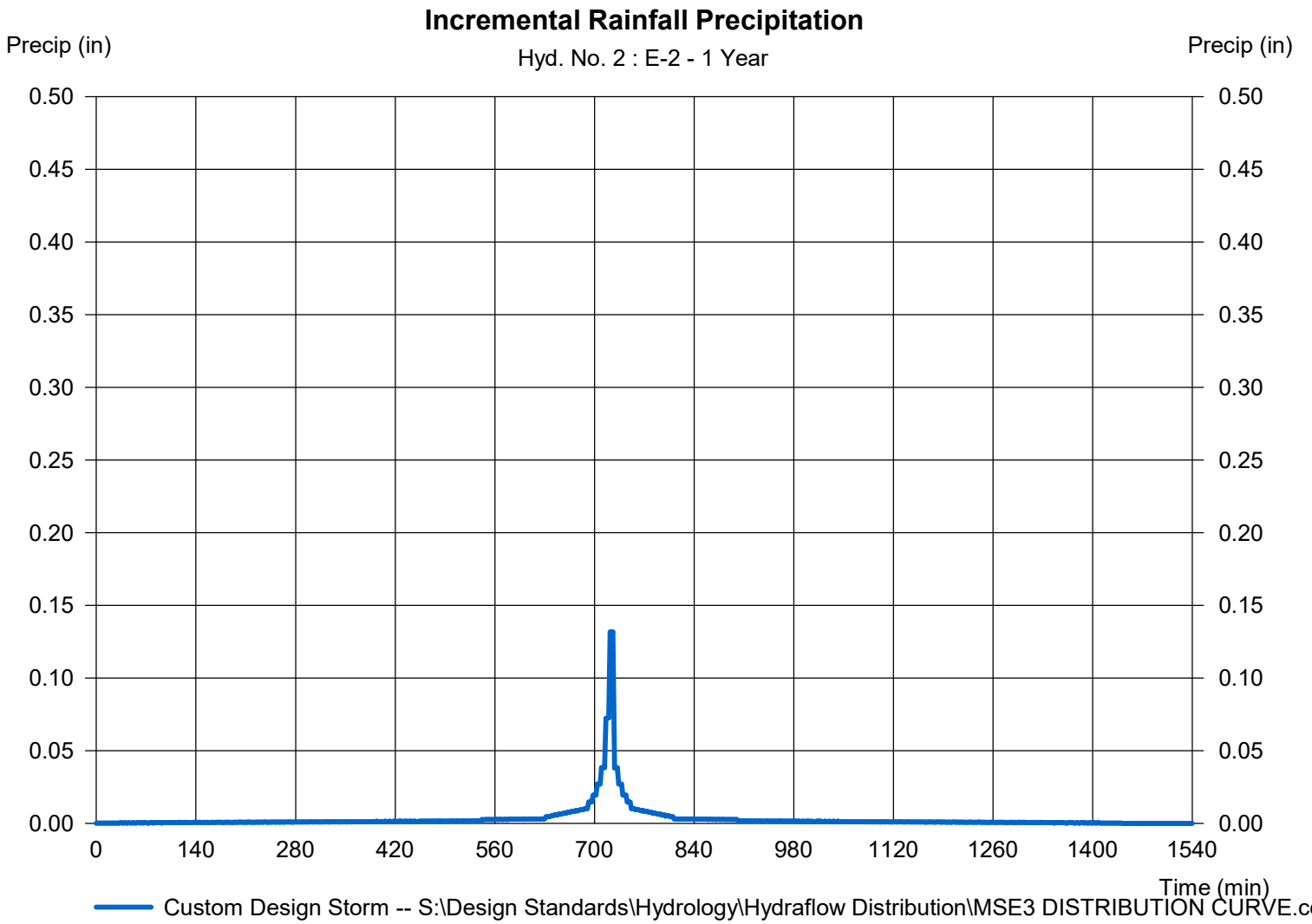
Total Travel Time, Tc ..... 23.10 min

Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



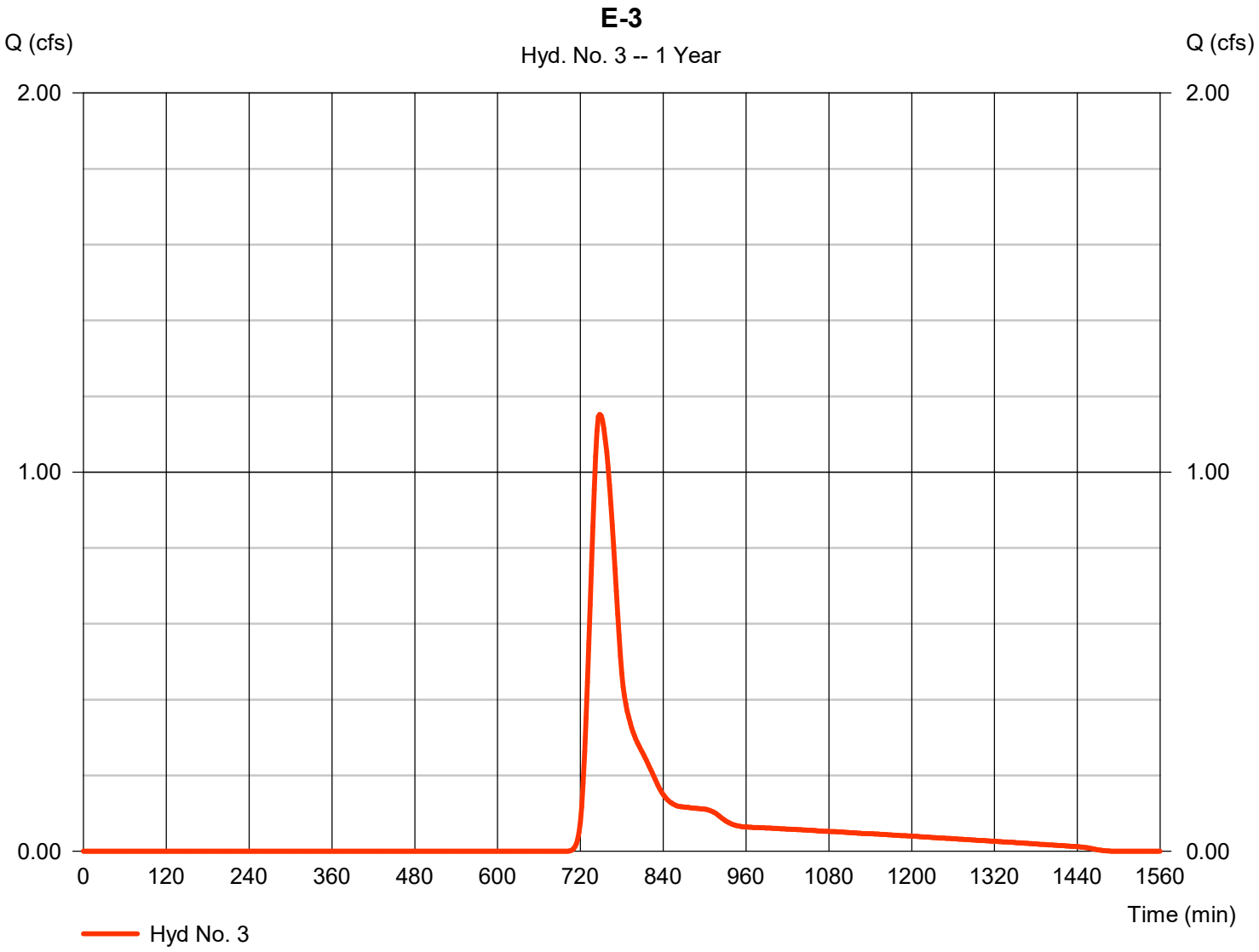
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 3

E-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.152 cfs
Storm frequency	= 1 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 5,639 cuft
Drainage area	= 2.650 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.90 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 3

E-3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.240		0.011		
Flow length (ft)	= 61.0		67.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 1.25		1.25		0.00		
Travel Time (min)	**= 19.00**	**+**	**13.61**	**+**	**0.00**	**=**	**32.61**
Shallow Concentrated Flow							
Flow length (ft)	= 510.00		0.00		0.00		
Watercourse slope (%)	= 2.50		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.55		0.00		0.00		
Travel Time (min)	**= 3.33**	**+**	**0.00**	**+**	**0.00**	**=**	**3.33**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

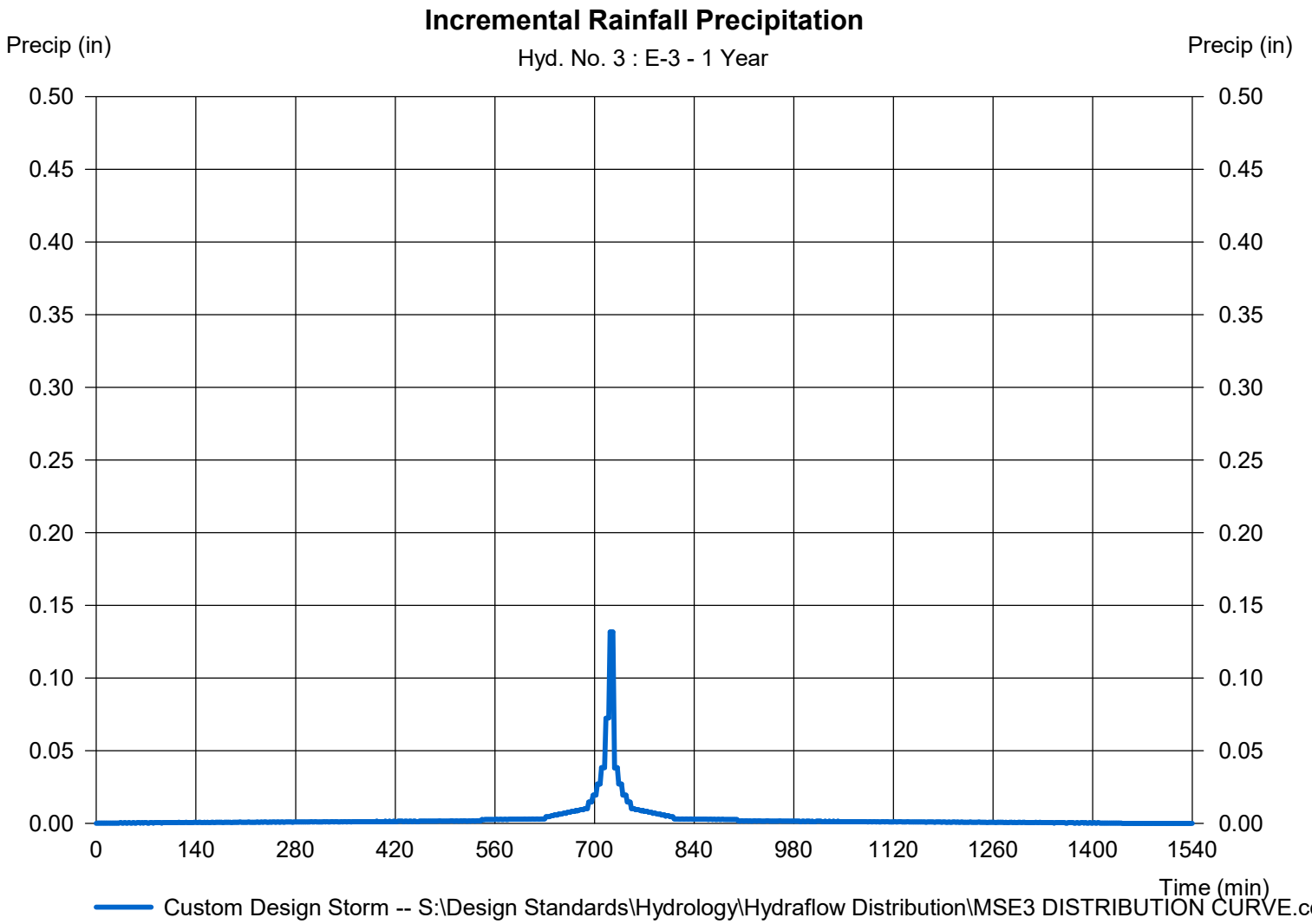
Total Travel Time, Tc ..... 35.90 min

Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



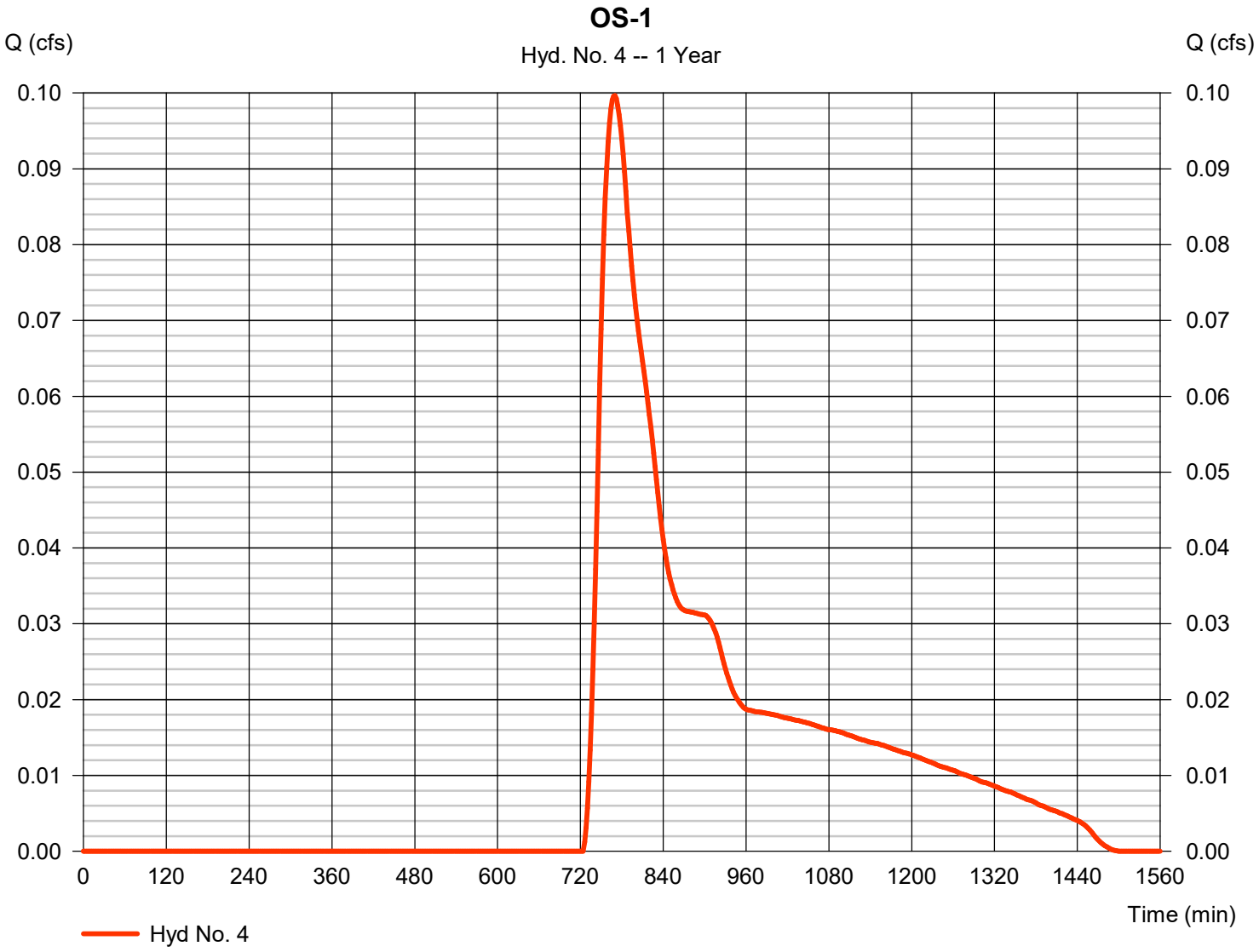
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 4

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.100 cfs
Storm frequency	= 1 yrs	Time to peak	= 770 min
Time interval	= 2 min	Hyd. volume	= 1,009 cuft
Drainage area	= 1.893 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 40.30 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 4

OS-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 300.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 5.33		0.00		0.00		
Travel Time (min)	**= 38.04**	**+**	**0.00**	**+**	**0.00**	**=**	**38.04**
Shallow Concentrated Flow							
Flow length (ft)	= 355.00		0.00		0.00		
Watercourse slope (%)	= 2.53		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.57		0.00		0.00		
Travel Time (min)	**= 2.31**	**+**	**0.00**	**+**	**0.00**	**=**	**2.31**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

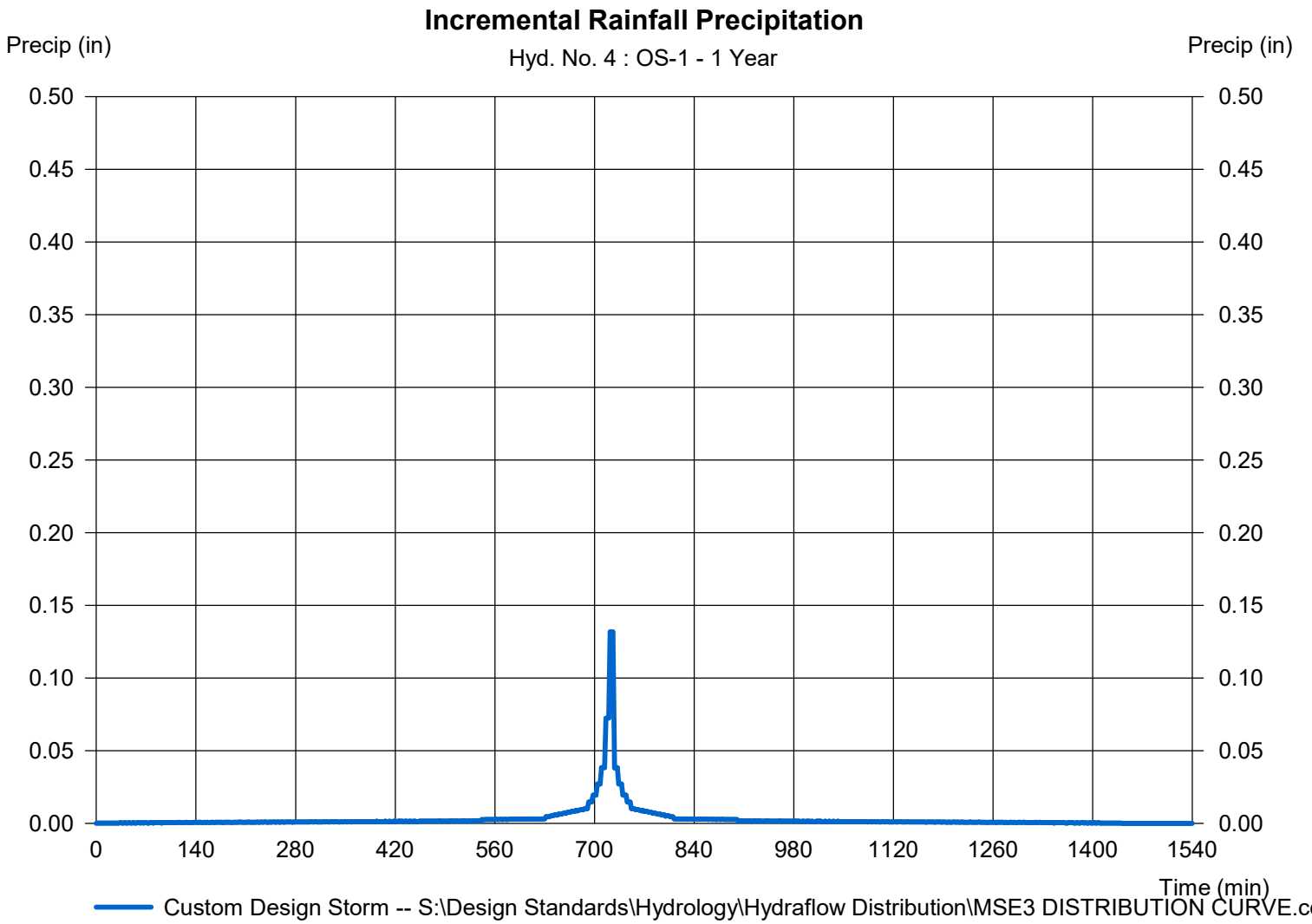
Total Travel Time, Tc ..... 40.30 min

Precipitation Report

Hyd. No. 4

OS-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



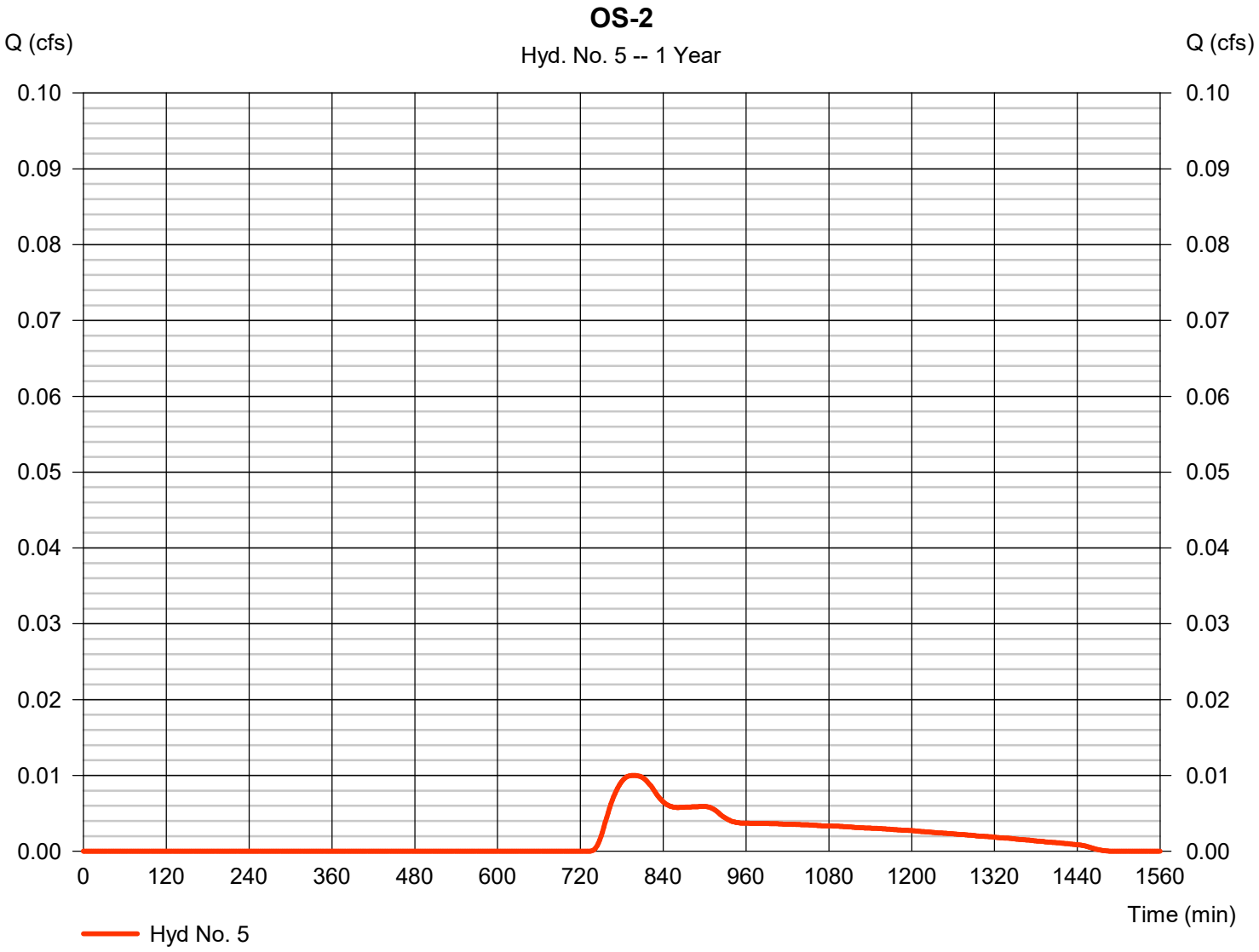
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 5

OS-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.010 cfs
Storm frequency	= 1 yrs	Time to peak	= 798 min
Time interval	= 2 min	Hyd. volume	= 157 cuft
Drainage area	= 0.655 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 5

OS-2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 137.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 1.75		0.00		0.00		
Travel Time (min)	**= 31.72**	**+**	**0.00**	**+**	**0.00**	**=**	**31.72**
Shallow Concentrated Flow							
Flow length (ft)	= 78.00		0.00		0.00		
Watercourse slope (%)	= 2.60		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.60		0.00		0.00		
Travel Time (min)	**= 0.50**	**+**	**0.00**	**+**	**0.00**	**=**	**0.50**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

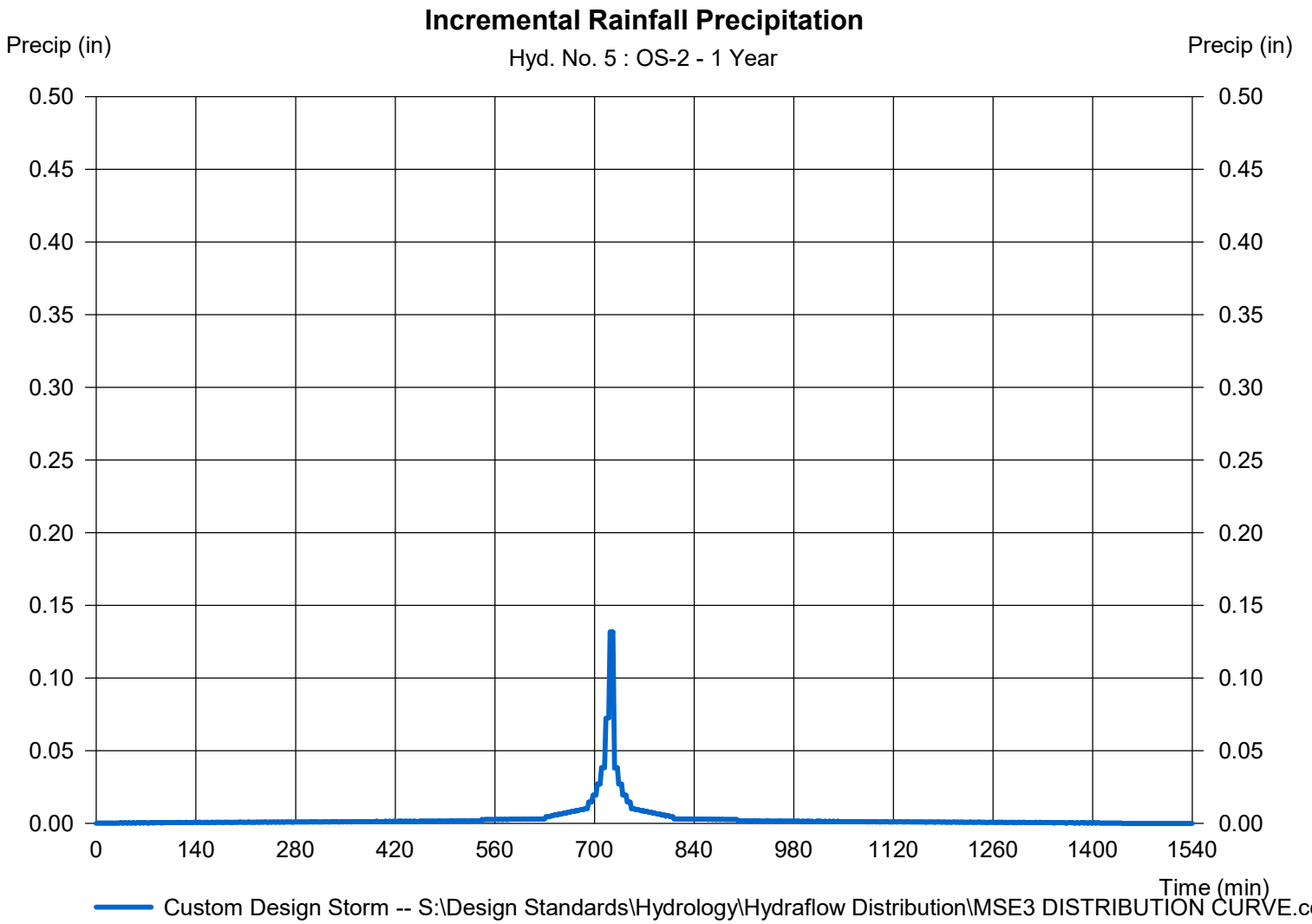
Total Travel Time, Tc ..... 32.20 min

Precipitation Report

Hyd. No. 5

OS-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

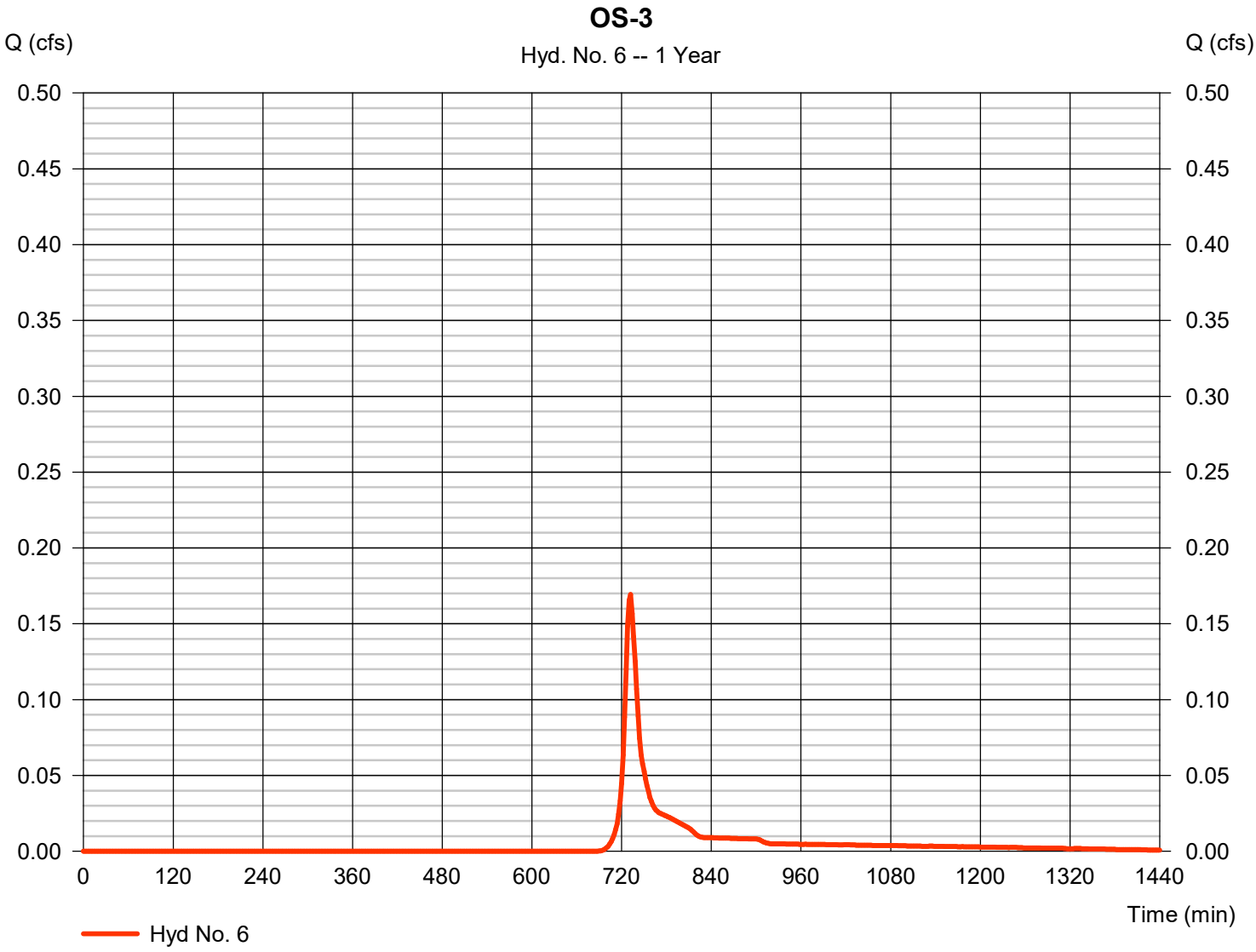


Hydrograph Report

Hyd. No. 6

OS-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.169 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	453 cuft
Drainage area	=	0.167 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd factor	Shape factor	=	484 DISTRIBUTION CU

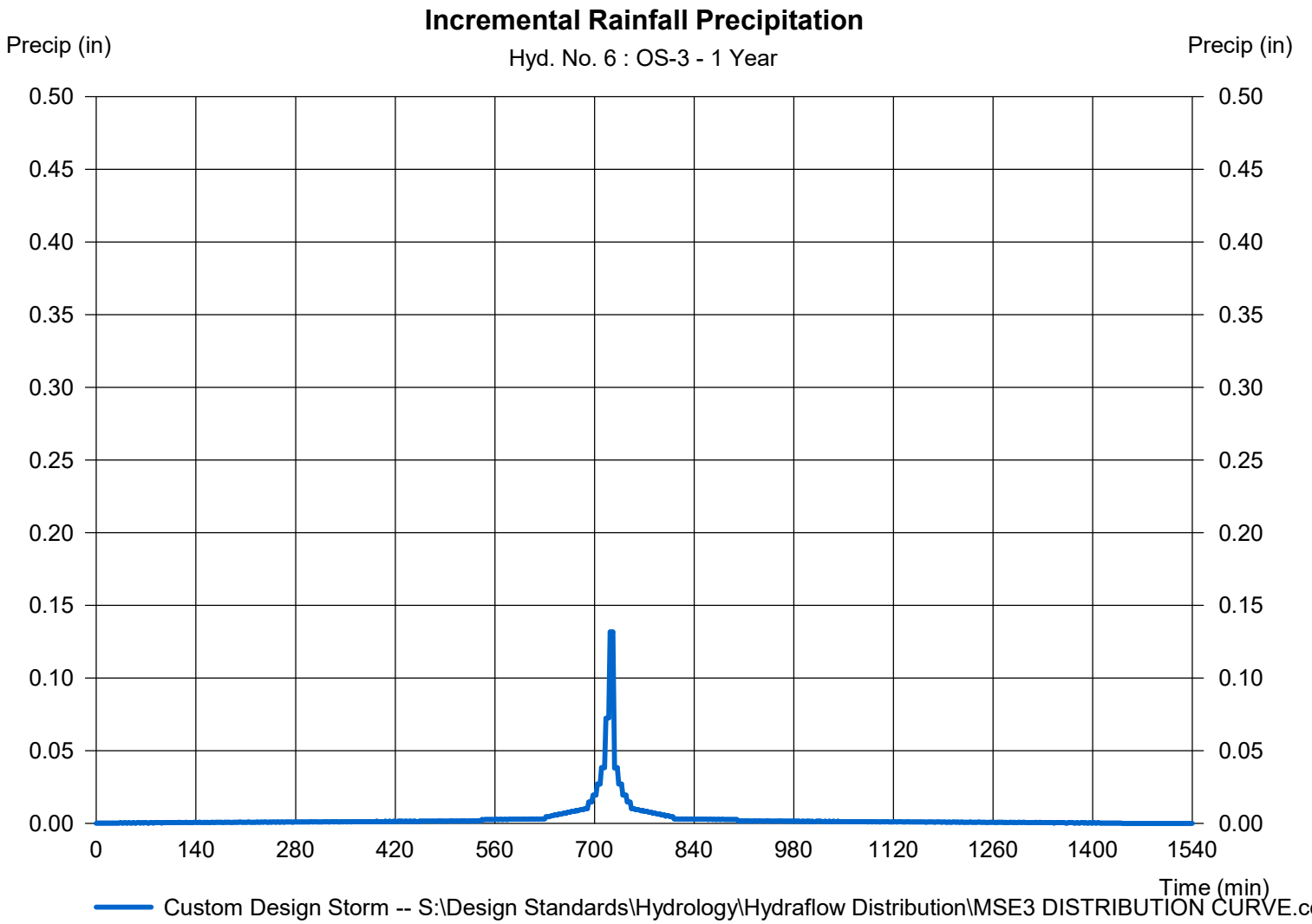


Precipitation Report

Hyd. No. 6

OS-3

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

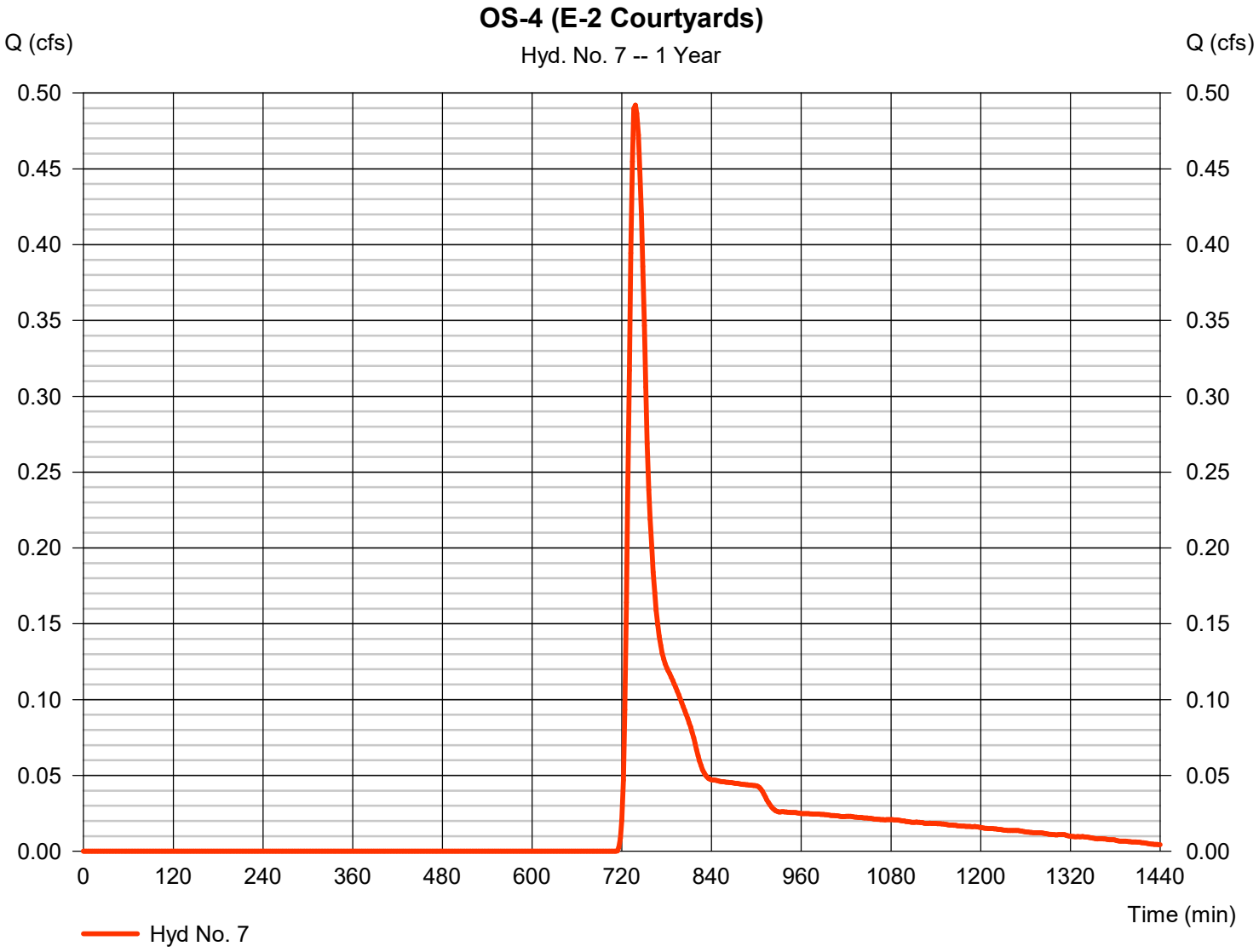


Hydrograph Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.492 cfs
Storm frequency	=	1 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	1,958 cuft
Drainage area	=	1.321 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.40 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor	Shape factor Distribution	=	484 DISTRIBUTION CU



TR55 Tc Worksheet

Hyd. No. 7

OS-4 (E-2 Courtyards)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 16.28**	**+**	**0.00**	**+**	**0.00**	**=**	**16.28**
Shallow Concentrated Flow							
Flow length (ft)	= 200.00		0.00		0.00		
Watercourse slope (%)	= 3.75		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.12		0.00		0.00		
Travel Time (min)	**= 1.07**	**+**	**0.00**	**+**	**0.00**	**=**	**1.07**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

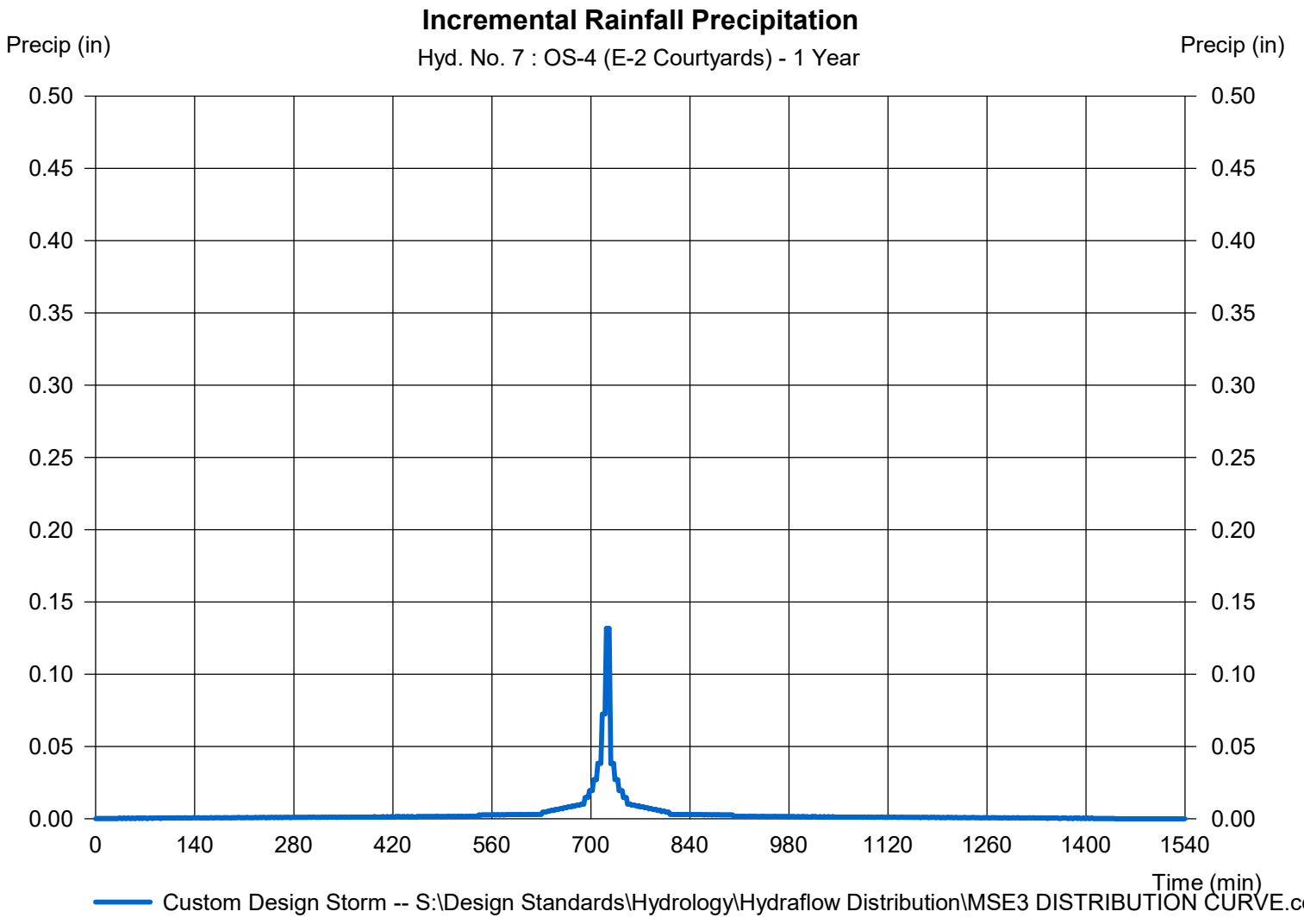
Total Travel Time, Tc ..... 17.40 min

Precipitation Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

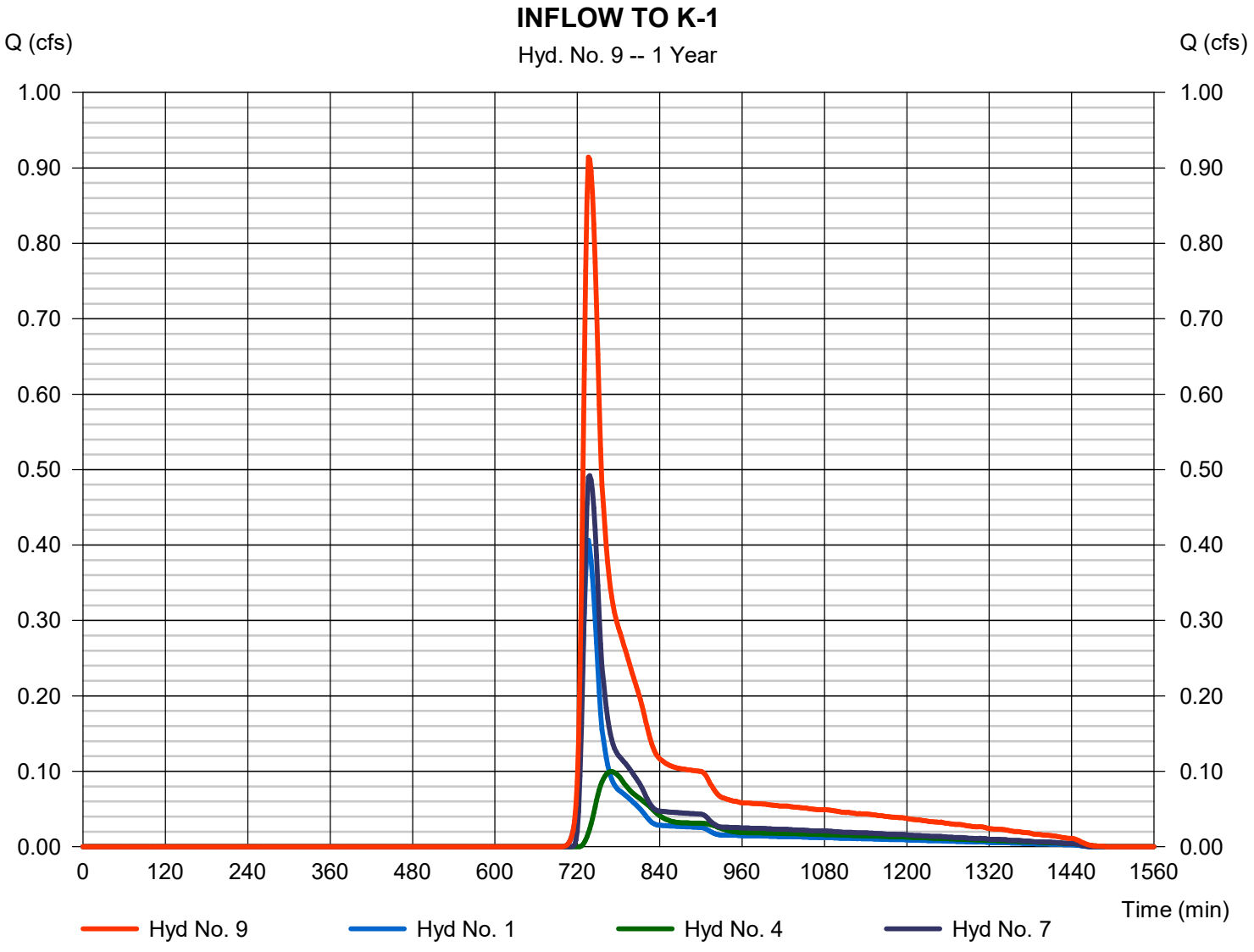


Hydrograph Report

Hyd. No. 9

INFLOW TO K-1

Hydrograph type	= Combine	Peak discharge	= 0.914 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 4,325 cuft
Inflow hyds.	= 1, 4, 7	Contrib. drain. area	= 3.803 ac



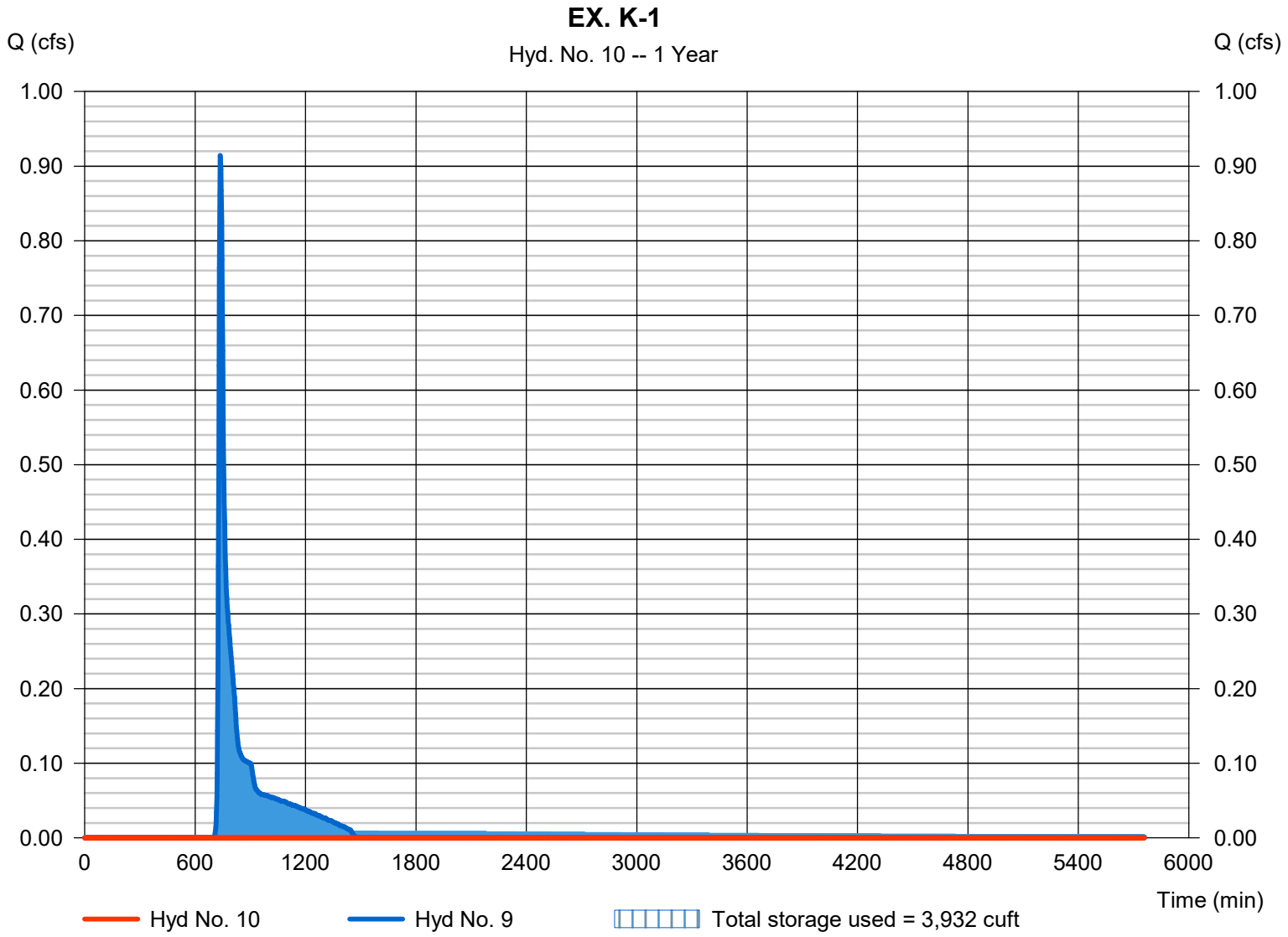
Hydrograph Report

Hyd. No. 10

EX. K-1

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 944 min
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 9 - INFLOW TO K-1	Max. Elevation	= 112.13 ft
Reservoir name	= EX. KETTLE K-1	Max. Storage	= 3,932 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond No. 1 - EX. KETTLE K-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 109.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	109.10	00	0	0
0.90	110.00	198	59	59
1.90	111.00	1,245	646	706
2.90	112.00	3,752	2,386	3,092
3.90	113.00	9,458	6,388	9,480
4.90	114.00	22,031	15,306	24,787

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.00	0.00	0.00	0.00
Crest El. (ft)	= 113.10	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.100 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	109.10	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.09	6	109.19	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.18	12	109.28	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.27	18	109.37	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.36	24	109.46	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.45	30	109.55	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.54	36	109.64	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.63	42	109.73	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.72	48	109.82	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.81	53	109.91	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.90	59	110.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	124	110.10	---	---	---	---	0.00	---	---	---	0.001	---	0.001
1.10	189	110.20	---	---	---	---	0.00	---	---	---	0.001	---	0.001
1.20	253	110.30	---	---	---	---	0.00	---	---	---	0.001	---	0.001
1.30	318	110.40	---	---	---	---	0.00	---	---	---	0.001	---	0.001
1.40	383	110.50	---	---	---	---	0.00	---	---	---	0.002	---	0.002
1.50	447	110.60	---	---	---	---	0.00	---	---	---	0.002	---	0.002
1.60	512	110.70	---	---	---	---	0.00	---	---	---	0.002	---	0.002
1.70	577	110.80	---	---	---	---	0.00	---	---	---	0.002	---	0.002
1.80	641	110.90	---	---	---	---	0.00	---	---	---	0.003	---	0.003
1.90	706	111.00	---	---	---	---	0.00	---	---	---	0.003	---	0.003
2.00	944	111.10	---	---	---	---	0.00	---	---	---	0.003	---	0.003
2.10	1,183	111.20	---	---	---	---	0.00	---	---	---	0.004	---	0.004
2.20	1,422	111.30	---	---	---	---	0.00	---	---	---	0.005	---	0.005
2.30	1,660	111.40	---	---	---	---	0.00	---	---	---	0.005	---	0.005
2.40	1,899	111.50	---	---	---	---	0.00	---	---	---	0.006	---	0.006
2.50	2,137	111.60	---	---	---	---	0.00	---	---	---	0.006	---	0.006
2.60	2,376	111.70	---	---	---	---	0.00	---	---	---	0.007	---	0.007
2.70	2,615	111.80	---	---	---	---	0.00	---	---	---	0.008	---	0.008
2.80	2,853	111.90	---	---	---	---	0.00	---	---	---	0.008	---	0.008
2.90	3,092	112.00	---	---	---	---	0.00	---	---	---	0.009	---	0.009
3.00	3,731	112.10	---	---	---	---	0.00	---	---	---	0.010	---	0.010
3.10	4,369	112.20	---	---	---	---	0.00	---	---	---	0.011	---	0.011
3.20	5,008	112.30	---	---	---	---	0.00	---	---	---	0.013	---	0.013
3.30	5,647	112.40	---	---	---	---	0.00	---	---	---	0.014	---	0.014
3.40	6,286	112.50	---	---	---	---	0.00	---	---	---	0.015	---	0.015
3.50	6,925	112.60	---	---	---	---	0.00	---	---	---	0.017	---	0.017

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EX. KETTLE K-1

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
3.60	7,564	112.70	---	---	---	---	0.00	---	---	---	0.018	---	0.018
3.70	8,202	112.80	---	---	---	---	0.00	---	---	---	0.019	---	0.019
3.80	8,841	112.90	---	---	---	---	0.00	---	---	---	0.021	---	0.021
3.90	9,480	113.00	---	---	---	---	0.00	---	---	---	0.022	---	0.022
4.00	11,011	113.10	---	---	---	---	0.00	---	---	---	0.025	---	0.025
4.10	12,541	113.20	---	---	---	---	1.23	---	---	---	0.028	---	1.261
4.20	14,072	113.30	---	---	---	---	3.49	---	---	---	0.031	---	3.519
4.30	15,603	113.40	---	---	---	---	6.41	---	---	---	0.034	---	6.442
4.40	17,133	113.50	---	---	---	---	9.87	---	---	---	0.036	---	9.903
4.50	18,664	113.60	---	---	---	---	13.79	---	---	---	0.039	---	13.83
4.60	20,195	113.70	---	---	---	---	18.13	---	---	---	0.042	---	18.17
4.70	21,725	113.80	---	---	---	---	22.84	---	---	---	0.045	---	22.89
4.80	23,256	113.90	---	---	---	---	27.91	---	---	---	0.048	---	27.95
4.90	24,787	114.00	---	---	---	---	33.30	---	---	---	0.051	---	33.35

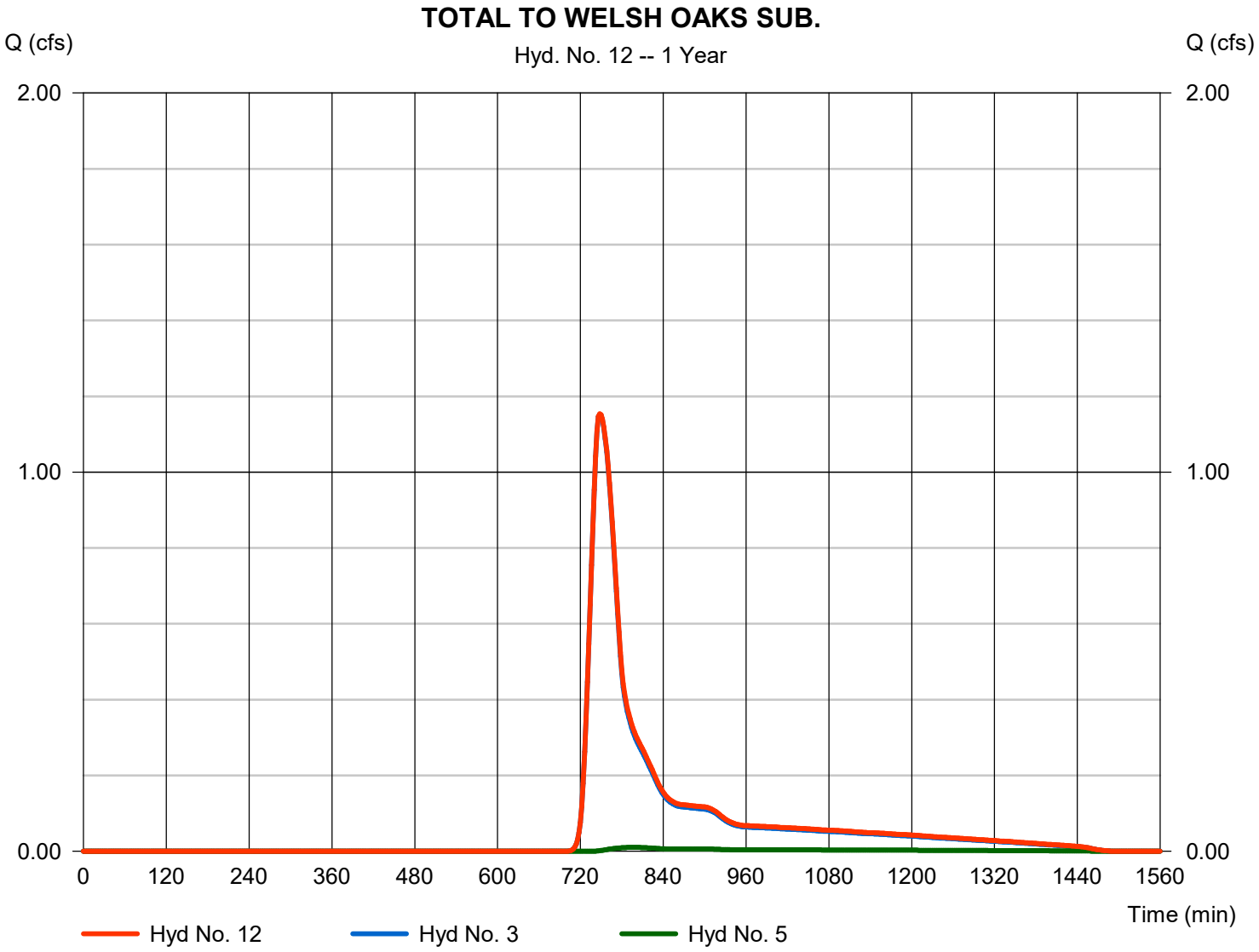
...End

Hydrograph Report

Hyd. No. 12

TOTAL TO WELSH OAKS SUB.

Hydrograph type	= Combine	Peak discharge	= 1.153 cfs
Storm frequency	= 1 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 5,796 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 3.305 ac

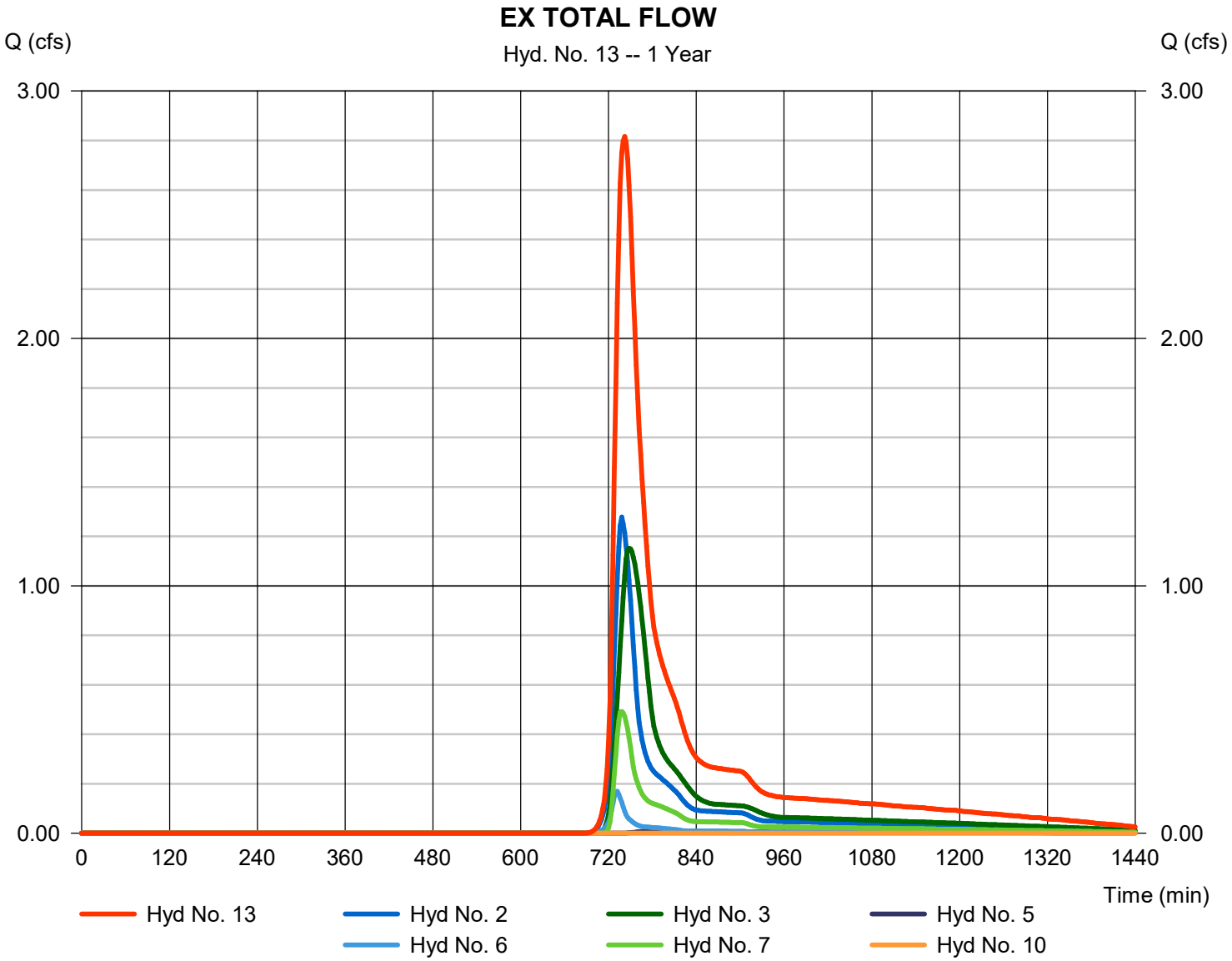


Hydrograph Report

Hyd. No. 13

EX TOTAL FLOW

Hydrograph type	= Combine	Peak discharge	= 2.816 cfs
Storm frequency	= 1 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 12,778 cuft
Inflow hyds.	= 2, 3, 5, 6, 7, 10	Contrib. drain. area	= 6.502 ac



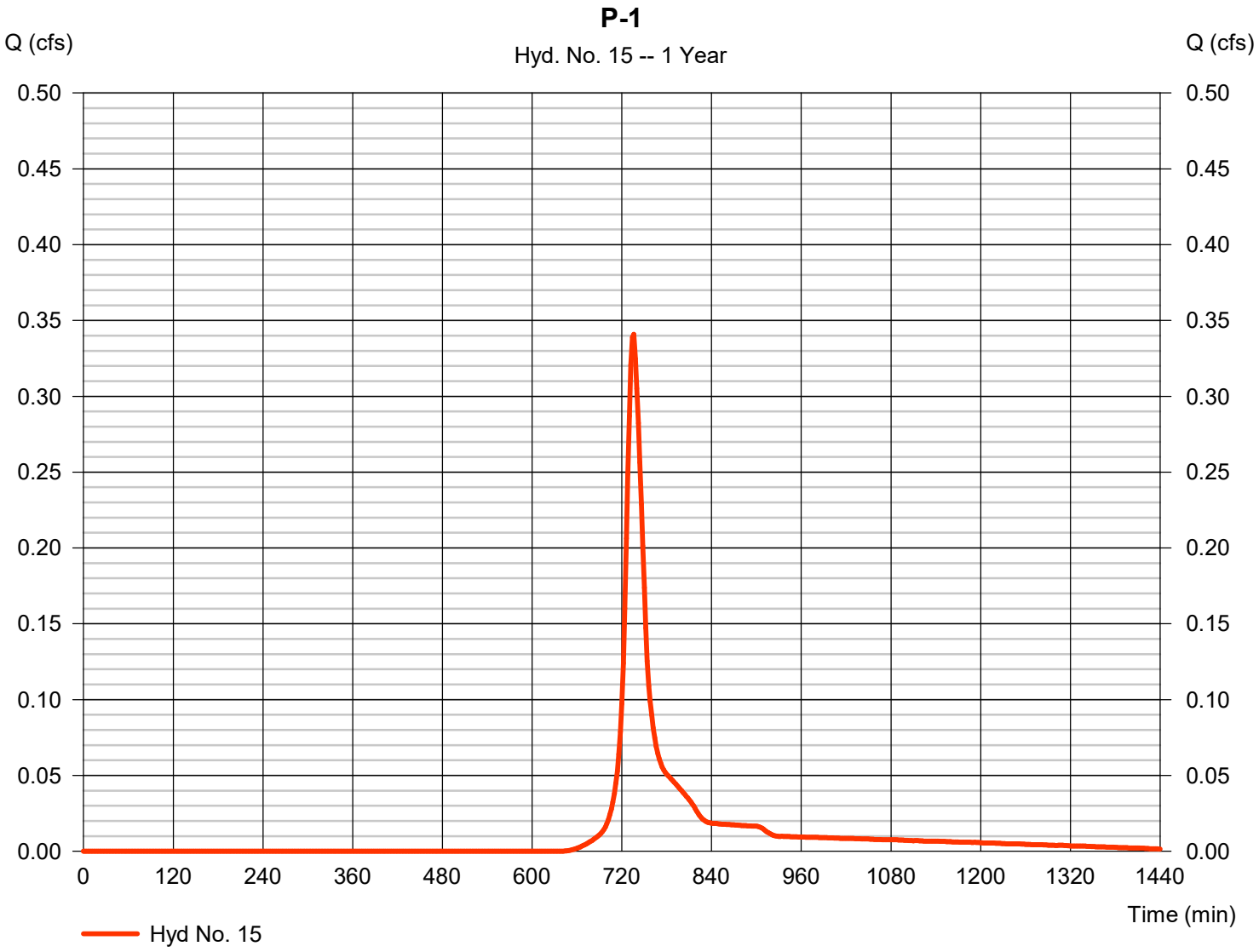
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 15

P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.341 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 1,060 cuft
Drainage area	= 0.281 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.80 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 15

P-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.240		0.011		
Flow length (ft)	= 27.0		108.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 12.90		3.20		0.00		
Travel Time (min)	**= 2.59**	**+**	**13.69**	**+**	**0.00**	**=**	**16.28**
Shallow Concentrated Flow							
Flow length (ft)	= 80.00		0.00		0.00		
Watercourse slope (%)	= 2.50		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.55		0.00		0.00		
Travel Time (min)	**= 0.52**	**+**	**0.00**	**+**	**0.00**	**=**	**0.52**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

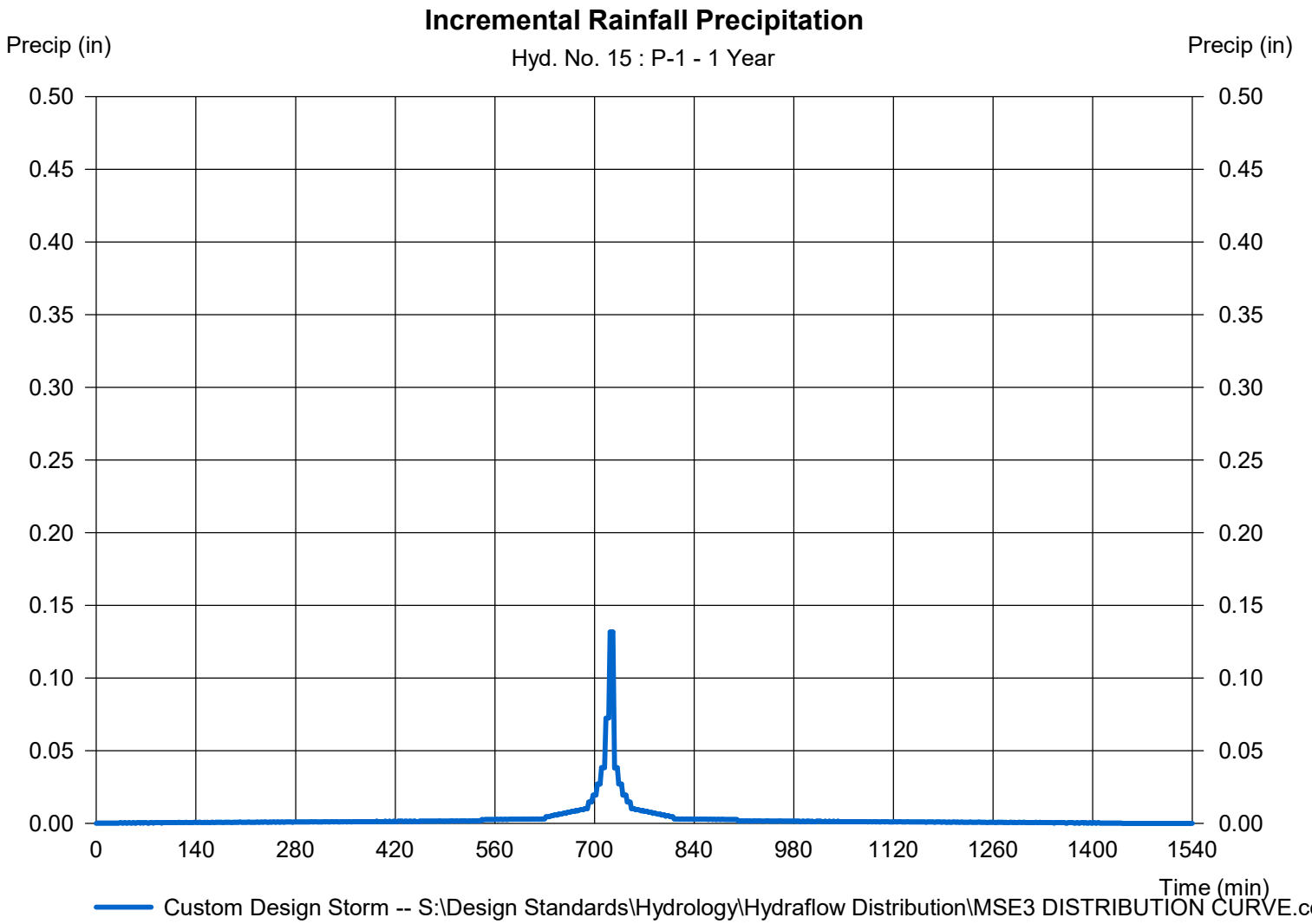
Total Travel Time, Tc ..... 16.80 min

Precipitation Report

Hyd. No. 15

P-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



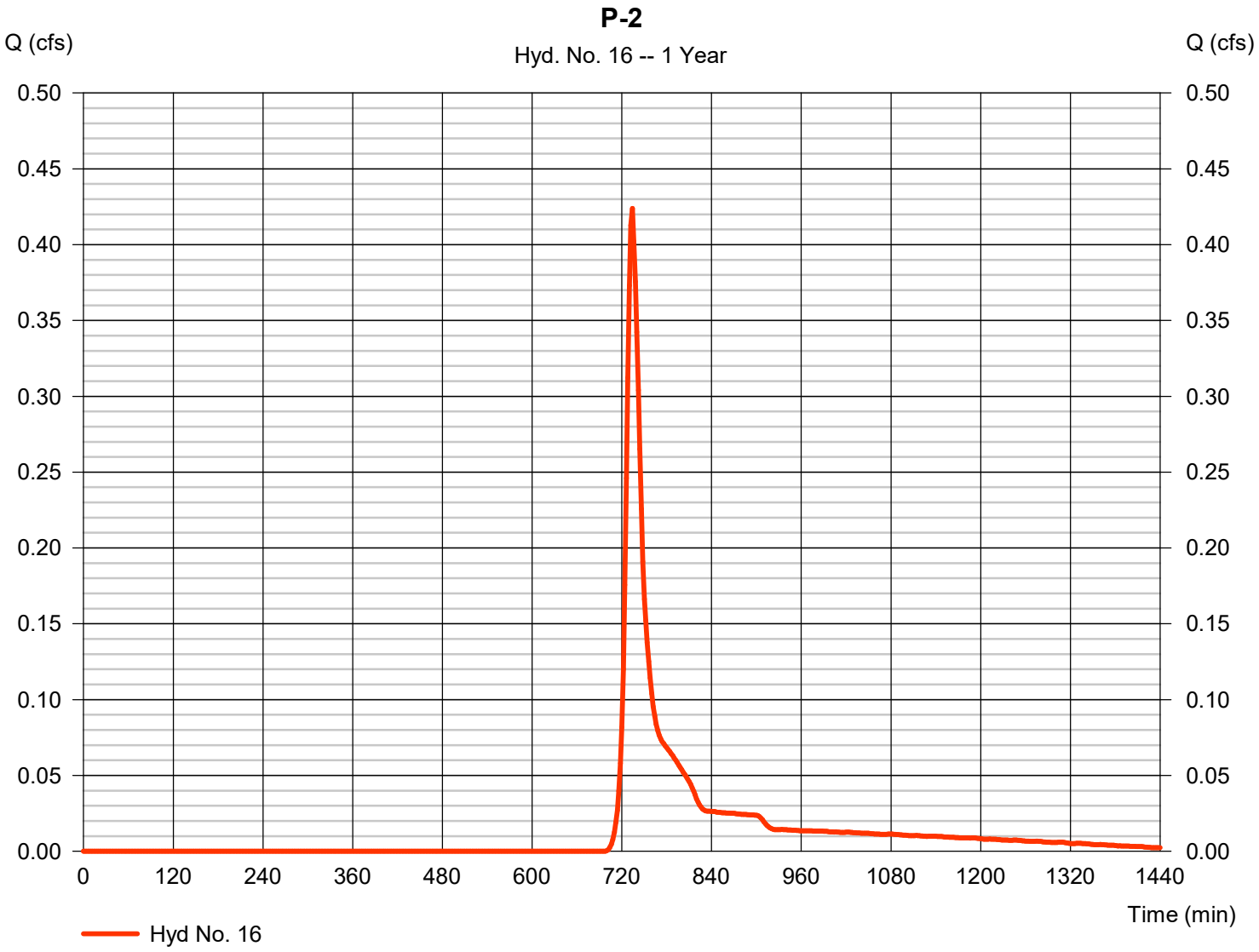
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 16

P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.424 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 1,263 cuft
Drainage area	= 0.562 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.70 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 16

P-2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.240		0.011		
Flow length (ft)	= 55.0		40.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 10.50		1.00		0.00		
Travel Time (min)	**= 4.96**	**+**	**9.85**	**+**	**0.00**	**=**	**14.81**
Shallow Concentrated Flow							
Flow length (ft)	= 89.00		0.00		0.00		
Watercourse slope (%)	= 1.10		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.69		0.00		0.00		
Travel Time (min)	**= 0.88**	**+**	**0.00**	**+**	**0.00**	**=**	**0.88**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

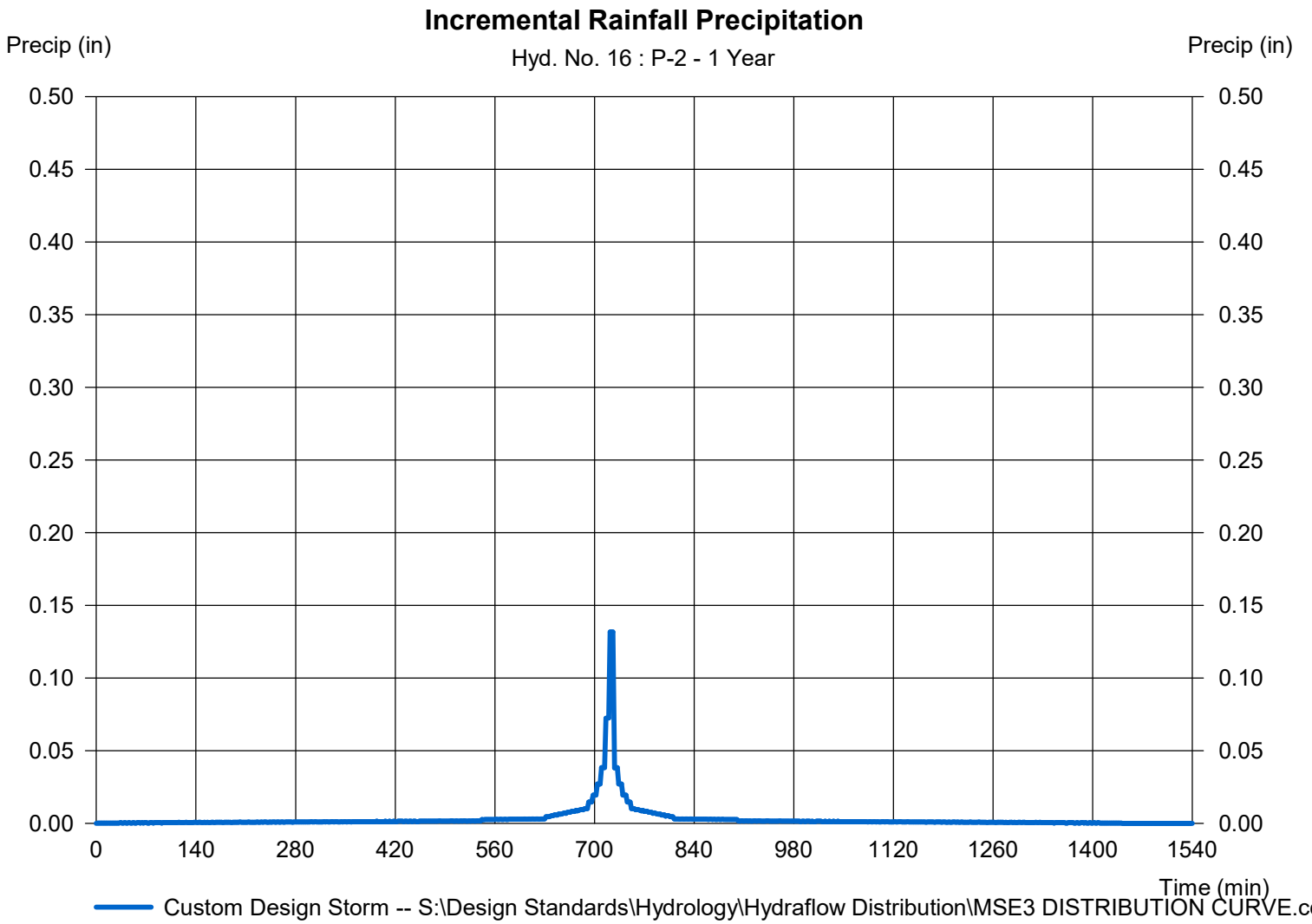
Total Travel Time, Tc ..... 15.70 min

Precipitation Report

Hyd. No. 16

P-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



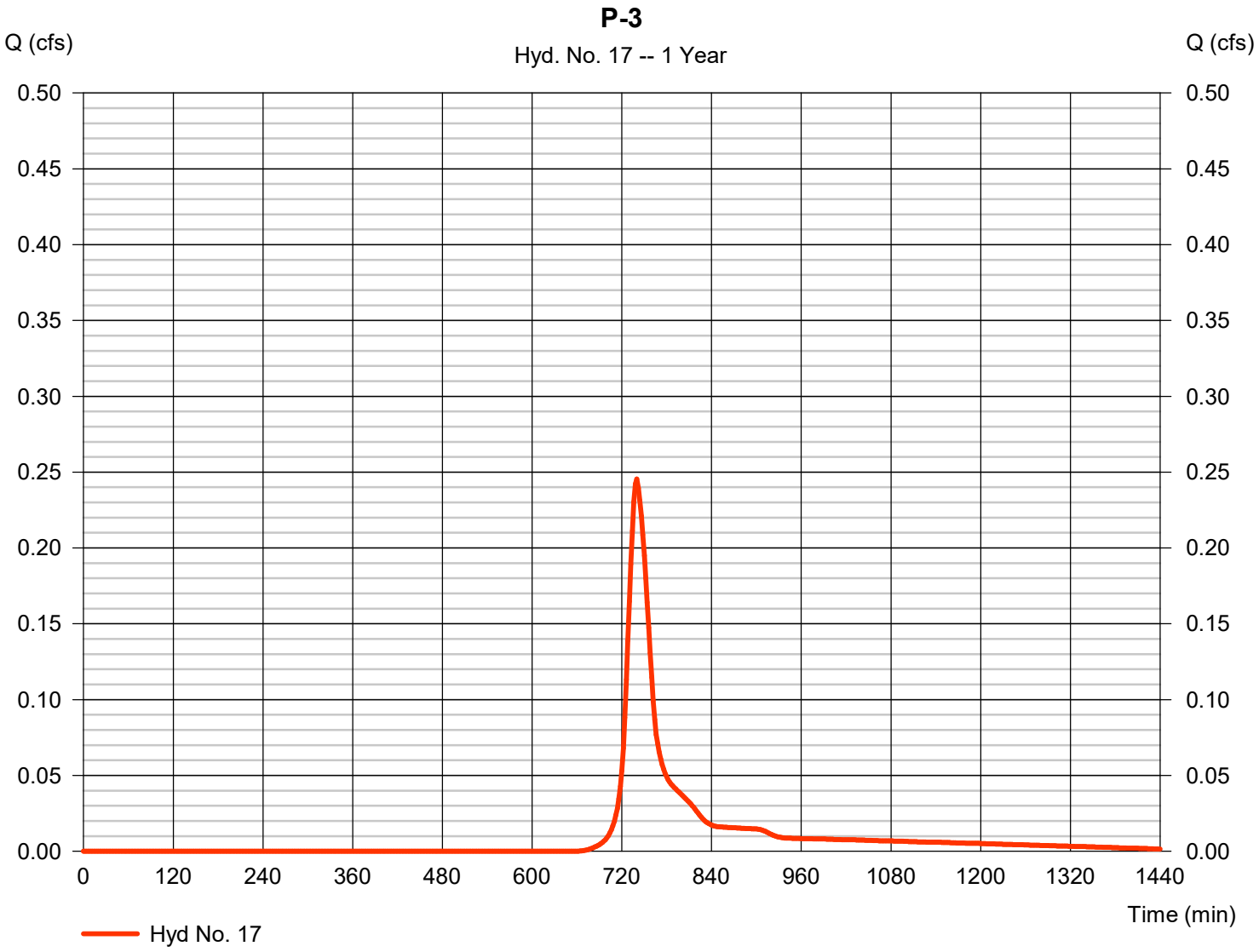
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 17

P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.246 cfs
Storm frequency	= 1 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 893 cuft
Drainage area	= 0.270 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.60 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 17

P-3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 119.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 23.56**	**+**	**0.00**	**+**	**0.00**	**=**	**23.56**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

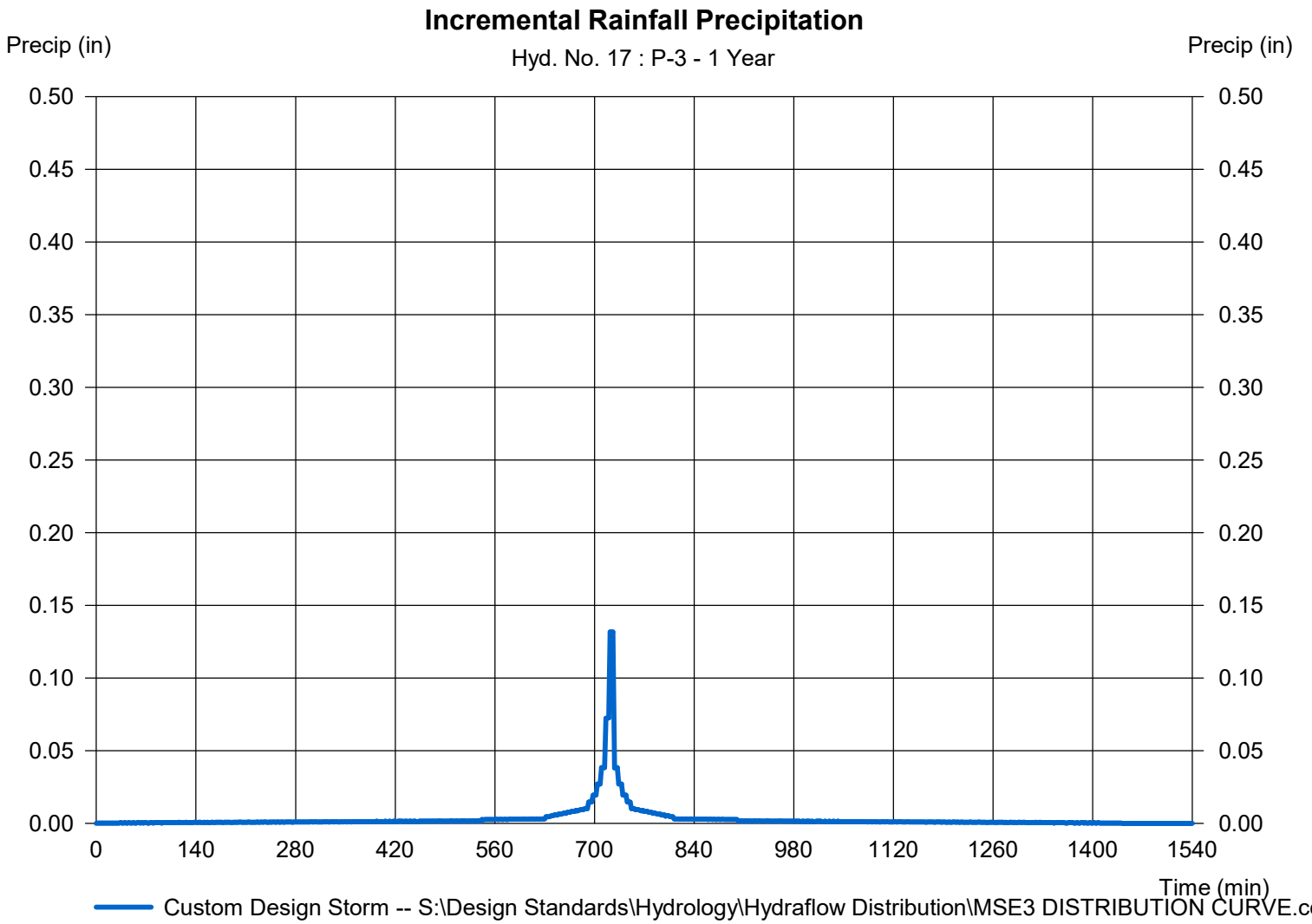
Total Travel Time, Tc ..... 23.60 min

Precipitation Report

Hyd. No. 17

P-3

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



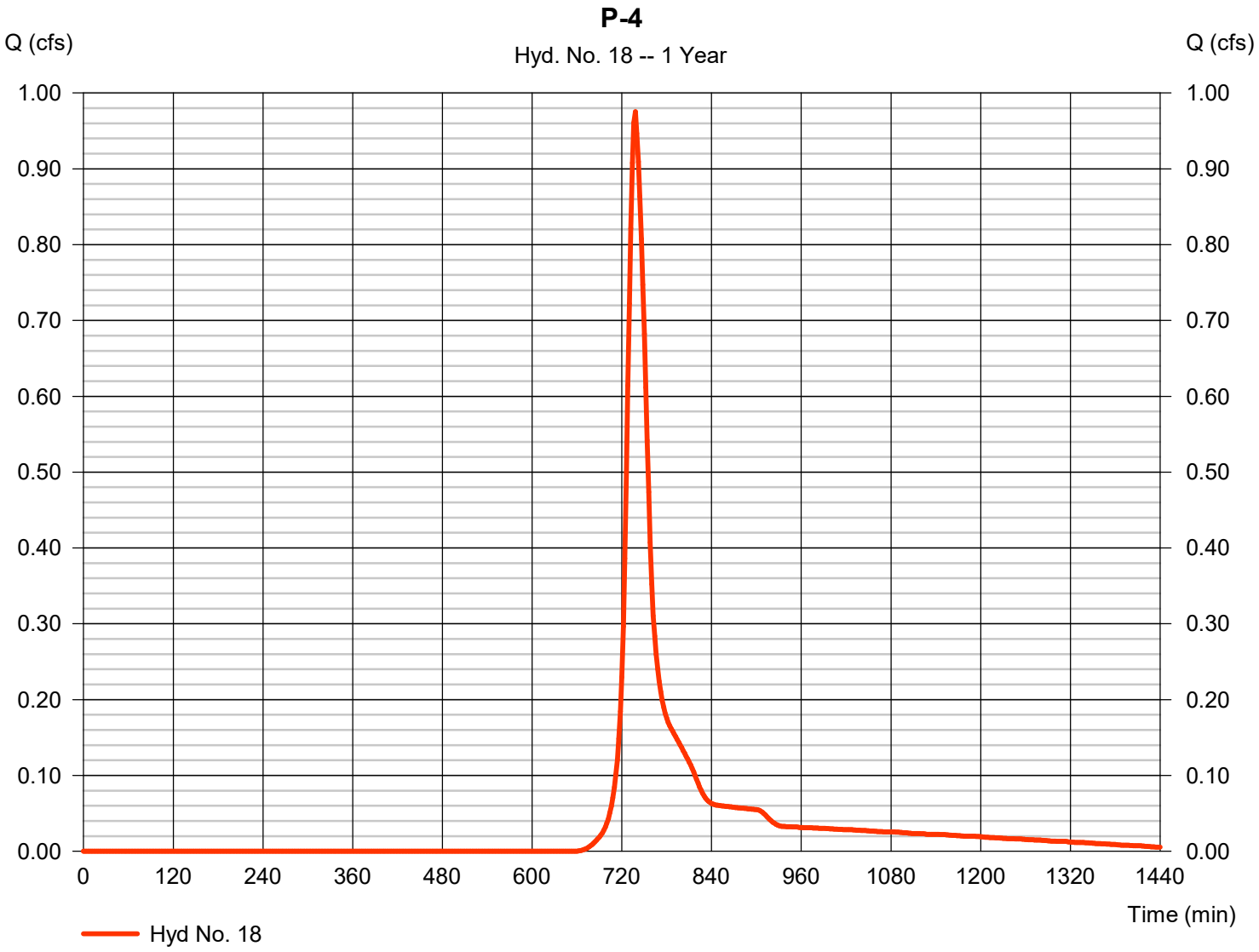
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 18

P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.976 cfs
Storm frequency	= 1 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 3,357 cuft
Drainage area	= 0.982 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 20.40 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 18

P-4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.240		0.011		
Flow length (ft)	= 20.0		92.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 10.00		1.30		0.00		
Travel Time (min)	**= 2.25**	**+**	**17.27**	**+**	**0.00**	**=**	**19.52**
Shallow Concentrated Flow							
Flow length (ft)	= 101.00		0.00		0.00		
Watercourse slope (%)	= 2.90		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.75		0.00		0.00		
Travel Time (min)	**= 0.61**	**+**	**0.00**	**+**	**0.00**	**=**	**0.61**
Channel Flow							
X sectional flow area (sqft)	= 0.79		0.00		0.00		
Wetted perimeter (ft)	= 3.14		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	=3.47						
			0.00				
					0.00		
Flow length (ft)	({0})61.0		0.0		0.0		
Travel Time (min)	**= 0.29**	**+**	**0.00**	**+**	**0.00**	**=**	**0.29**

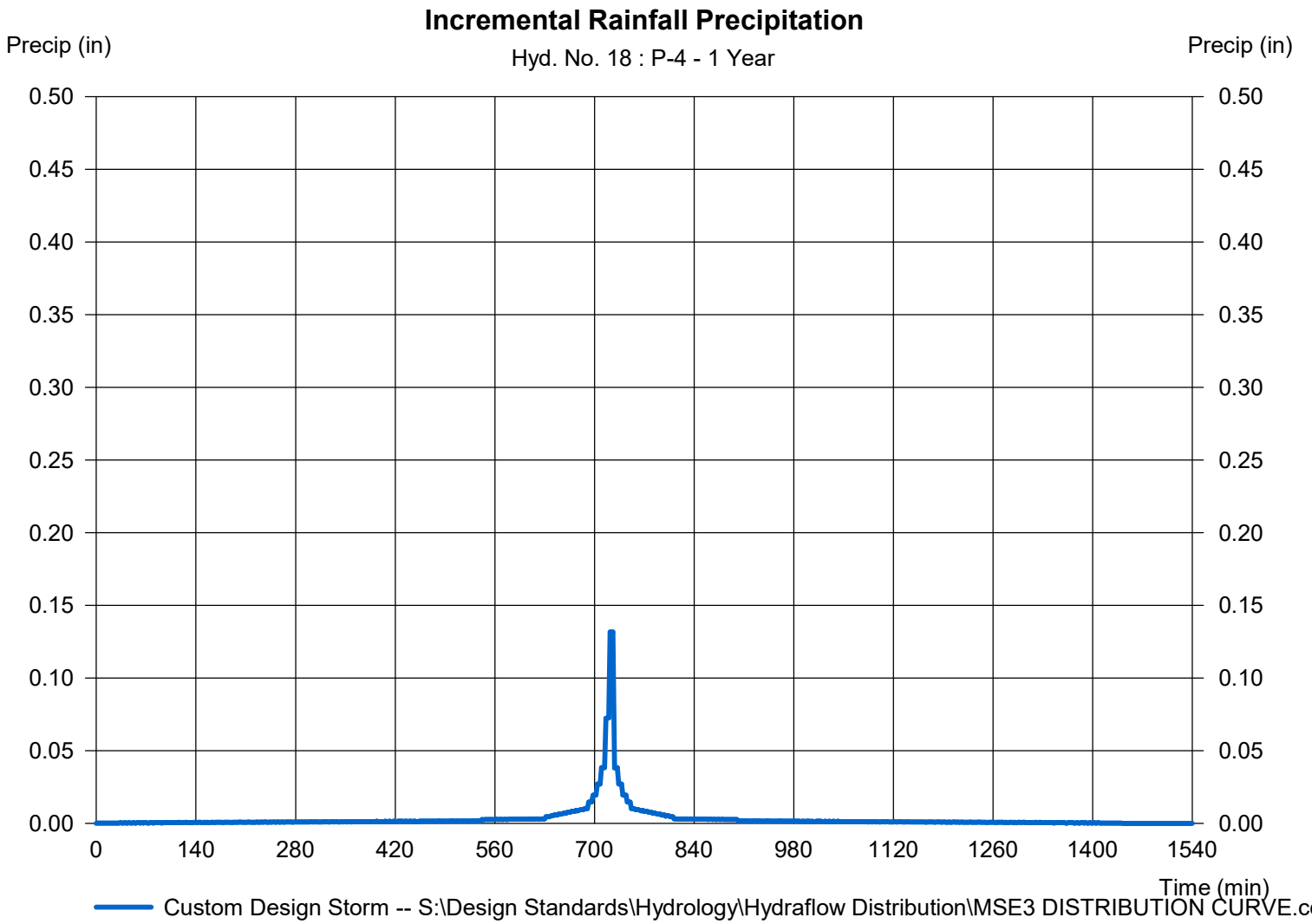
Total Travel Time, Tc ..... 20.40 min

Precipitation Report

Hyd. No. 18

P-4

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



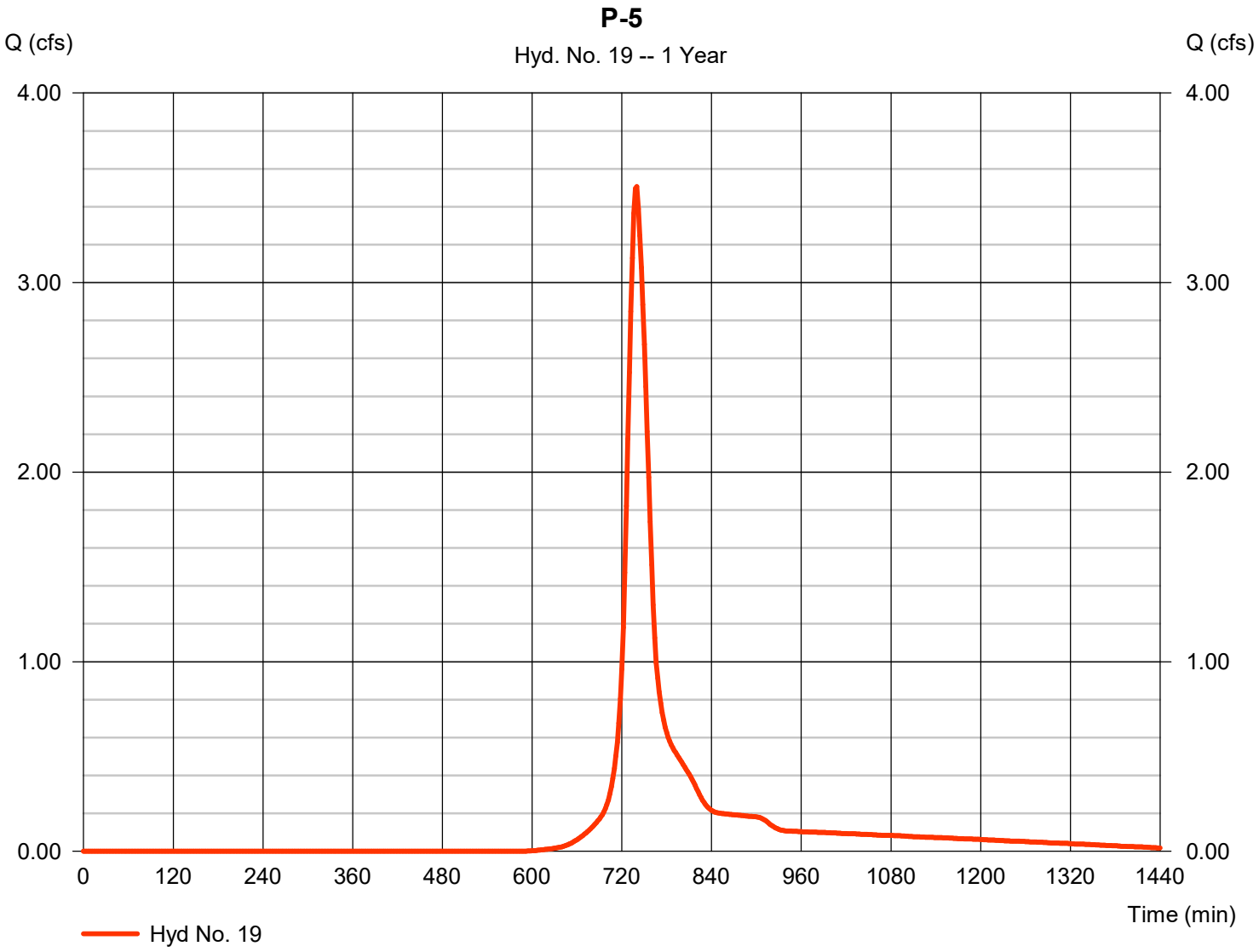
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 19

P-5

Hydrograph type	= SCS Runoff	Peak discharge	= 3.506 cfs
Storm frequency	= 1 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 12,518 cuft
Drainage area	= 2.853 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.00 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484



TR55 Tc Worksheet

Hyd. No. 19

P-5

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.240		0.011		
Flow length (ft)	= 111.0		47.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 1.10		14.00		0.00		
Travel Time (min)	**= 21.45**	**+**	**3.90**	**+**	**0.00**	**=**	**25.35**
Shallow Concentrated Flow							
Flow length (ft)	= 152.00		0.00		0.00		
Watercourse slope (%)	= 5.30		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.71		0.00		0.00		
Travel Time (min)	**= 0.68**	**+**	**0.00**	**+**	**0.00**	**=**	**0.68**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

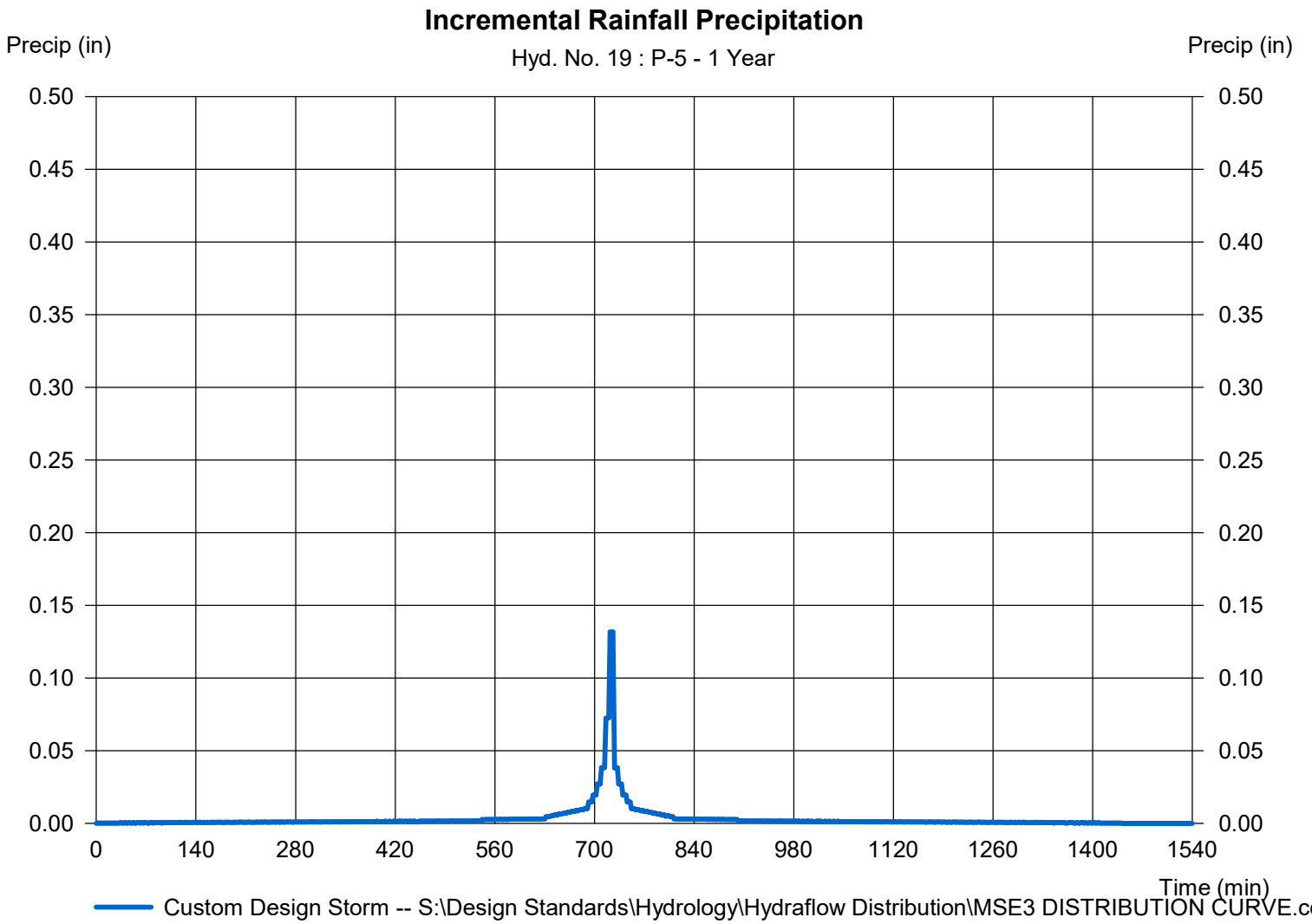
Total Travel Time, Tc ..... 26.00 min

Precipitation Report

Hyd. No. 19

P-5

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

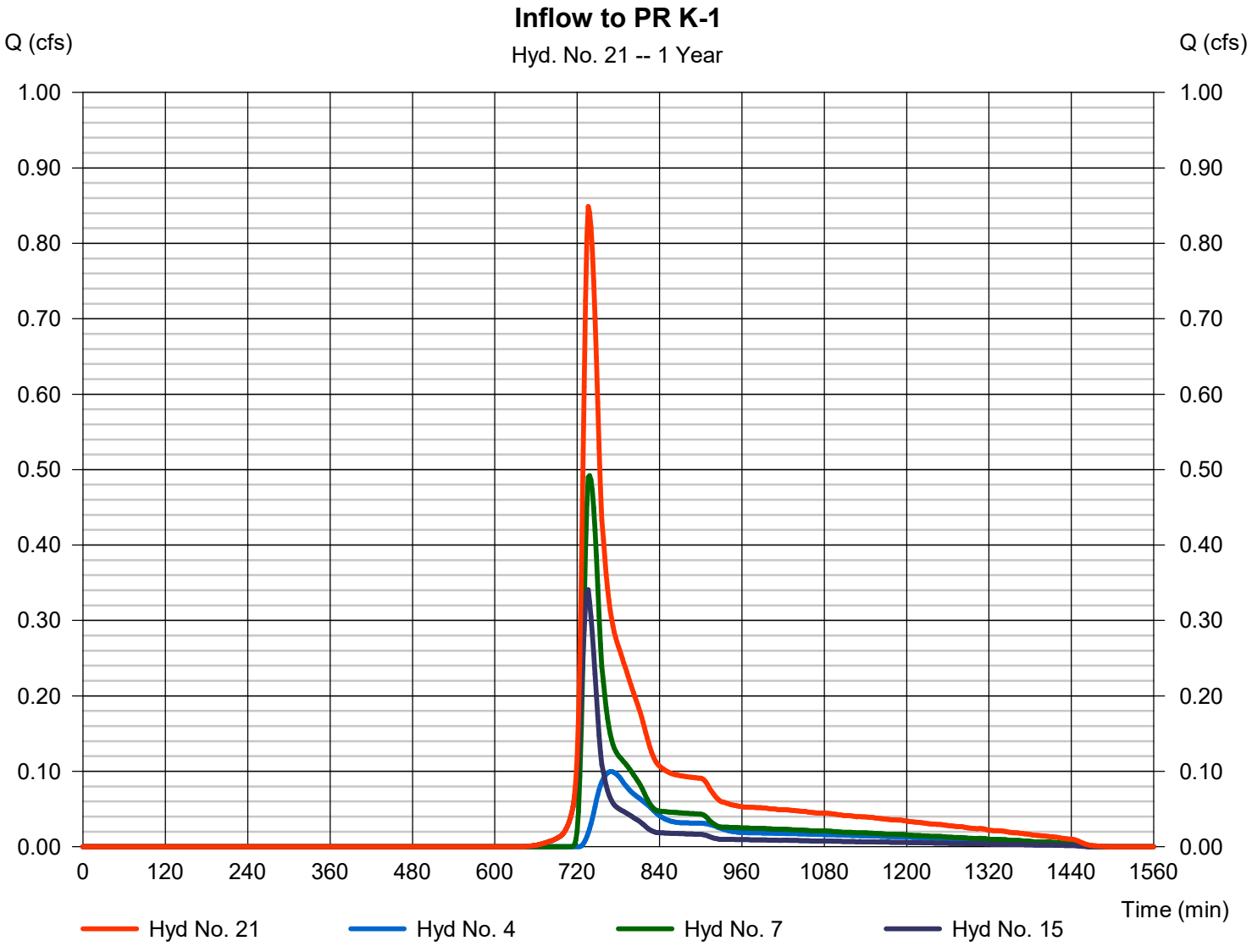


Hydrograph Report

Hyd. No. 21

Inflow to PR K-1

Hydrograph type	= Combine	Peak discharge	= 0.849 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 4,027 cuft
Inflow hyds.	= 4, 7, 15	Contrib. drain. area	= 3.495 ac



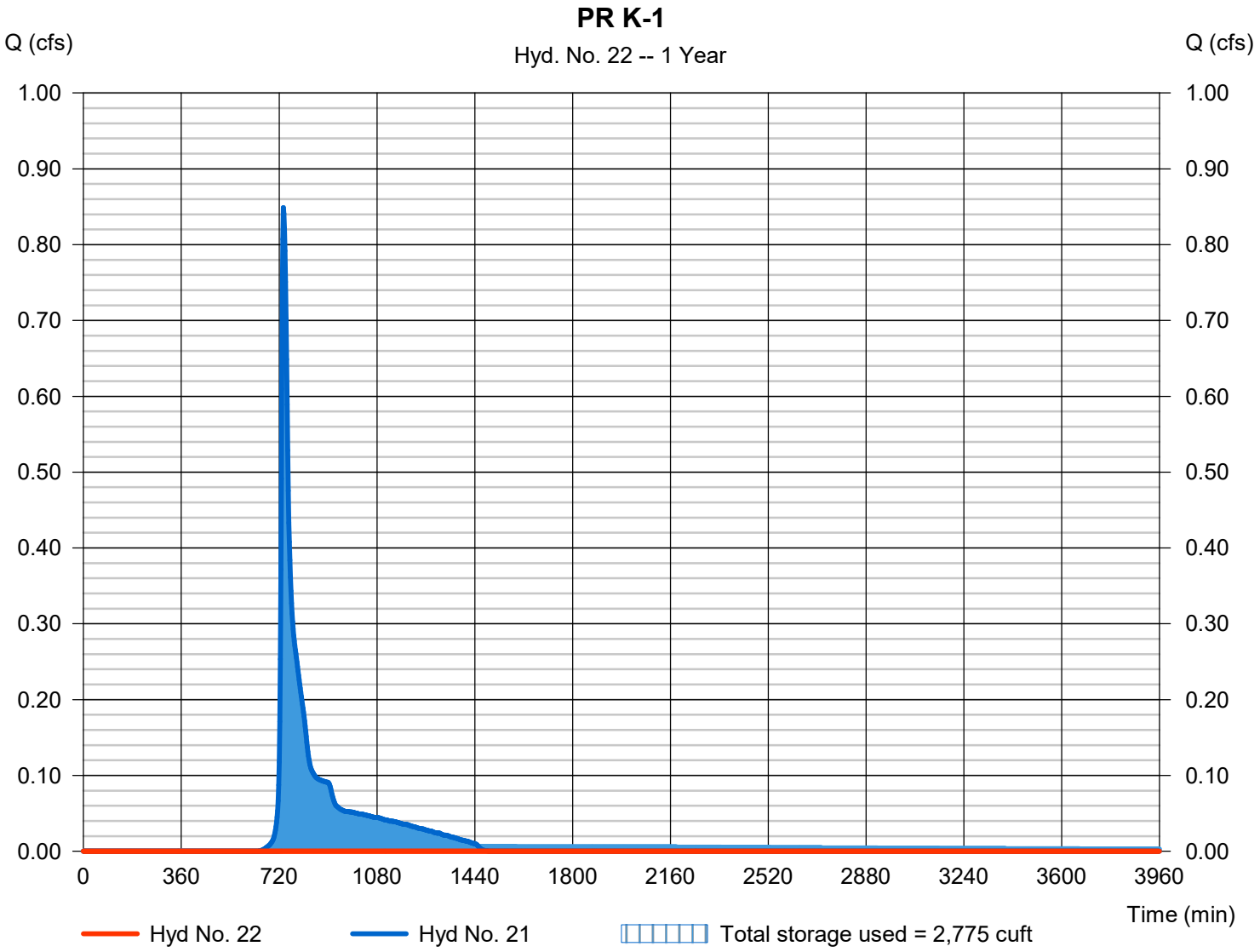
Hydrograph Report

Hyd. No. 22

PR K-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	772 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	21 - Inflow to PR K-1	Max. Elevation	=	111.02 ft
Reservoir name	=	PR KETTLE K-1	Max. Storage	=	2,775 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond No. 2 - PR KETTLE K-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 110.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	110.00	2,278	0	0
1.00	111.00	3,138	2,696	2,696
2.00	112.00	5,532	4,278	6,975
3.00	113.00	6,708	6,110	13,085
4.00	114.00	12,240	9,335	22,420

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 113.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	110.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.10	270	110.10	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.20	539	110.20	---	---	---	---	0.00	---	---	---	0.007	---	0.007
0.30	809	110.30	---	---	---	---	0.00	---	---	---	0.011	---	0.011
0.40	1,079	110.40	---	---	---	---	0.00	---	---	---	0.015	---	0.015
0.50	1,348	110.50	---	---	---	---	0.00	---	---	---	0.018	---	0.018
0.60	1,618	110.60	---	---	---	---	0.00	---	---	---	0.022	---	0.022
0.70	1,887	110.70	---	---	---	---	0.00	---	---	---	0.025	---	0.025
0.80	2,157	110.80	---	---	---	---	0.00	---	---	---	0.029	---	0.029
0.90	2,427	110.90	---	---	---	---	0.00	---	---	---	0.033	---	0.033
1.00	2,696	111.00	---	---	---	---	0.00	---	---	---	0.036	---	0.036
1.10	3,124	111.10	---	---	---	---	0.00	---	---	---	0.039	---	0.039
1.20	3,552	111.20	---	---	---	---	0.00	---	---	---	0.042	---	0.042
1.30	3,980	111.30	---	---	---	---	0.00	---	---	---	0.045	---	0.045
1.40	4,408	111.40	---	---	---	---	0.00	---	---	---	0.047	---	0.047
1.50	4,835	111.50	---	---	---	---	0.00	---	---	---	0.050	---	0.050
1.60	5,263	111.60	---	---	---	---	0.00	---	---	---	0.053	---	0.053
1.70	5,691	111.70	---	---	---	---	0.00	---	---	---	0.056	---	0.056
1.80	6,119	111.80	---	---	---	---	0.00	---	---	---	0.058	---	0.058
1.90	6,547	111.90	---	---	---	---	0.00	---	---	---	0.061	---	0.061
2.00	6,975	112.00	---	---	---	---	0.00	---	---	---	0.064	---	0.064
2.10	7,586	112.10	---	---	---	---	0.00	---	---	---	0.065	---	0.065
2.20	8,197	112.20	---	---	---	---	0.00	---	---	---	0.067	---	0.067
2.30	8,808	112.30	---	---	---	---	0.00	---	---	---	0.068	---	0.068
2.40	9,419	112.40	---	---	---	---	0.00	---	---	---	0.069	---	0.069
2.50	10,030	112.50	---	---	---	---	0.00	---	---	---	0.071	---	0.071
2.60	10,641	112.60	---	---	---	---	0.00	---	---	---	0.072	---	0.072
2.70	11,252	112.70	---	---	---	---	0.00	---	---	---	0.074	---	0.074
2.80	11,863	112.80	---	---	---	---	0.00	---	---	---	0.075	---	0.075
2.90	12,474	112.90	---	---	---	---	0.00	---	---	---	0.076	---	0.076
3.00	13,085	113.00	---	---	---	---	0.00	---	---	---	0.078	---	0.078
3.10	14,018	113.10	---	---	---	---	0.82	---	---	---	0.084	---	0.906
3.20	14,952	113.20	---	---	---	---	2.33	---	---	---	0.090	---	2.416
3.30	15,885	113.30	---	---	---	---	4.27	---	---	---	0.097	---	4.369
3.40	16,819	113.40	---	---	---	---	6.58	---	---	---	0.103	---	6.681
3.50	17,752	113.50	---	---	---	---	9.19	---	---	---	0.110	---	9.302
3.60	18,686	113.60	---	---	---	---	12.08	---	---	---	0.116	---	12.20
3.70	19,619	113.70	---	---	---	---	15.23	---	---	---	0.122	---	15.35

Continues on next page...

PR KETTLE K-1

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
3.80	20,553	113.80	---	---	---	---	18.60	---	---	---	0.129	---	18.73
3.90	21,487	113.90	---	---	---	---	22.20	---	---	---	0.135	---	22.33
4.00	22,420	114.00	---	---	---	---	26.00	---	---	---	0.142	---	26.14

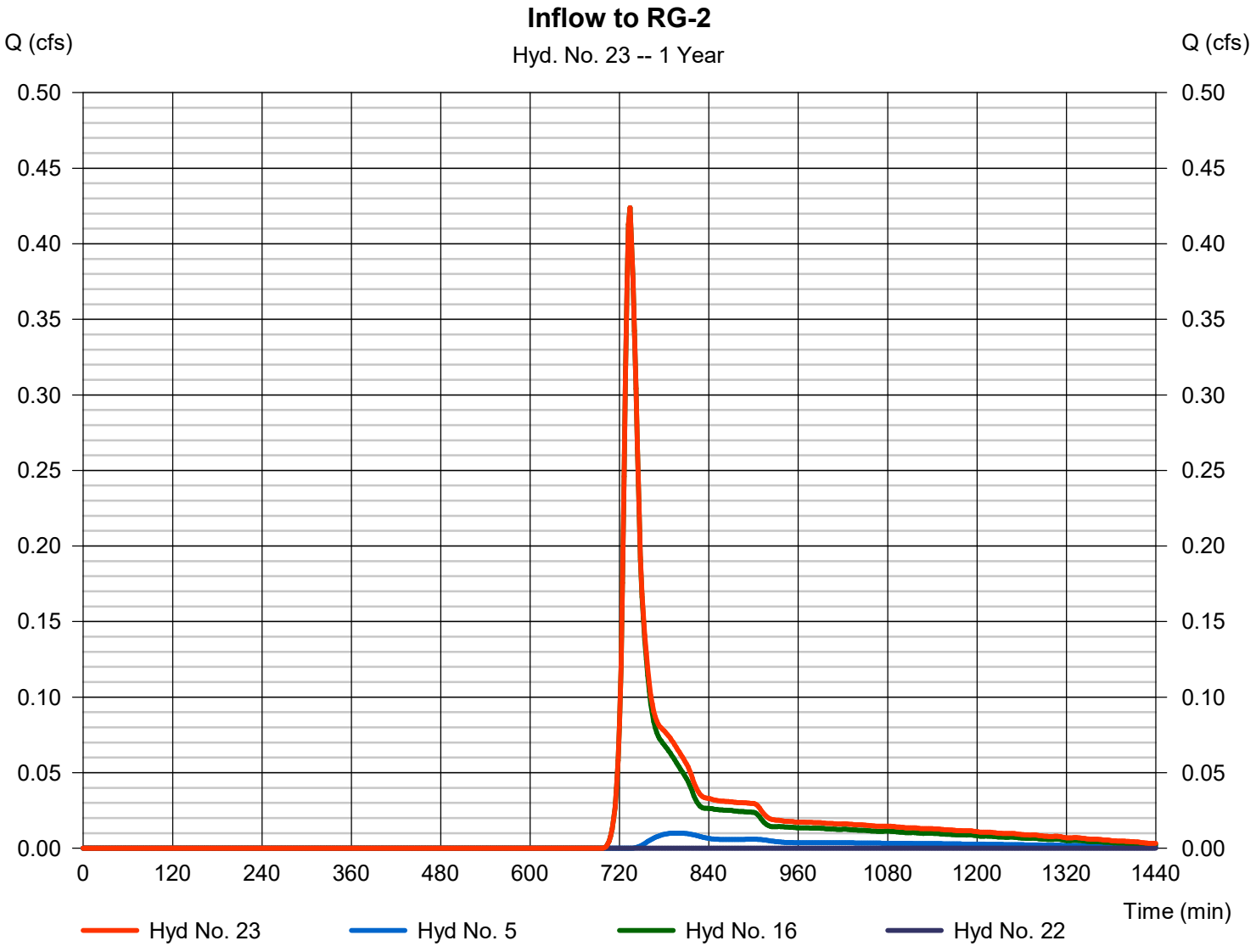
...End

Hydrograph Report

Hyd. No. 23

Inflow to RG-2

Hydrograph type	= Combine	Peak discharge	= 0.424 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 1,420 cuft
Inflow hyds.	= 5, 16, 22	Contrib. drain. area	= 1.217 ac



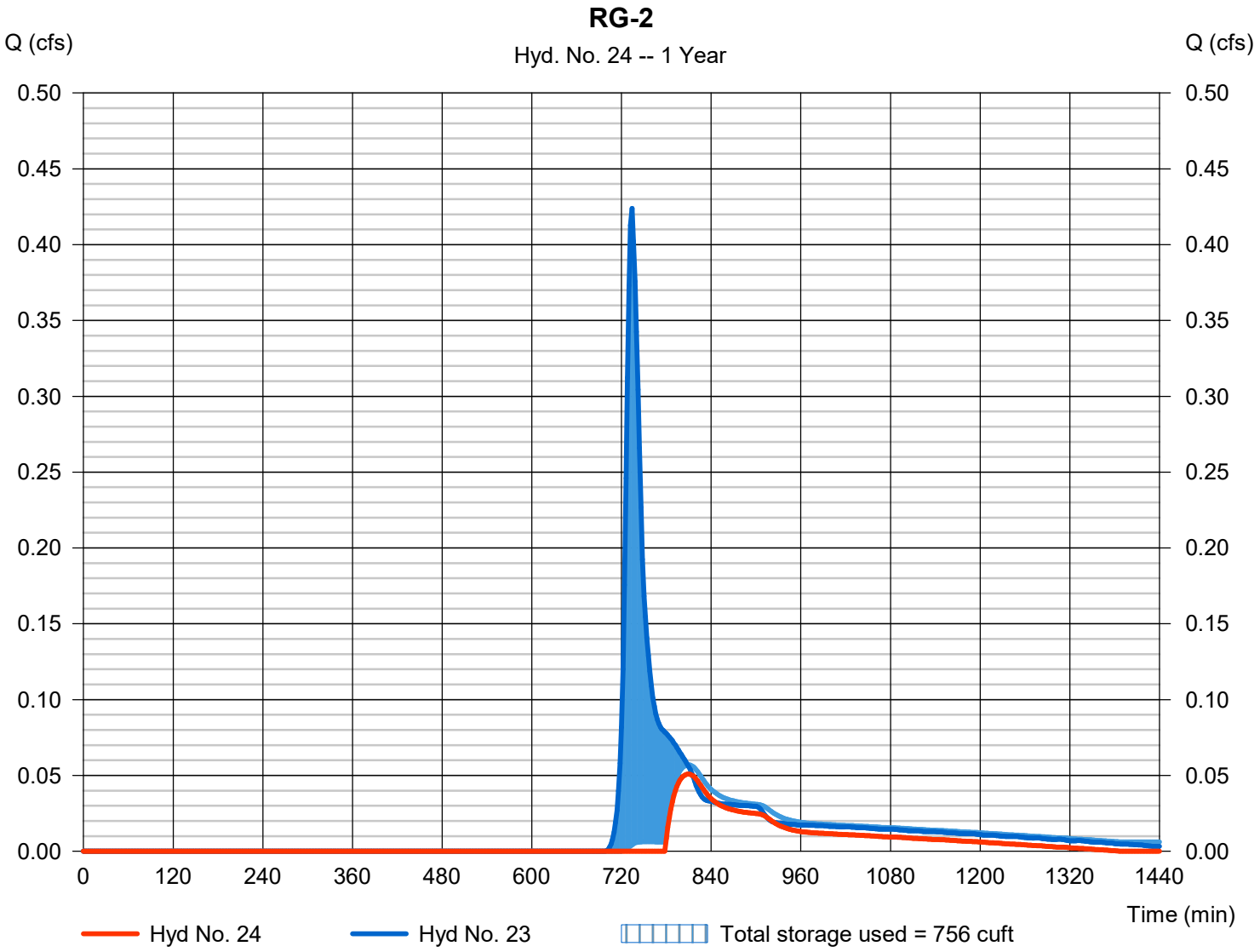
Hydrograph Report

Hyd. No. 24

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	0.051 cfs
Storm frequency	=	1 yrs	Time to peak	=	810 min
Time interval	=	2 min	Hyd. volume	=	487 cuft
Inflow hyd. No.	=	23 - Inflow to RG-2	Max. Elevation	=	110.02 ft
Reservoir name	=	RG-2	Max. Storage	=	756 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 3 - RG-2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 109.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	109.50	1,064	0	0
0.50	110.00	1,796	707	707
1.50	111.00	3,962	2,808	3,515

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 110.05	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.130 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

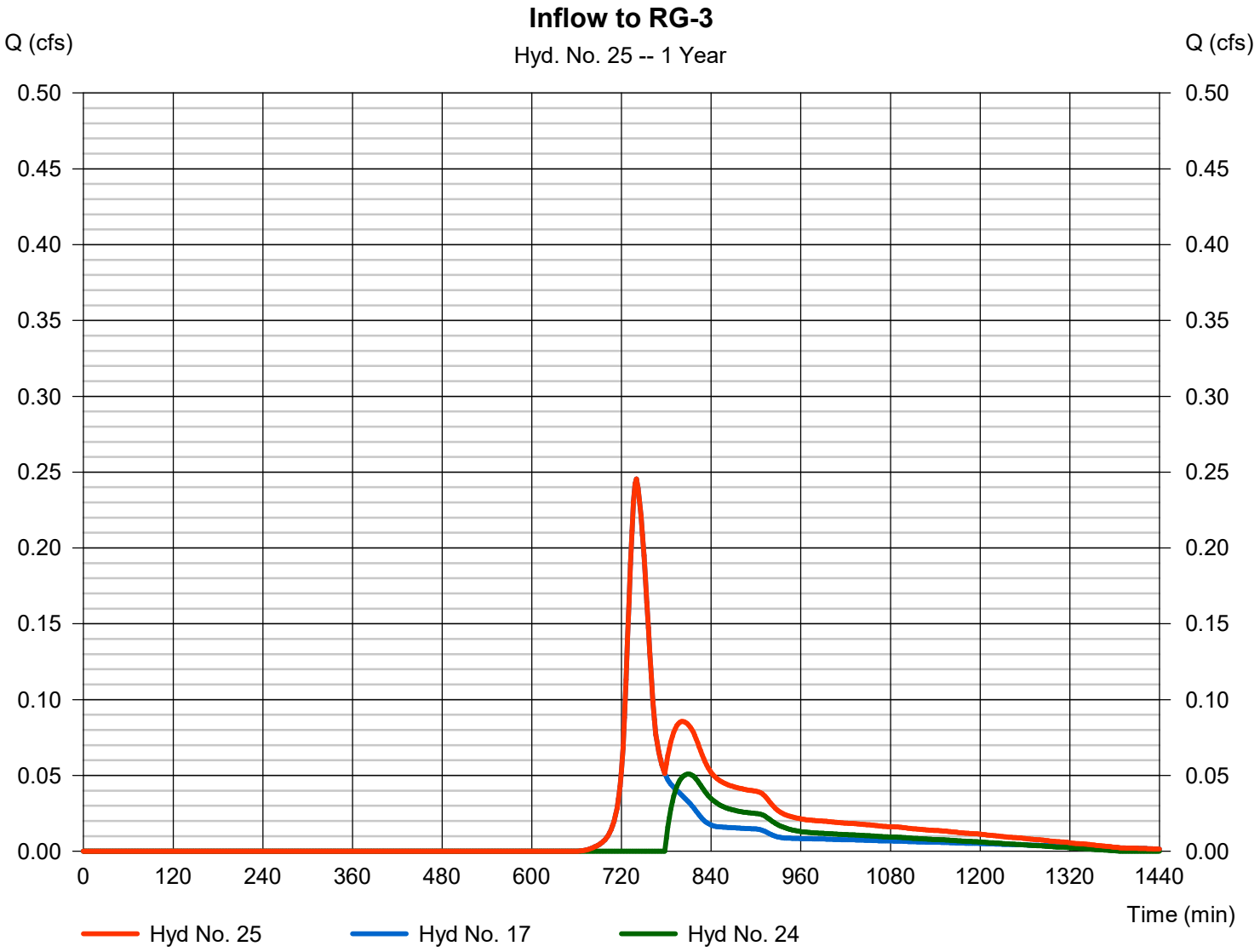
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	109.50	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.05	71	109.55	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.10	141	109.60	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.15	212	109.65	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.20	283	109.70	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.25	353	109.75	---	---	---	---	0.00	---	---	---	0.003	---	0.003
0.30	424	109.80	---	---	---	---	0.00	---	---	---	0.003	---	0.003
0.35	495	109.85	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.40	566	109.90	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.45	636	109.95	---	---	---	---	0.00	---	---	---	0.005	---	0.005
0.50	707	110.00	---	---	---	---	0.00	---	---	---	0.005	---	0.005
0.60	988	110.10	---	---	---	---	0.29	---	---	---	0.006	---	0.297
0.70	1,269	110.20	---	---	---	---	1.51	---	---	---	0.007	---	1.517
0.80	1,549	110.30	---	---	---	---	3.25	---	---	---	0.007	---	3.257
0.90	1,830	110.40	---	---	---	---	5.38	---	---	---	0.008	---	5.392
1.00	2,111	110.50	---	---	---	---	7.85	---	---	---	0.009	---	7.857
1.10	2,392	110.60	---	---	---	---	10.61	---	---	---	0.009	---	10.61
1.20	2,673	110.70	---	---	---	---	13.63	---	---	---	0.010	---	13.63
1.30	2,954	110.80	---	---	---	---	16.89	---	---	---	0.011	---	16.90
1.40	3,234	110.90	---	---	---	---	20.38	---	---	---	0.011	---	20.39
1.50	3,515	111.00	---	---	---	---	24.07	---	---	---	0.012	---	24.09

Hydrograph Report

Hyd. No. 25

Inflow to RG-3

Hydrograph type	=	Combine	Peak discharge	=	0.246 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	1,379 cuft
Inflow hyds.	=	17, 24	Contrib. drain. area	=	0.270 ac



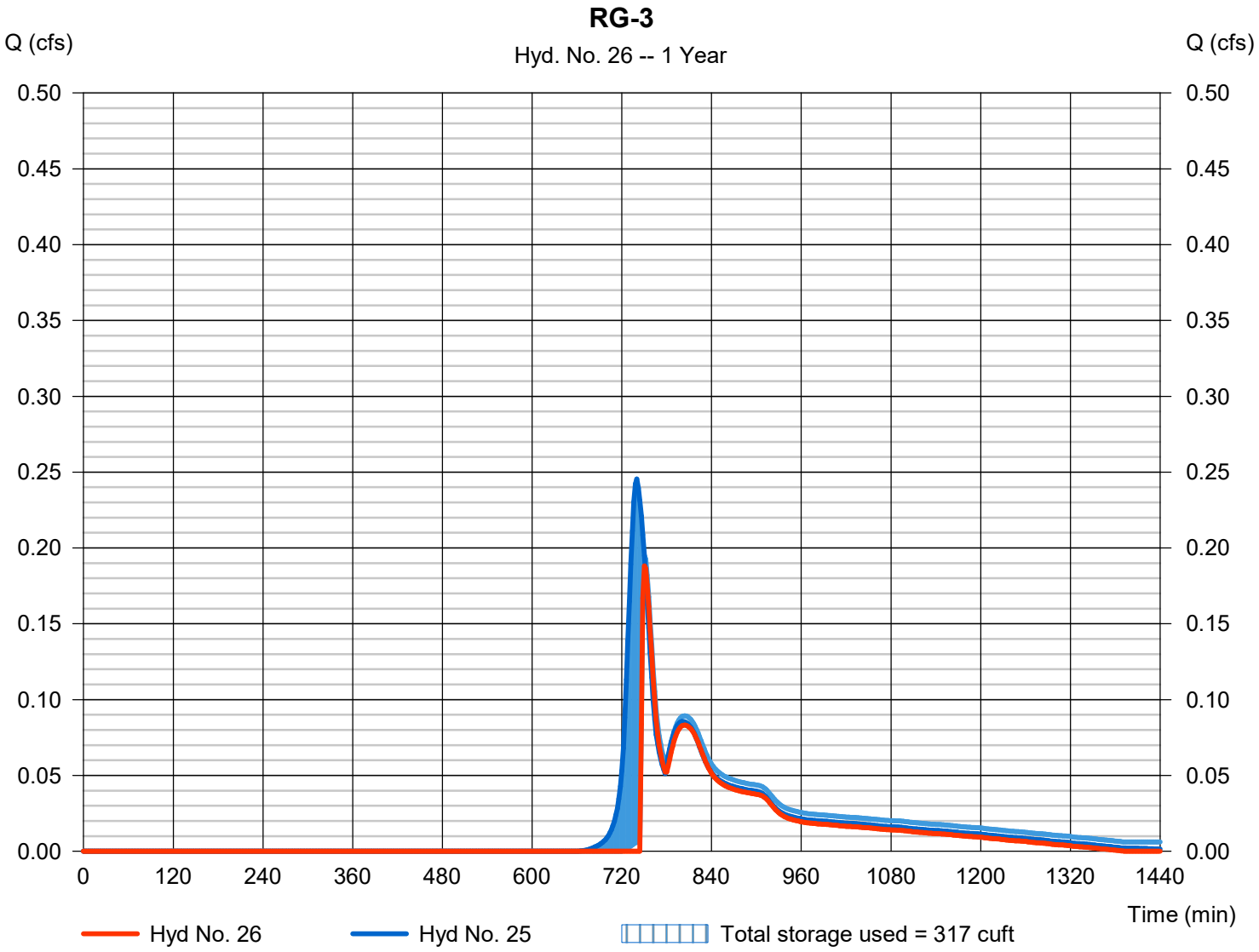
Hydrograph Report

Hyd. No. 26

RG-3

Hydrograph type	=	Reservoir	Peak discharge	=	0.188 cfs
Storm frequency	=	1 yrs	Time to peak	=	750 min
Time interval	=	2 min	Hyd. volume	=	995 cuft
Inflow hyd. No.	=	25 - Inflow to RG-3	Max. Elevation	=	109.02 ft
Reservoir name	=	RG-3	Max. Storage	=	317 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 4 - RG-3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 108.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	108.50	476	0	0
0.50	109.00	706	294	294
1.50	110.00	1,403	1,035	1,328

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 109.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.130 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	108.50	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.05	29	108.55	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.10	59	108.60	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.15	88	108.65	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.20	117	108.70	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.25	147	108.75	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.30	176	108.80	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.35	206	108.85	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.40	235	108.90	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.45	264	108.95	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.50	294	109.00	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.60	397	109.10	---	---	---	---	0.82	---	---	---	0.002	---	0.825
0.70	501	109.20	---	---	---	---	2.33	---	---	---	0.003	---	2.328
0.80	604	109.30	---	---	---	---	4.27	---	---	---	0.003	---	4.275
0.90	707	109.40	---	---	---	---	6.58	---	---	---	0.003	---	6.581
1.00	811	109.50	---	---	---	---	9.19	---	---	---	0.003	---	9.196
1.10	914	109.60	---	---	---	---	12.08	---	---	---	0.003	---	12.09
1.20	1,018	109.70	---	---	---	---	15.23	---	---	---	0.004	---	15.23
1.30	1,121	109.80	---	---	---	---	18.60	---	---	---	0.004	---	18.61
1.40	1,225	109.90	---	---	---	---	22.20	---	---	---	0.004	---	22.20
1.50	1,328	110.00	---	---	---	---	26.00	---	---	---	0.004	---	26.00

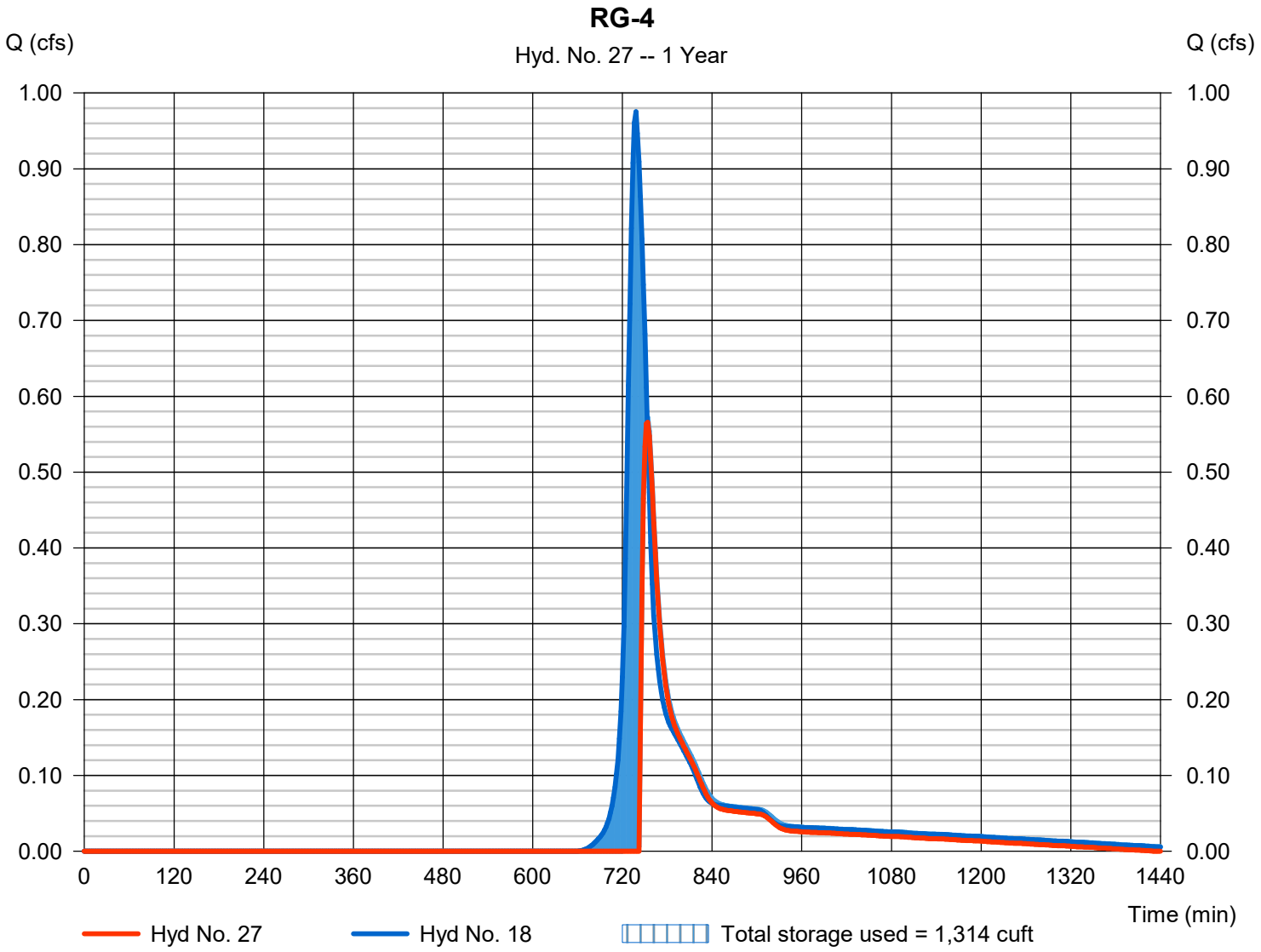
Hydrograph Report

Hyd. No. 27

RG-4

Hydrograph type	=	Reservoir	Peak discharge	=	0.566 cfs
Storm frequency	=	1 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	1,987 cuft
Inflow hyd. No.	=	18 - P-4	Max. Elevation	=	102.19 ft
Reservoir name	=	RG-4	Max. Storage	=	1,314 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 5 - RG-4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 101.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	101.50	1,559	0	0
0.50	102.00	1,911	866	866
1.50	103.00	2,939	2,406	3,272

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 102.10	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.130 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

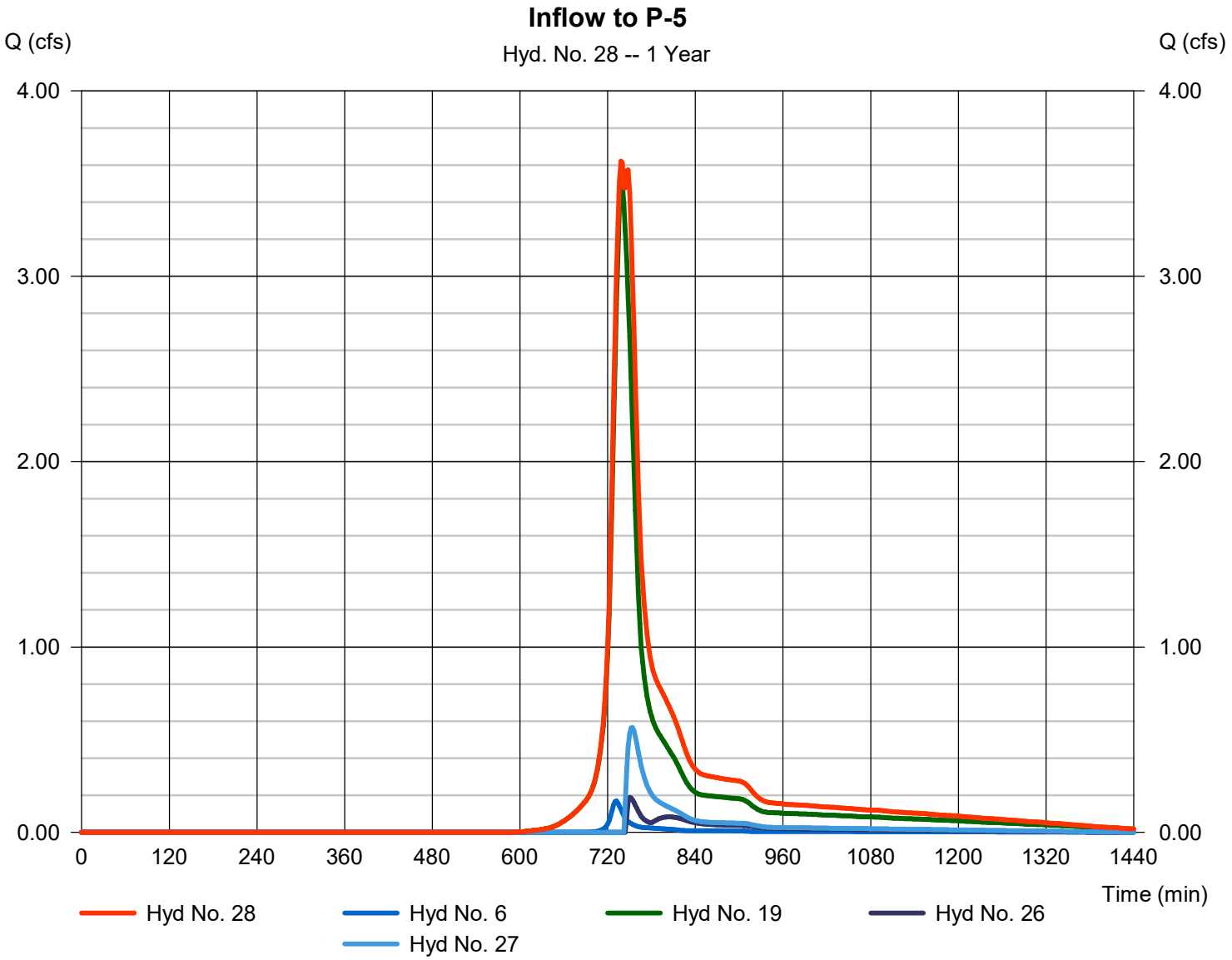
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	101.50	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.05	87	101.55	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.10	173	101.60	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.15	260	101.65	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.20	346	101.70	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.25	433	101.75	---	---	---	---	0.00	---	---	---	0.003	---	0.003
0.30	520	101.80	---	---	---	---	0.00	---	---	---	0.003	---	0.003
0.35	606	101.85	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.40	693	101.90	---	---	---	---	0.00	---	---	---	0.005	---	0.005
0.45	779	101.95	---	---	---	---	0.00	---	---	---	0.005	---	0.005
0.50	866	102.00	---	---	---	---	0.00	---	---	---	0.006	---	0.006
0.60	1,107	102.10	---	---	---	---	0.00	---	---	---	0.006	---	0.006
0.70	1,347	102.20	---	---	---	---	0.66	---	---	---	0.006	---	0.664
0.80	1,588	102.30	---	---	---	---	1.86	---	---	---	0.007	---	1.867
0.90	1,828	102.40	---	---	---	---	3.42	---	---	---	0.007	---	3.425
1.00	2,069	102.50	---	---	---	---	5.26	---	---	---	0.007	---	5.269
1.10	2,310	102.60	---	---	---	---	7.35	---	---	---	0.008	---	7.362
1.20	2,550	102.70	---	---	---	---	9.67	---	---	---	0.008	---	9.675
1.30	2,791	102.80	---	---	---	---	12.18	---	---	---	0.008	---	12.19
1.40	3,032	102.90	---	---	---	---	14.88	---	---	---	0.009	---	14.89
1.50	3,272	103.00	---	---	---	---	17.76	---	---	---	0.009	---	17.77

Hydrograph Report

Hyd. No. 28

Inflow to P-5

Hydrograph type	=	Combine	Peak discharge	=	3.621 cfs
Storm frequency	=	1 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	15,952 cuft
Inflow hyds.	=	6, 19, 26, 27	Contrib. drain. area	=	3.020 ac



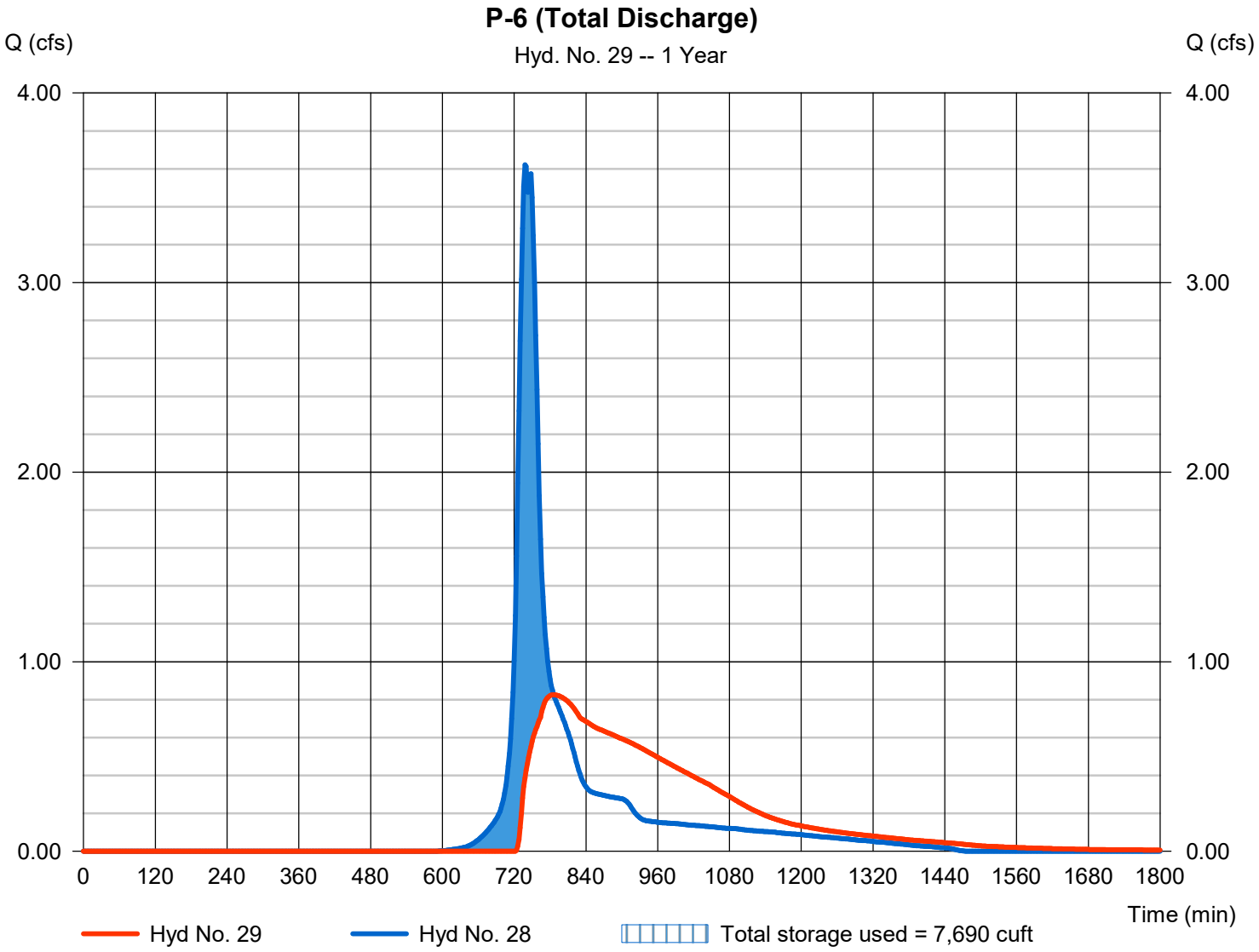
Hydrograph Report

Hyd. No. 29

P-6 (Total Discharge)

Hydrograph type	= Reservoir	Peak discharge	= 0.825 cfs
Storm frequency	= 1 yrs	Time to peak	= 786 min
Time interval	= 2 min	Hyd. volume	= 14,800 cuft
Inflow hyd. No.	= 28 - Inflow to P-5	Max. Elevation	= 94.88 ft
Reservoir name	= POND P-5	Max. Storage	= 7,690 cuft

Storage Indication method used.



Pond No. 6 - POND P-5

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 93.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	93.00	1,019	0	0
0.50	93.50	3,769	1,125	1,125
1.00	94.00	4,473	2,058	3,182
2.00	95.00	5,801	5,122	8,304
3.00	96.00	7,032	6,406	14,710
4.00	97.00	8,926	7,959	22,670
5.00	98.00	10,742	9,819	32,489
5.50	98.50	11,617	5,588	38,077
6.00	99.00	12,874	6,119	44,196
6.50	99.50	14,243	6,776	50,972

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	5.00	6.50	0.00
Span (in)	= 15.00	5.00	6.50	0.00
No. Barrels	= 1	1	2	0
Invert El. (ft)	= 90.00	93.50	94.75	0.00
Length (ft)	= 69.00	0.50	0.50	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.42	10.00	Inactive	Inactive
Crest El. (ft)	= 98.25	98.50	96.05	96.30
Weir Coeff.	= 3.33	2.60	3.33	0.56
Weir Type	= 1	Broad	Rect	25 degV
Multi-Stage	= Yes	No	Yes	Yes
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	93.00	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.05	112	93.05	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.10	225	93.10	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.15	337	93.15	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.20	450	93.20	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.25	562	93.25	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.30	675	93.30	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.35	787	93.35	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.40	900	93.40	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.45	1,012	93.45	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.50	1,125	93.50	8.75 oc	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.55	1,330	93.55	8.75 oc	0.01 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.007
0.60	1,536	93.60	8.75 oc	0.03 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.028
0.65	1,742	93.65	8.75 oc	0.06 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.058
0.70	1,948	93.70	8.75 oc	0.10 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.100
0.75	2,153	93.75	8.75 oc	0.15 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.146
0.80	2,359	93.80	8.75 oc	0.20 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.198
0.85	2,565	93.85	8.75 oc	0.25 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.247
0.90	2,771	93.90	8.75 oc	0.29 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.290
0.95	2,977	93.95	8.75 oc	0.32 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.323
1.00	3,182	94.00	8.75 oc	0.35 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.355
1.10	3,695	94.10	8.75 oc	0.41 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.411
1.20	4,207	94.20	8.75 oc	0.46 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.460
1.30	4,719	94.30	8.75 oc	0.50 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.505
1.40	5,231	94.40	8.75 oc	0.55 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.546
1.50	5,743	94.50	8.75 oc	0.58 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.584
1.60	6,256	94.60	8.75 oc	0.62 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.620
1.70	6,768	94.70	8.75 oc	0.65 ic	0.00	---	0.00	0.00	0.00	---	---	---	0.654
1.80	7,280	94.80	8.75 oc	0.69 ic	0.02 ic	---	0.00	0.00	0.00	---	---	---	0.703
1.90	7,792	94.90	8.75 oc	0.72 ic	0.14 ic	---	0.00	0.00	0.00	---	---	---	0.856
2.00	8,304	95.00	8.75 oc	0.75 ic	0.36 ic	---	0.00	0.00	0.00	---	---	---	1.107
2.10	8,945	95.10	8.75 oc	0.77 ic	0.64 ic	---	0.00	0.00	0.00	---	---	---	1.410
2.20	9,586	95.20	8.75 oc	0.80 ic	0.94 ic	---	0.00	0.00	0.00	---	---	---	1.742

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POND P-5

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
2.30	10,226	95.30	8.75 oc	0.83 ic	1.17 ic	---	0.00	0.00	0.00	---	---	---	2.001
2.40	10,867	95.40	8.75 oc	0.85 ic	1.37 ic	---	0.00	0.00	0.00	---	---	---	2.220
2.50	11,507	95.50	8.75 oc	0.88 ic	1.54 ic	---	0.00	0.00	0.00	---	---	---	2.415
2.60	12,148	95.60	8.75 oc	0.90 ic	1.69 ic	---	0.00	0.00	0.00	---	---	---	2.591
2.70	12,789	95.70	8.75 oc	0.93 ic	1.83 ic	---	0.00	0.00	0.00	---	---	---	2.755
2.80	13,429	95.80	8.75 oc	0.95 ic	1.96 ic	---	0.00	0.00	0.00	---	---	---	2.908
2.90	14,070	95.90	8.75 oc	0.97 ic	2.08 ic	---	0.00	0.00	0.00	---	---	---	3.052
3.00	14,710	96.00	8.75 oc	0.99 ic	2.20 ic	---	0.00	0.00	0.00	---	---	---	3.189
3.10	15,506	96.10	8.75 oc	1.02 ic	2.30 ic	---	0.00	0.00	0.00	---	---	---	3.320
3.20	16,302	96.20	8.75 oc	1.04 ic	2.41 ic	---	0.00	0.00	0.00	---	---	---	3.446
3.30	17,098	96.30	8.75 oc	1.06 ic	2.51 ic	---	0.00	0.00	0.00	---	---	---	3.566
3.40	17,894	96.40	8.75 oc	1.08 ic	2.61 ic	---	0.00	0.00	0.00	---	---	---	3.683
3.50	18,690	96.50	8.75 oc	1.10 ic	2.70 ic	---	0.00	0.00	0.00	---	---	---	3.795
3.60	19,486	96.60	8.75 oc	1.12 ic	2.79 ic	---	0.00	0.00	0.00	---	---	---	3.905
3.70	20,282	96.70	8.75 oc	1.14 ic	2.88 ic	---	0.00	0.00	0.00	---	---	---	4.011
3.80	21,078	96.80	8.75 oc	1.15 ic	2.96 ic	---	0.00	0.00	0.00	---	---	---	4.114
3.90	21,874	96.90	8.75 oc	1.17 ic	3.04 ic	---	0.00	0.00	0.00	---	---	---	4.214
4.00	22,670	97.00	8.75 oc	1.19 ic	3.12 ic	---	0.00	0.00	0.00	---	---	---	4.313
4.10	23,652	97.10	8.75 oc	1.21 ic	3.20 ic	---	0.00	0.00	0.00	---	---	---	4.408
4.20	24,634	97.20	8.75 oc	1.23 ic	3.28 ic	---	0.00	0.00	0.00	---	---	---	4.502
4.30	25,616	97.30	8.75 oc	1.24 ic	3.35 ic	---	0.00	0.00	0.00	---	---	---	4.594
4.40	26,597	97.40	8.75 oc	1.26 ic	3.42 ic	---	0.00	0.00	0.00	---	---	---	4.684
4.50	27,579	97.50	8.75 oc	1.28 ic	3.49 ic	---	0.00	0.00	0.00	---	---	---	4.772
4.60	28,561	97.60	8.75 oc	1.30 ic	3.56 ic	---	0.00	0.00	0.00	---	---	---	4.858
4.70	29,543	97.70	8.75 oc	1.31 ic	3.63 ic	---	0.00	0.00	0.00	---	---	---	4.943
4.80	30,525	97.80	8.75 oc	1.33 ic	3.70 ic	---	0.00	0.00	0.00	---	---	---	5.027
4.90	31,507	97.90	8.75 oc	1.34 ic	3.76 ic	---	0.00	0.00	0.00	---	---	---	5.109
5.00	32,489	98.00	8.75 oc	1.36 ic	3.83 ic	---	0.00	0.00	0.00	---	---	---	5.190
5.05	33,048	98.05	8.75 oc	1.37 ic	3.86 ic	---	0.00	0.00	0.00	---	---	---	5.230
5.10	33,606	98.10	8.75 oc	1.38 ic	3.89 ic	---	0.00	0.00	0.00	---	---	---	5.269
5.15	34,165	98.15	8.75 oc	1.38 ic	3.92 ic	---	0.00	0.00	0.00	---	---	---	5.308
5.20	34,724	98.20	8.75 oc	1.39 ic	3.96 ic	---	0.00	0.00	0.00	---	---	---	5.347
5.25	35,283	98.25	8.75 oc	1.40 ic	3.99 ic	---	0.00	0.00	0.00	---	---	---	5.386
5.30	35,842	98.30	8.75 oc	1.41 ic	4.02 ic	---	0.35	0.00	0.00	---	---	---	5.776
5.35	36,400	98.35	8.75 oc	1.41 ic	4.05 ic	---	0.99	0.00	0.00	---	---	---	6.455
5.40	36,959	98.40	8.75 oc	1.42 ic	4.08 ic	---	1.82	0.00	0.00	---	---	---	7.323
5.45	37,518	98.45	8.75 oc	1.43 ic	4.11 ic	---	2.81	0.00	0.00	---	---	---	8.345
5.50	38,077	98.50	9.50 oc	1.44 ic	4.14 ic	---	3.92	0.00	0.00	---	---	---	9.497
5.55	38,689	98.55	10.69 oc	1.37 ic	4.17 ic	---	5.15	0.29	0.00	---	---	---	10.98
5.60	39,300	98.60	11.90 oc	1.23 ic	4.17 ic	---	6.50	0.82	0.00	---	---	---	12.72
5.65	39,912	98.65	12.80 oc	1.11 ic	3.76 ic	---	7.94	1.51	0.00	---	---	---	14.32
5.70	40,524	98.70	13.70 oc	0.97 ic	3.26 ic	---	9.47	2.33	0.00	---	---	---	16.02
5.75	41,136	98.75	14.55 oc	0.79 ic	2.67 ic	---	11.09	3.25	0.00	---	---	---	17.80
5.80	41,748	98.80	15.32 oc	0.58 ic	1.94 ic	---	12.80	4.27	0.00	---	---	---	19.59
5.85	42,360	98.85	15.70 oc	0.44 ic	1.47 ic	---	13.78 s	5.38	0.00	---	---	---	21.08
5.90	42,972	98.90	15.84 oc	0.39 ic	1.30 ic	---	14.15 s	6.58	0.00	---	---	---	22.42
5.95	43,584	98.95	15.96 oc	0.35 ic	1.17 ic	---	14.43 s	7.85	0.00	---	---	---	23.80
6.00	44,196	99.00	16.05 oc	0.32 ic	1.07 ic	---	14.67 s	9.19	0.00	---	---	---	25.24
6.05	44,874	99.05	16.14 oc	0.29 ic	0.98 ic	---	14.86 s	10.61	0.00	---	---	---	26.74
6.10	45,551	99.10	16.21 oc	0.27 ic	0.91 ic	---	15.04 s	12.08	0.00	---	---	---	28.29
6.15	46,229	99.15	16.28 oc	0.25 ic	0.84 ic	---	15.19 s	13.63	0.00	---	---	---	29.91
6.20	46,906	99.20	16.35 oc	0.23 ic	0.78 ic	---	15.33 s	15.23	0.00	---	---	---	31.57
6.25	47,584	99.25	16.41 oc	0.22 ic	0.73 ic	---	15.46 s	16.89	0.00	---	---	---	33.30
6.30	48,261	99.30	16.47 oc	0.20 ic	0.69 ic	---	15.58 s	18.60	0.00	---	---	---	35.08
6.35	48,939	99.35	16.53 oc	0.19 ic	0.65 ic	---	15.69 s	20.38	0.00	---	---	---	36.91
6.40	49,617	99.40	16.59 oc	0.18 ic	0.61 ic	---	15.79 s	22.20	0.00	---	---	---	38.78
6.45	50,294	99.45	16.64 oc	0.17 ic	0.58 ic	---	15.89 s	24.08	0.00	---	---	---	40.71
6.50	50,972	99.50	16.69 oc	0.16 ic	0.55 ic	---	15.97 s	26.00	0.00	---	---	---	42.69

...End

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.540	2	736	1,750	------	------	------	E-1
2	SCS Runoff	1.661	2	738	5,812	------	------	------	E-2
3	SCS Runoff	1.560	2	746	7,327	------	------	------	E-3
4	SCS Runoff	0.192	2	764	1,593	------	------	------	OS-1
5	SCS Runoff	0.025	2	770	294	------	------	------	OS-2
6	SCS Runoff	0.219	2	732	575	------	------	------	OS-3
7	SCS Runoff	0.730	2	736	2,657	------	------	------	OS-4 (E-2 Courtyards)
9	Combine	1.326	2	736	6,001	1, 4, 7,	------	------	INFLOW TO K-1
10	Reservoir	0.000	2	798	0	9	112.37	5,484	EX. K-1
12	Combine	1.572	2	748	7,620	3, 5,	------	------	TOTAL TO WELSH OAKS SUB.
13	Combine	3.794	2	742	16,665	2, 3, 5, 6, 7, 10,	------	------	EX TOTAL FLOW
15	SCS Runoff	0.419	2	736	1,299	------	------	------	P-1
16	SCS Runoff	0.561	2	734	1,628	------	------	------	P-2
17	SCS Runoff	0.307	2	740	1,107	------	------	------	P-3
18	SCS Runoff	1.221	2	738	4,162	------	------	------	P-4
19	SCS Runoff	4.226	2	740	15,089	------	------	------	P-5
21	Combine	1.205	2	736	5,549	4, 7, 15,	------	------	Inflow to PR K-1
22	Reservoir	0.000	2	2136	0	21	111.30	3,973	PR K-1
23	Combine	0.563	2	734	1,922	5, 16, 22	------	------	Inflow to RG-2
24	Reservoir	0.113	2	772	981	23	110.04	816	RG-2
25	Combine	0.307	2	740	2,088	17, 24	------	------	Inflow to RG-3
26	Reservoir	0.273	2	746	1,702	25	109.03	328	RG-3
27	Reservoir	0.920	2	748	2,789	18	102.22	1,400	RG-4
28	Combine	5.027	2	744	20,155	6, 19, 26, 27	------	------	Inflow to P-5
29	Reservoir	1.543	2	770	19,003	28	95.14	9,202	P-6 (Total Discharge)

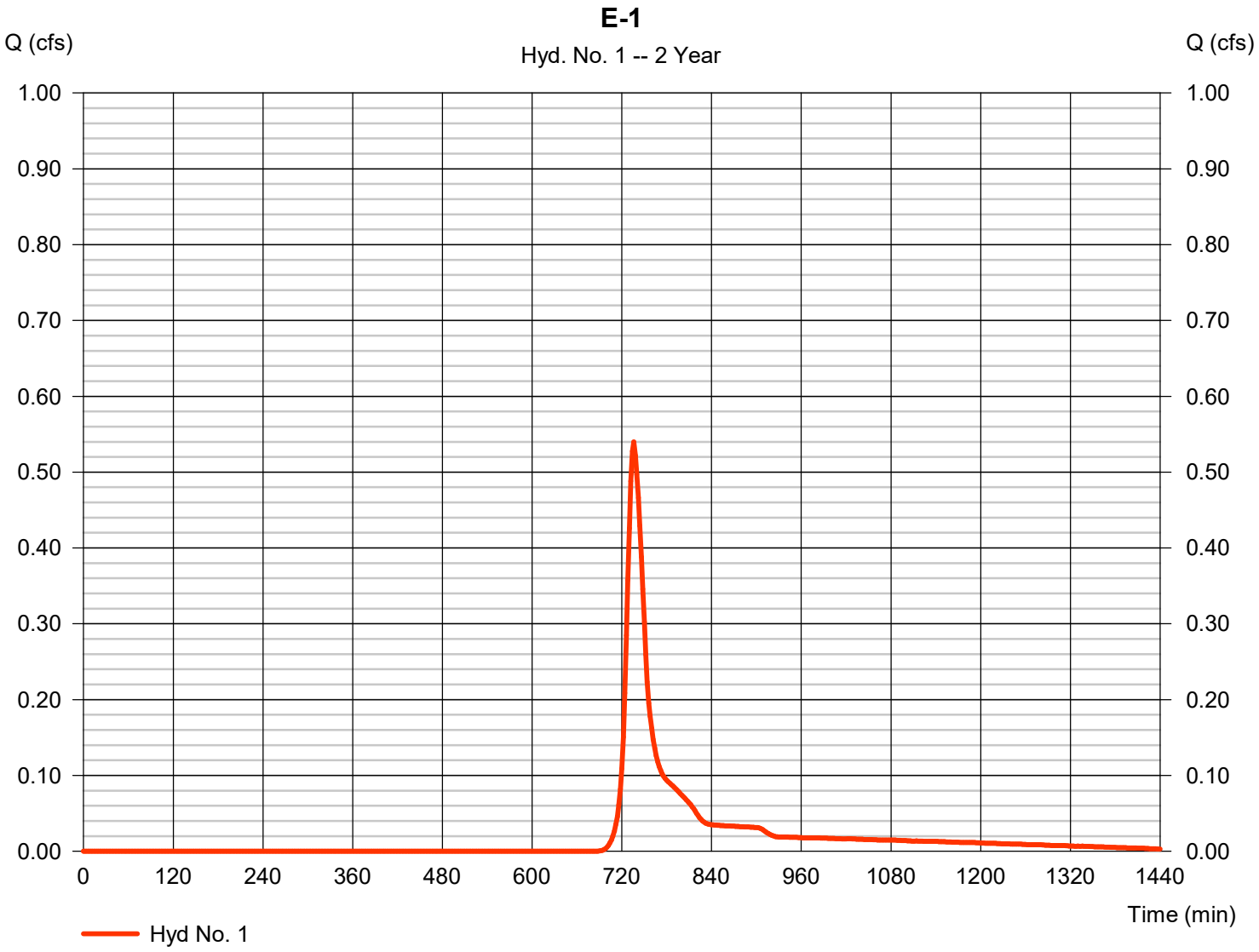
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 1

E-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.540 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 1,750 cuft
Drainage area	= 0.589 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.00 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

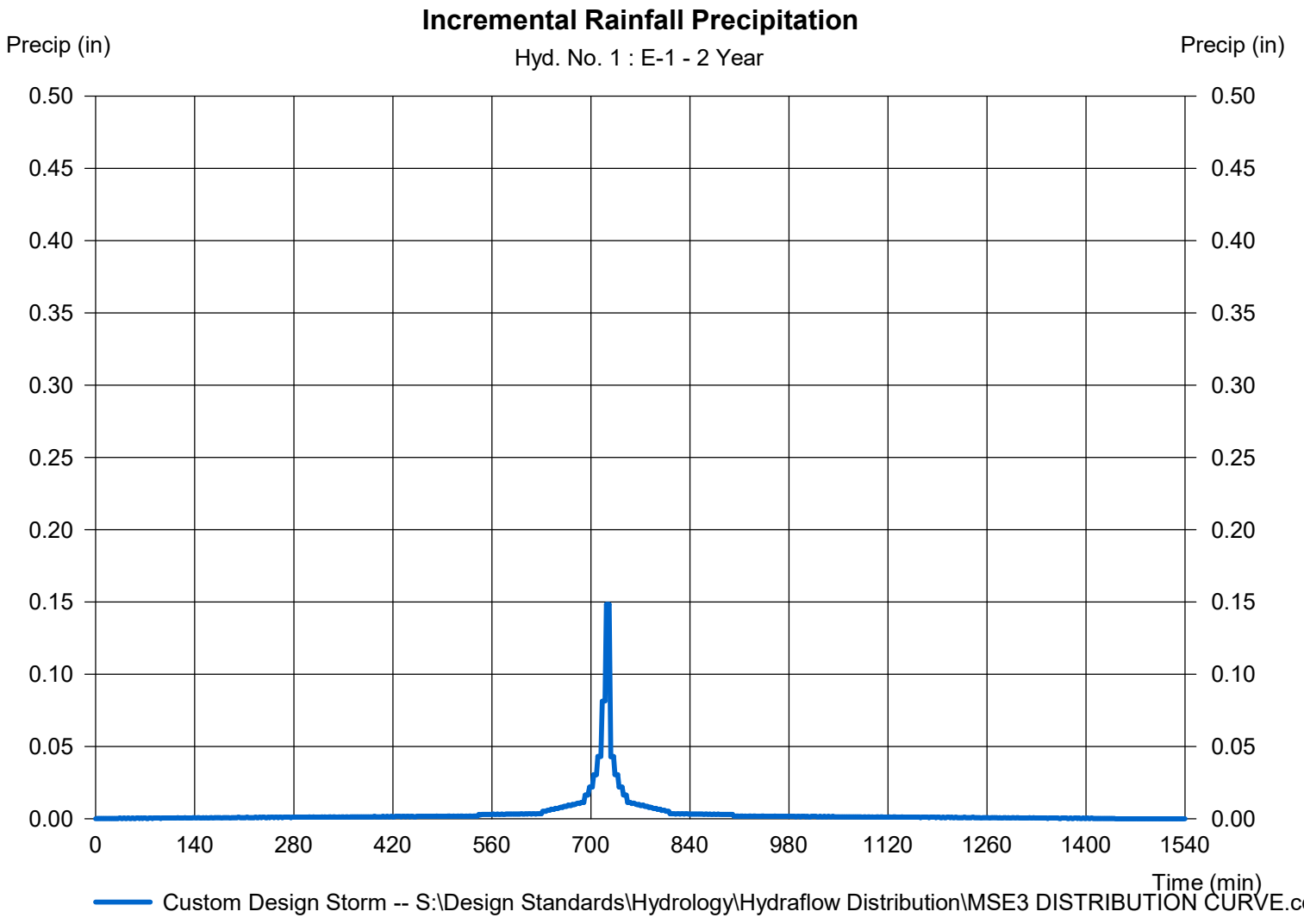


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

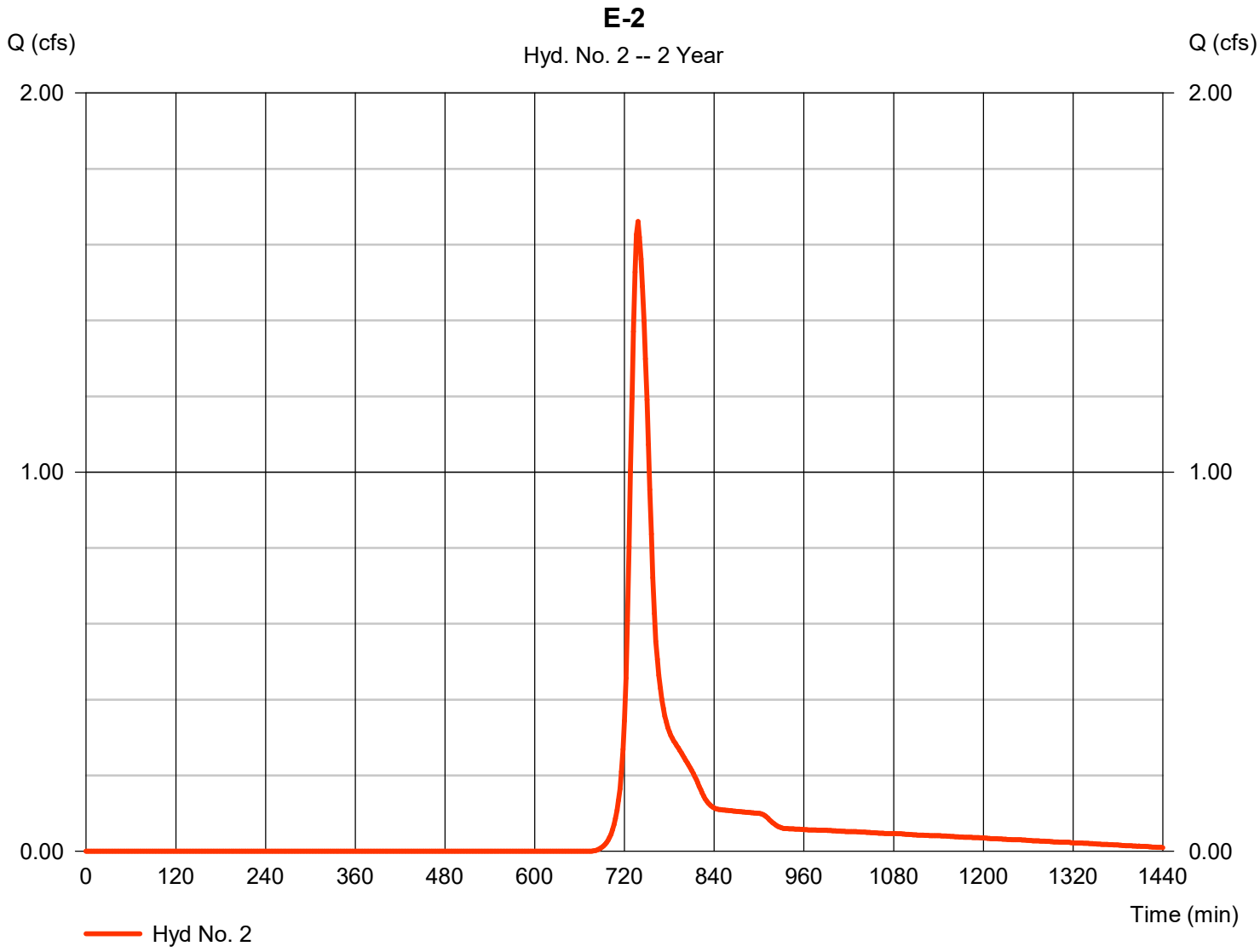


Hydrograph Report

Hyd. No. 2

E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.661 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	5,812 cuft
Drainage area	=	1.709 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	23.10 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

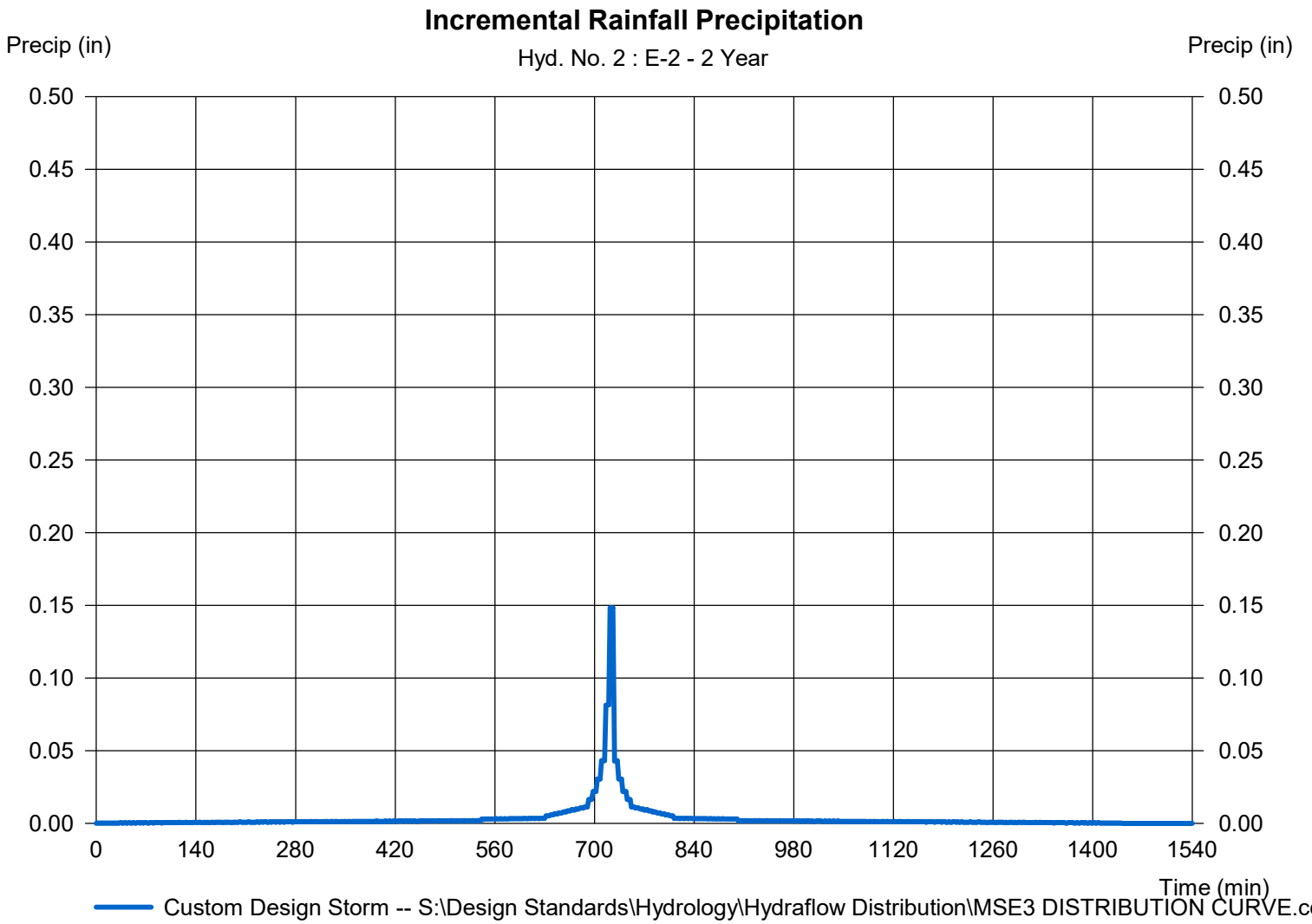


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

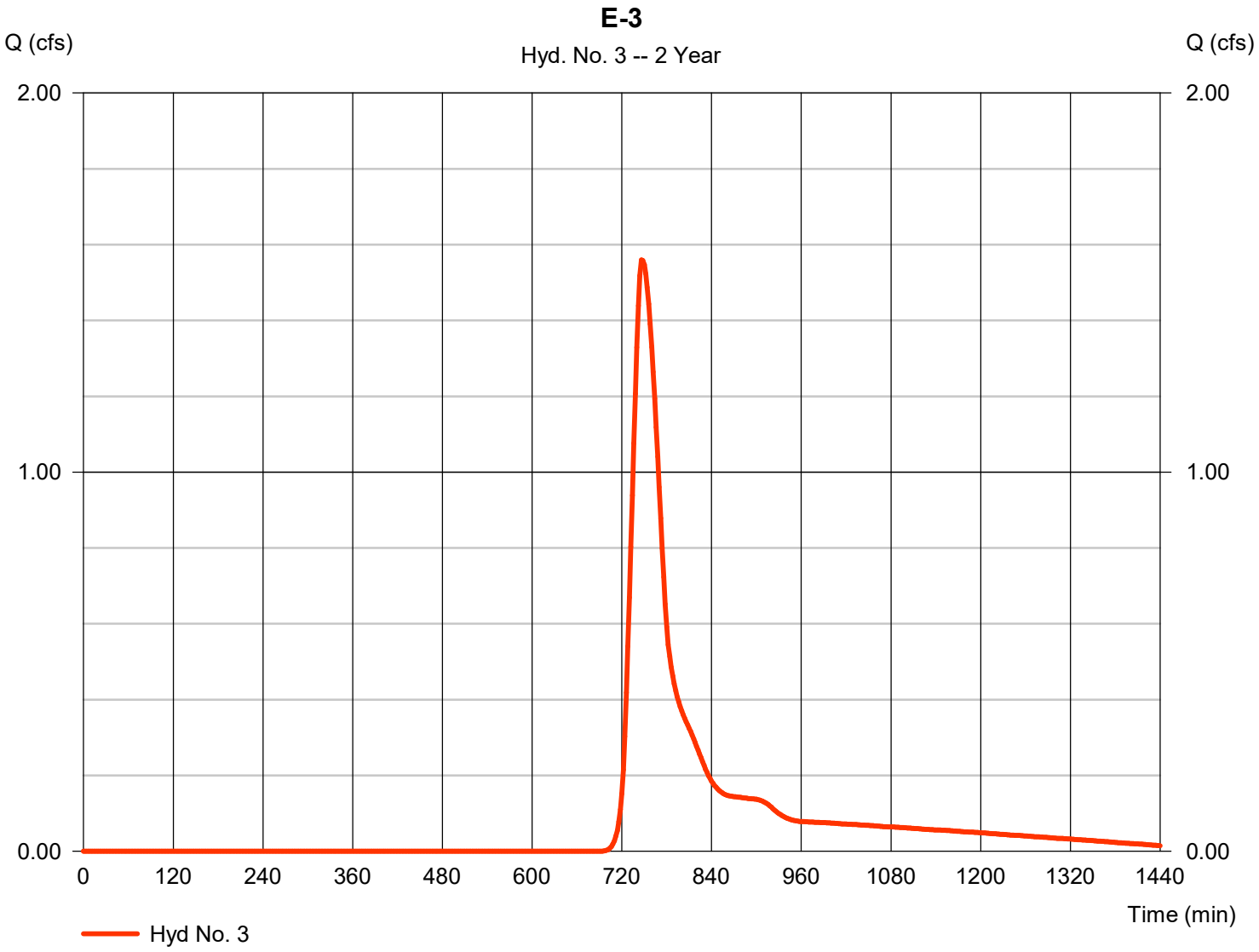


Hydrograph Report

Hyd. No. 3

E-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.560 cfs
Storm frequency	=	2 yrs	Time to peak	=	746 min
Time interval	=	2 min	Hyd. volume	=	7,327 cuft
Drainage area	=	2.650 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	35.90 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

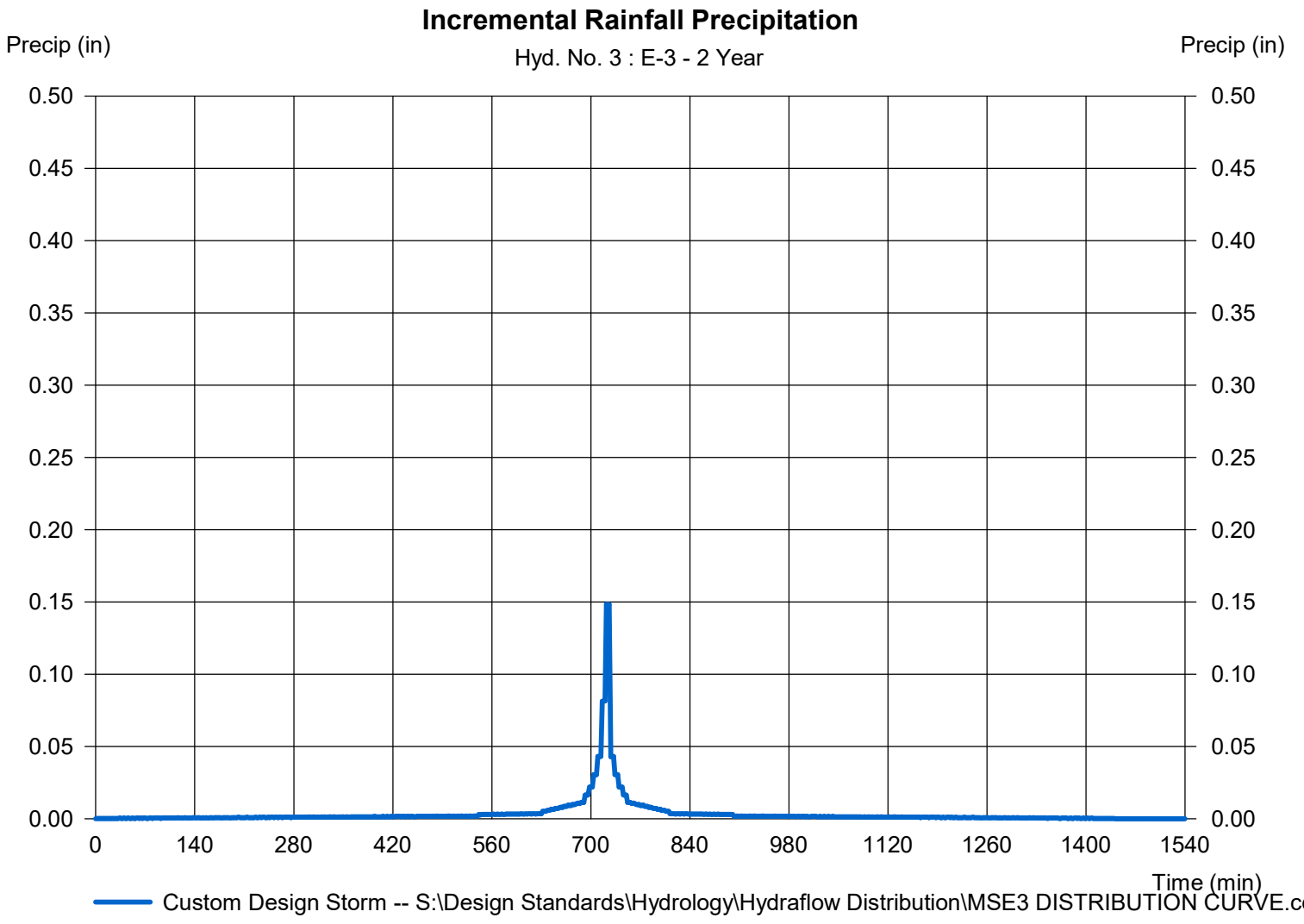


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



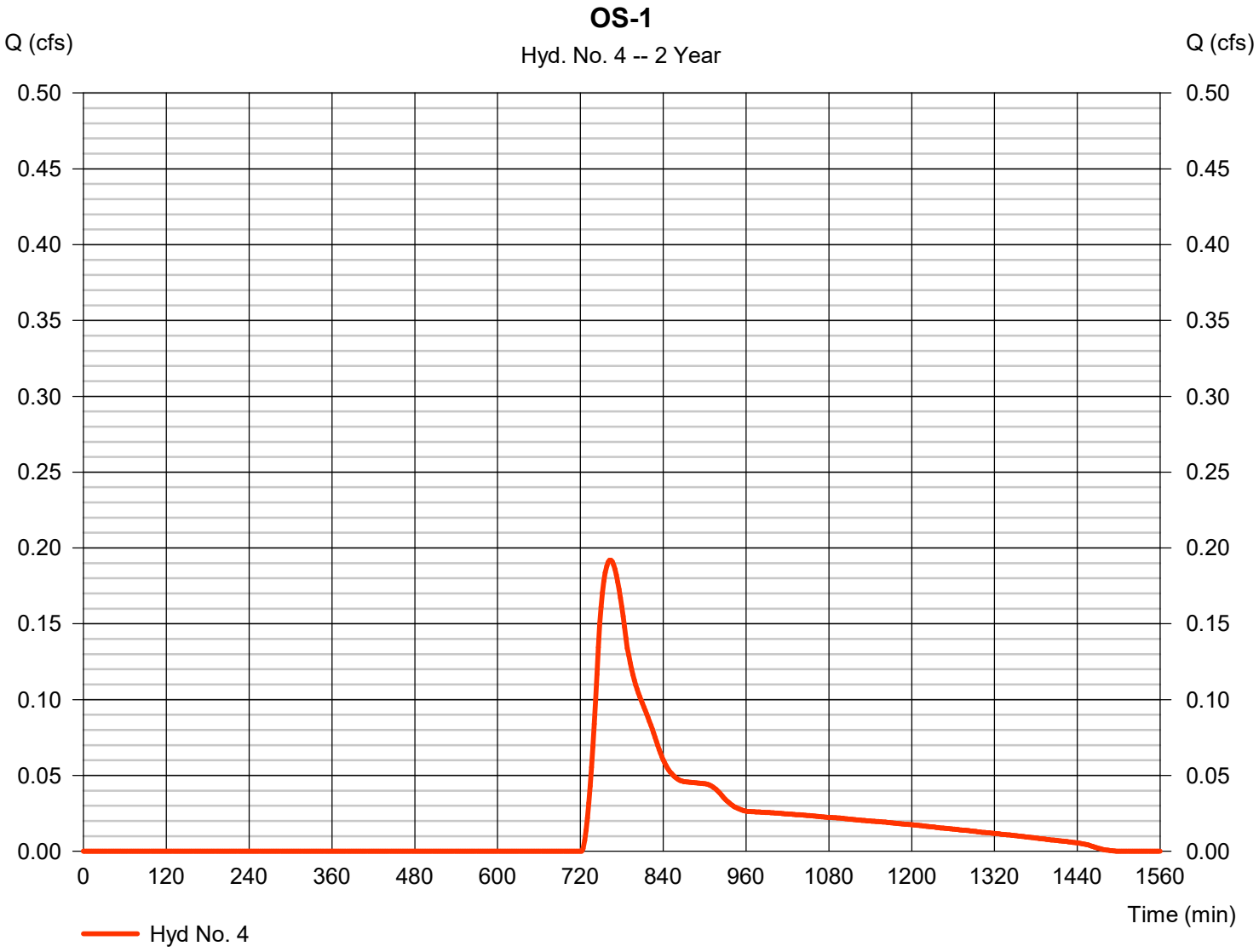
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 4

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.192 cfs
Storm frequency	= 2 yrs	Time to peak	= 764 min
Time interval	= 2 min	Hyd. volume	= 1,593 cuft
Drainage area	= 1.893 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 40.30 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

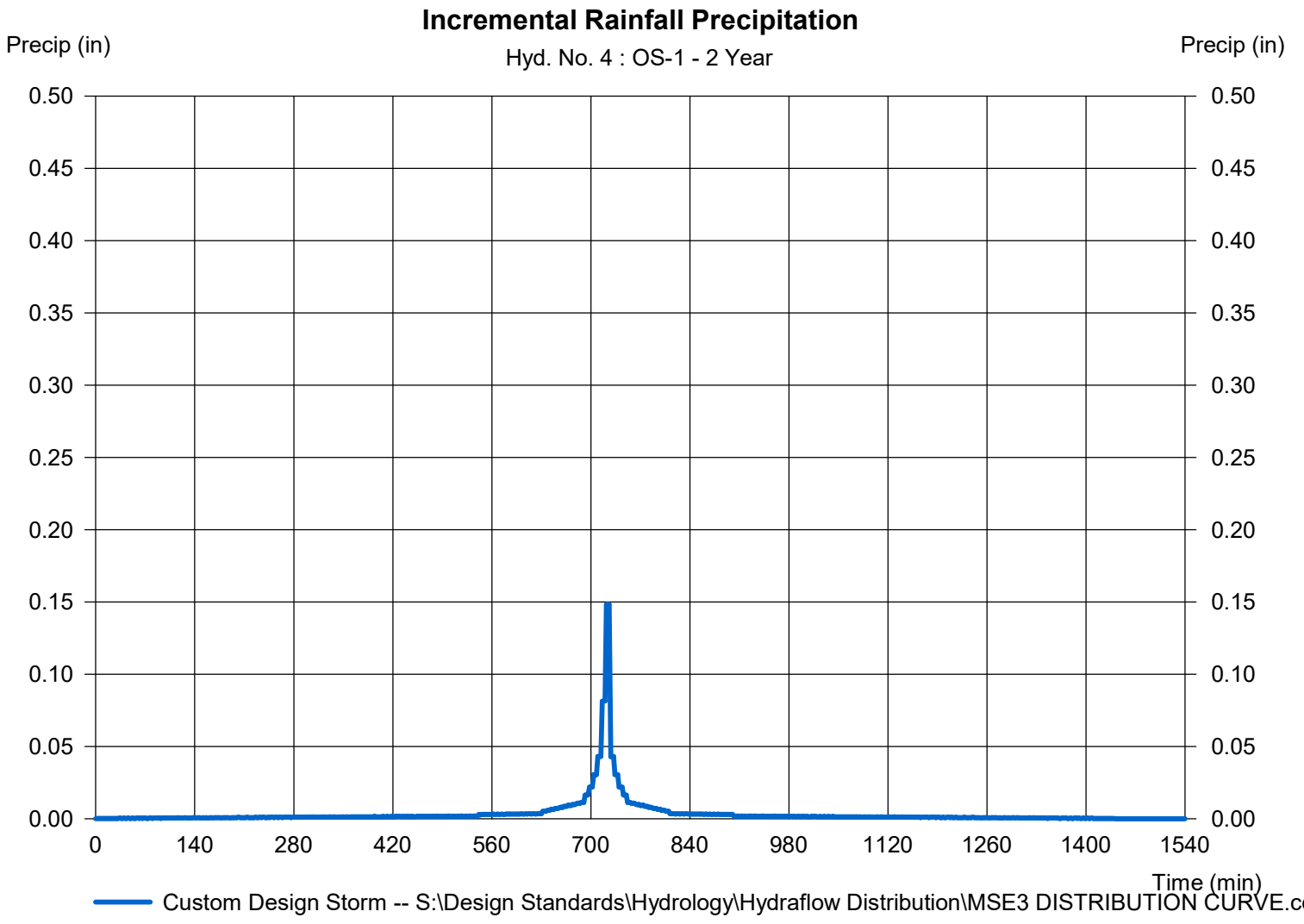


Precipitation Report

Hyd. No. 4

OS-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



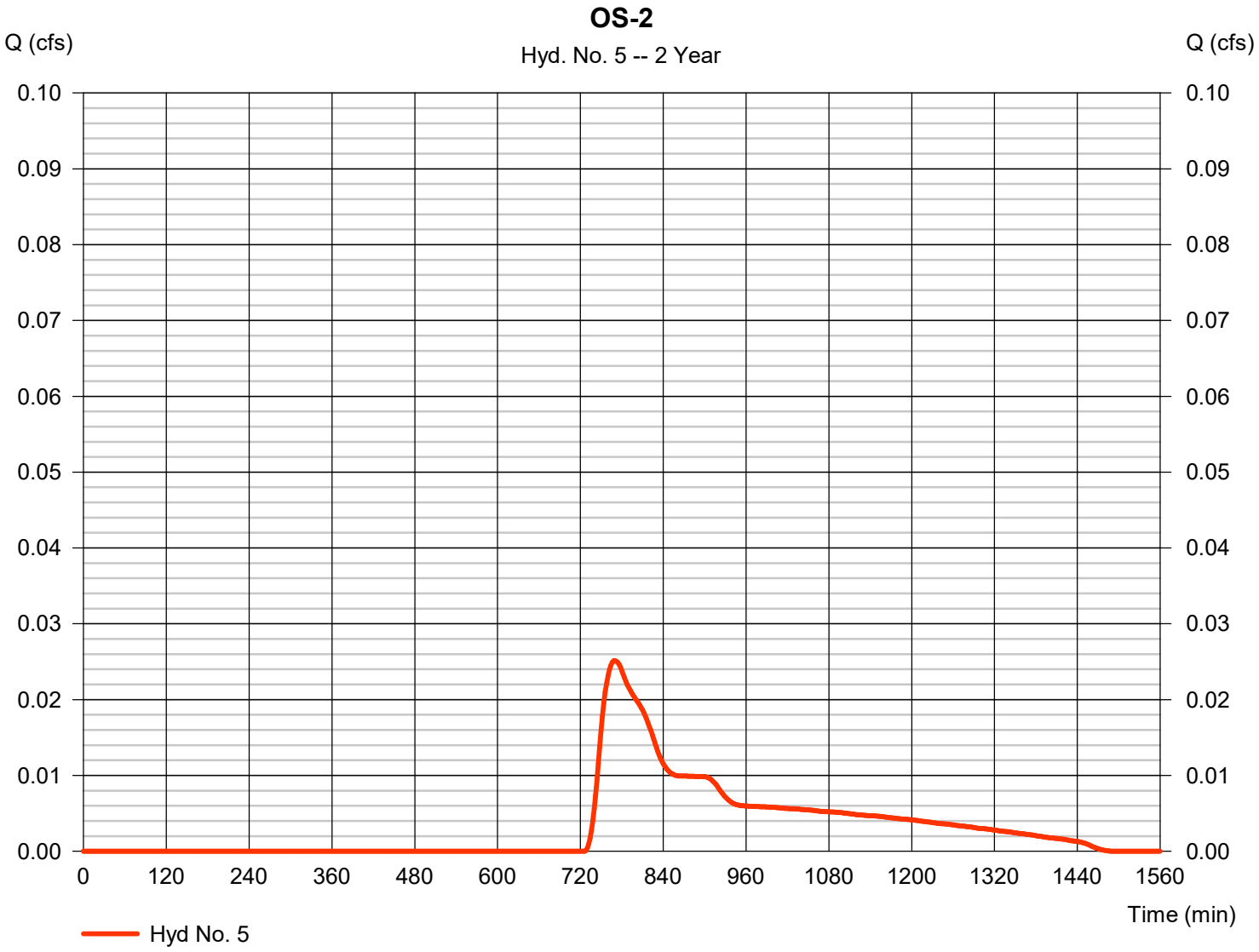
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 5

OS-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.025 cfs
Storm frequency	= 2 yrs	Time to peak	= 770 min
Time interval	= 2 min	Hyd. volume	= 294 cuft
Drainage area	= 0.655 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

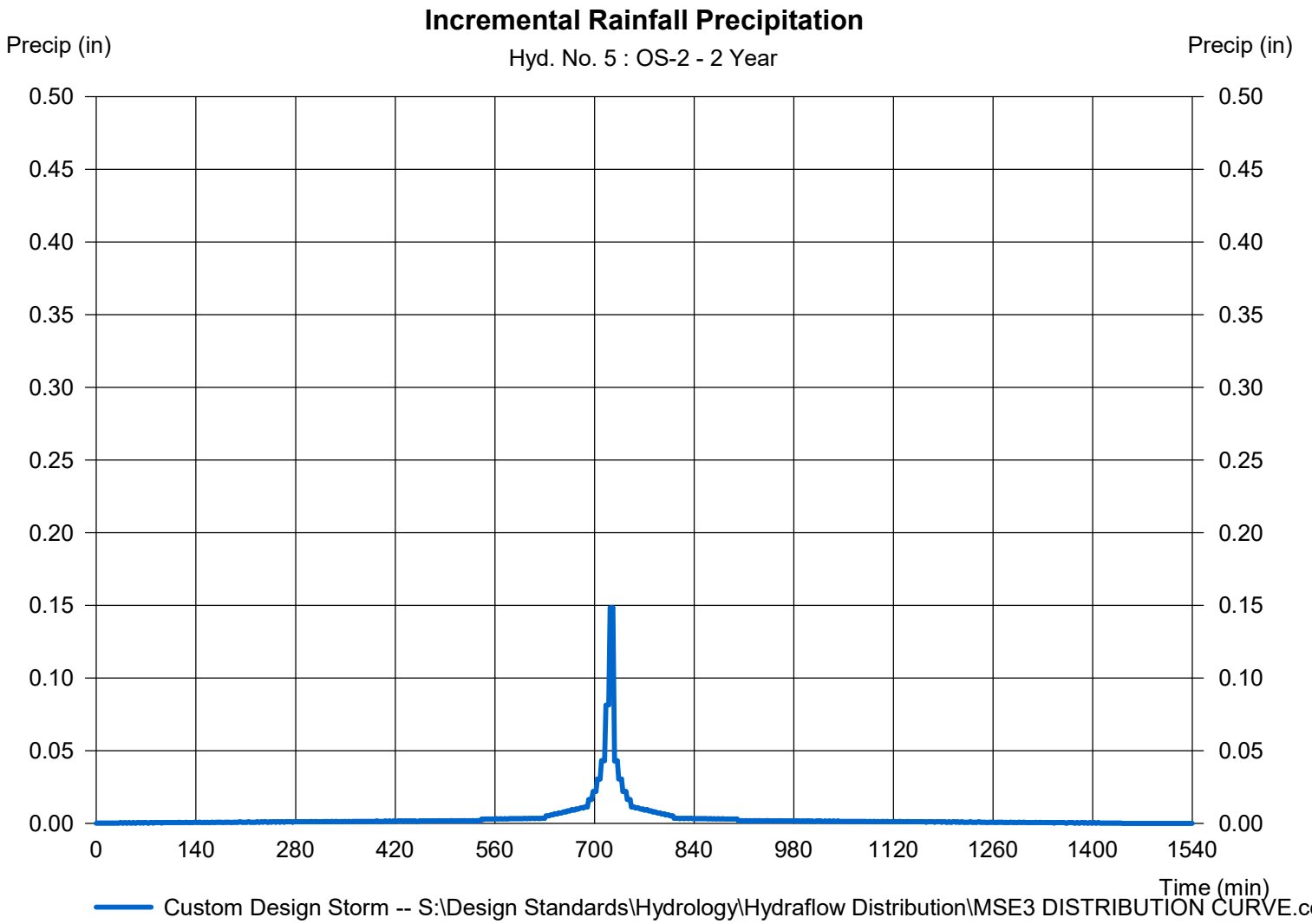


Precipitation Report

Hyd. No. 5

OS-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



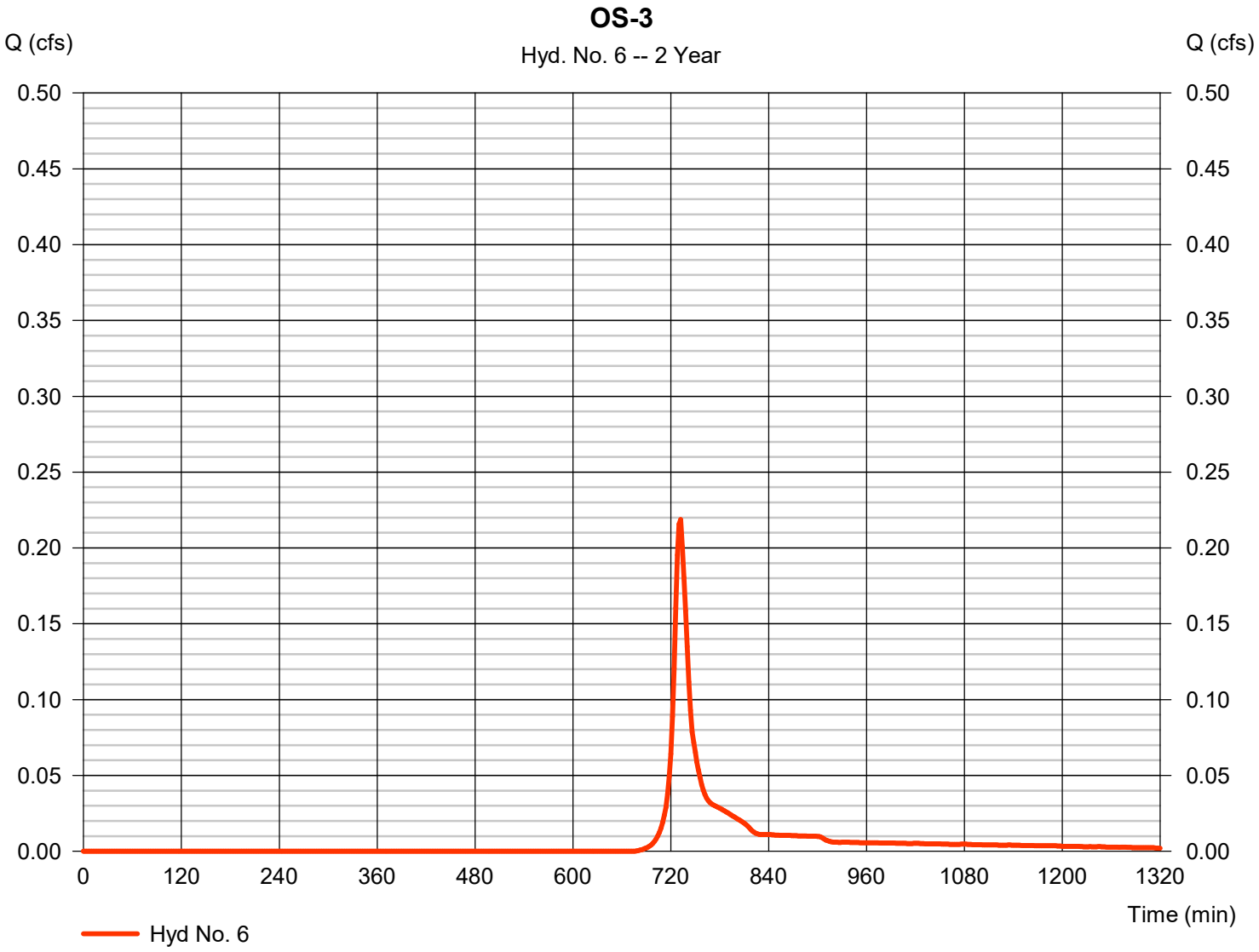
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 6

OS-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.219 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 575 cuft
Drainage area	= 0.167 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

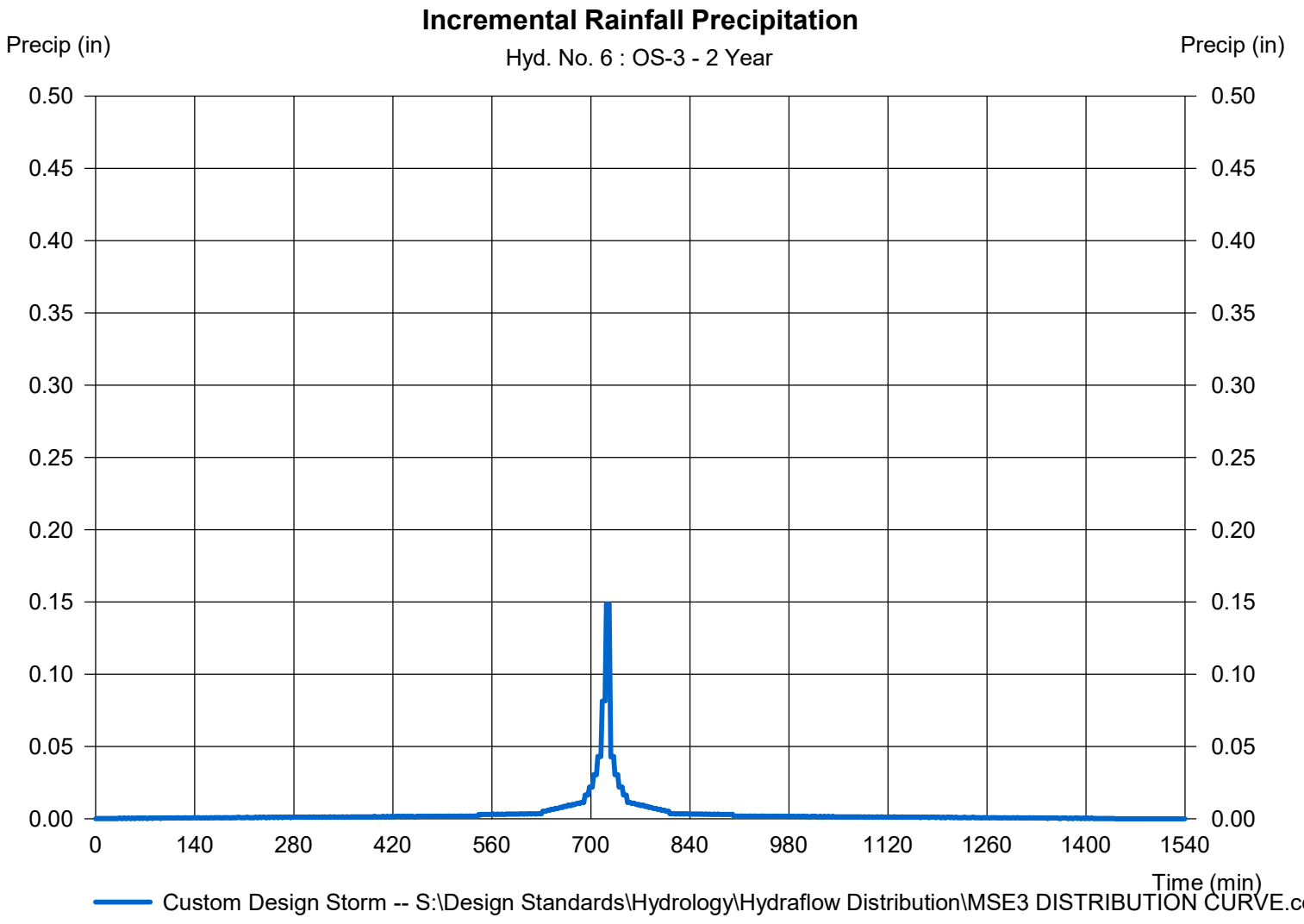


Precipitation Report

Hyd. No. 6

OS-3

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



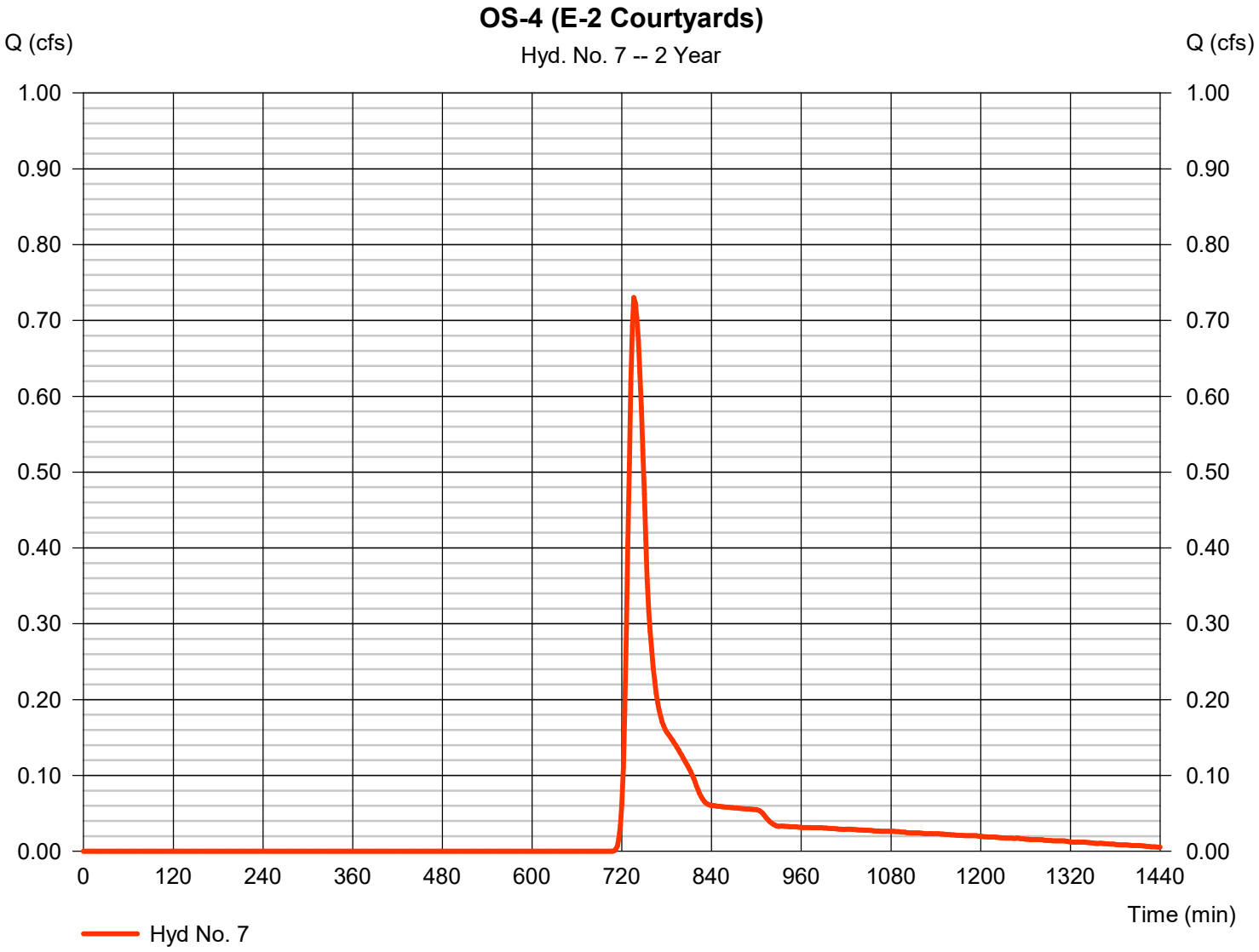
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 7

OS-4 (E-2 Courtyards)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.730 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 2,657 cuft
Drainage area	= 1.321 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.40 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

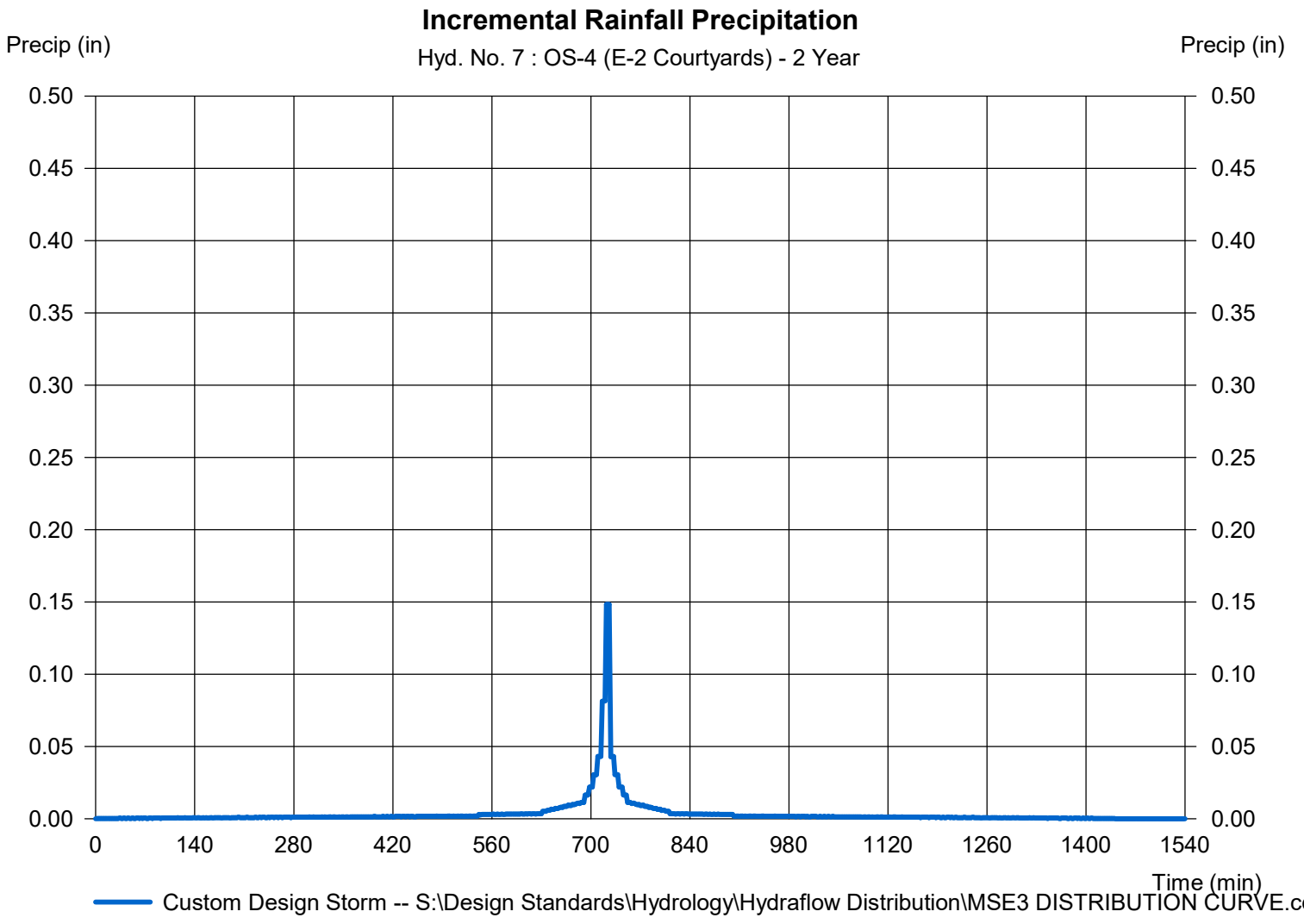


Precipitation Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

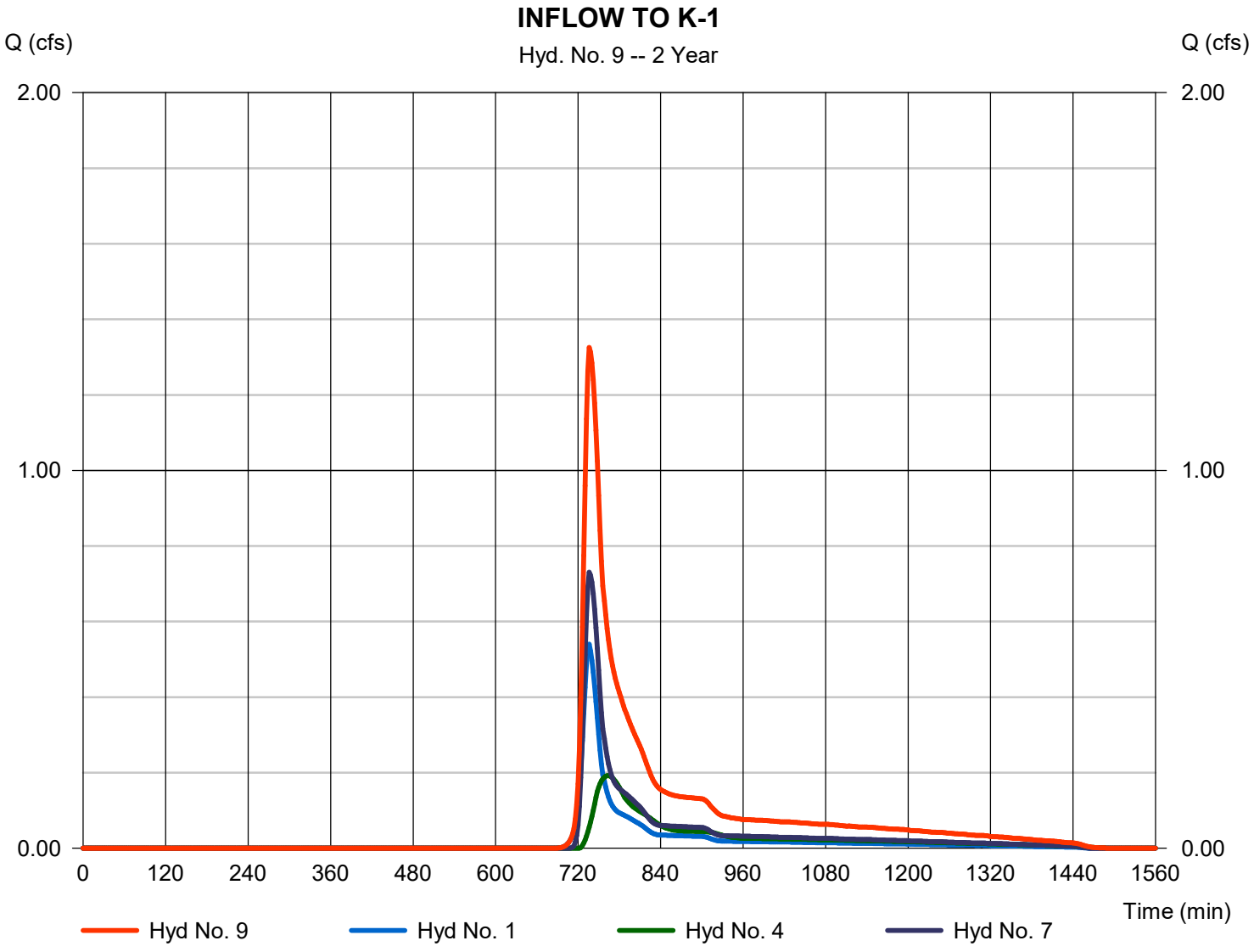


Hydrograph Report

Hyd. No. 9

INFLOW TO K-1

Hydrograph type	= Combine	Peak discharge	= 1.326 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 6,001 cuft
Inflow hyds.	= 1, 4, 7	Contrib. drain. area	= 3.803 ac



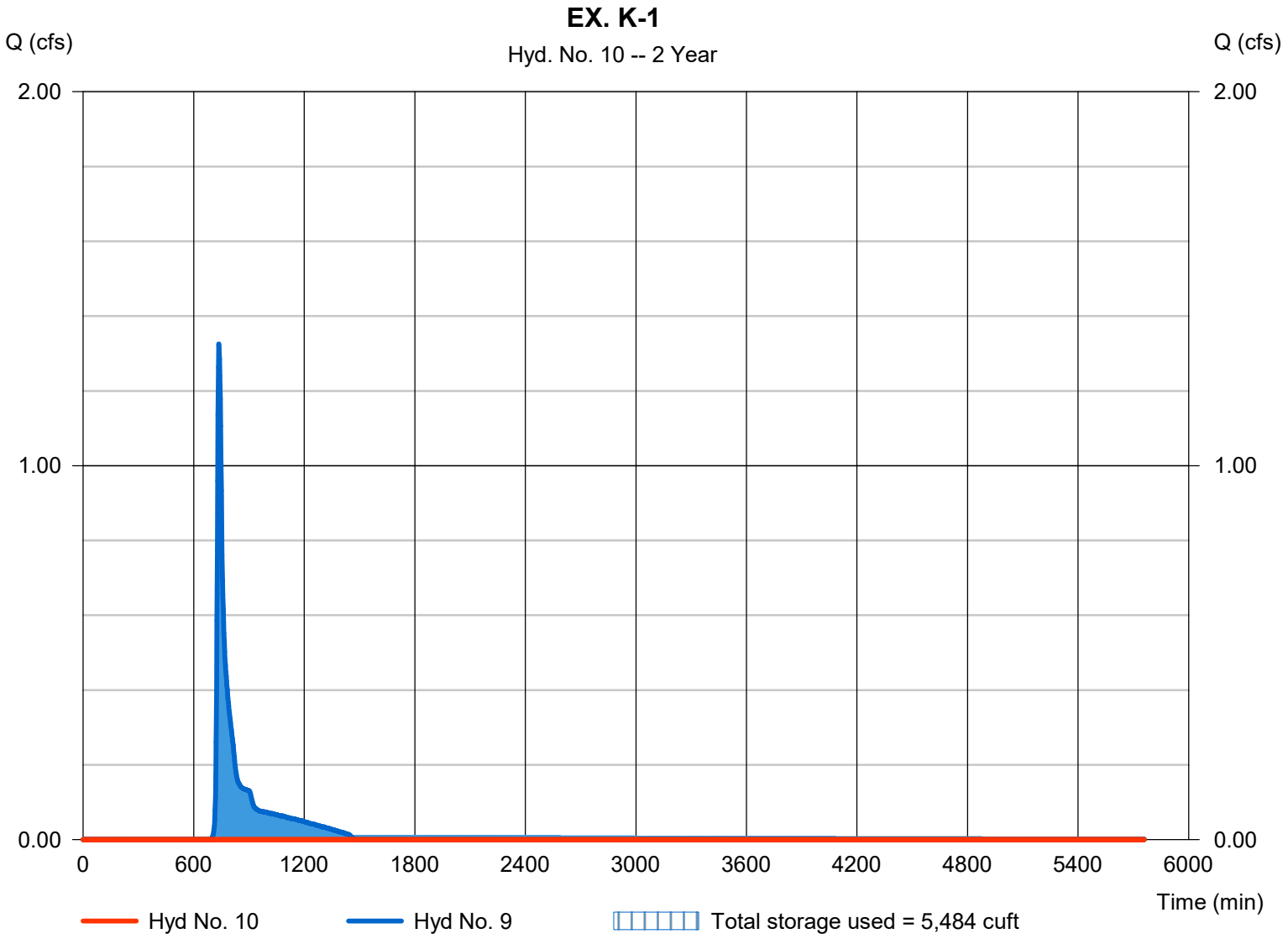
Hydrograph Report

Hyd. No. 10

EX. K-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	798 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	9 - INFLOW TO K-1	Max. Elevation	=	112.37 ft
Reservoir name	=	EX. KETTLE K-1	Max. Storage	=	5,484 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

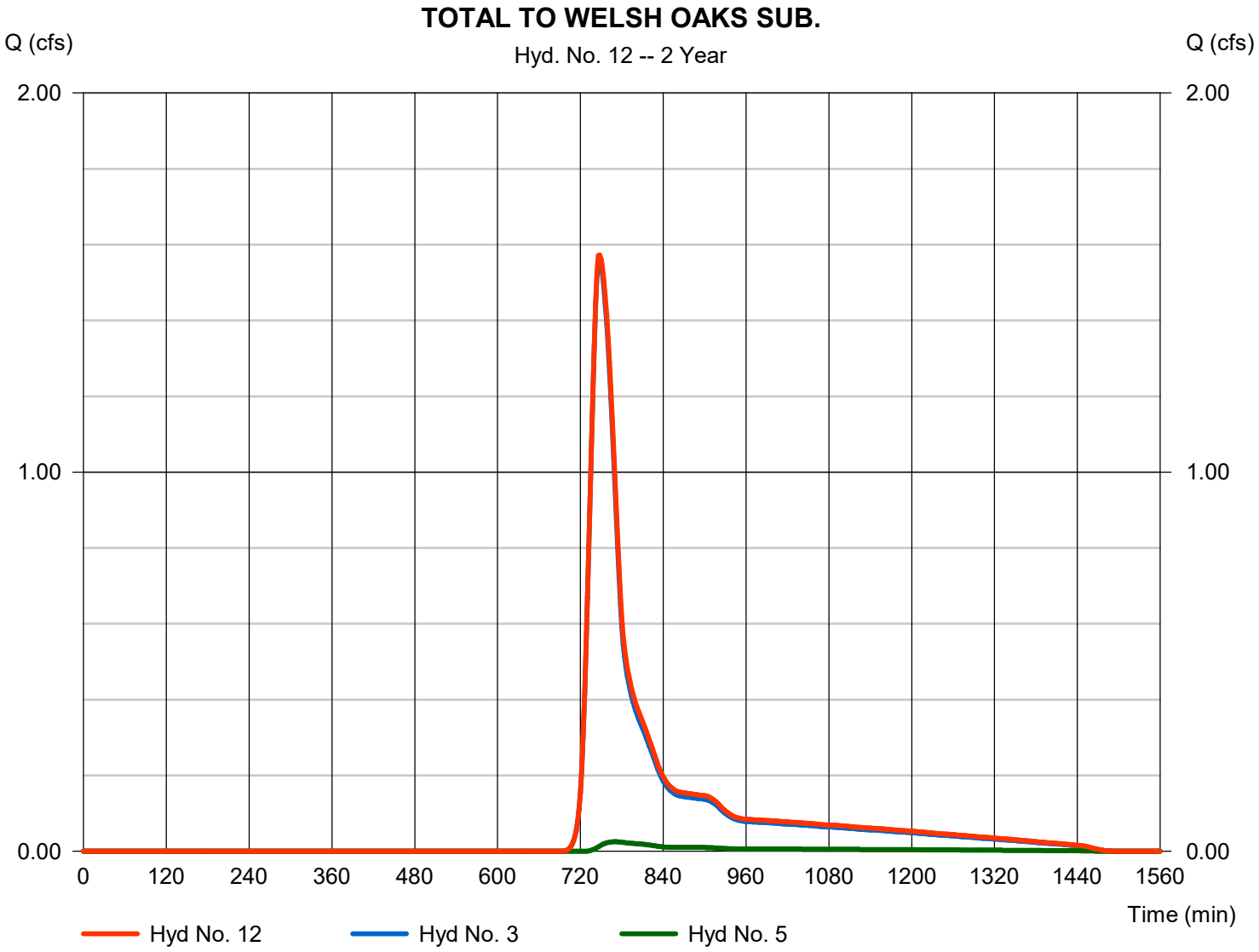


Hydrograph Report

Hyd. No. 12

TOTAL TO WELSH OAKS SUB.

Hydrograph type	= Combine	Peak discharge	= 1.572 cfs
Storm frequency	= 2 yrs	Time to peak	= 748 min
Time interval	= 2 min	Hyd. volume	= 7,620 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 3.305 ac

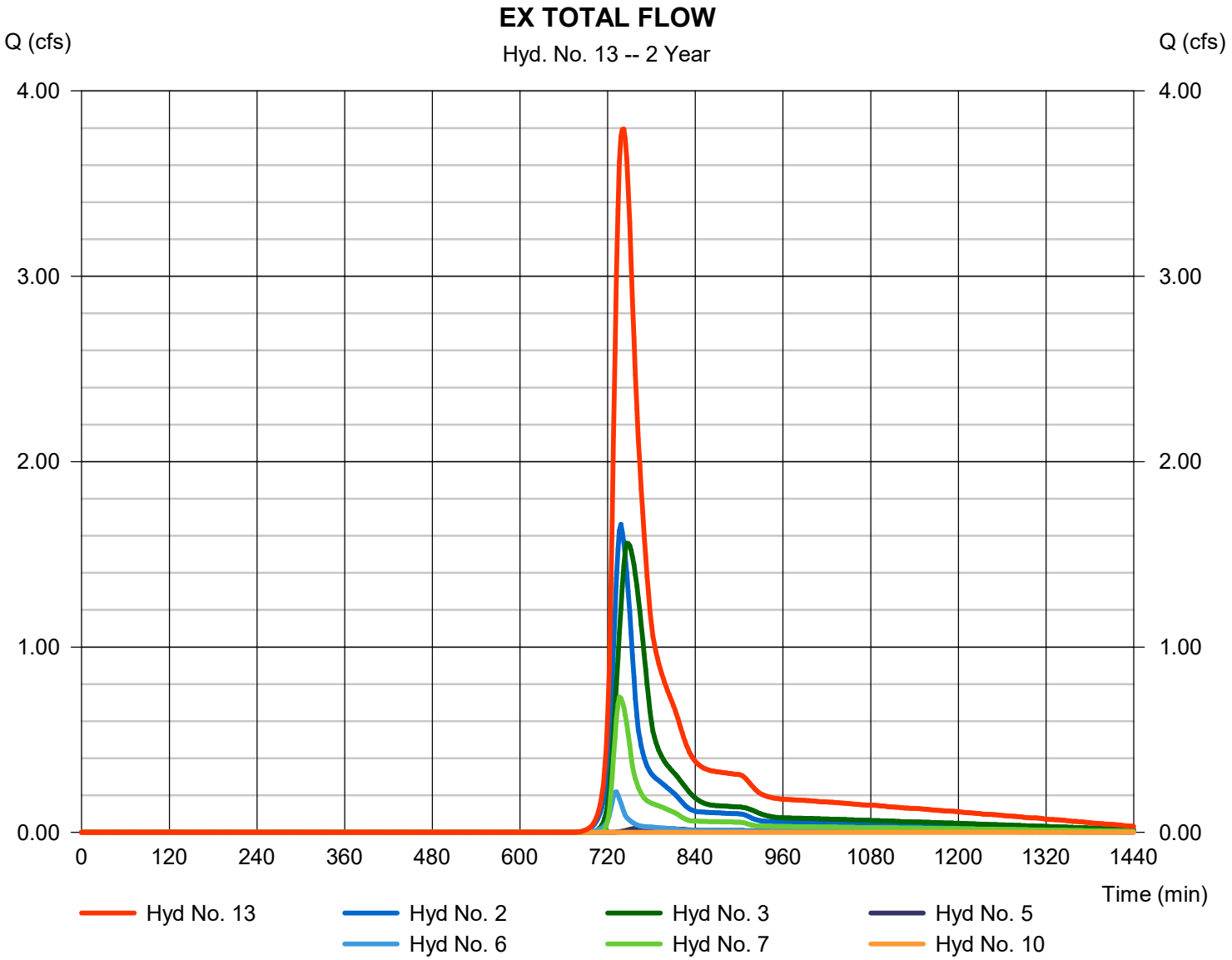


Hydrograph Report

Hyd. No. 13

EX TOTAL FLOW

Hydrograph type	= Combine	Peak discharge	= 3.794 cfs
Storm frequency	= 2 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 16,665 cuft
Inflow hyds.	= 2, 3, 5, 6, 7, 10	Contrib. drain. area	= 6.502 ac



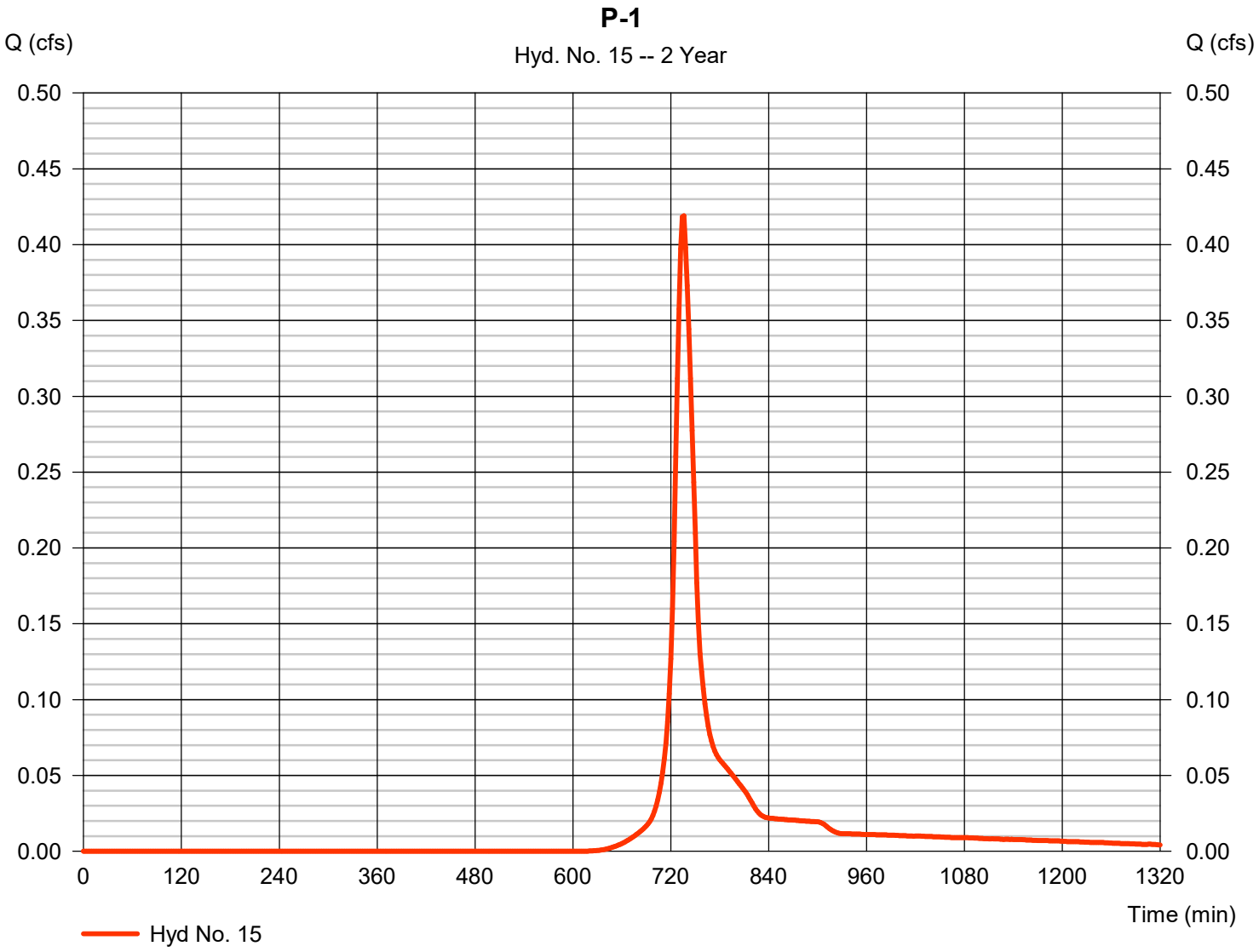
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 15

P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.419 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 1,299 cuft
Drainage area	= 0.281 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.80 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

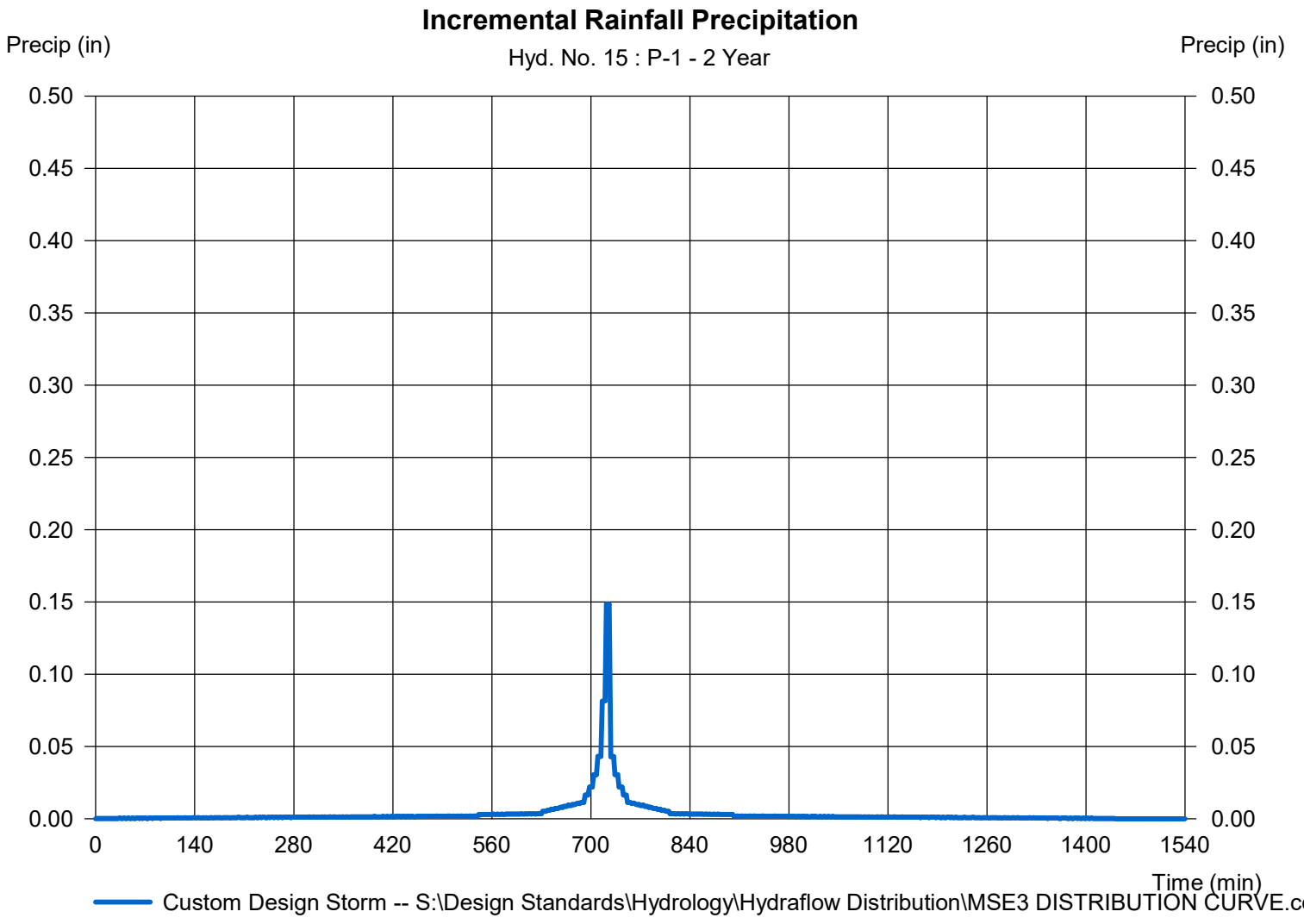


Precipitation Report

Hyd. No. 15

P-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



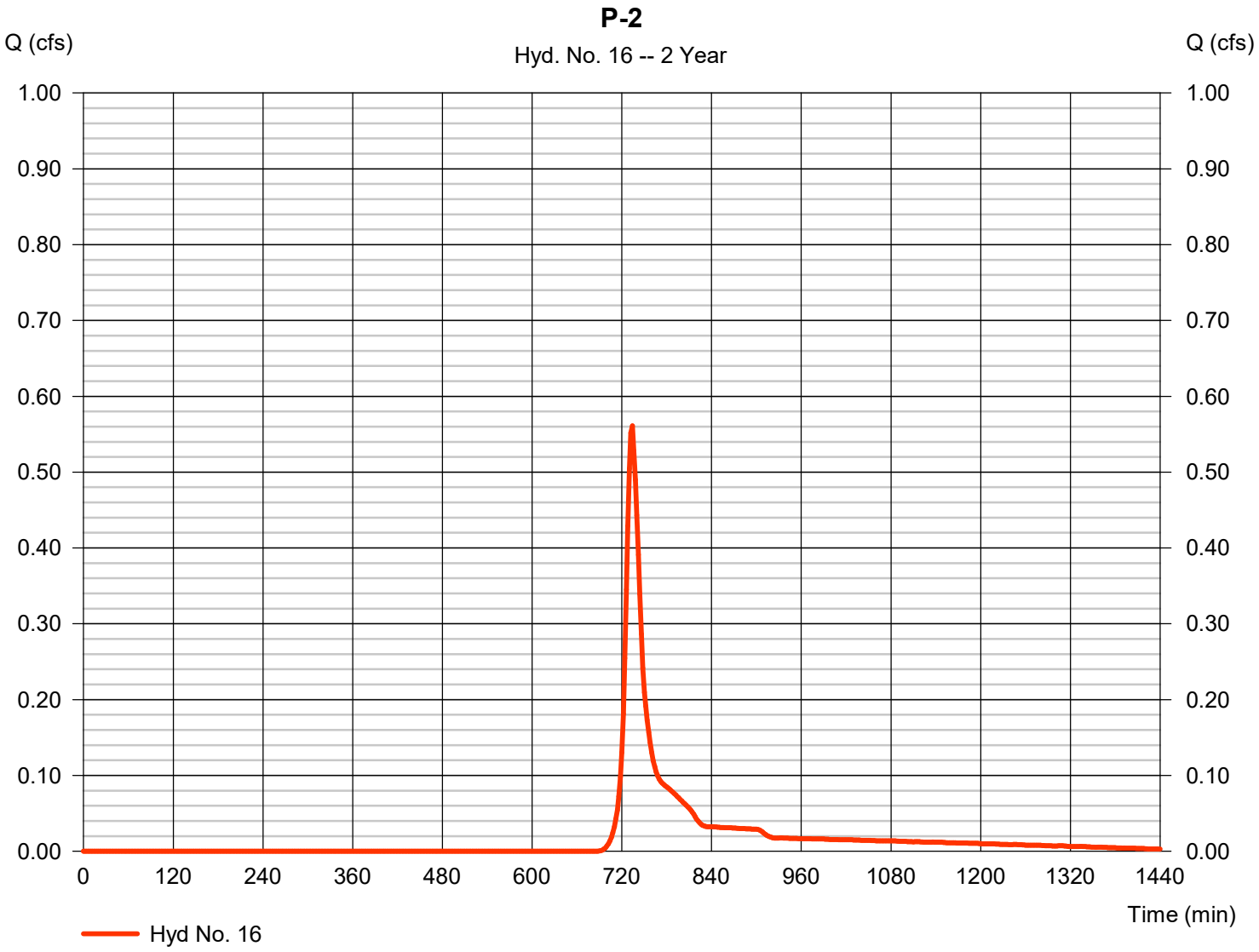
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 16

P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.561 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 1,628 cuft
Drainage area	= 0.562 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.70 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

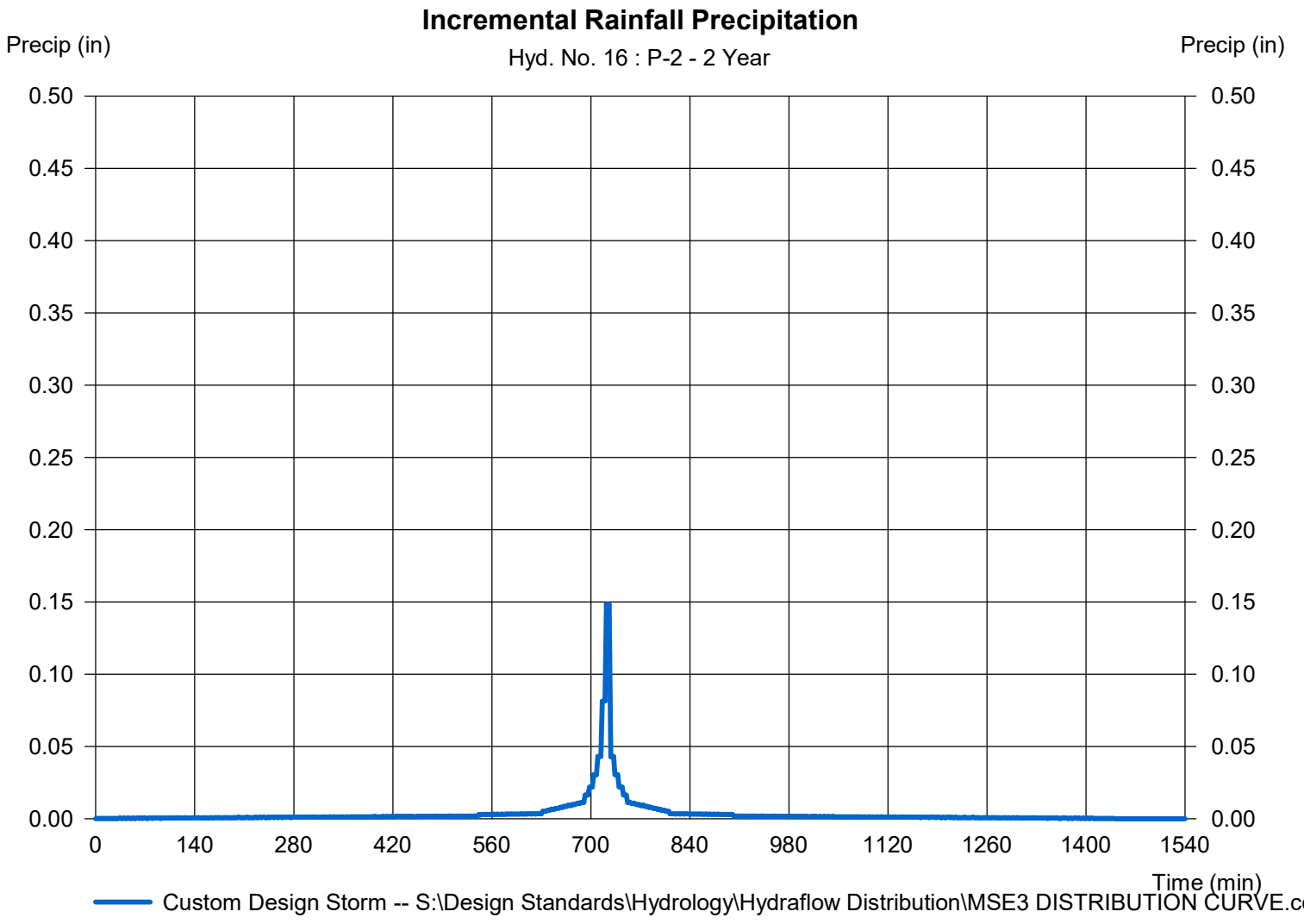


Precipitation Report

Hyd. No. 16

P-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



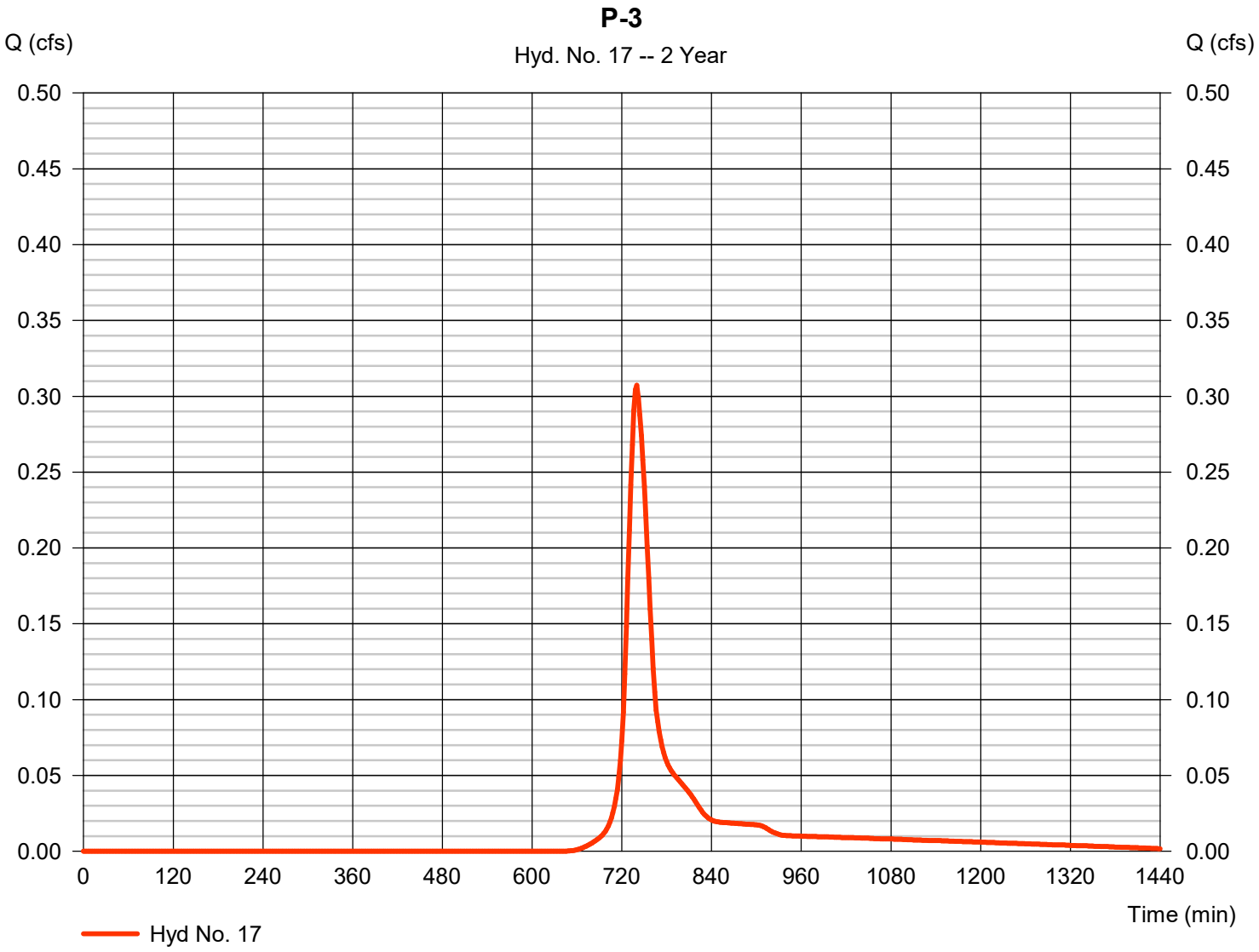
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 17

P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.307 cfs
Storm frequency	= 2 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 1,107 cuft
Drainage area	= 0.270 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.60 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

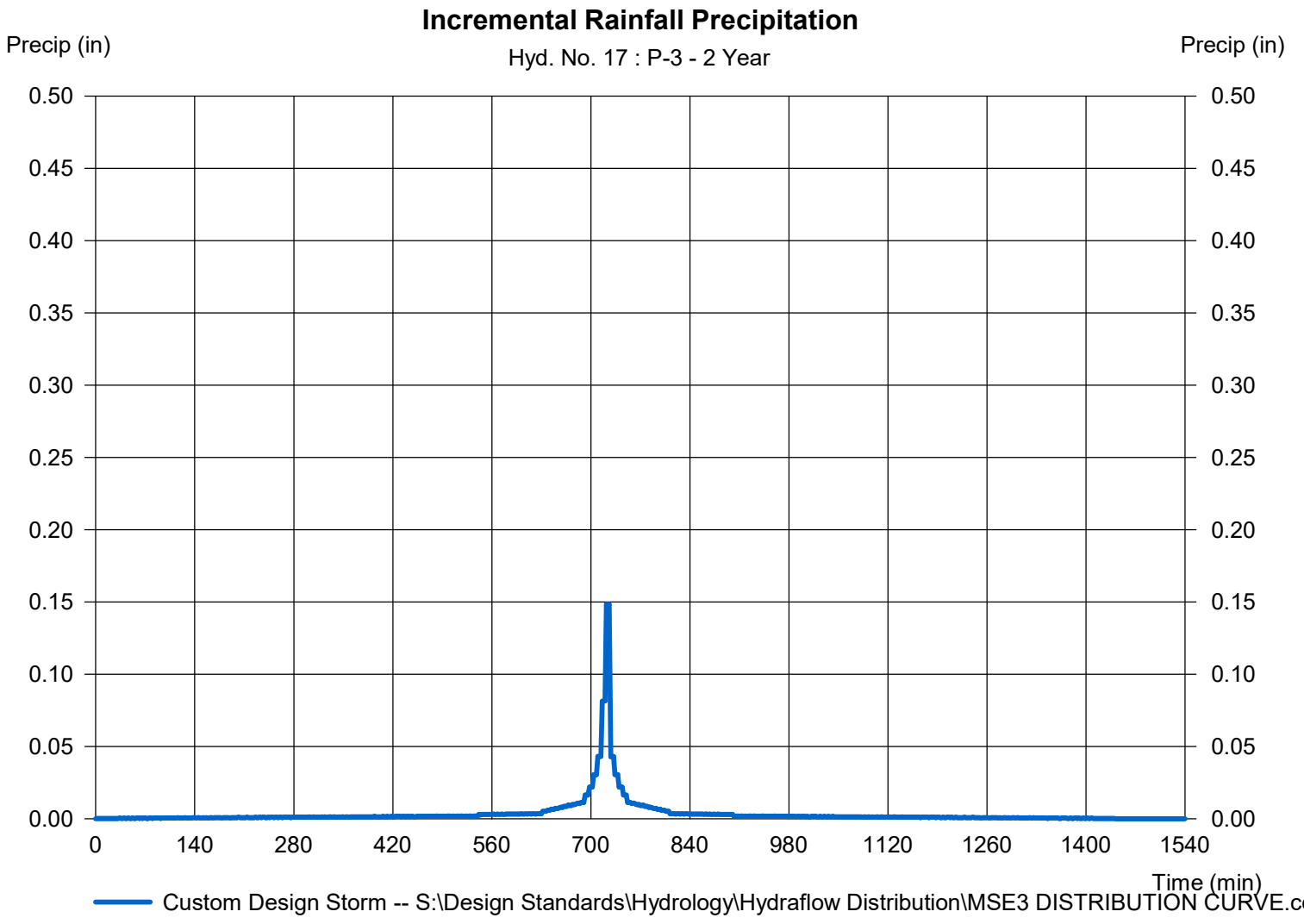


Precipitation Report

Hyd. No. 17

P-3

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



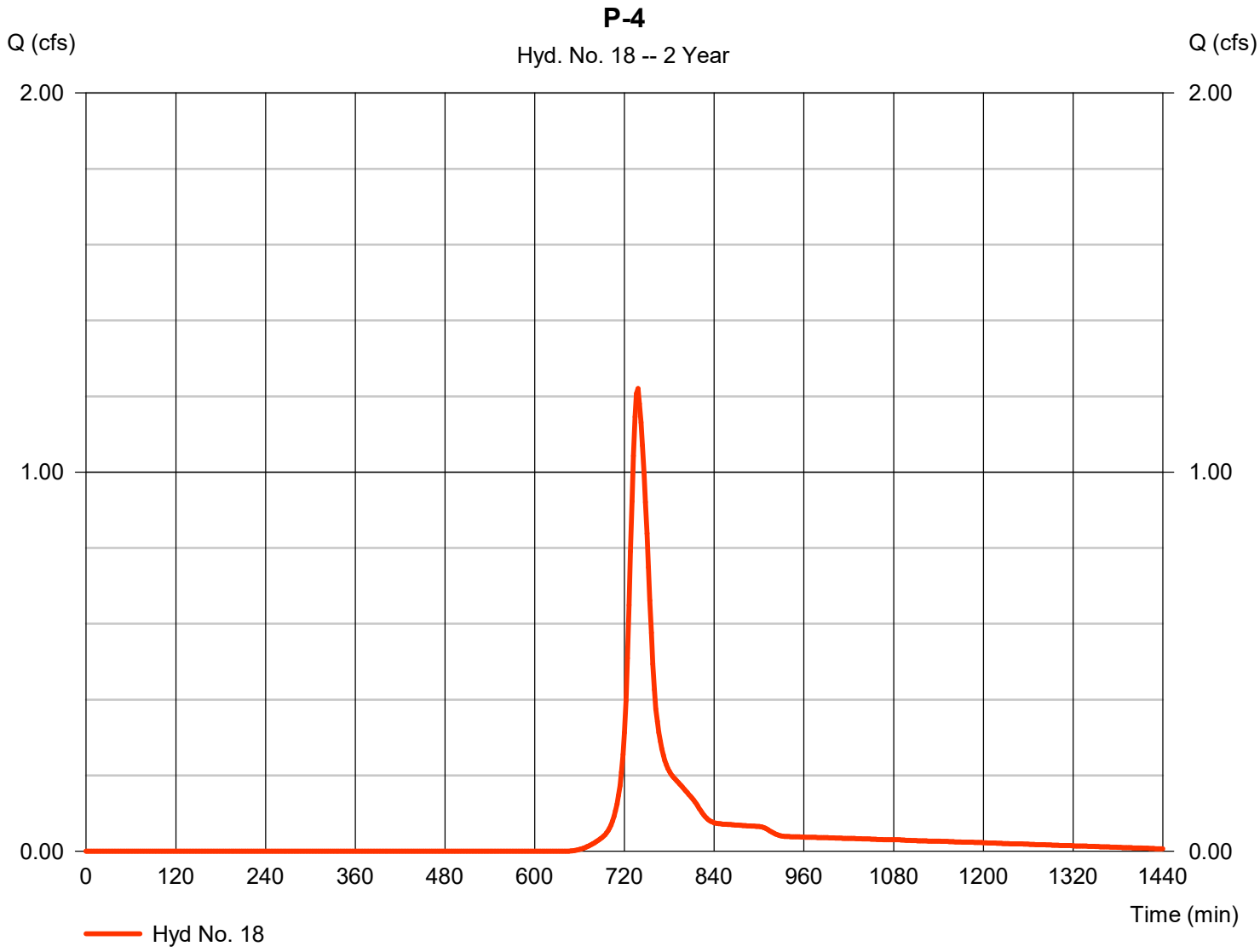
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 18

P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.221 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 4,162 cuft
Drainage area	= 0.982 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 20.40 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

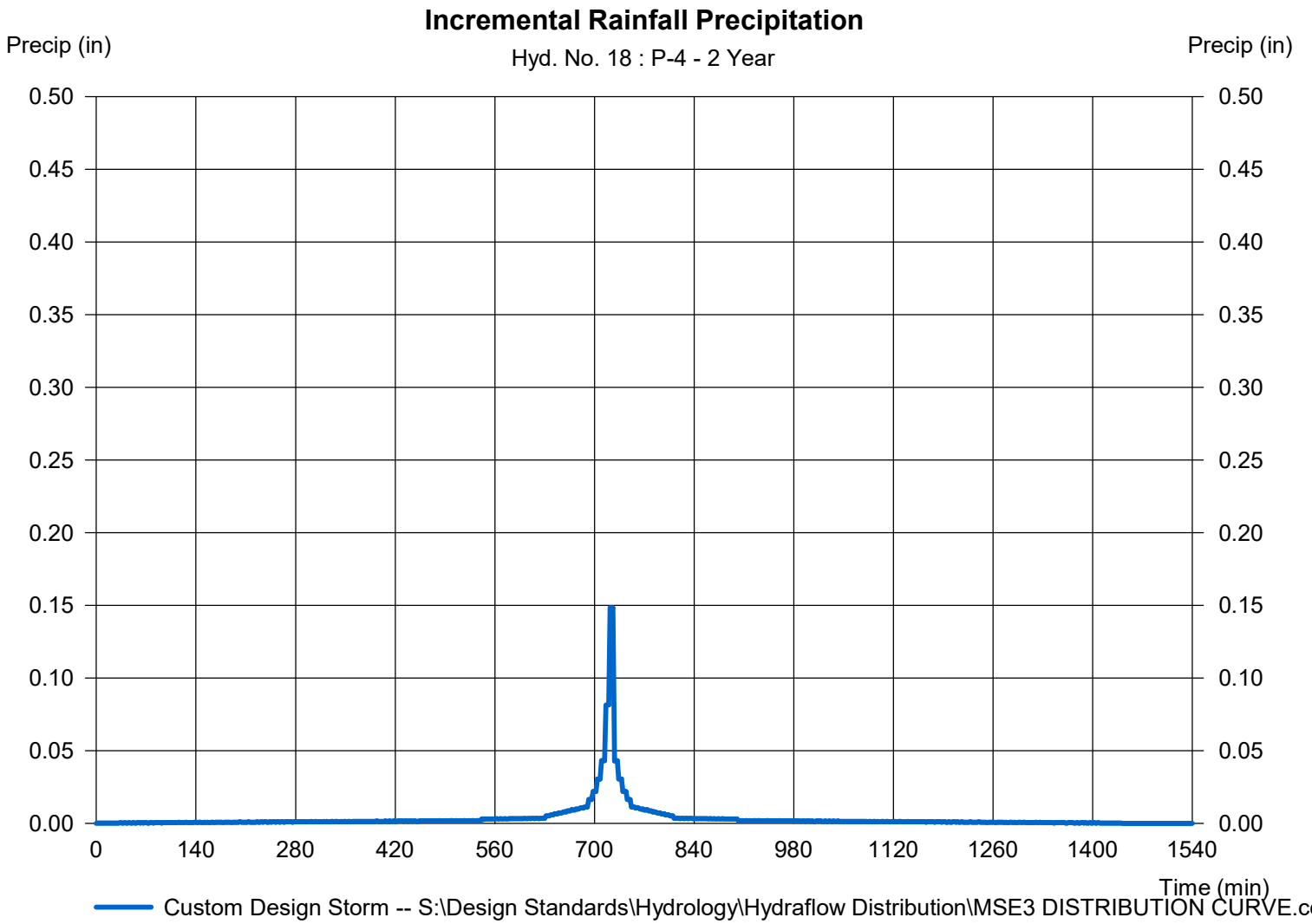


Precipitation Report

Hyd. No. 18

P-4

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



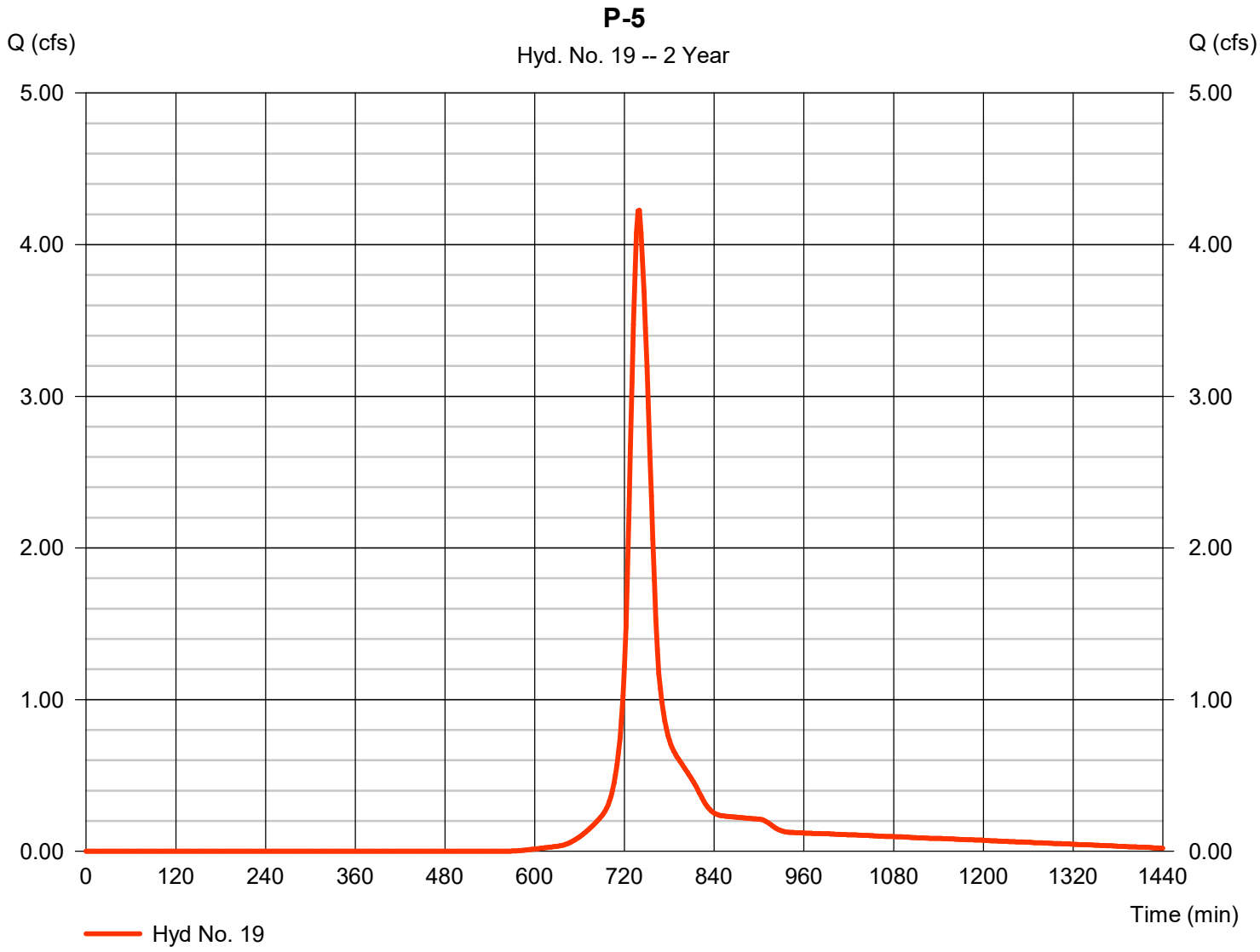
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 19

P-5

Hydrograph type	= SCS Runoff	Peak discharge	= 4.226 cfs
Storm frequency	= 2 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 15,089 cuft
Drainage area	= 2.853 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.00 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

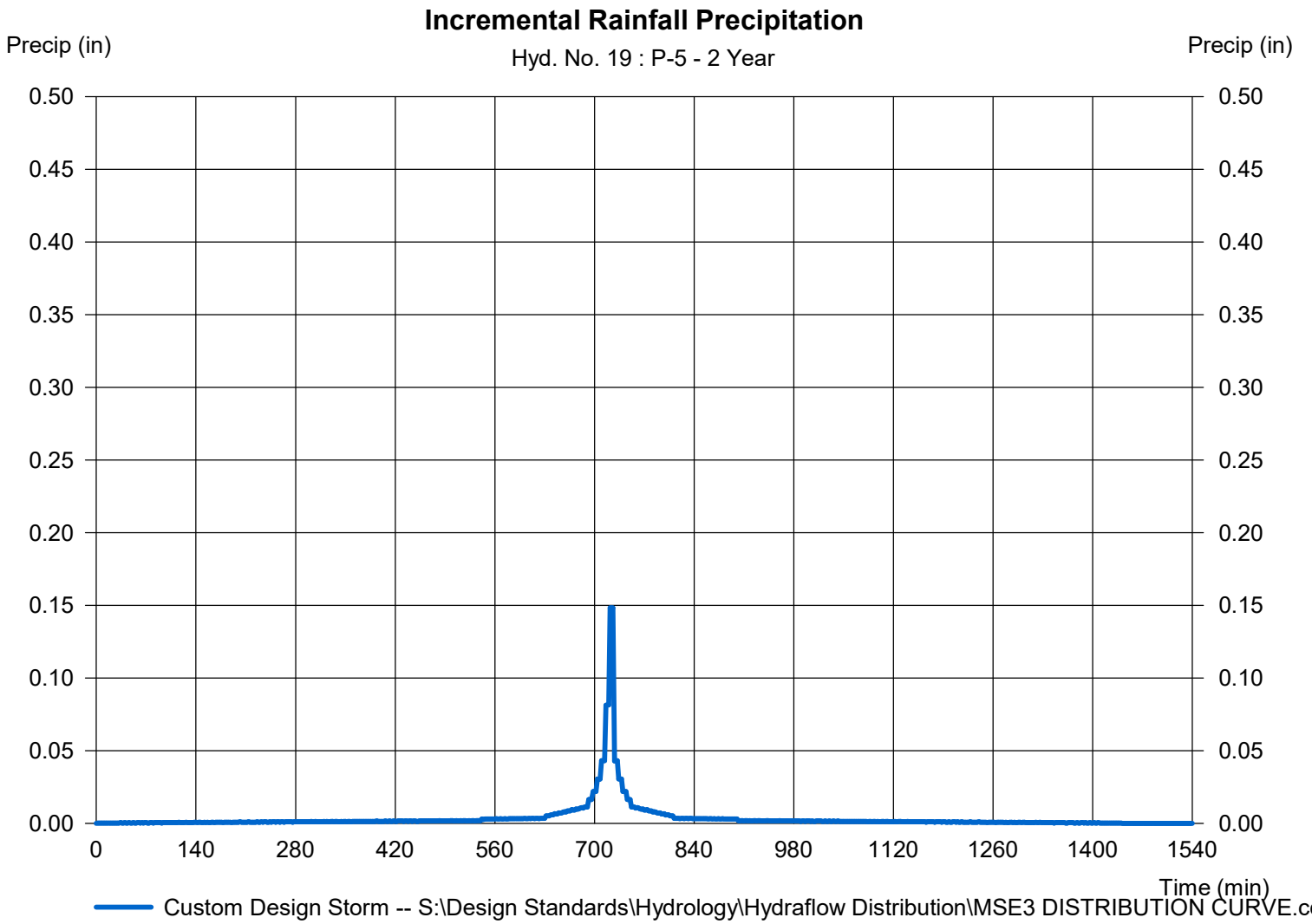


Precipitation Report

Hyd. No. 19

P-5

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

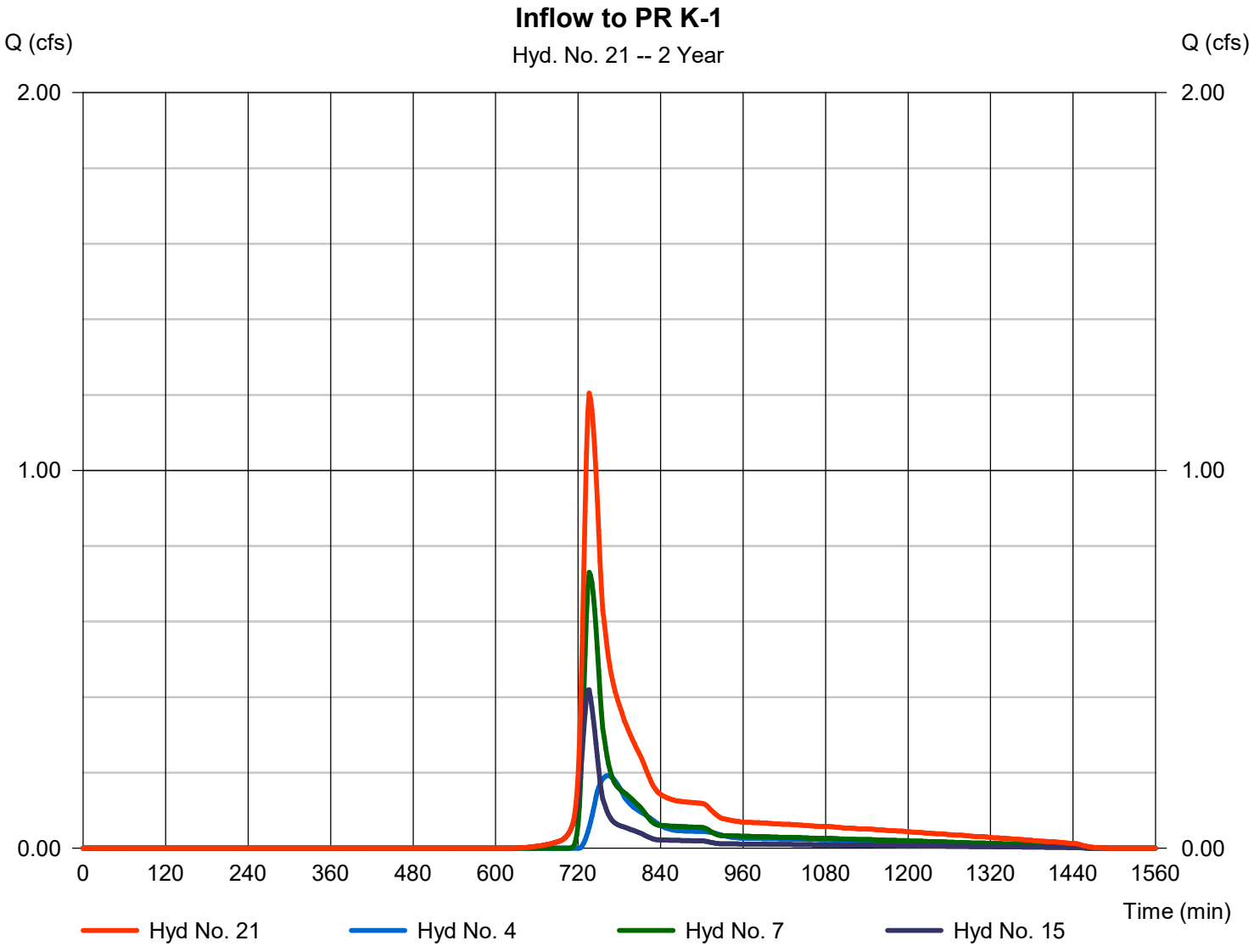


Hydrograph Report

Hyd. No. 21

Inflow to PR K-1

Hydrograph type	= Combine	Peak discharge	= 1.205 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 5,549 cuft
Inflow hyds.	= 4, 7, 15	Contrib. drain. area	= 3.495 ac



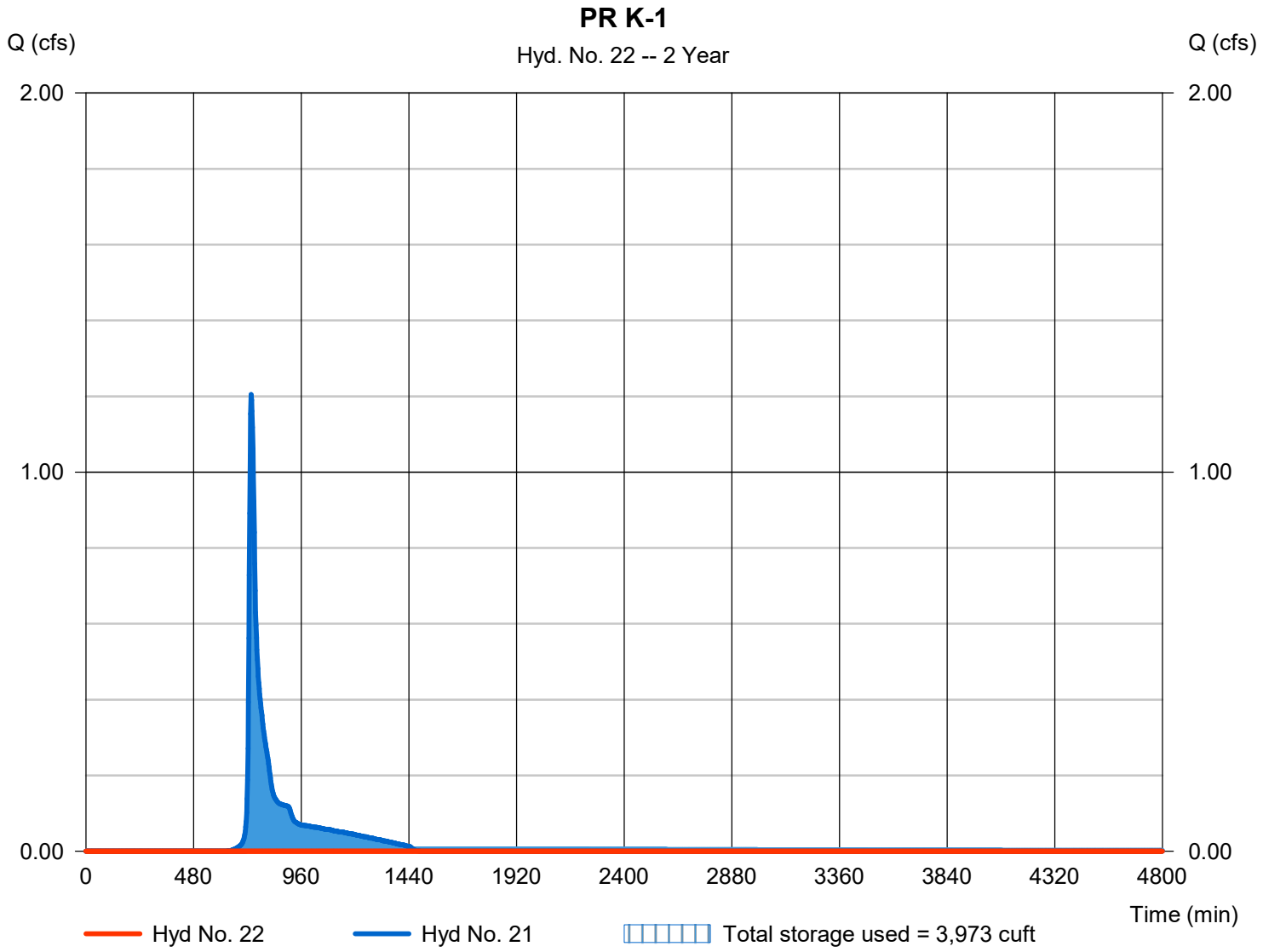
Hydrograph Report

Hyd. No. 22

PR K-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	2136 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	21 - Inflow to PR K-1	Max. Elevation	=	111.30 ft
Reservoir name	=	PR KETTLE K-1	Max. Storage	=	3,973 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

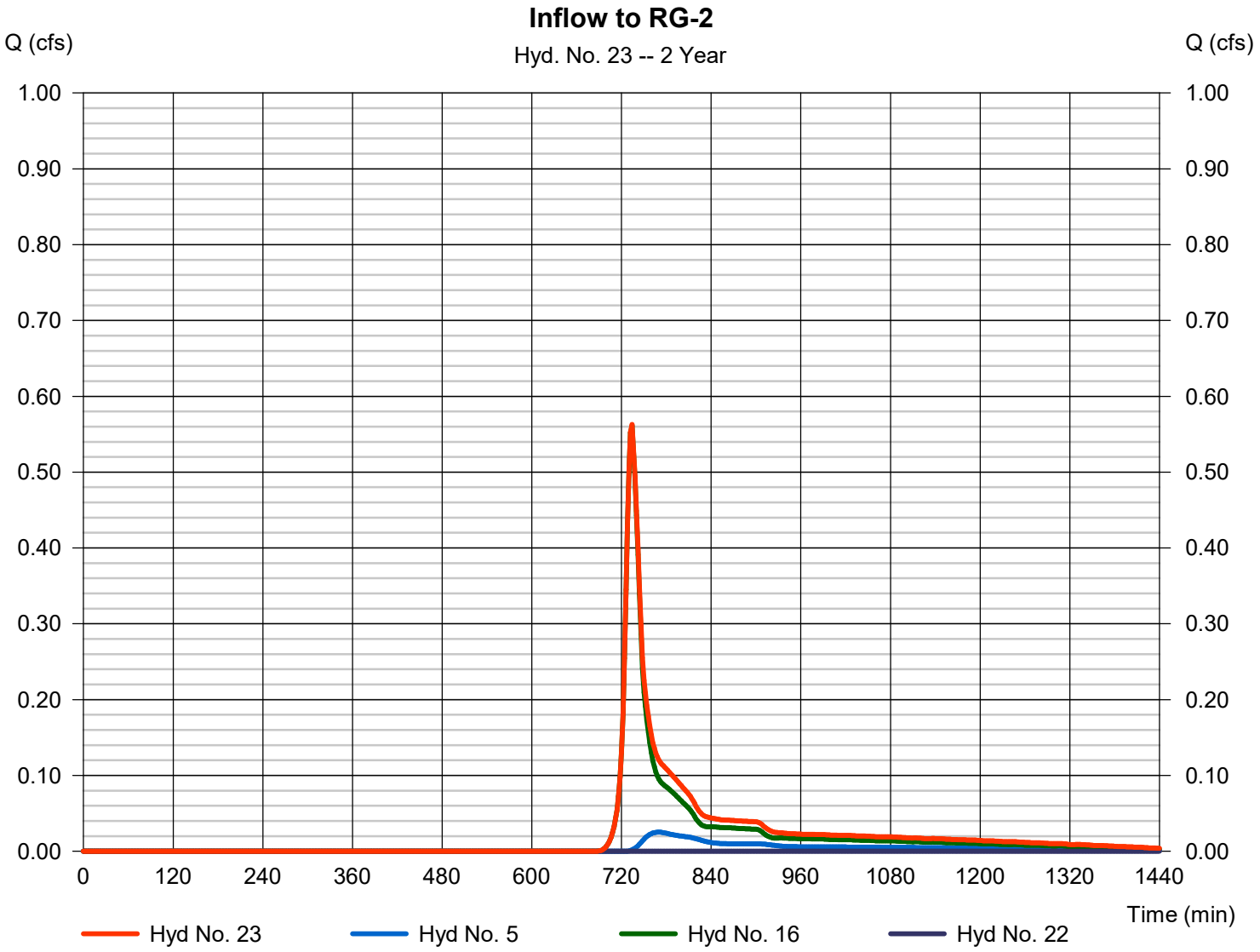


Hydrograph Report

Hyd. No. 23

Inflow to RG-2

Hydrograph type	= Combine	Peak discharge	= 0.563 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 1,922 cuft
Inflow hyds.	= 5, 16, 22	Contrib. drain. area	= 1.217 ac



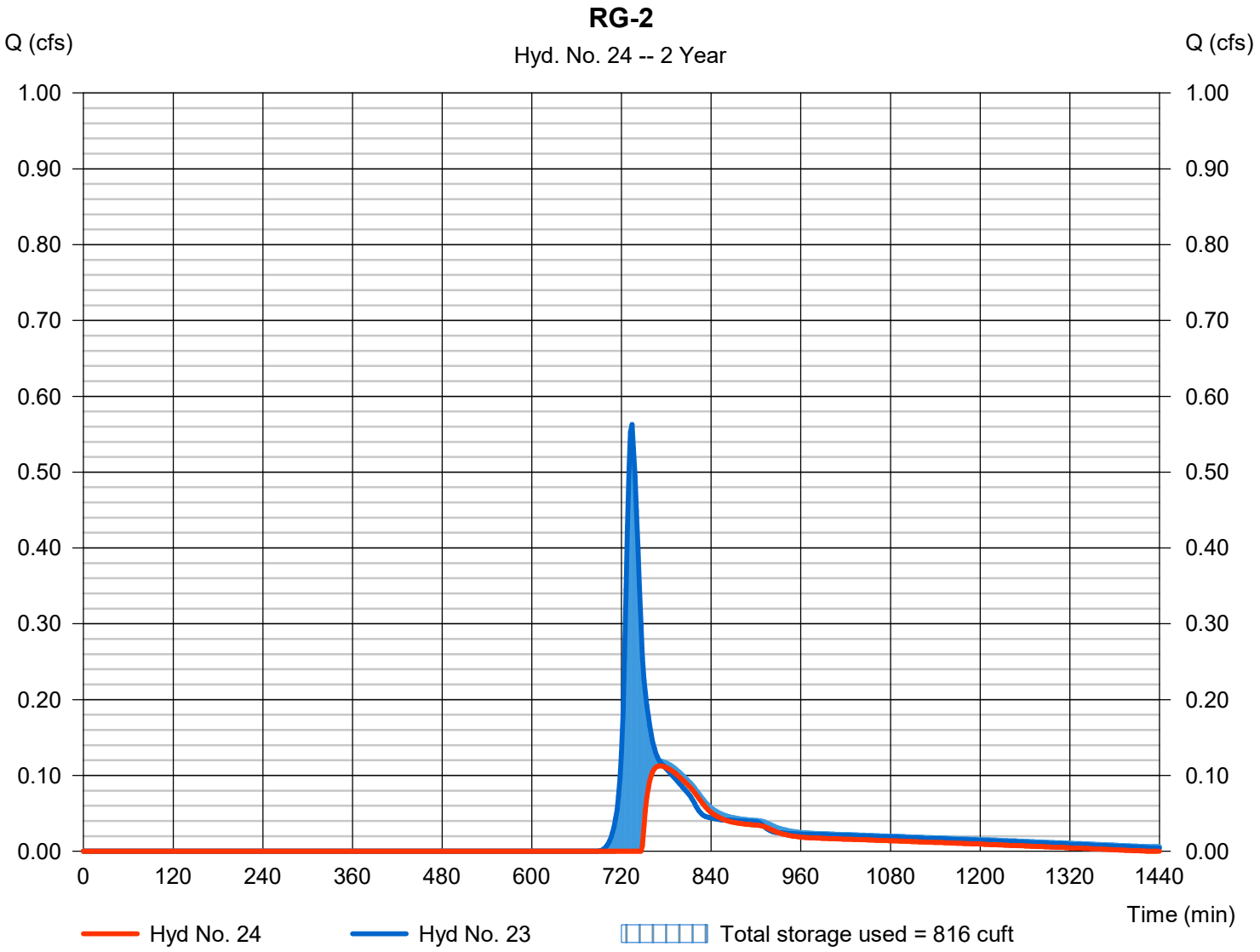
Hydrograph Report

Hyd. No. 24

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	0.113 cfs
Storm frequency	=	2 yrs	Time to peak	=	772 min
Time interval	=	2 min	Hyd. volume	=	981 cuft
Inflow hyd. No.	=	23 - Inflow to RG-2	Max. Elevation	=	110.04 ft
Reservoir name	=	RG-2	Max. Storage	=	816 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

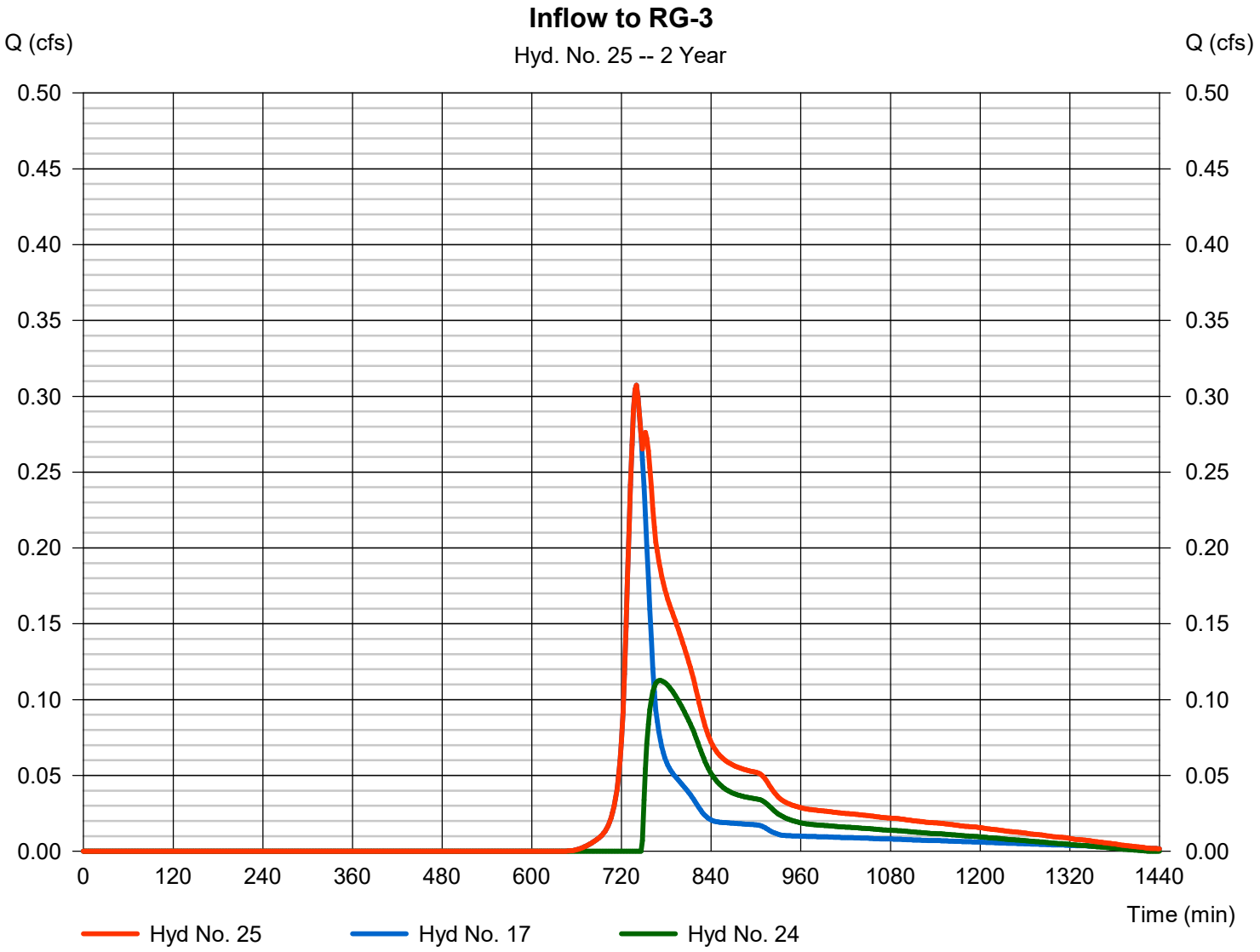


Hydrograph Report

Hyd. No. 25

Inflow to RG-3

Hydrograph type	=	Combine	Peak discharge	=	0.307 cfs
Storm frequency	=	2 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	2,088 cuft
Inflow hyds.	=	17, 24	Contrib. drain. area	=	0.270 ac



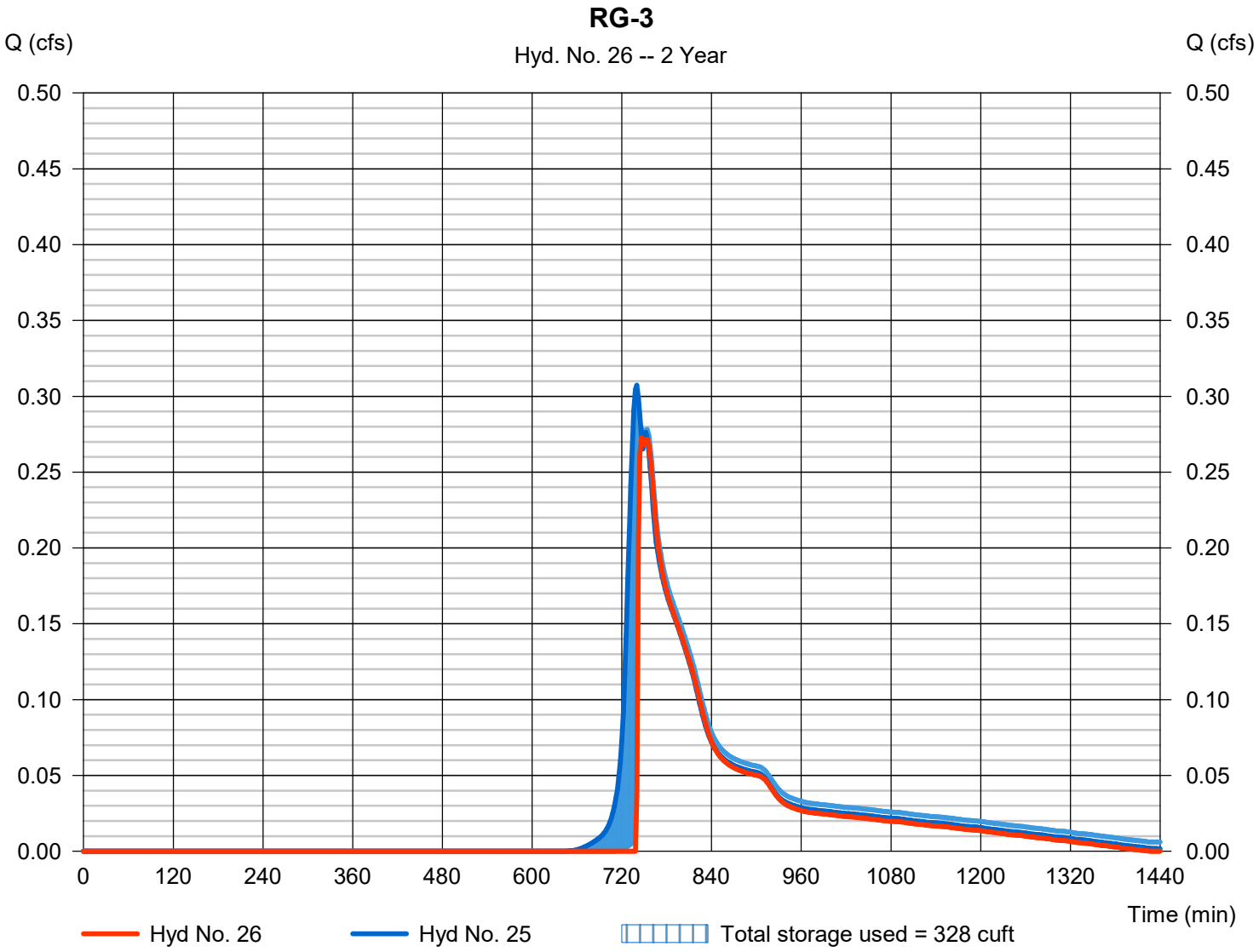
Hydrograph Report

Hyd. No. 26

RG-3

Hydrograph type	=	Reservoir	Peak discharge	=	0.273 cfs
Storm frequency	=	2 yrs	Time to peak	=	746 min
Time interval	=	2 min	Hyd. volume	=	1,702 cuft
Inflow hyd. No.	=	25 - Inflow to RG-3	Max. Elevation	=	109.03 ft
Reservoir name	=	RG-3	Max. Storage	=	328 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



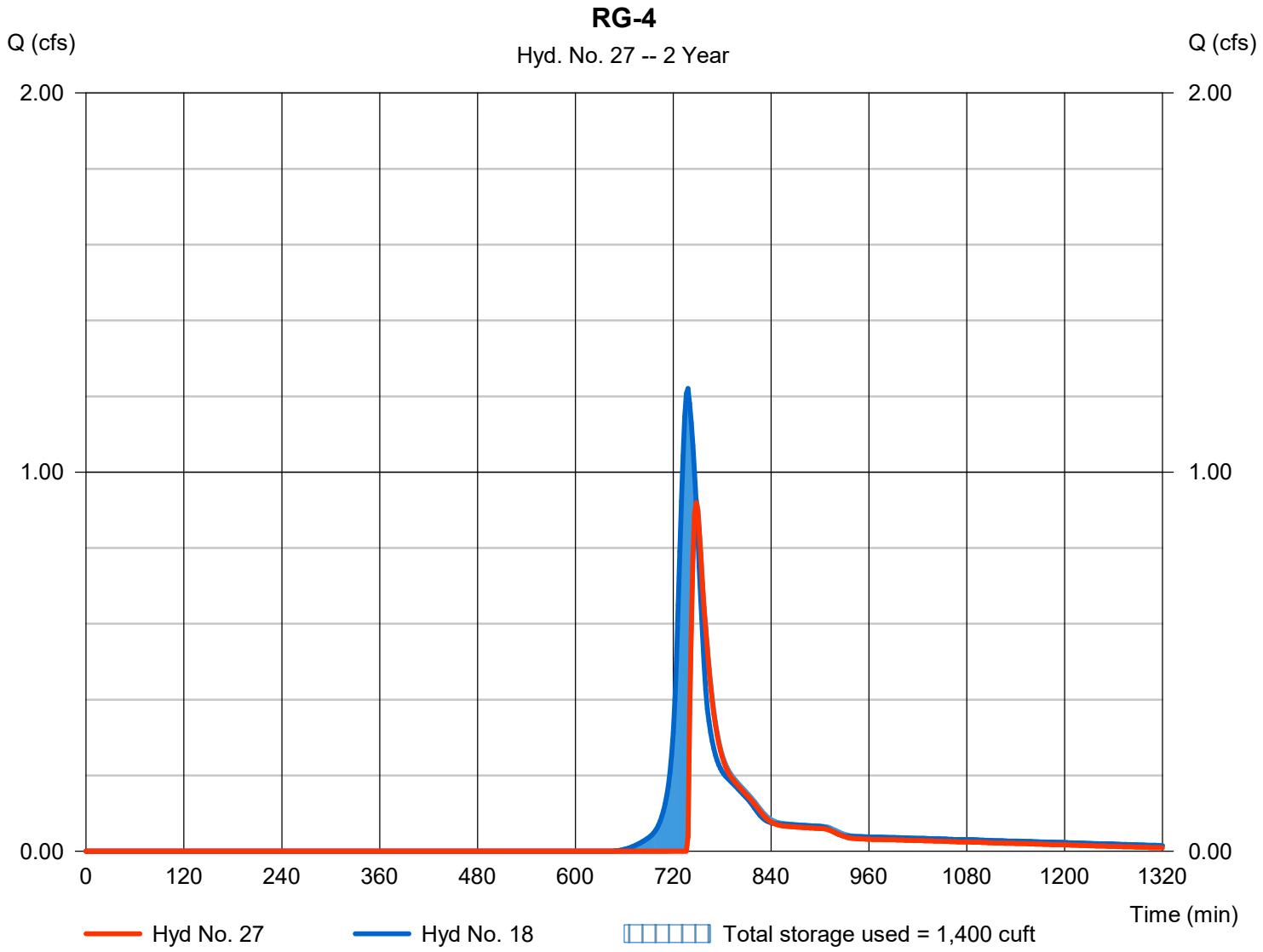
Hydrograph Report

Hyd. No. 27

RG-4

Hydrograph type	=	Reservoir	Peak discharge	=	0.920 cfs
Storm frequency	=	2 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	2,789 cuft
Inflow hyd. No.	=	18 - P-4	Max. Elevation	=	102.22 ft
Reservoir name	=	RG-4	Max. Storage	=	1,400 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

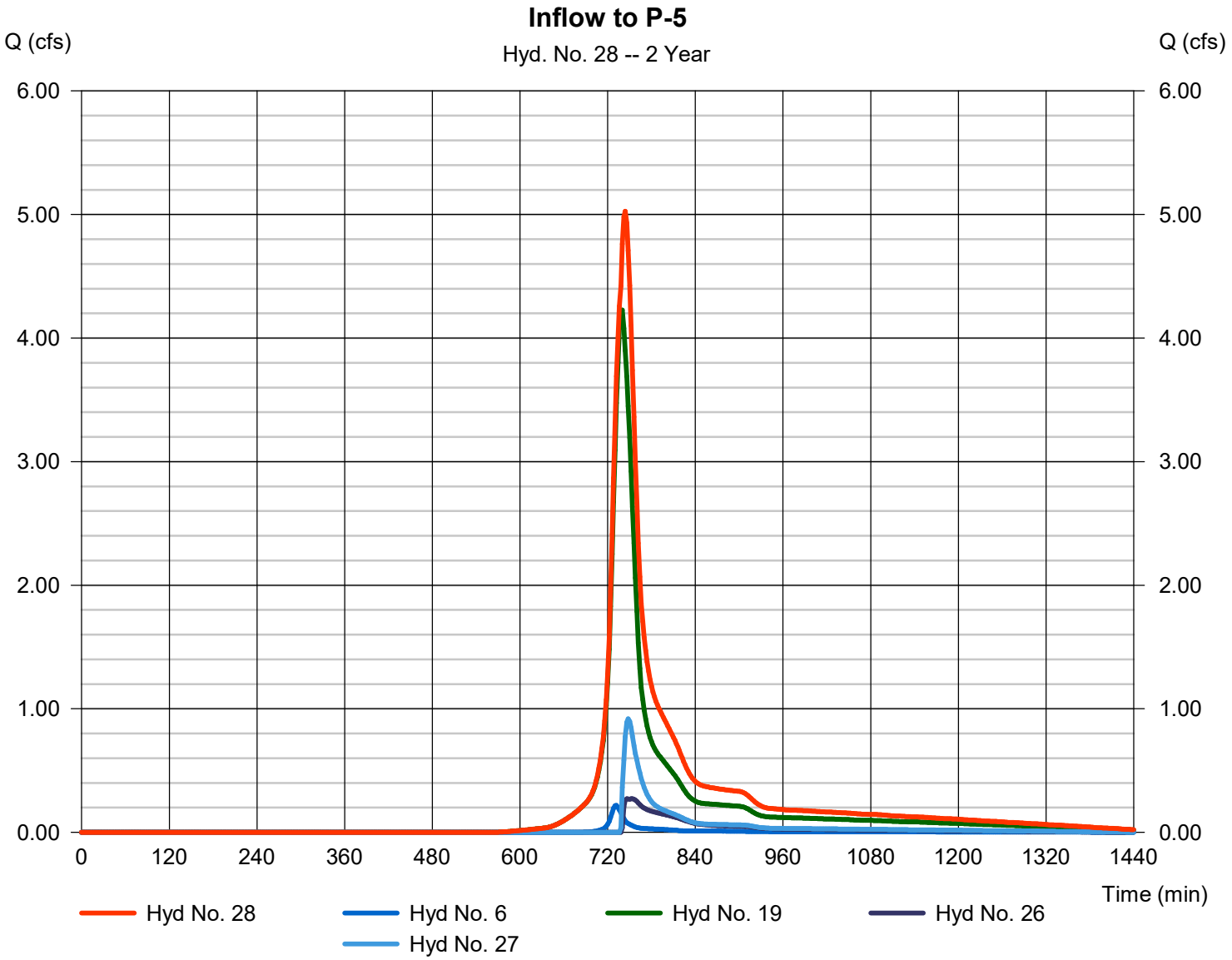


Hydrograph Report

Hyd. No. 28

Inflow to P-5

Hydrograph type	=	Combine	Peak discharge	=	5.027 cfs
Storm frequency	=	2 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	20,155 cuft
Inflow hyds.	=	6, 19, 26, 27	Contrib. drain. area	=	3.020 ac



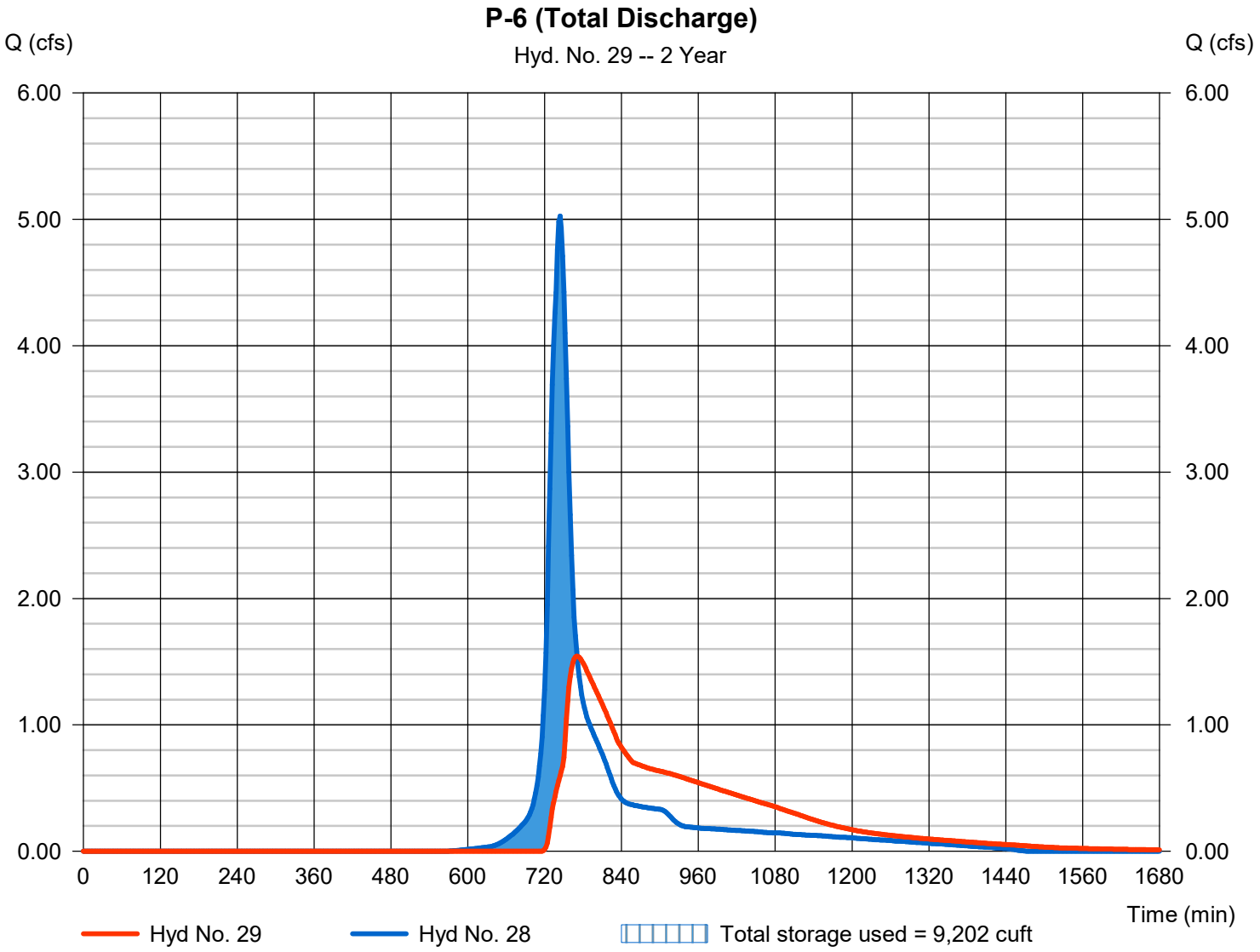
Hydrograph Report

Hyd. No. 29

P-6 (Total Discharge)

Hydrograph type	= Reservoir	Peak discharge	= 1.543 cfs
Storm frequency	= 2 yrs	Time to peak	= 770 min
Time interval	= 2 min	Hyd. volume	= 19,003 cuft
Inflow hyd. No.	= 28 - Inflow to P-5	Max. Elevation	= 95.14 ft
Reservoir name	= POND P-5	Max. Storage	= 9,202 cuft

Storage Indication method used.



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.094	2	736	3,409	------	------	------	E-1
2	SCS Runoff	3.231	2	738	10,967	------	------	------	E-2
3	SCS Runoff	3.304	2	746	14,508	------	------	------	E-3
4	SCS Runoff	0.784	2	754	4,609	------	------	------	OS-1
5	SCS Runoff	0.173	2	754	1,098	------	------	------	OS-2
6	SCS Runoff	0.420	2	730	1,086	------	------	------	OS-3
7	SCS Runoff	1.795	2	736	5,776	------	------	------	OS-4 (E-2 Courtyards)
9	Combine	3.278	2	736	13,794	1, 4, 7,	------	------	INFLOW TO K-1
10	Reservoir	0.105	2	1044	1,750	9	113.11	11,141	EX. K-1
12	Combine	3.466	2	746	15,607	3, 5,	------	------	TOTAL TO WELSH OAKS SUB.
13	Combine	8.088	2	738	35,185	2, 3, 5, 6, 7, 10,	------	------	EX TOTAL FLOW
15	SCS Runoff	0.728	2	734	2,249	------	------	------	P-1
16	SCS Runoff	1.130	2	732	3,171	------	------	------	P-2
17	SCS Runoff	0.552	2	740	1,970	------	------	------	P-3
18	SCS Runoff	2.190	2	738	7,407	------	------	------	P-4
19	SCS Runoff	7.003	2	738	25,109	------	------	------	P-5
21	Combine	2.907	2	736	12,634	4, 7, 15,	------	------	Inflow to PR K-1
22	Reservoir	0.000	2	3826	0	21	112.49	9,952	PR K-1
23	Combine	1.198	2	734	4,270	5, 16, 22	------	------	Inflow to RG-2
24	Reservoir	0.867	2	742	3,316	23	110.15	1,120	RG-2
25	Combine	1.400	2	742	5,285	17, 24	------	------	Inflow to RG-3
26	Reservoir	1.379	2	742	4,896	25	109.14	435	RG-3
27	Reservoir	2.081	2	740	6,024	18	102.31	1,622	RG-4
28	Combine	10.58	2	740	37,114	6, 19, 26, 27	------	------	Inflow to P-5
29	Reservoir	3.422	2	764	35,962	28	96.18	16,155	P-6 (Total Discharge)

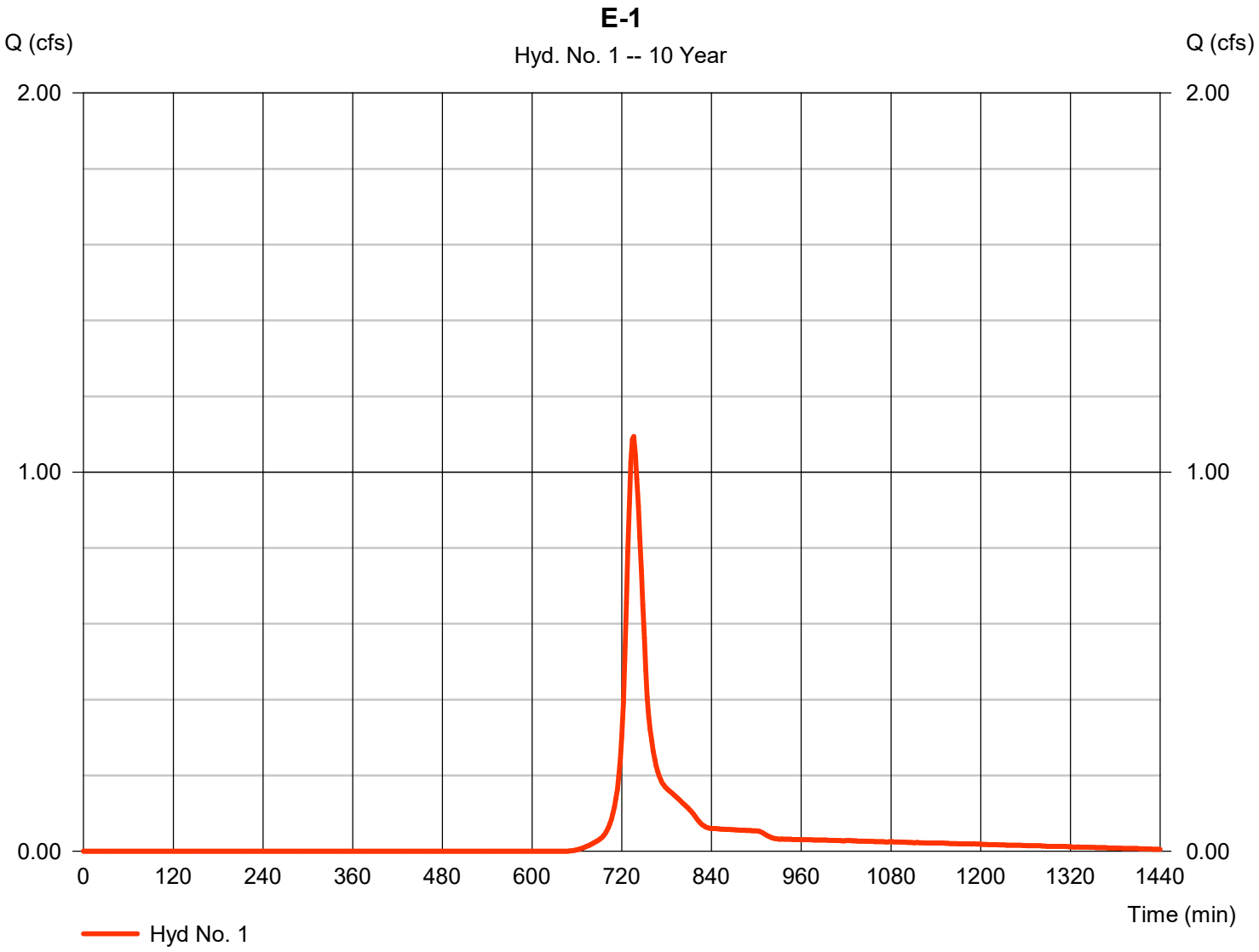
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 1

E-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.094 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 3,409 cuft
Drainage area	= 0.589 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.00 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

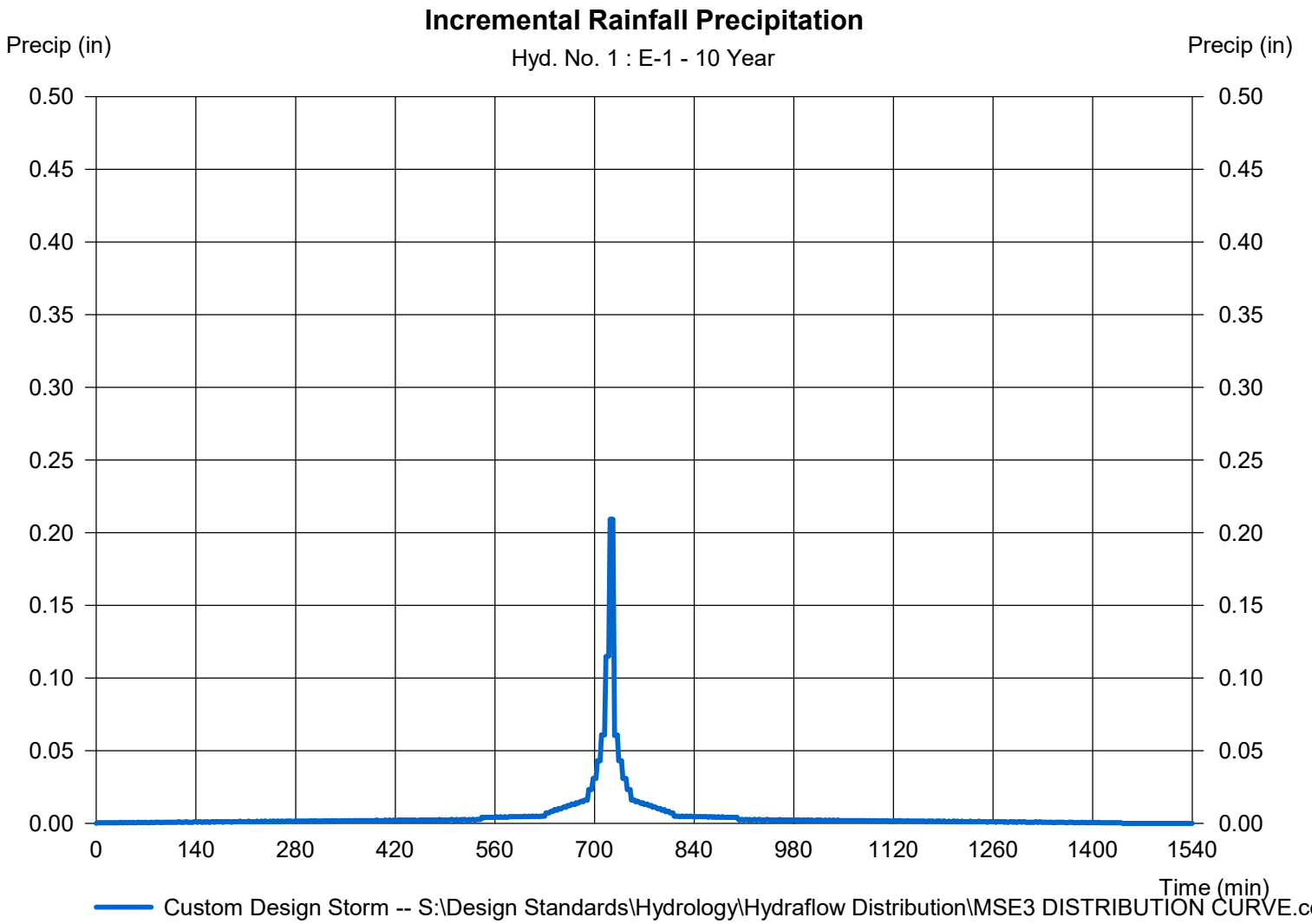


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



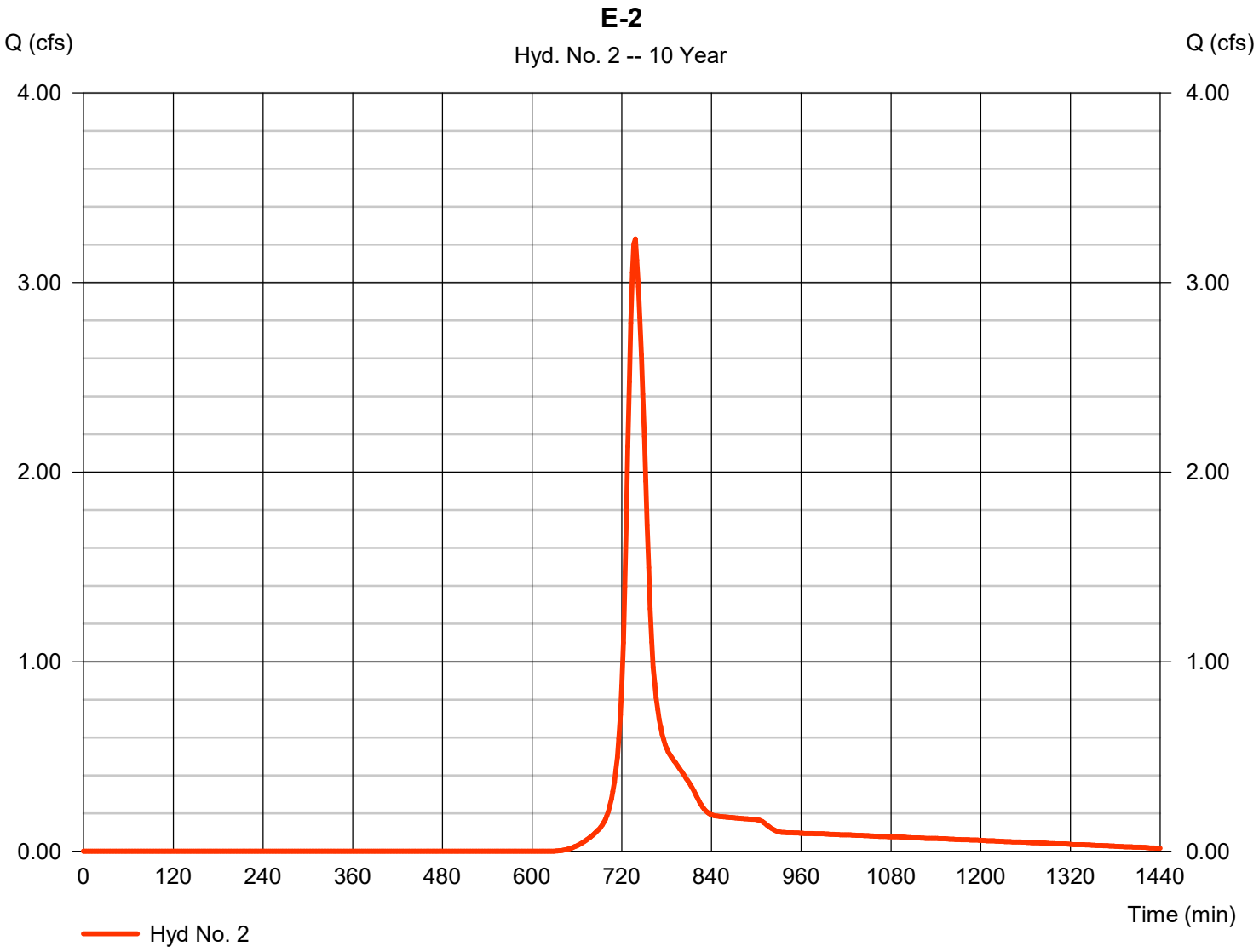
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 2

E-2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.231 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 10,967 cuft
Drainage area	= 1.709 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

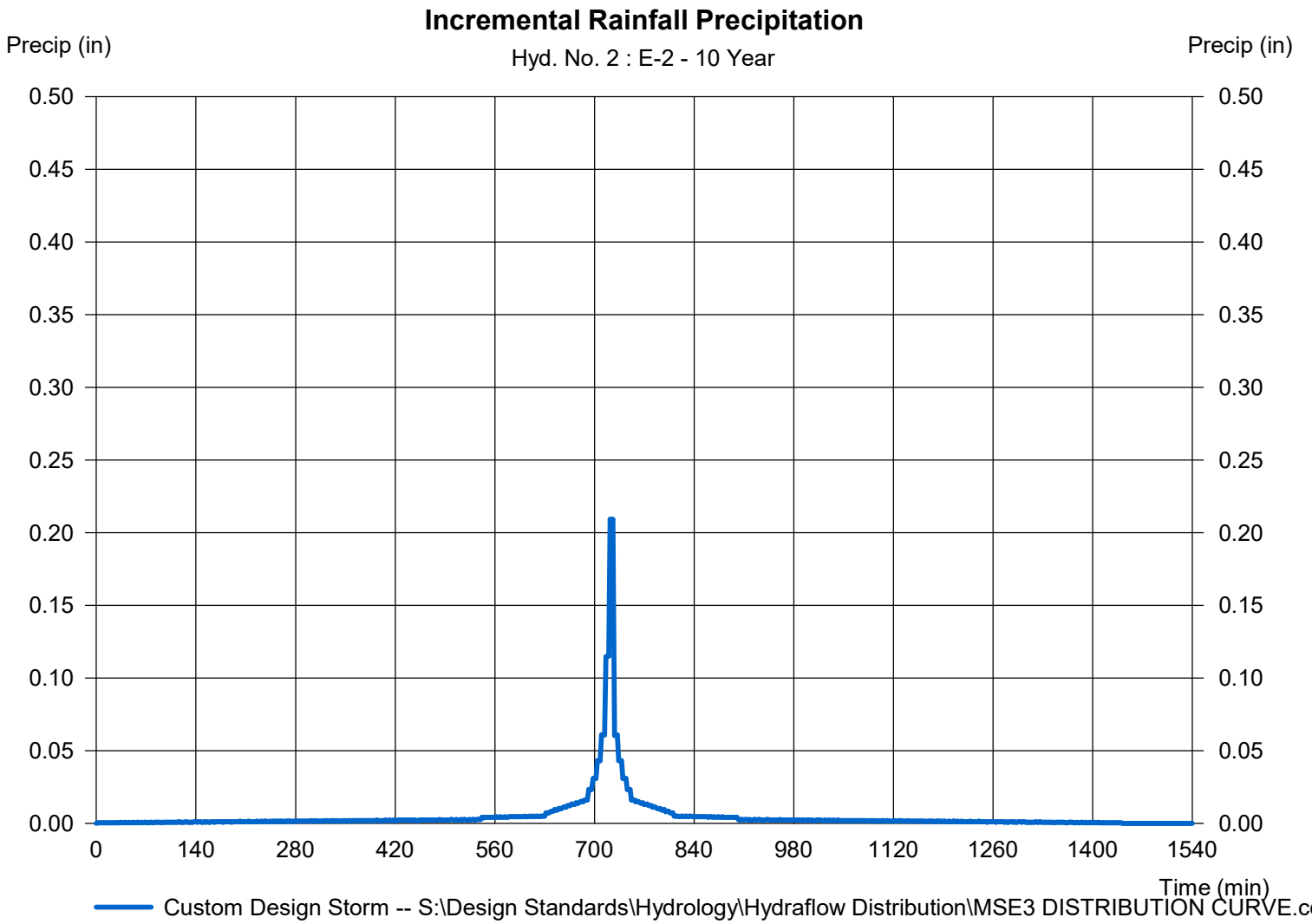


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



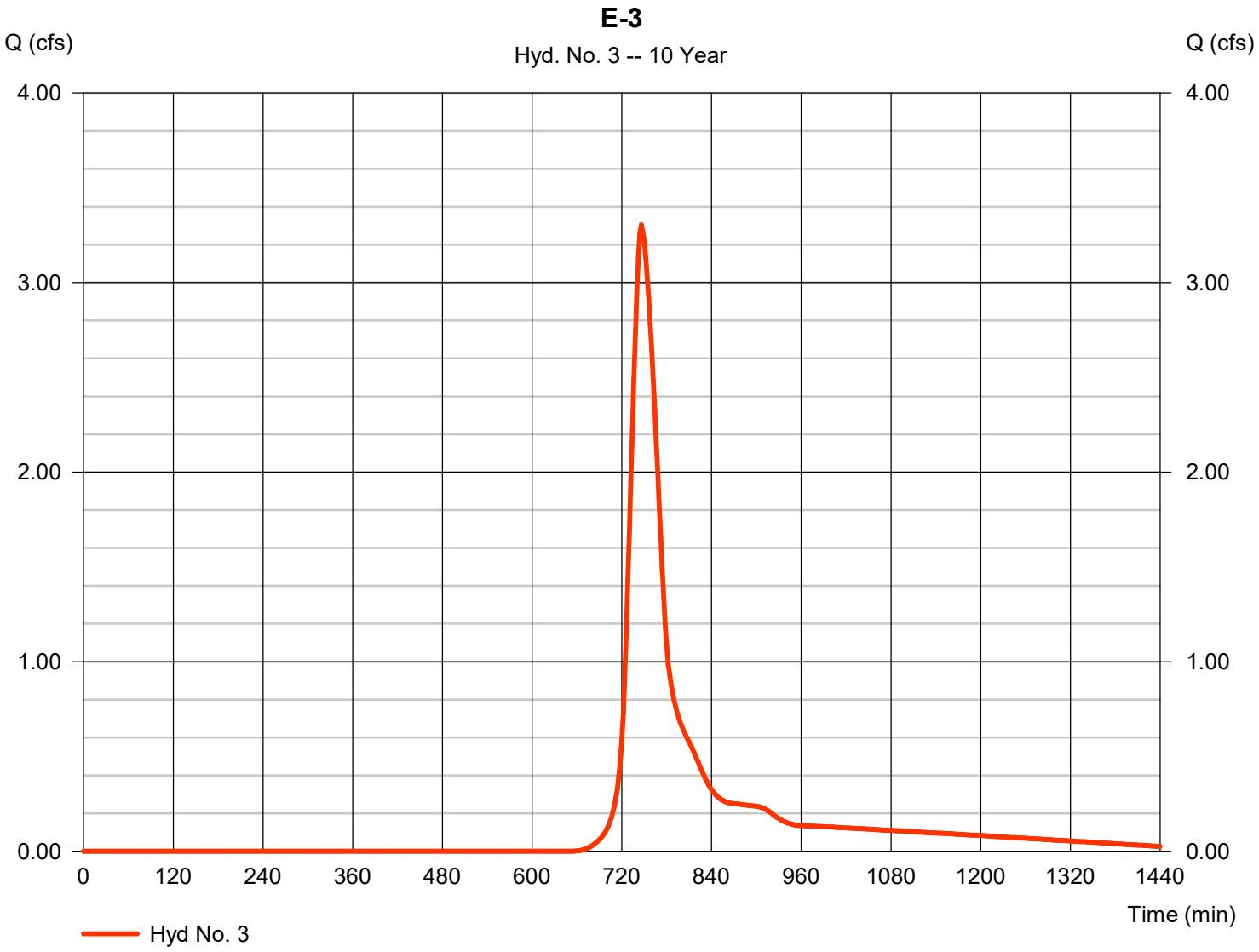
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 3

E-3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.304 cfs
Storm frequency	= 10 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 14,508 cuft
Drainage area	= 2.650 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.90 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

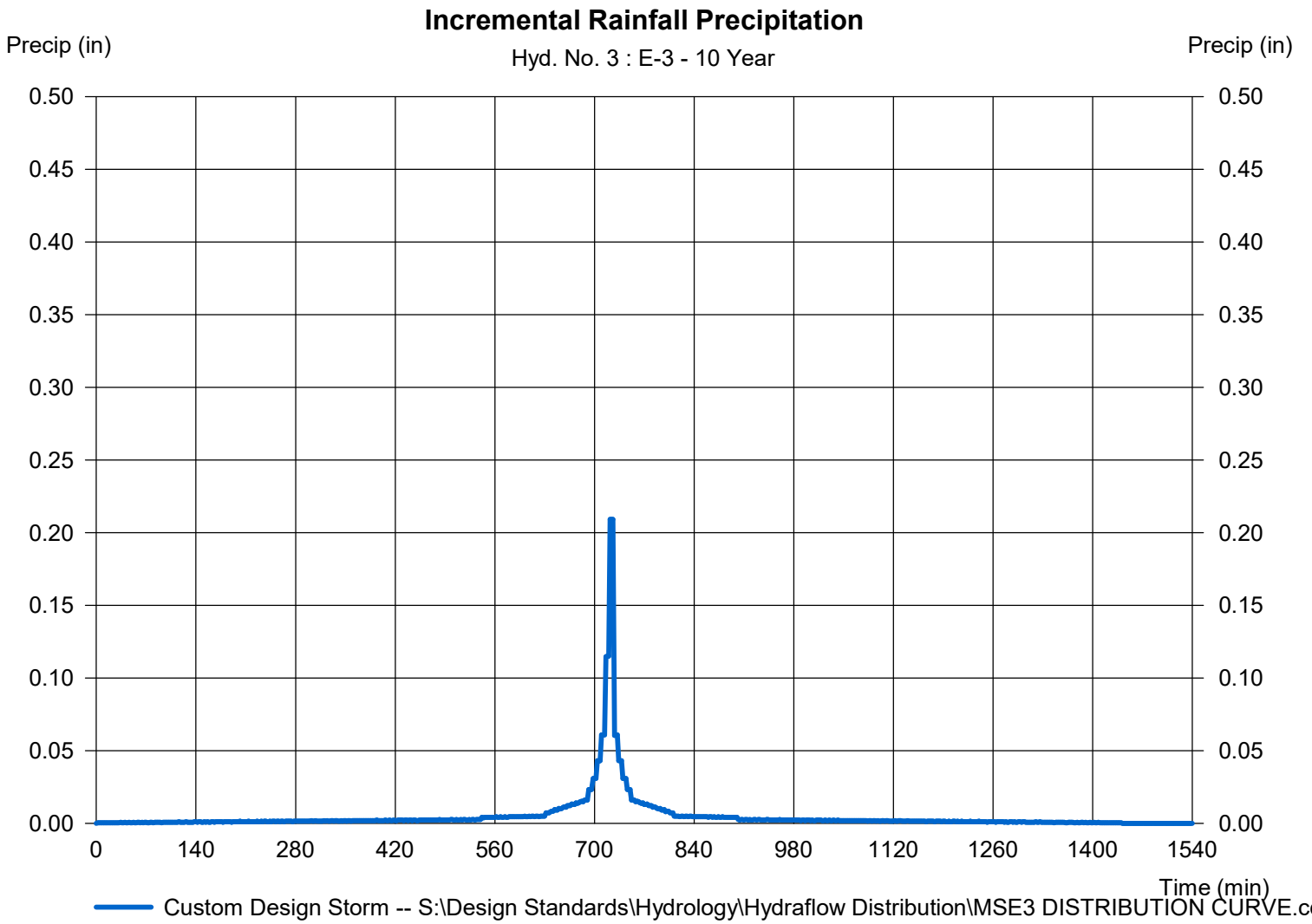


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



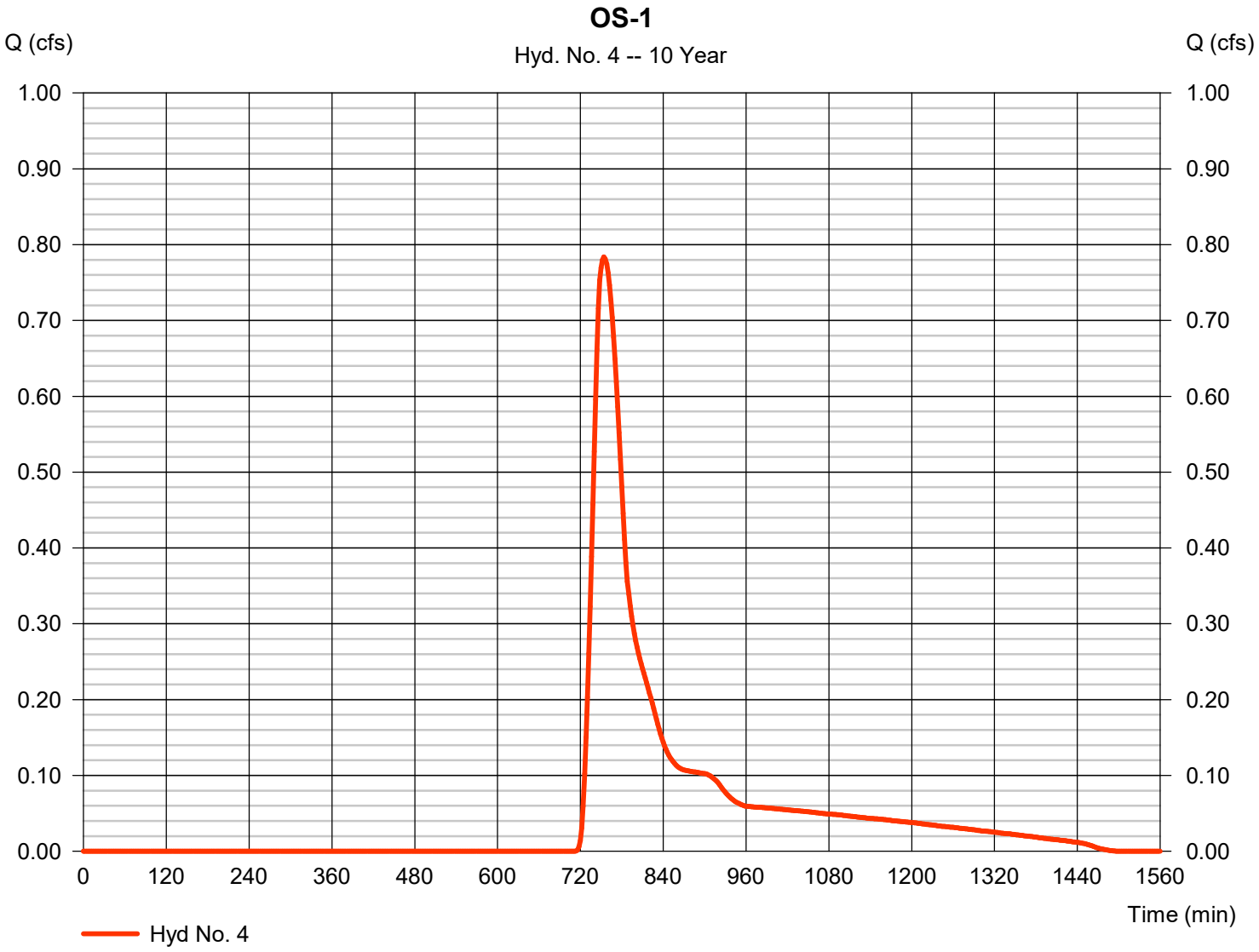
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 4

OS-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.784 cfs
Storm frequency	= 10 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 4,609 cuft
Drainage area	= 1.893 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 40.30 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hyd. factor	Shape factor Distribution	= MSE3 DISTRIBUTION CU

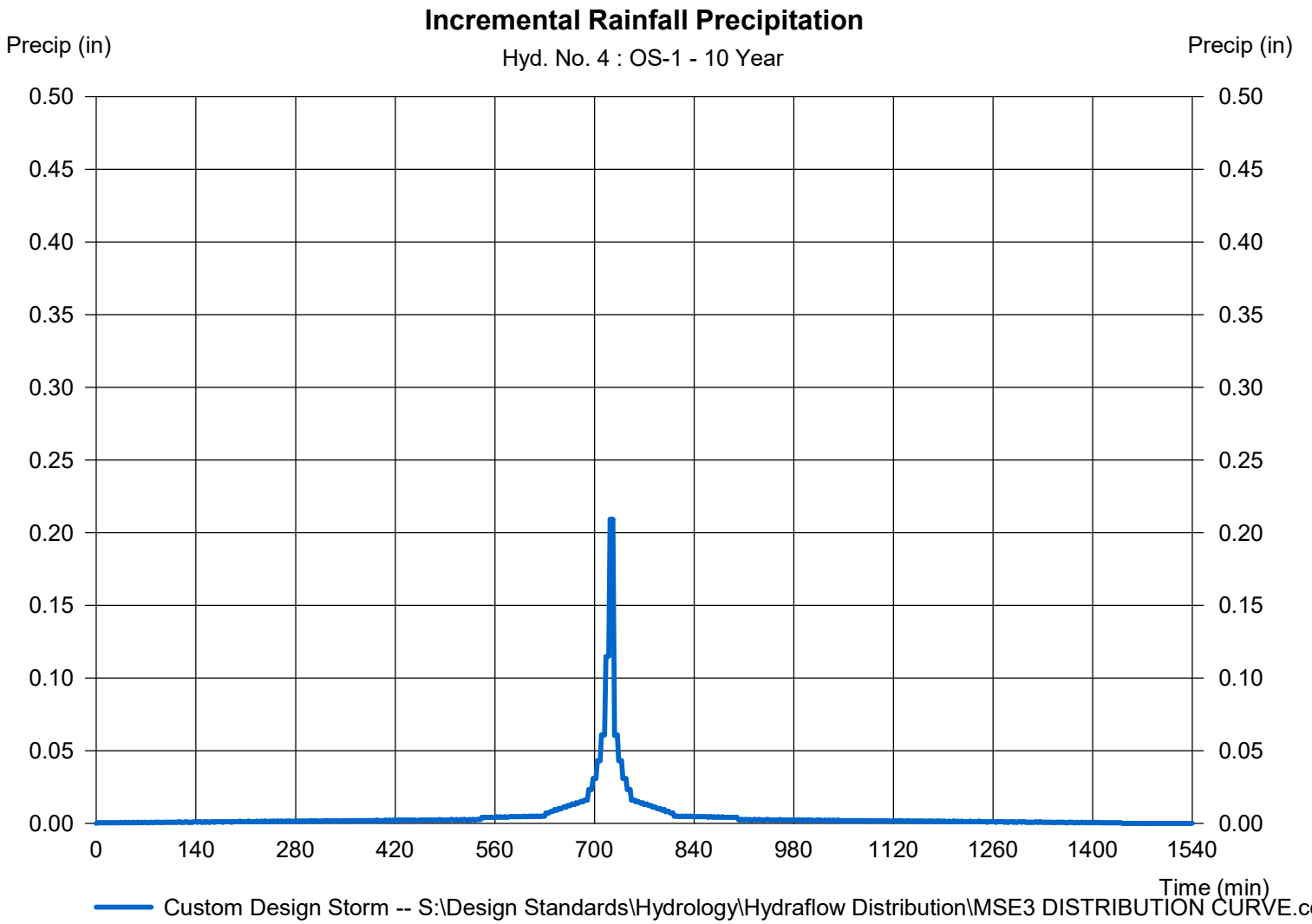


Precipitation Report

Hyd. No. 4

OS-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



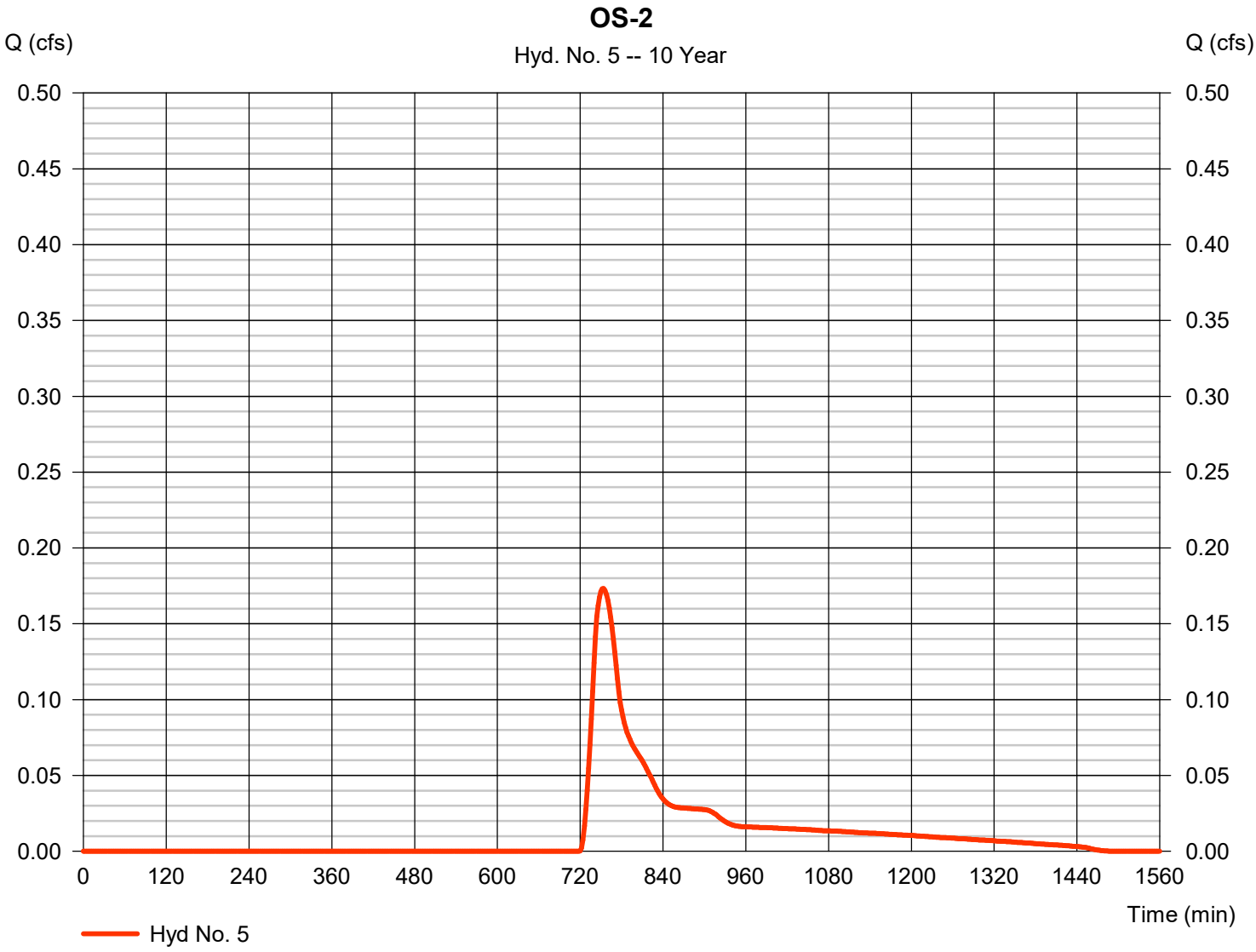
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 5

OS-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.173 cfs
Storm frequency	= 10 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 1,098 cuft
Drainage area	= 0.655 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

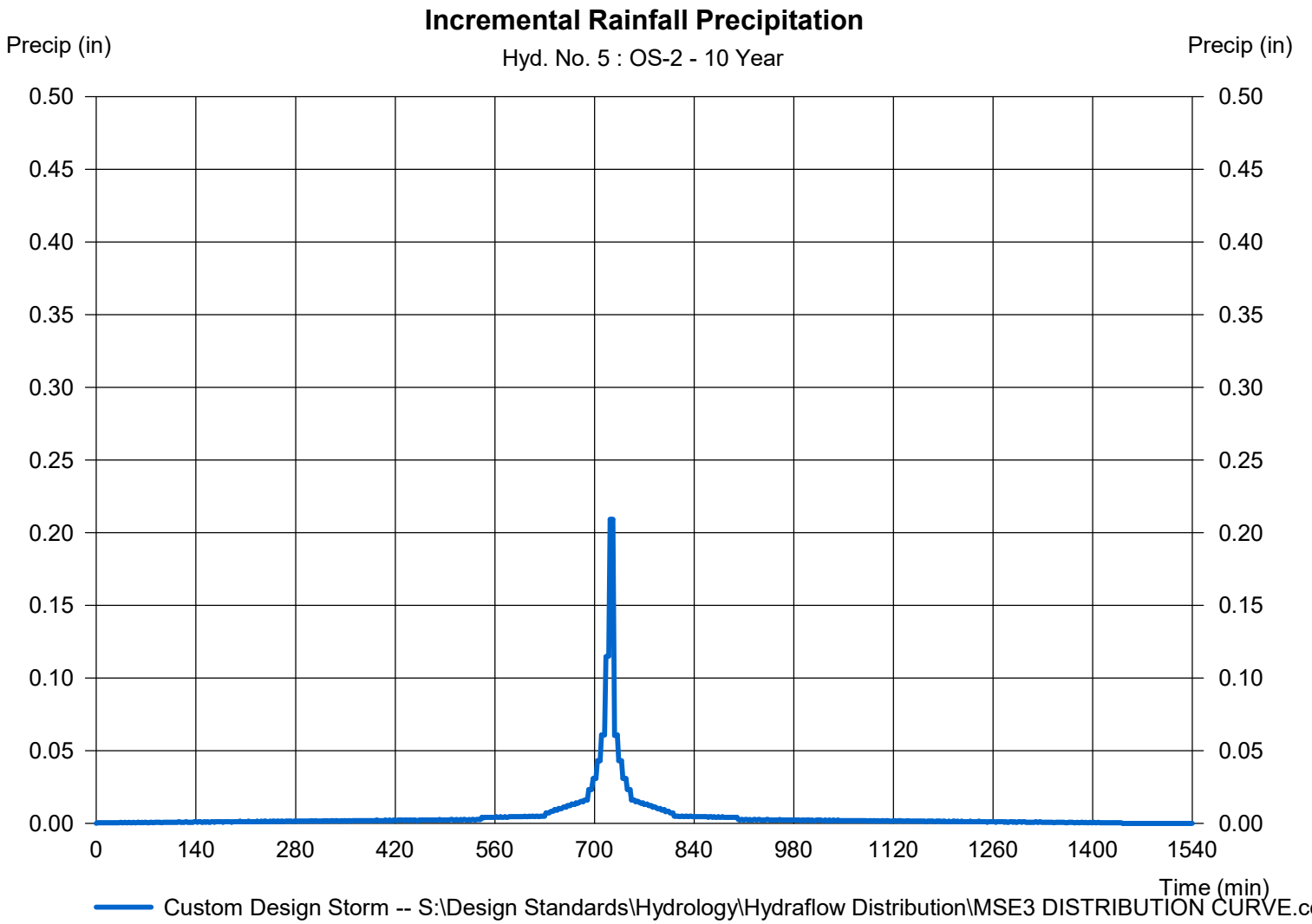


Precipitation Report

Hyd. No. 5

OS-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



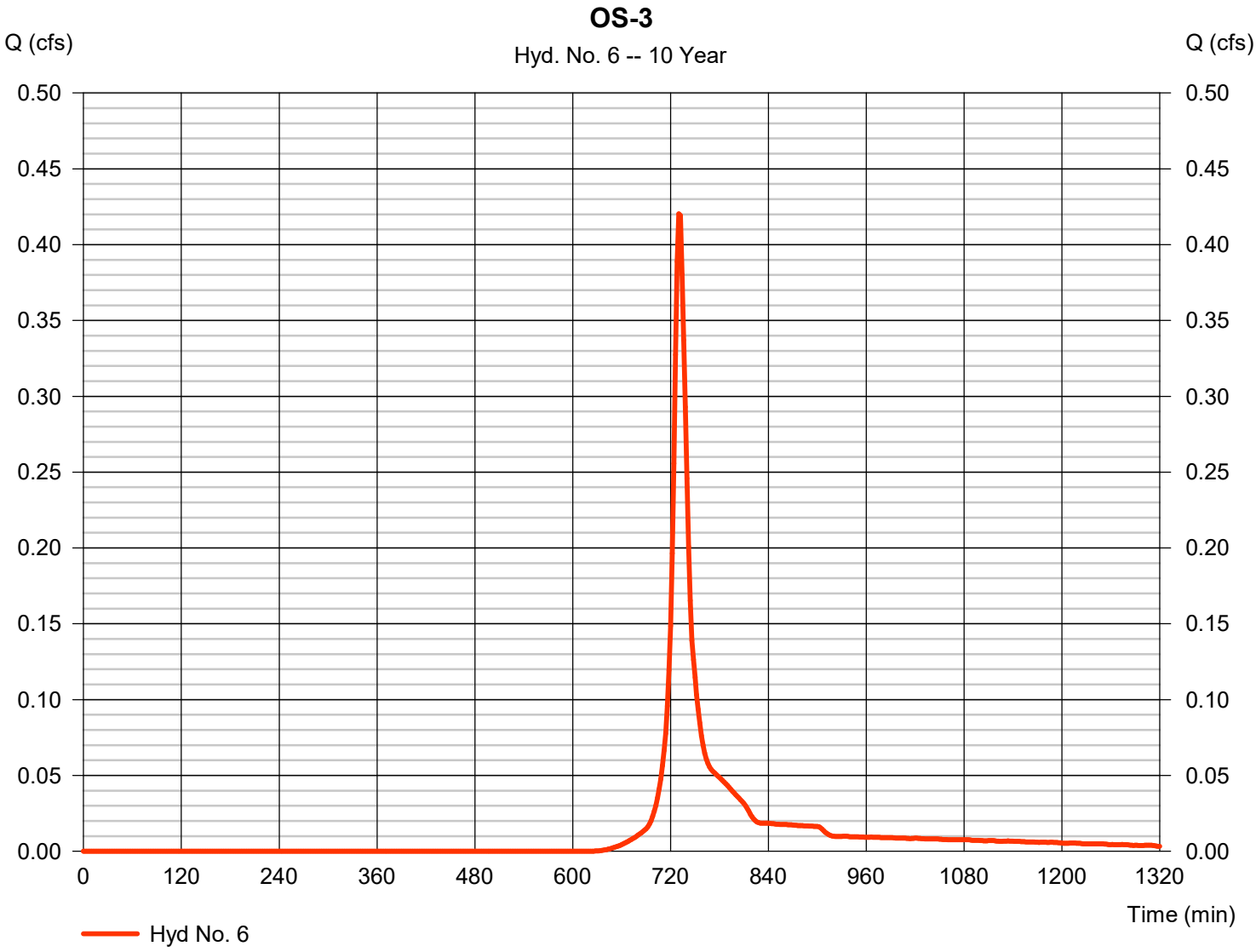
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 6

OS-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.420 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 1,086 cuft
Drainage area	= 0.167 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

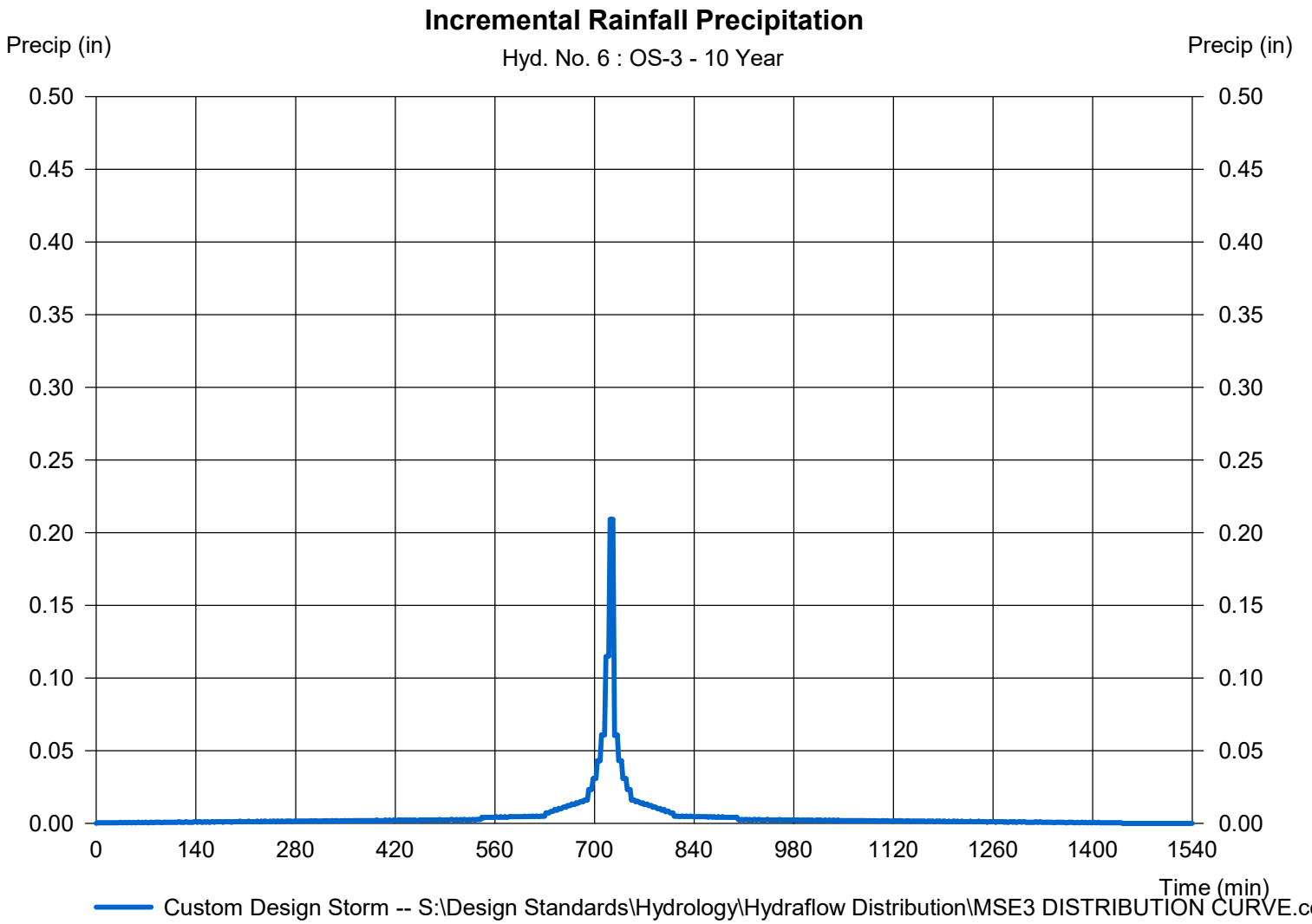


Precipitation Report

Hyd. No. 6

OS-3

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

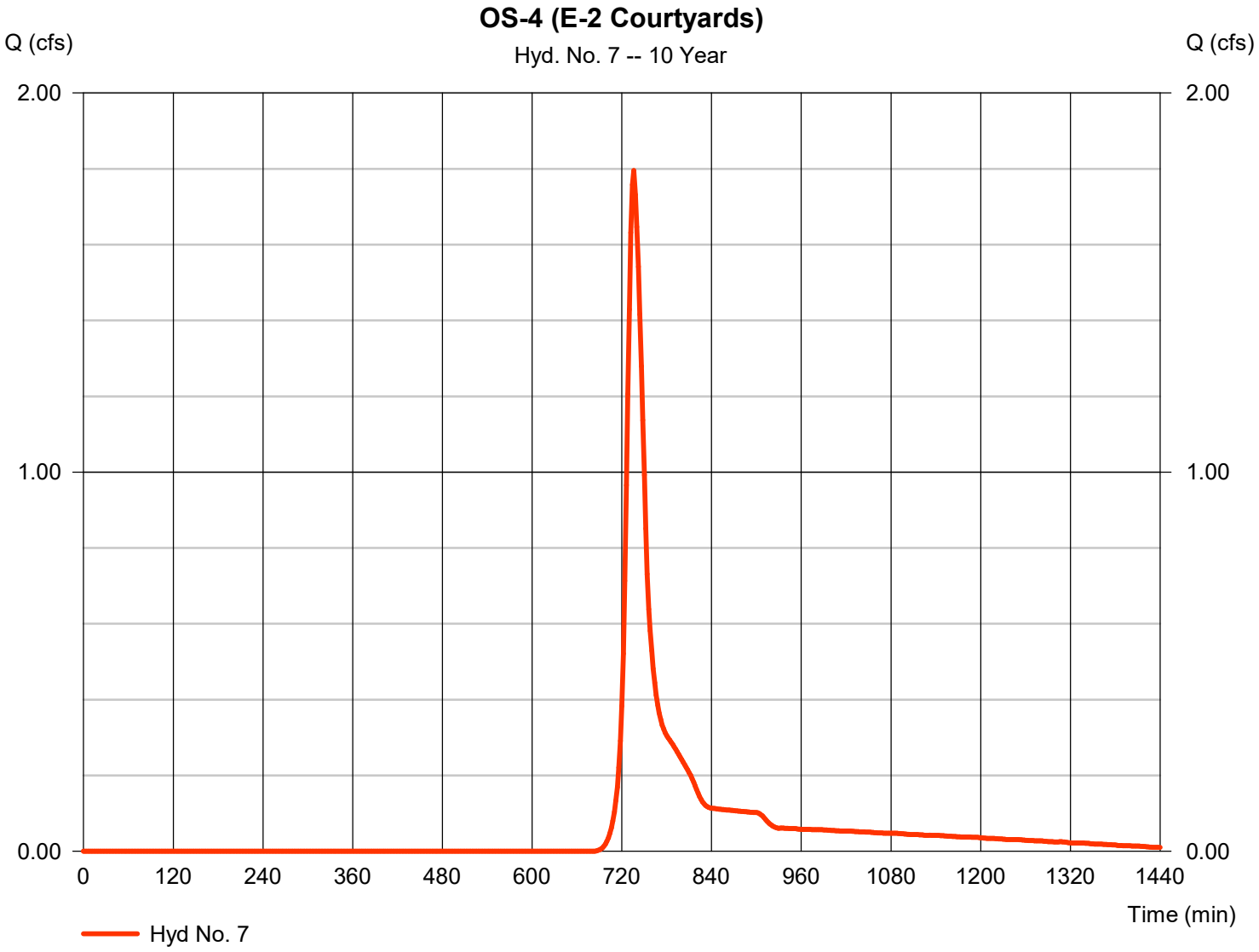


Hydrograph Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.795 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	5,776 cuft
Drainage area	=	1.321 ac	Curve number	=	70
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.40 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

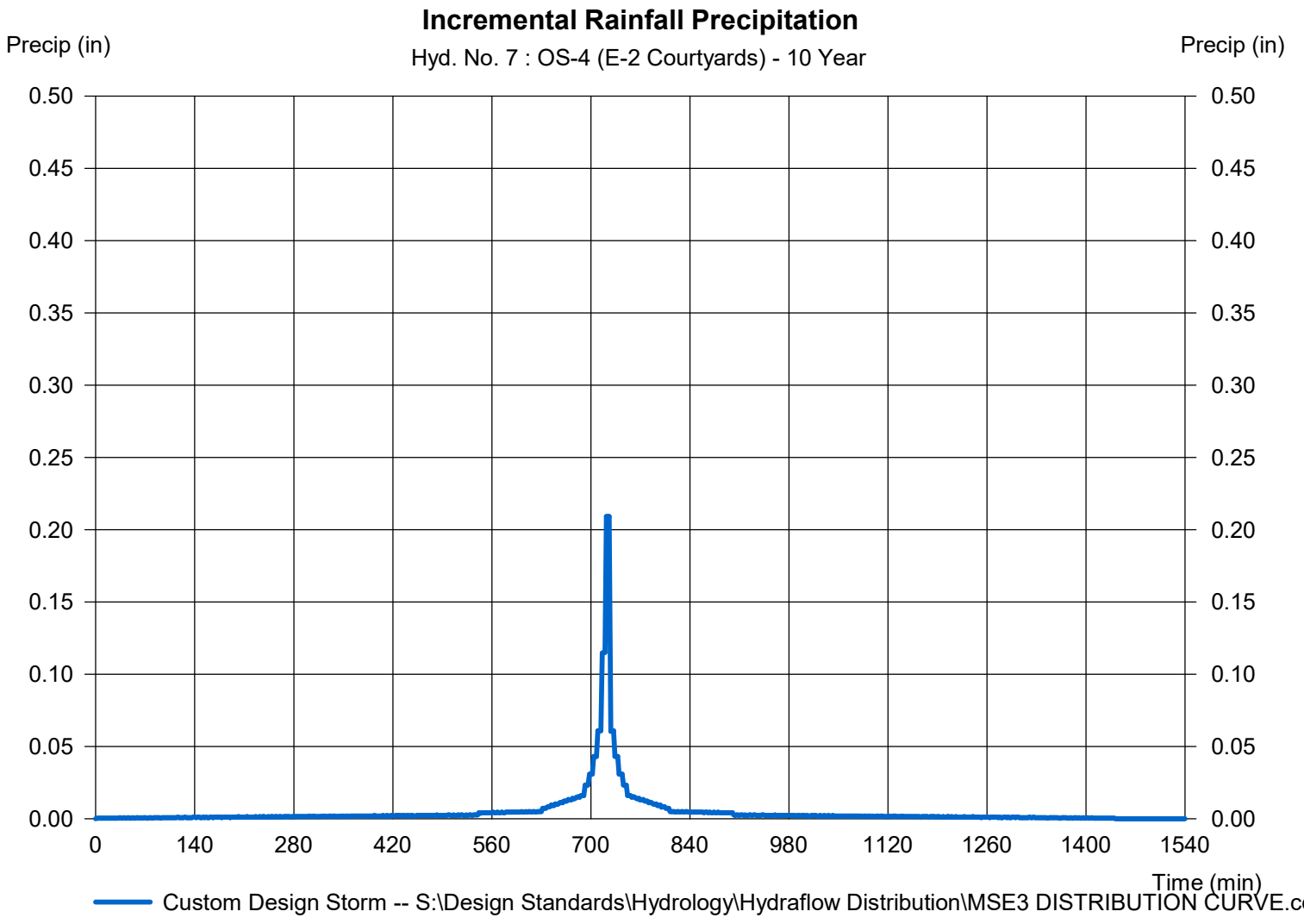


Precipitation Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

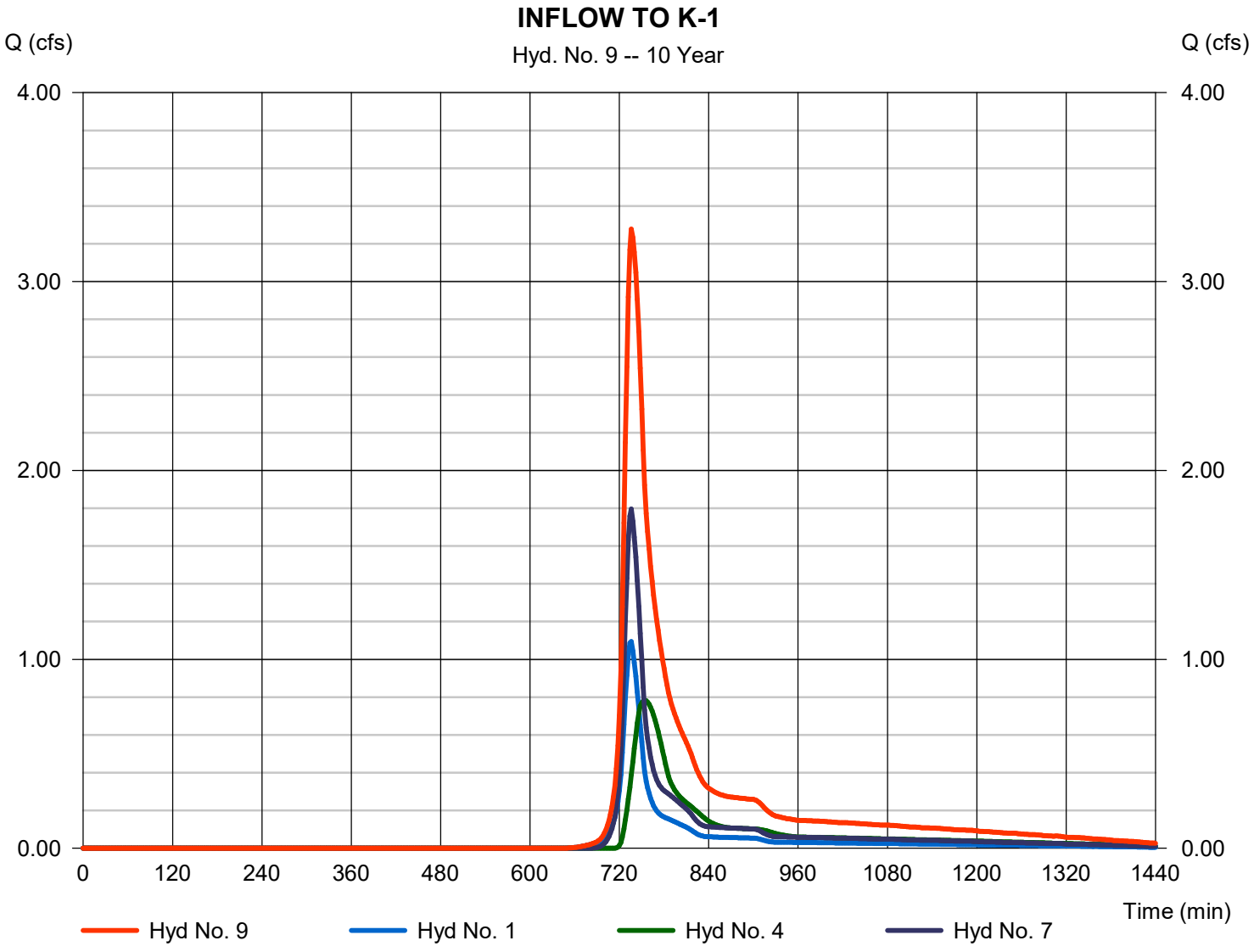


Hydrograph Report

Hyd. No. 9

INFLOW TO K-1

Hydrograph type	= Combine	Peak discharge	= 3.278 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 13,794 cuft
Inflow hyds.	= 1, 4, 7	Contrib. drain. area	= 3.803 ac



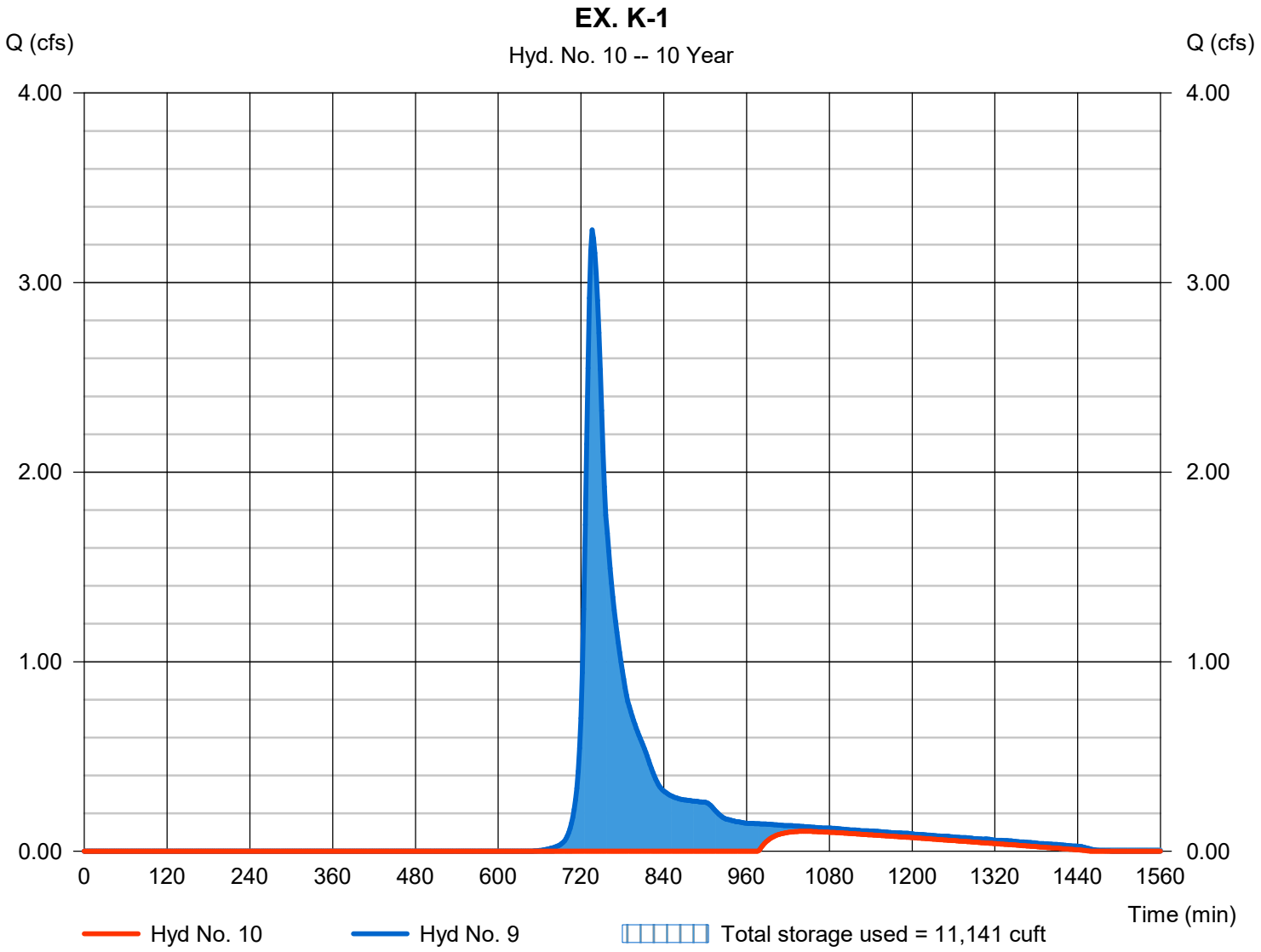
Hydrograph Report

Hyd. No. 10

EX. K-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.105 cfs
Storm frequency	=	10 yrs	Time to peak	=	1044 min
Time interval	=	2 min	Hyd. volume	=	1,750 cuft
Inflow hyd. No.	=	9 - INFLOW TO K-1	Max. Elevation	=	113.11 ft
Reservoir name	=	EX. KETTLE K-1	Max. Storage	=	11,141 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

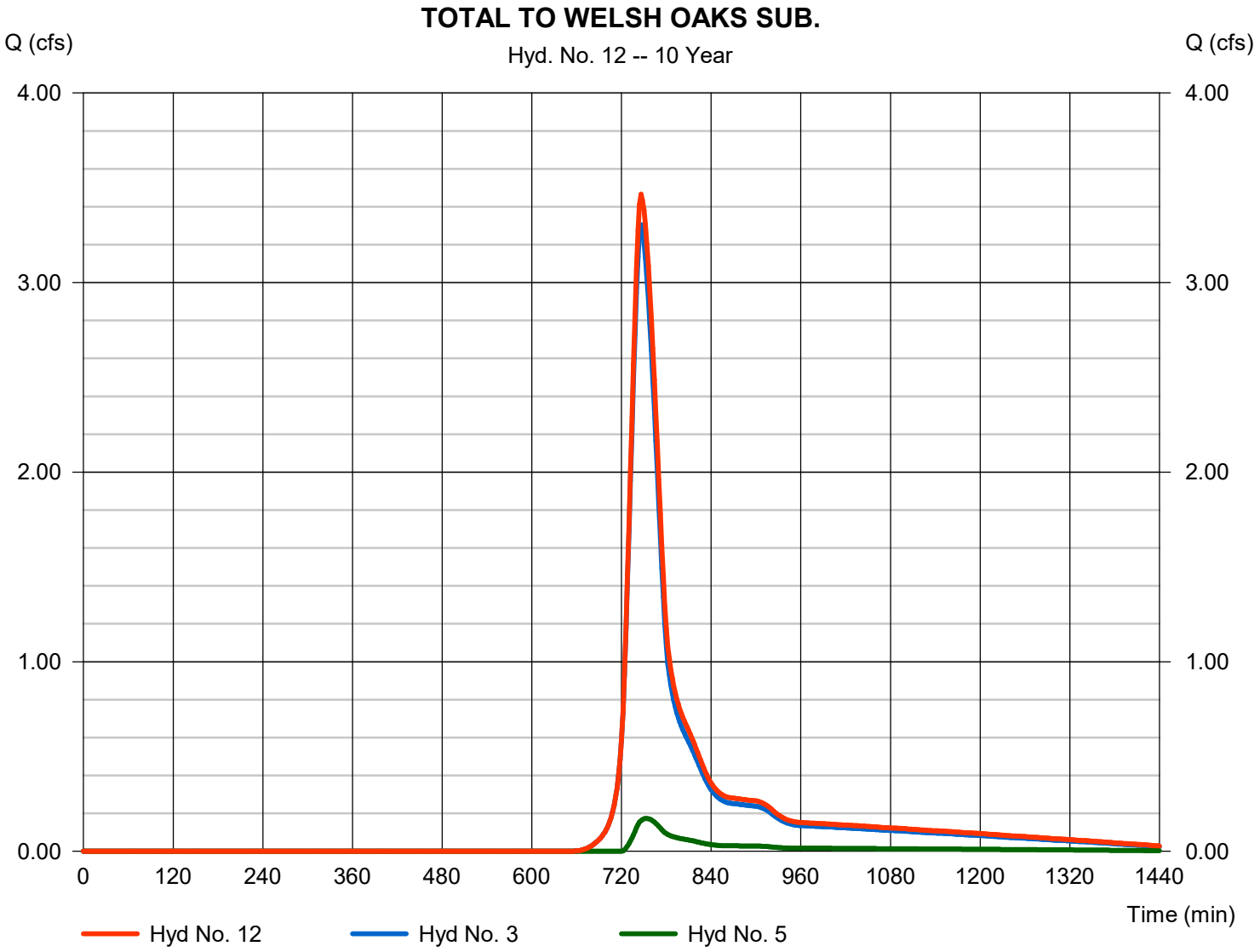


Hydrograph Report

Hyd. No. 12

TOTAL TO WELSH OAKS SUB.

Hydrograph type	= Combine	Peak discharge	= 3.466 cfs
Storm frequency	= 10 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 15,607 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 3.305 ac

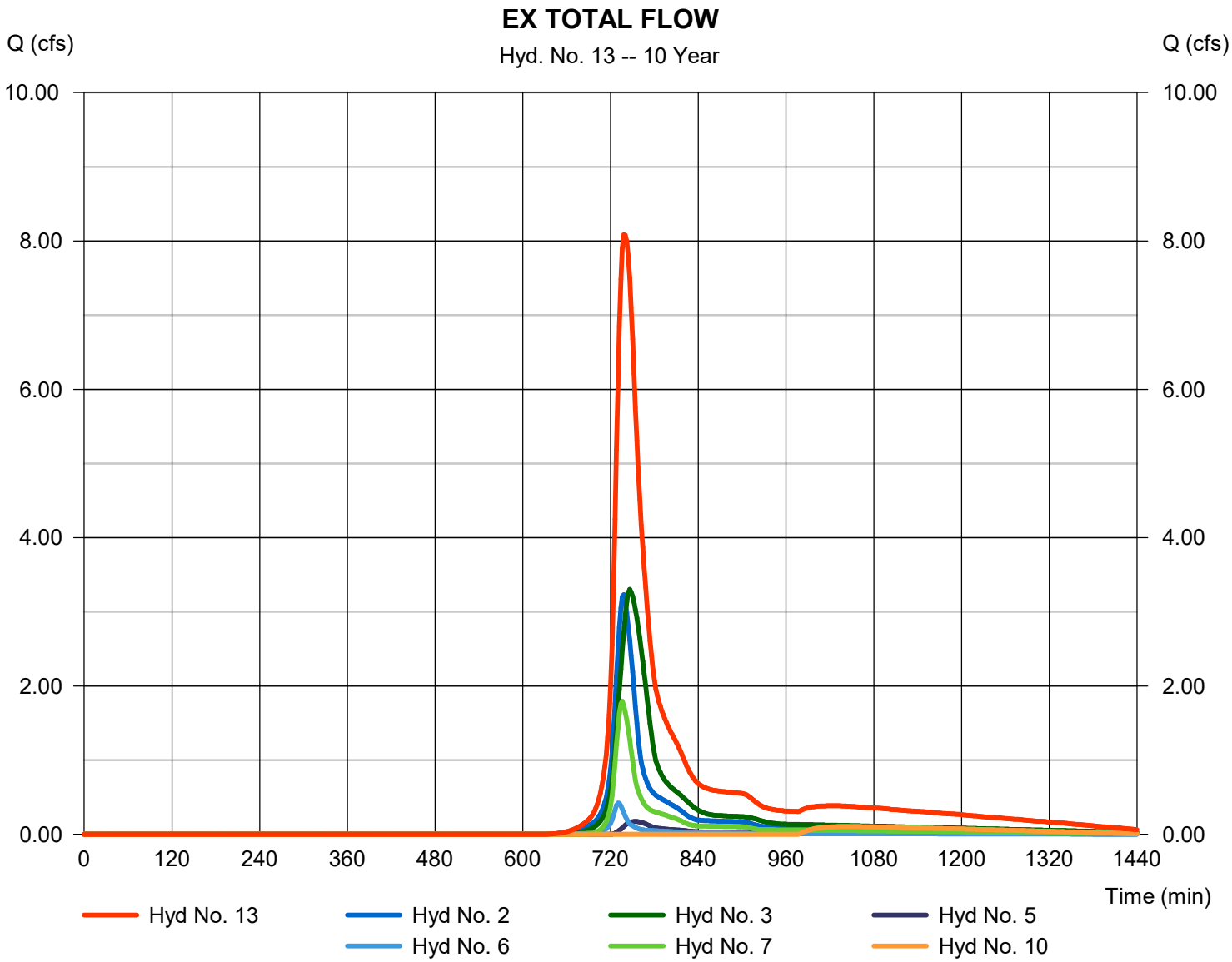


Hydrograph Report

Hyd. No. 13

EX TOTAL FLOW

Hydrograph type	= Combine	Peak discharge	= 8.088 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 35,185 cuft
Inflow hyds.	= 2, 3, 5, 6, 7, 10	Contrib. drain. area	= 6.502 ac



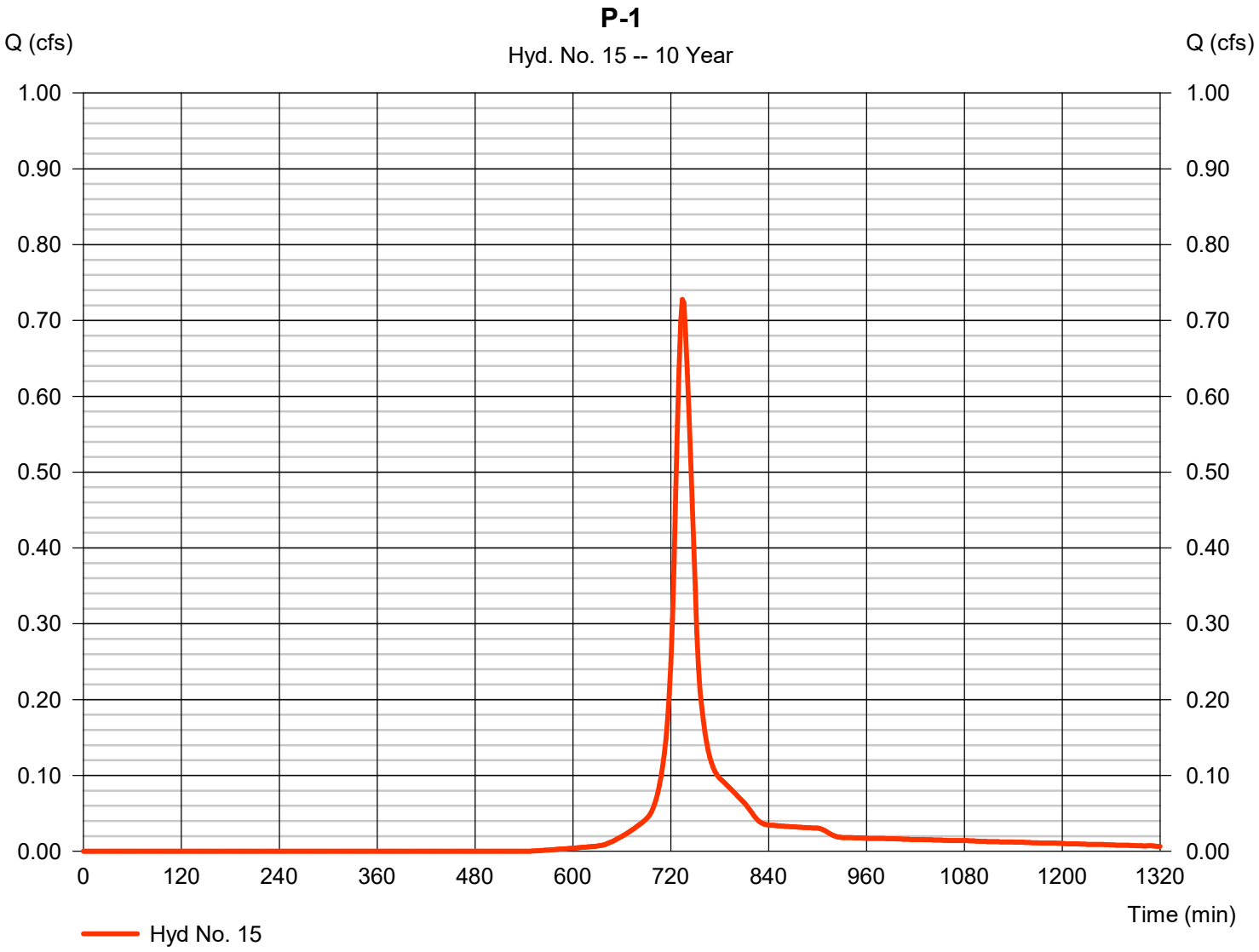
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 15

P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.728 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 2,249 cuft
Drainage area	= 0.281 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.80 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

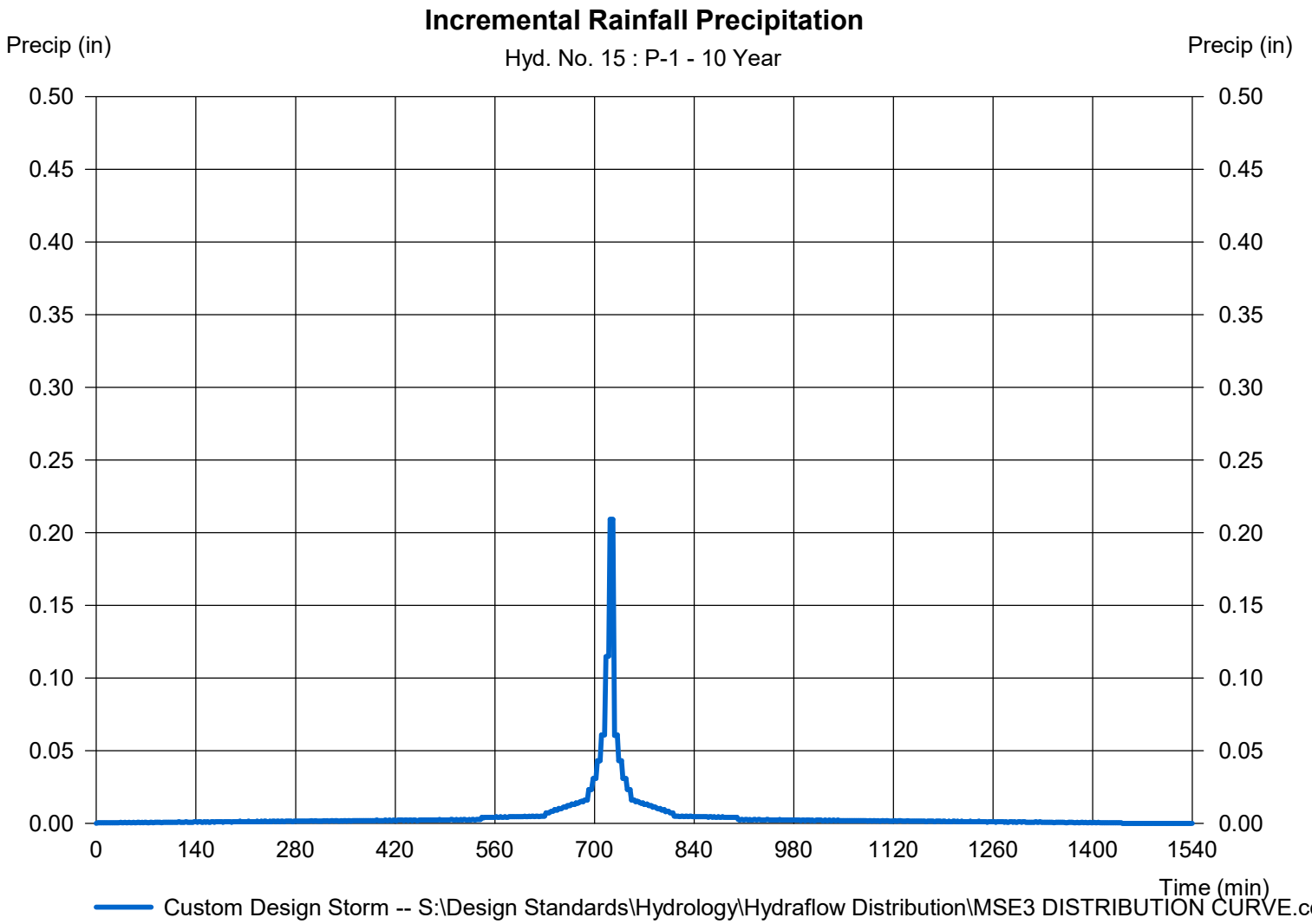


Precipitation Report

Hyd. No. 15

P-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



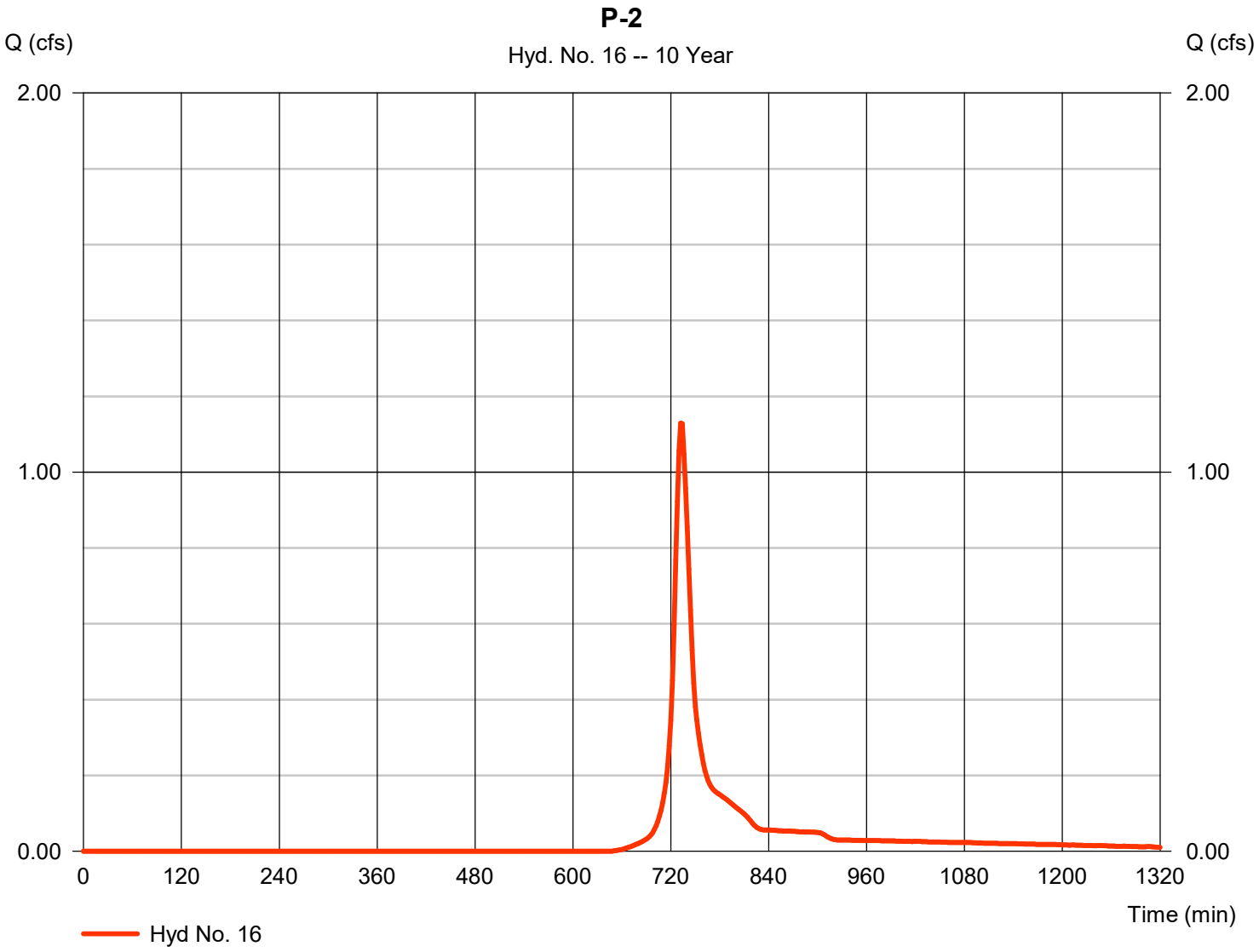
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 16

P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.130 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 3,171 cuft
Drainage area	= 0.562 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.70 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

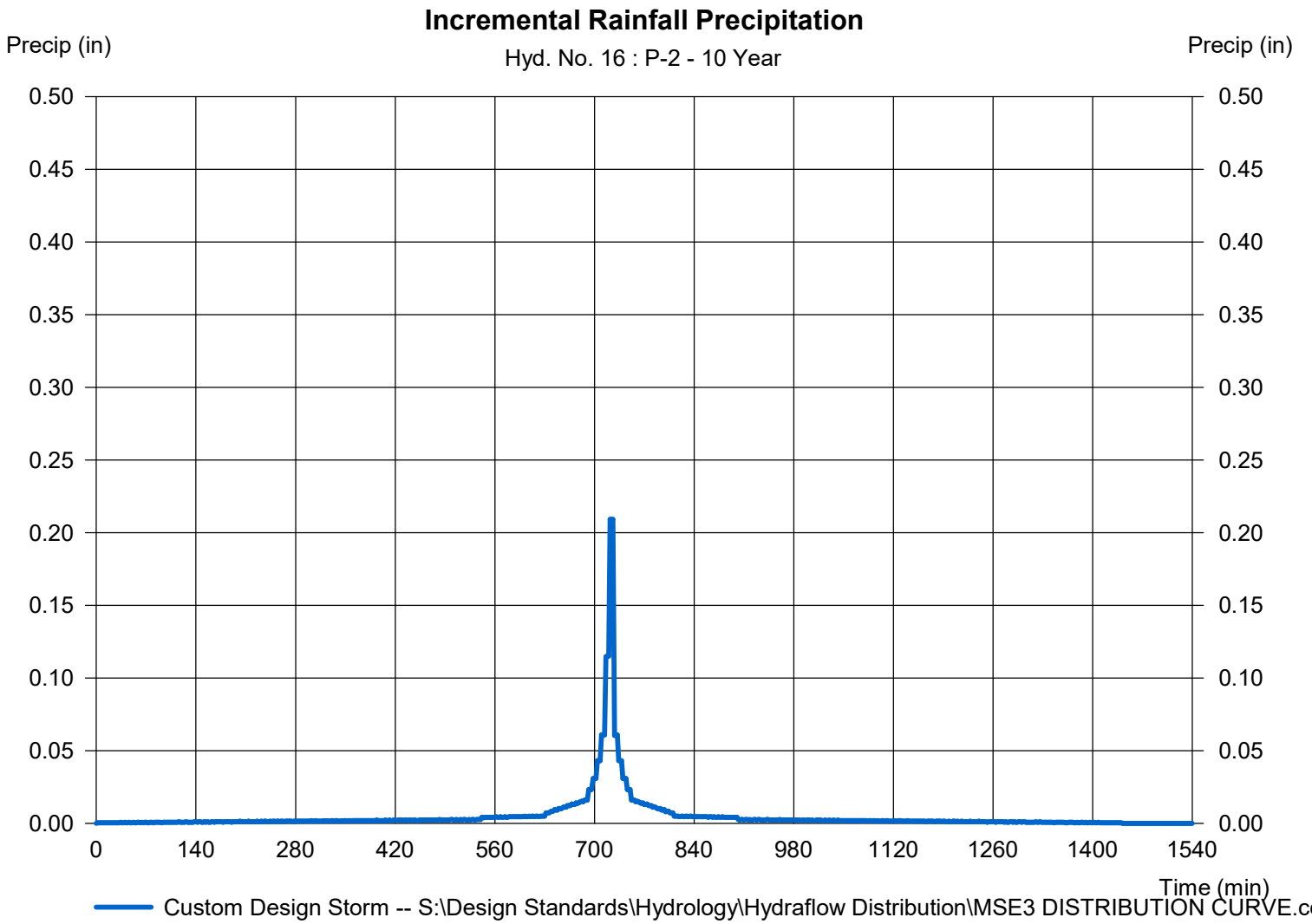


Precipitation Report

Hyd. No. 16

P-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



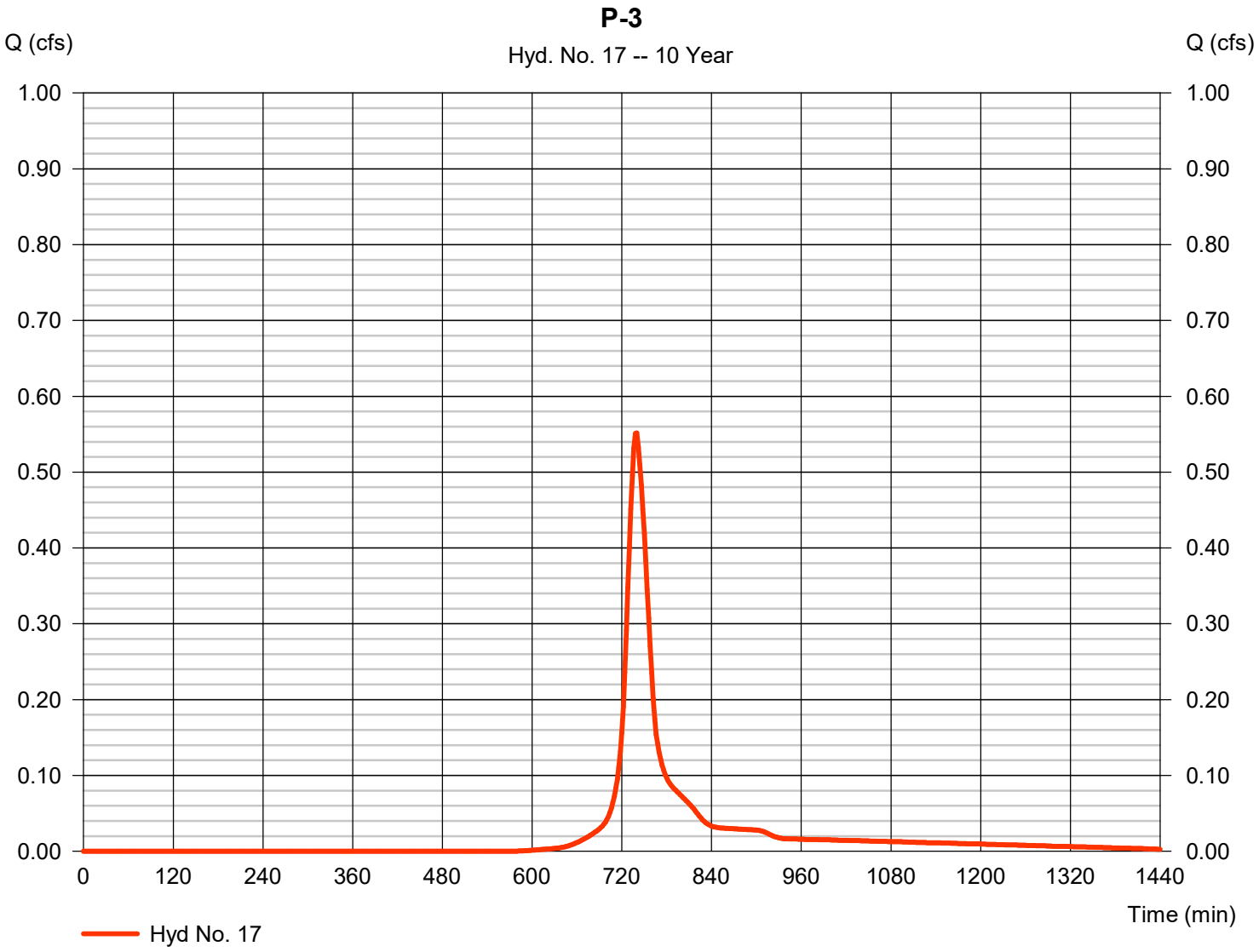
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 17

P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.552 cfs
Storm frequency	= 10 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 1,970 cuft
Drainage area	= 0.270 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.60 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

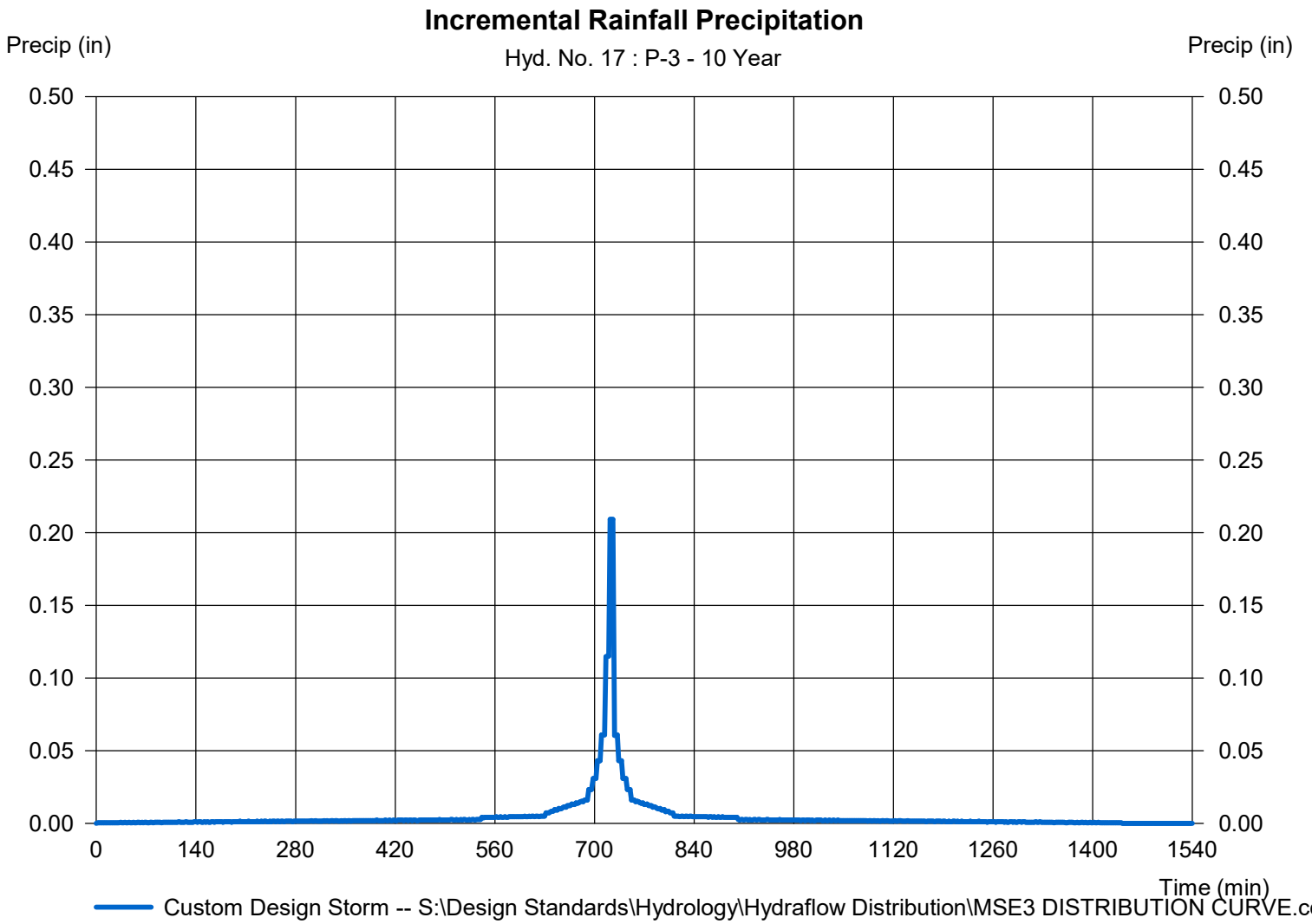


Precipitation Report

Hyd. No. 17

P-3

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



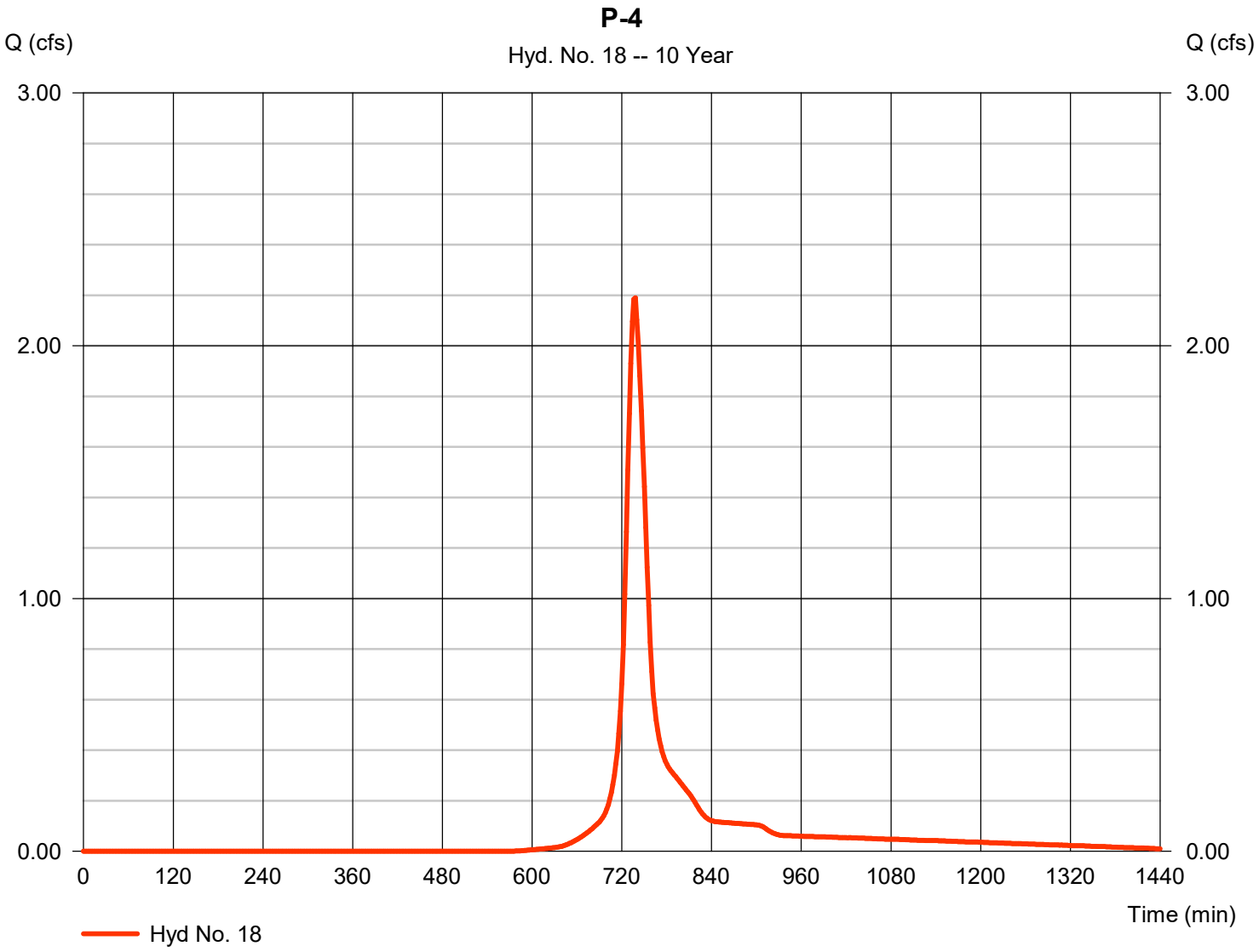
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 18

P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 2.190 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 7,407 cuft
Drainage area	= 0.982 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 20.40 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

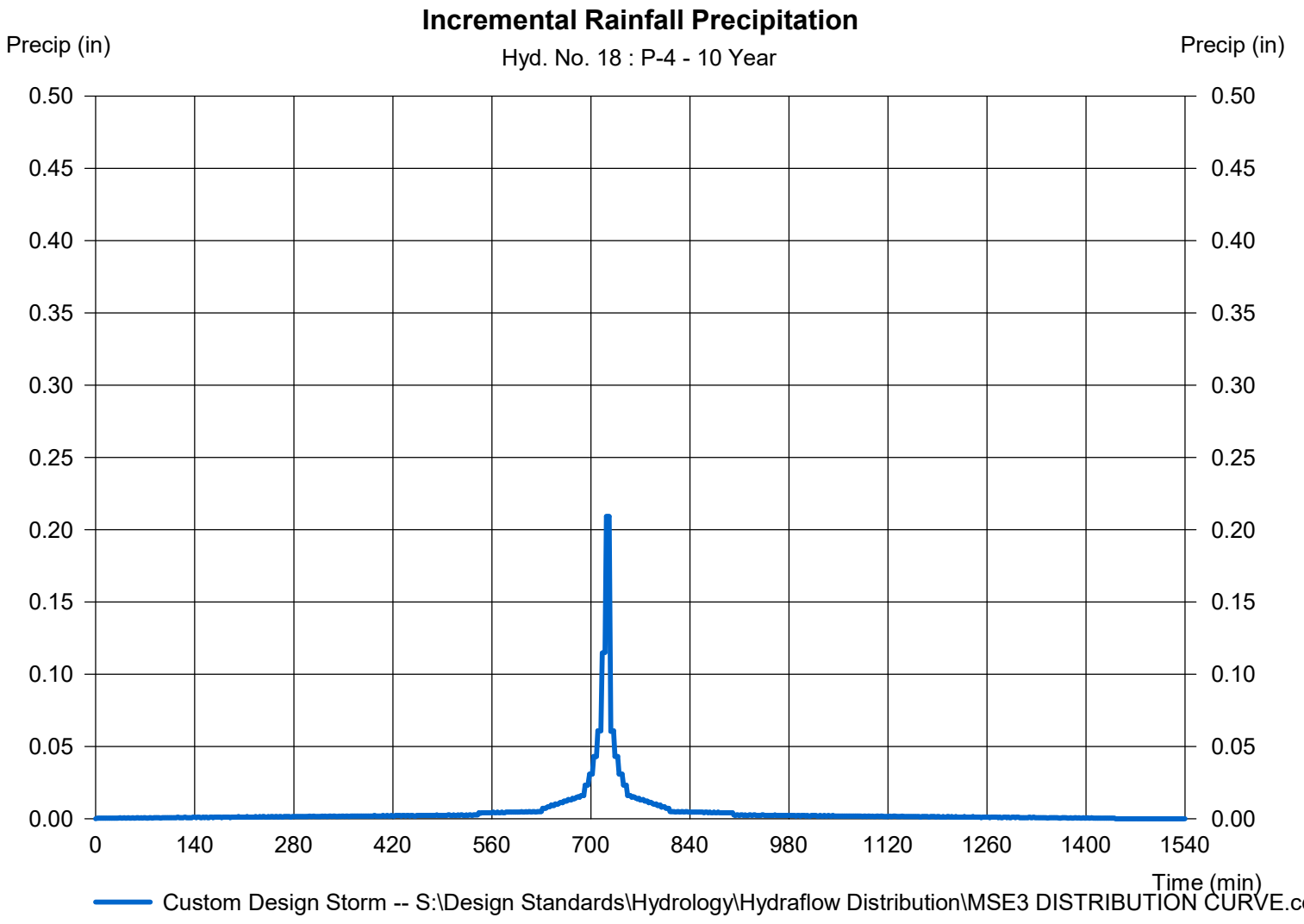


Precipitation Report

Hyd. No. 18

P-4

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



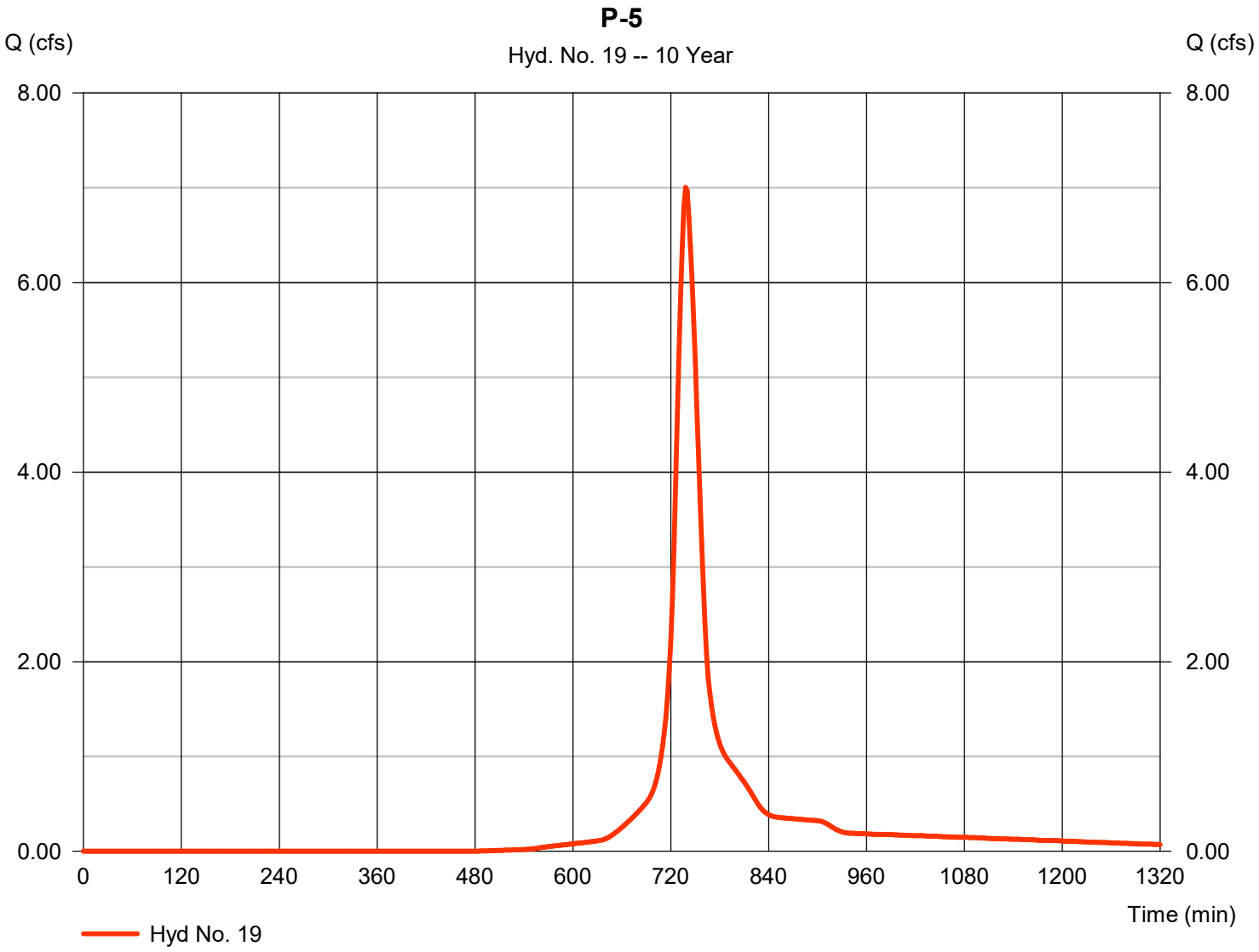
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 19

P-5

Hydrograph type	= SCS Runoff	Peak discharge	= 7.003 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 25,109 cuft
Drainage area	= 2.853 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.00 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

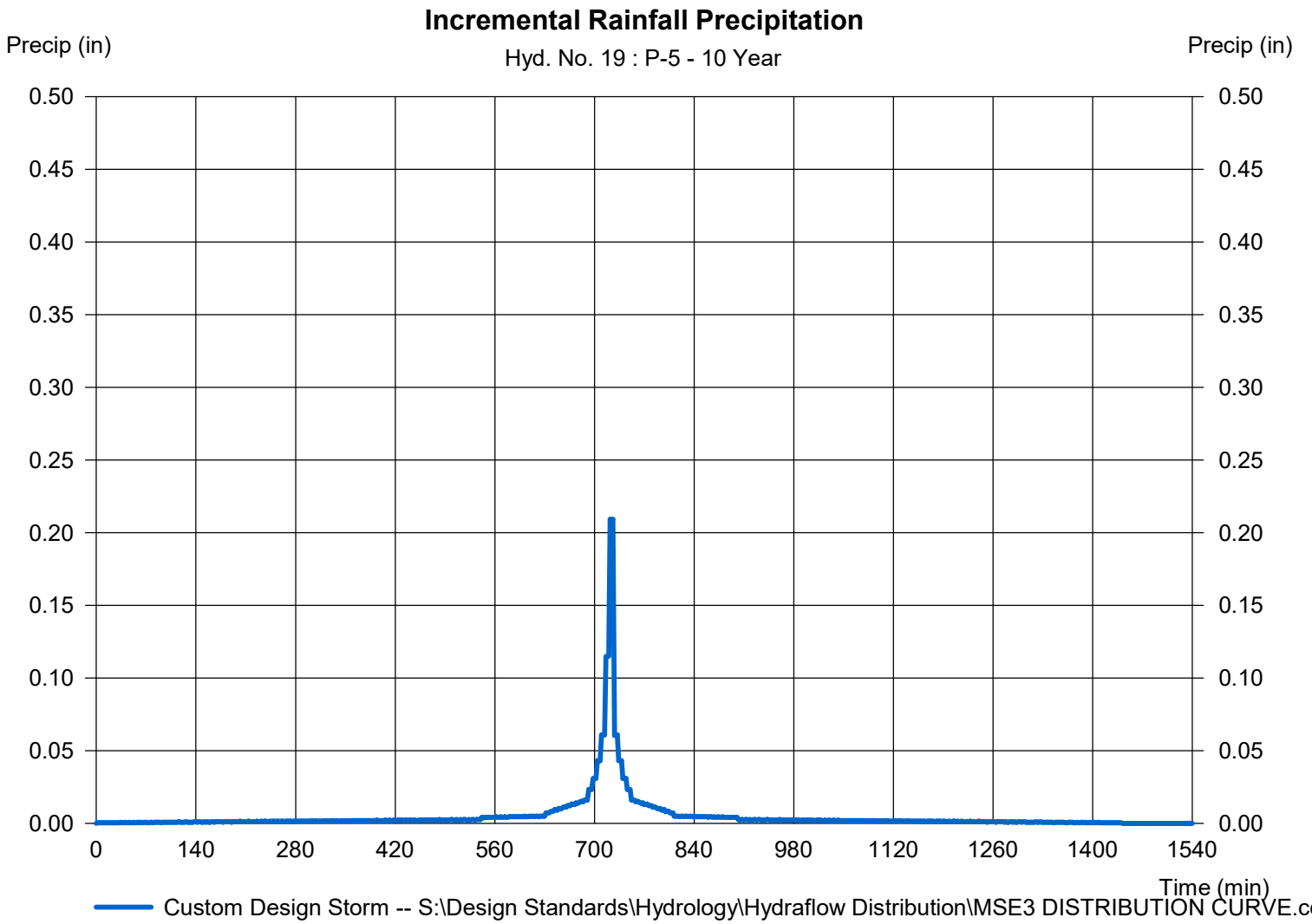


Precipitation Report

Hyd. No. 19

P-5

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

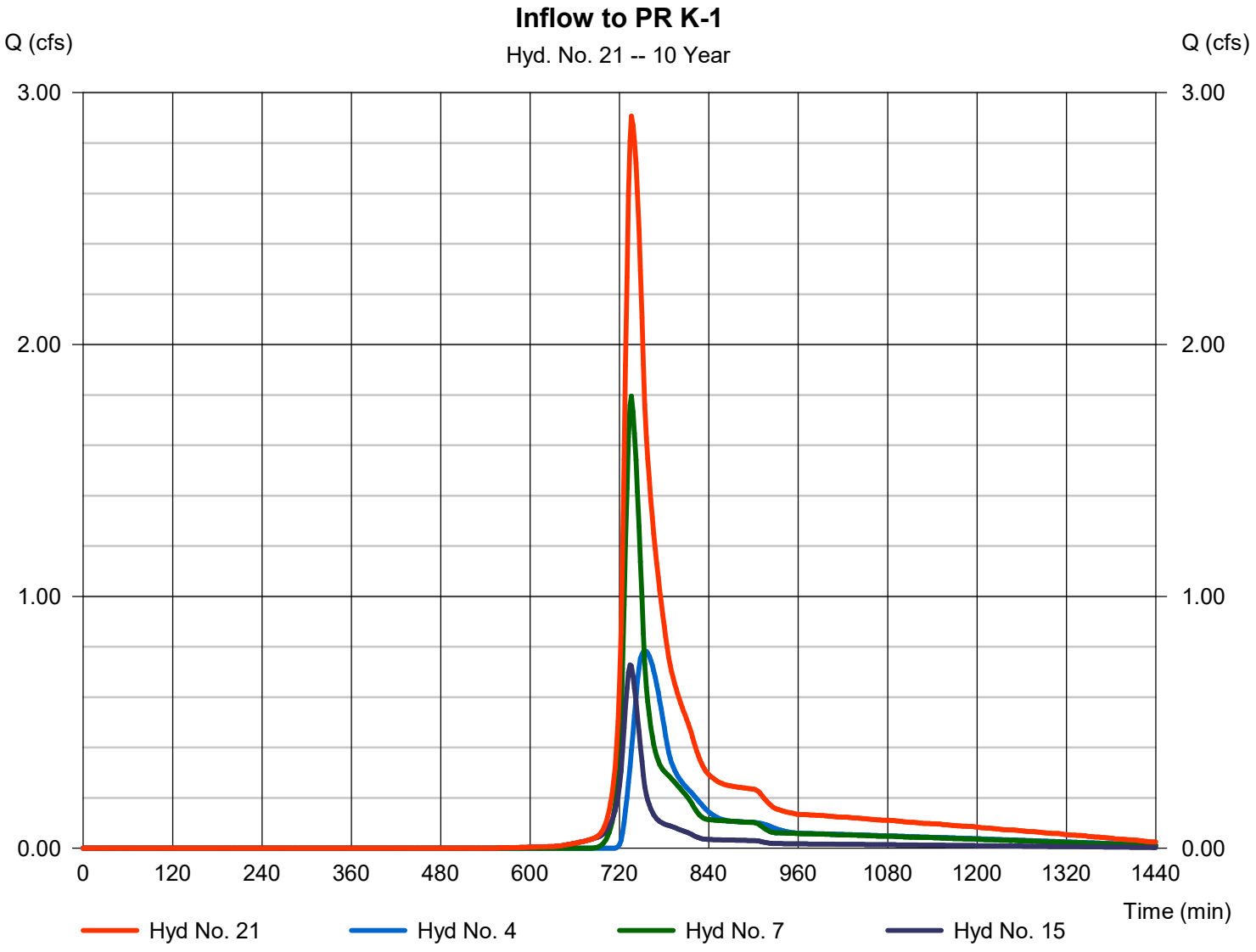


Hydrograph Report

Hyd. No. 21

Inflow to PR K-1

Hydrograph type	= Combine	Peak discharge	= 2.907 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 12,634 cuft
Inflow hyds.	= 4, 7, 15	Contrib. drain. area	= 3.495 ac



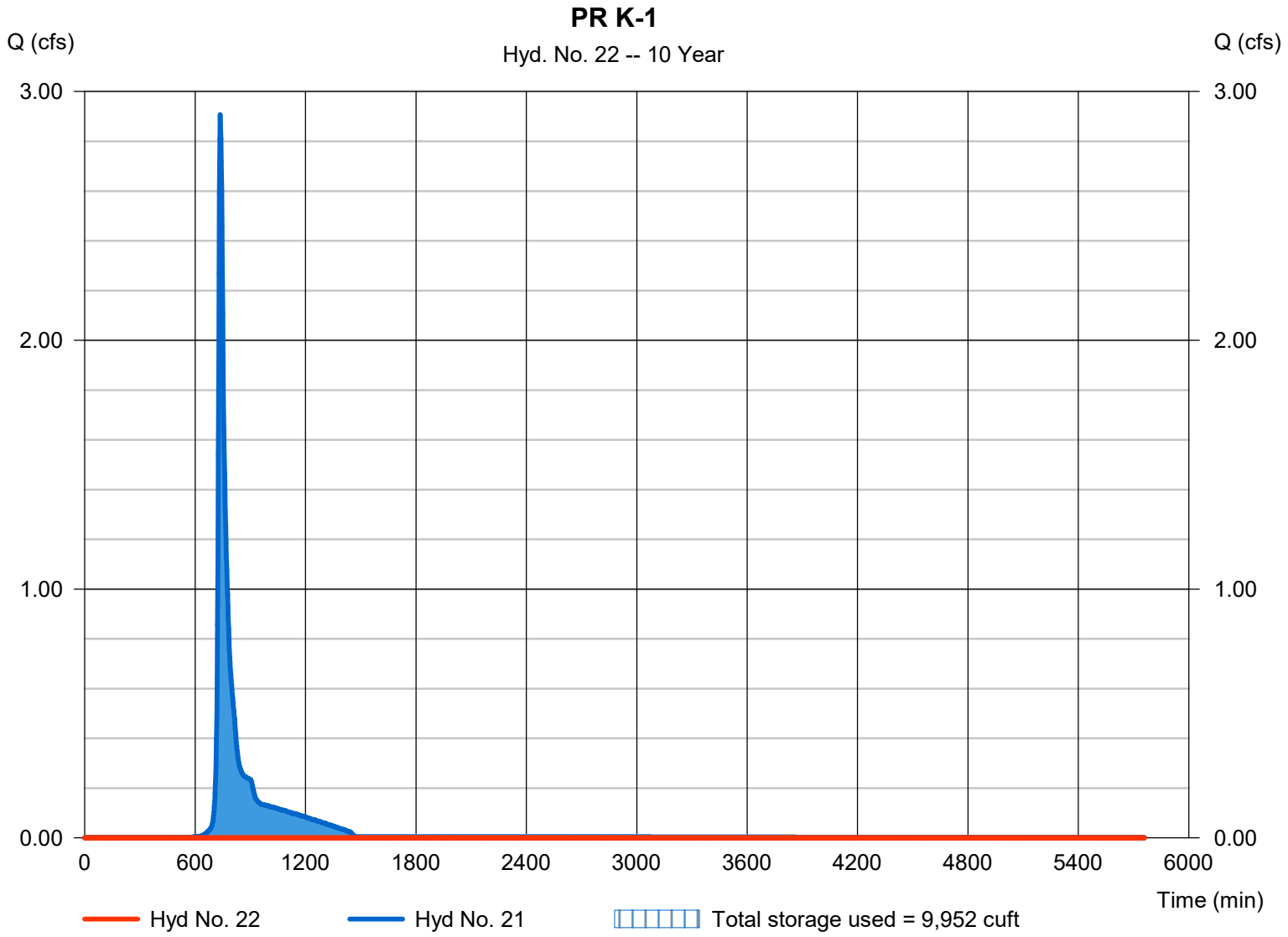
Hydrograph Report

Hyd. No. 22

PR K-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	3826 min
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	21 - Inflow to PR K-1	Max. Elevation	=	112.49 ft
Reservoir name	=	PR KETTLE K-1	Max. Storage	=	9,952 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

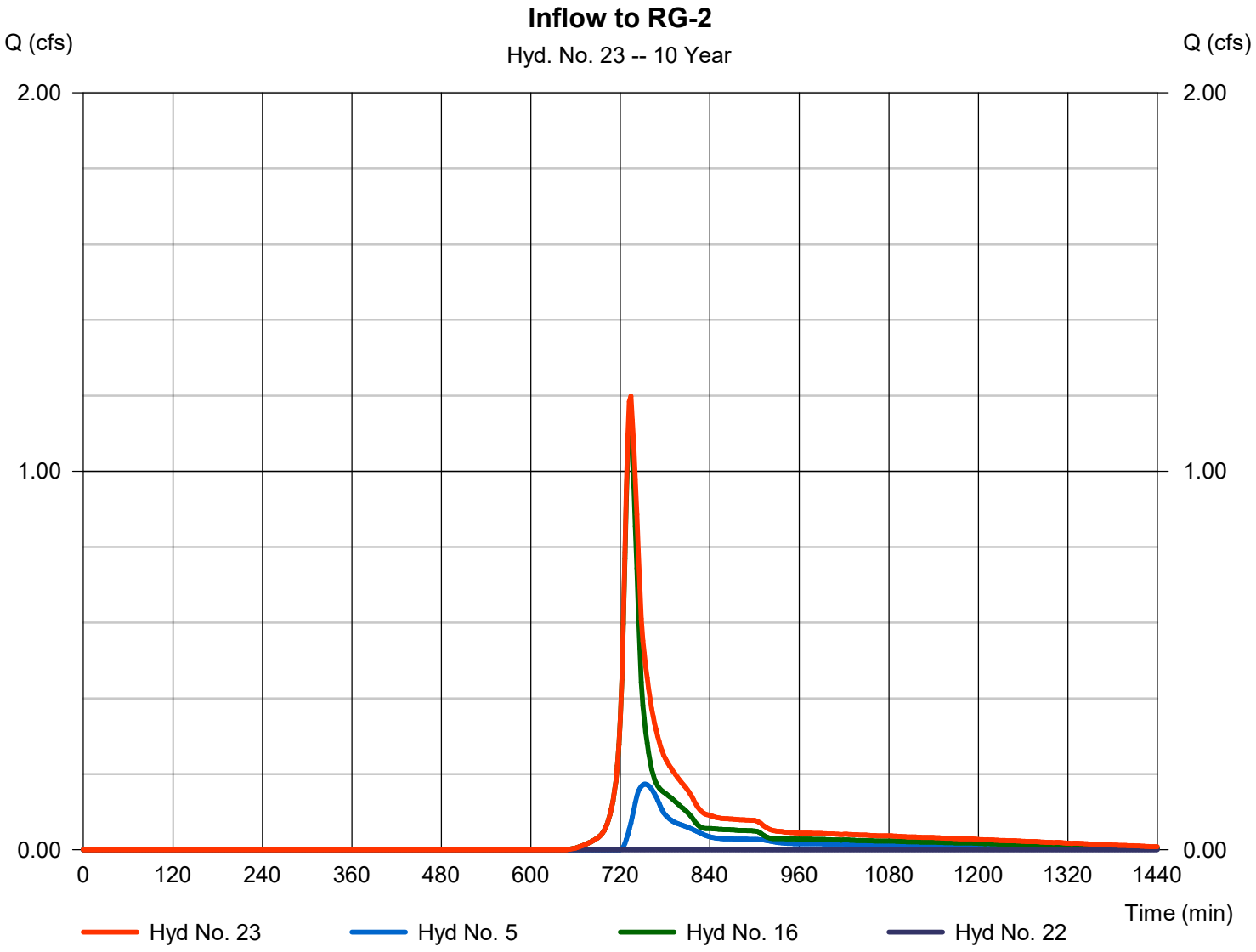


Hydrograph Report

Hyd. No. 23

Inflow to RG-2

Hydrograph type	=	Combine	Peak discharge	=	1.198 cfs
Storm frequency	=	10 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	4,270 cuft
Inflow hyds.	=	5, 16, 22	Contrib. drain. area	=	1.217 ac



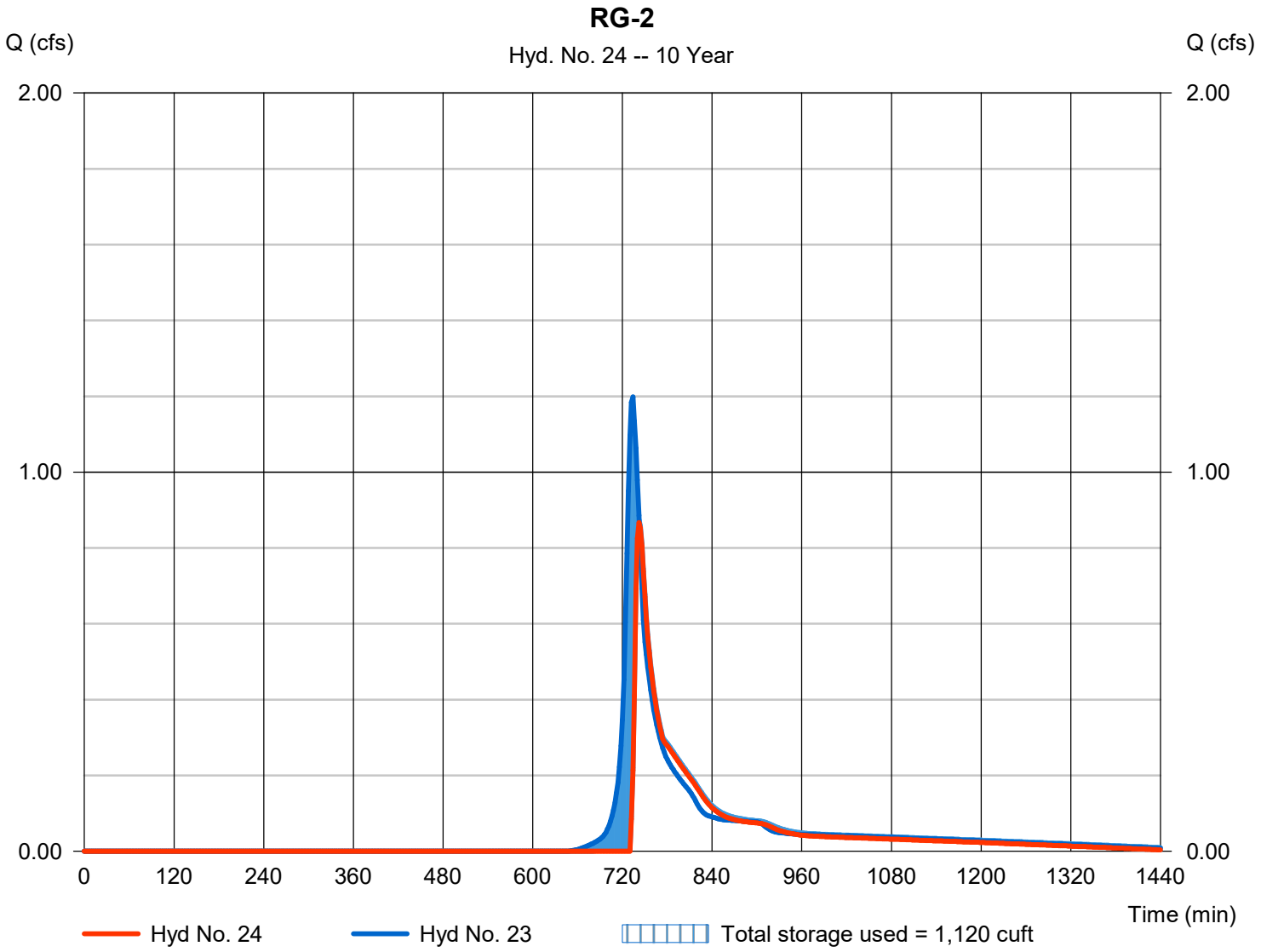
Hydrograph Report

Hyd. No. 24

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	0.867 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	3,316 cuft
Inflow hyd. No.	=	23 - Inflow to RG-2	Max. Elevation	=	110.15 ft
Reservoir name	=	RG-2	Max. Storage	=	1,120 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

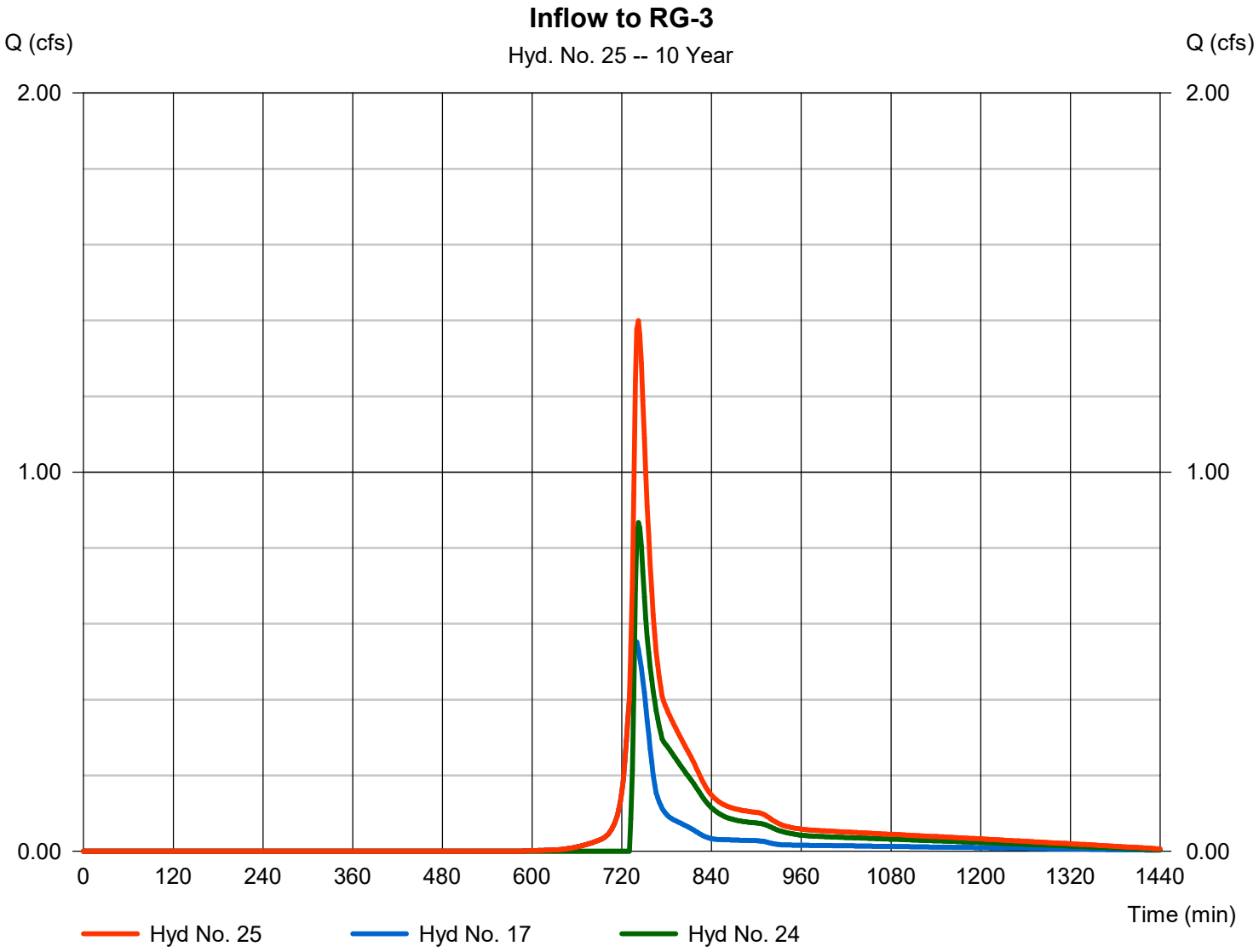


Hydrograph Report

Hyd. No. 25

Inflow to RG-3

Hydrograph type	=	Combine	Peak discharge	=	1.400 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	5,285 cuft
Inflow hyds.	=	17, 24	Contrib. drain. area	=	0.270 ac



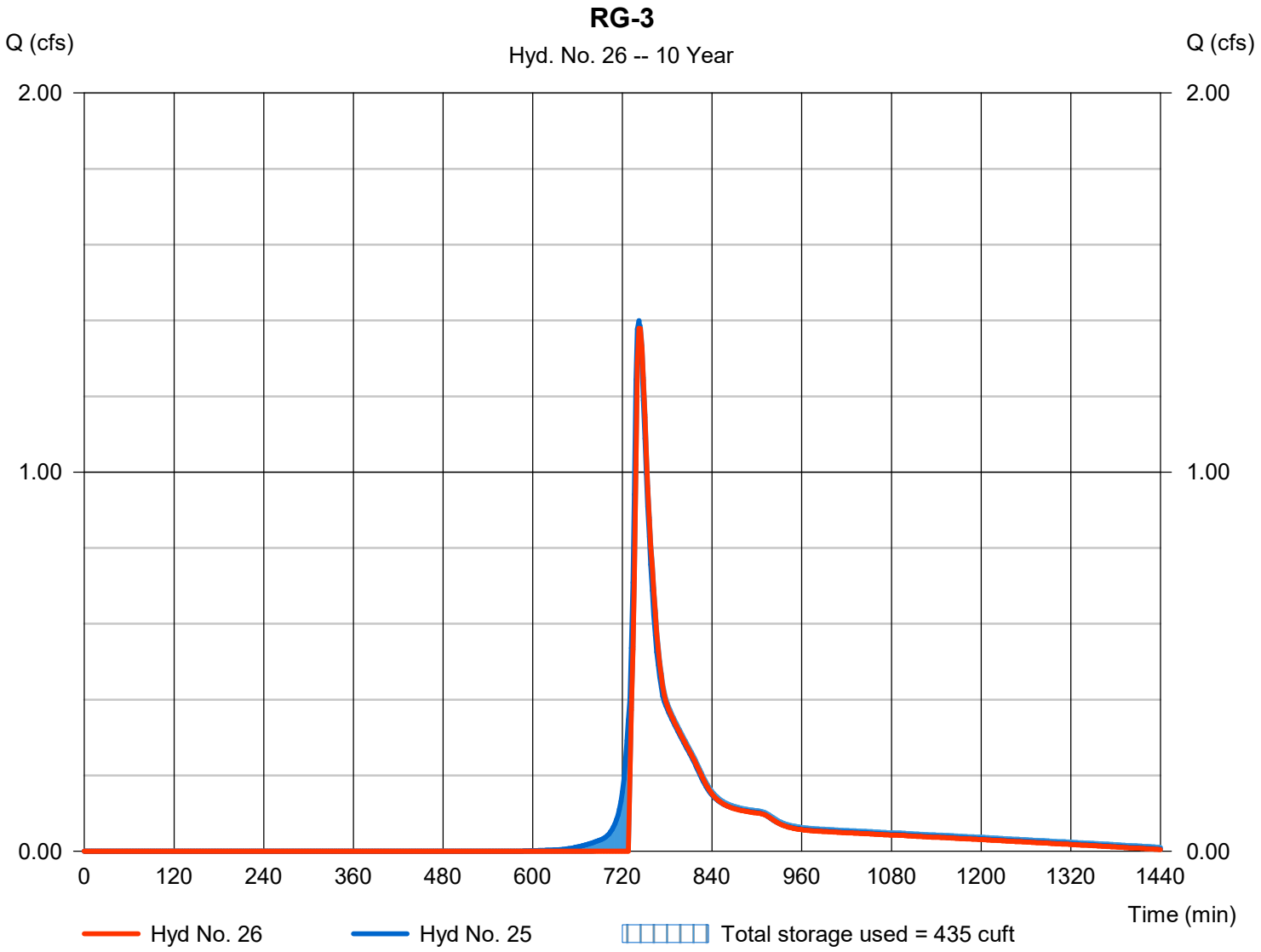
Hydrograph Report

Hyd. No. 26

RG-3

Hydrograph type	=	Reservoir	Peak discharge	=	1.379 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	4,896 cuft
Inflow hyd. No.	=	25 - Inflow to RG-3	Max. Elevation	=	109.14 ft
Reservoir name	=	RG-3	Max. Storage	=	435 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



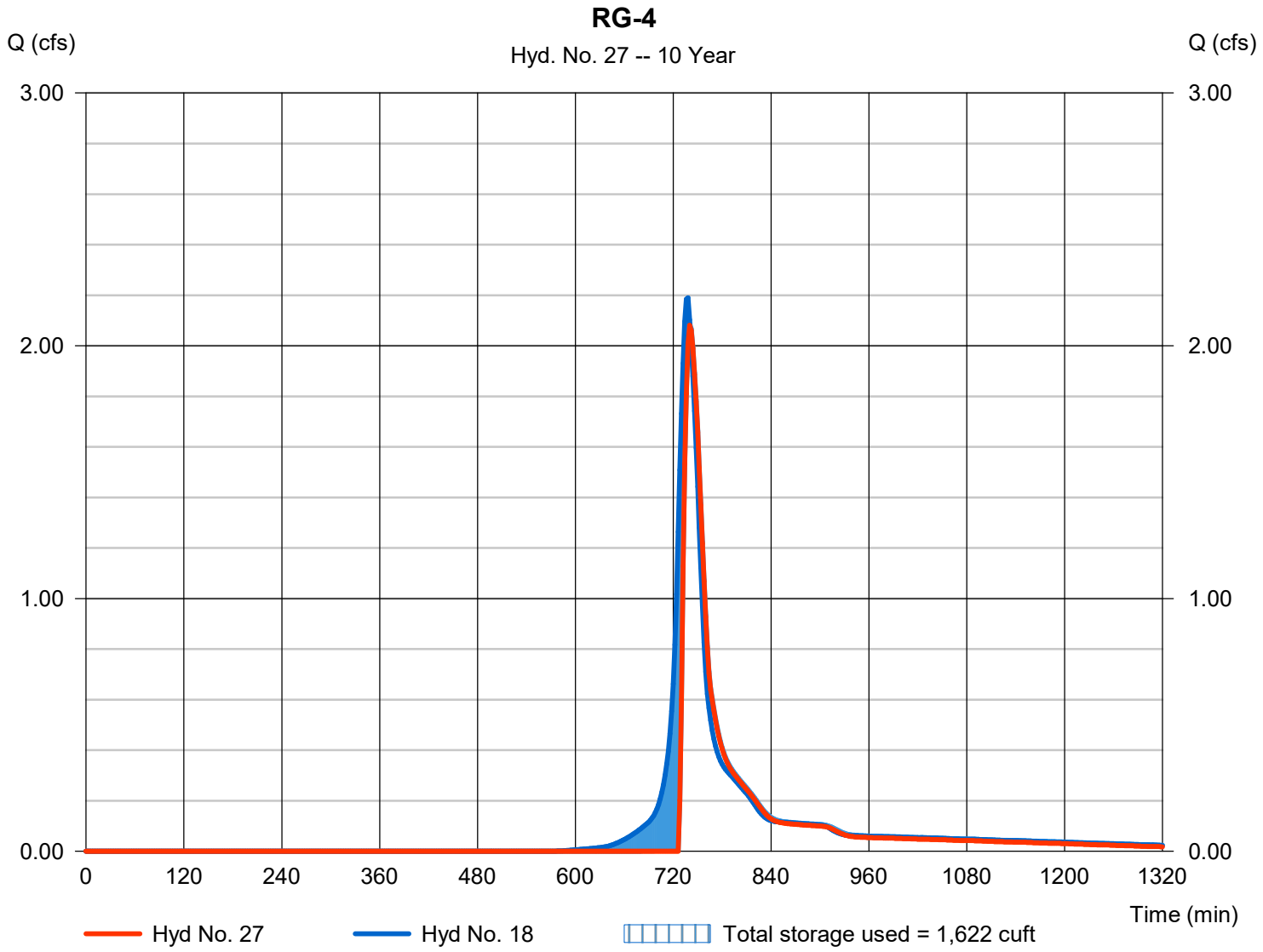
Hydrograph Report

Hyd. No. 27

RG-4

Hydrograph type	=	Reservoir	Peak discharge	=	2.081 cfs
Storm frequency	=	10 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	6,024 cuft
Inflow hyd. No.	=	18 - P-4	Max. Elevation	=	102.31 ft
Reservoir name	=	RG-4	Max. Storage	=	1,622 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

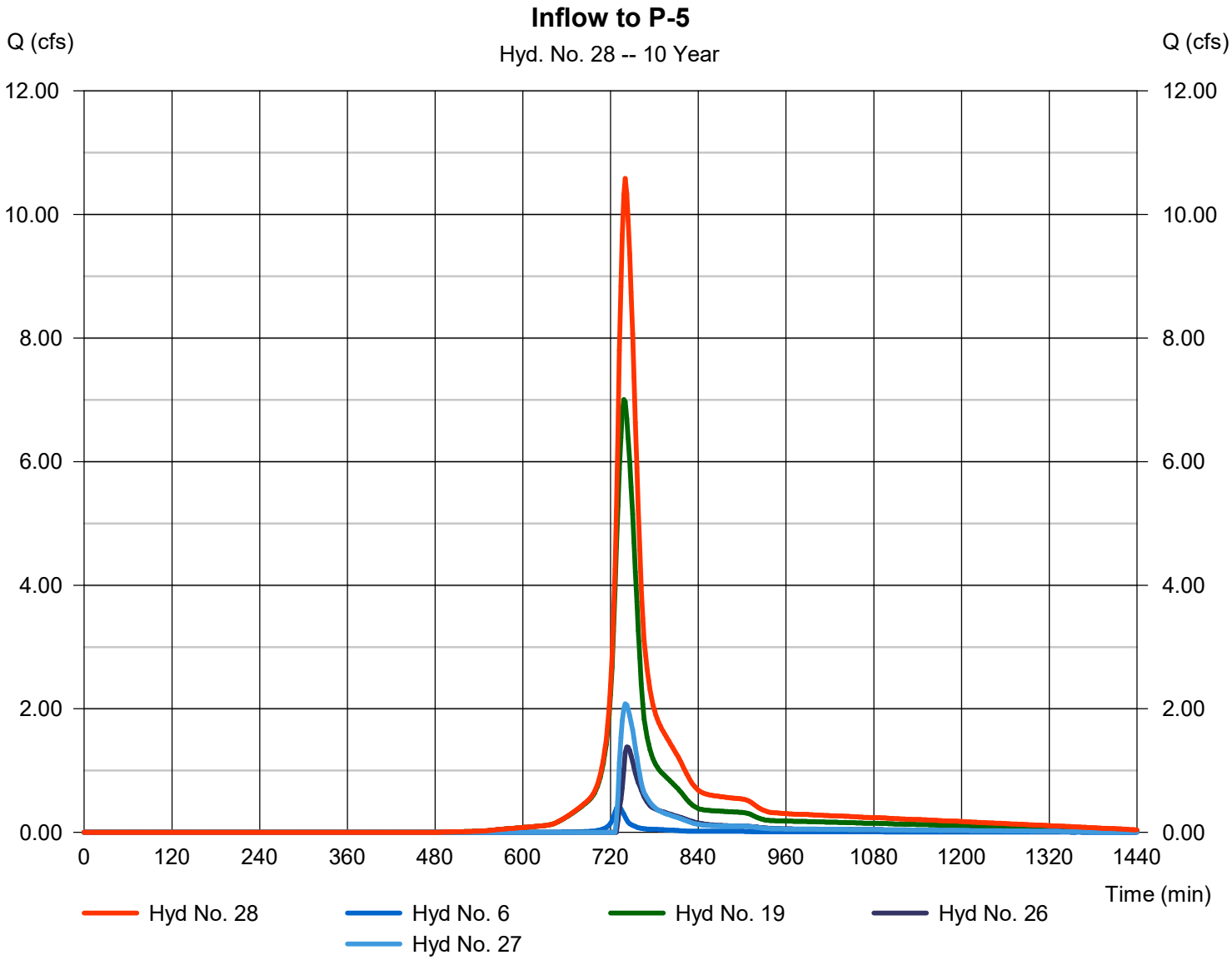


Hydrograph Report

Hyd. No. 28

Inflow to P-5

Hydrograph type	= Combine	Peak discharge	= 10.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 37,114 cuft
Inflow hyds.	= 6, 19, 26, 27	Contrib. drain. area	= 3.020 ac



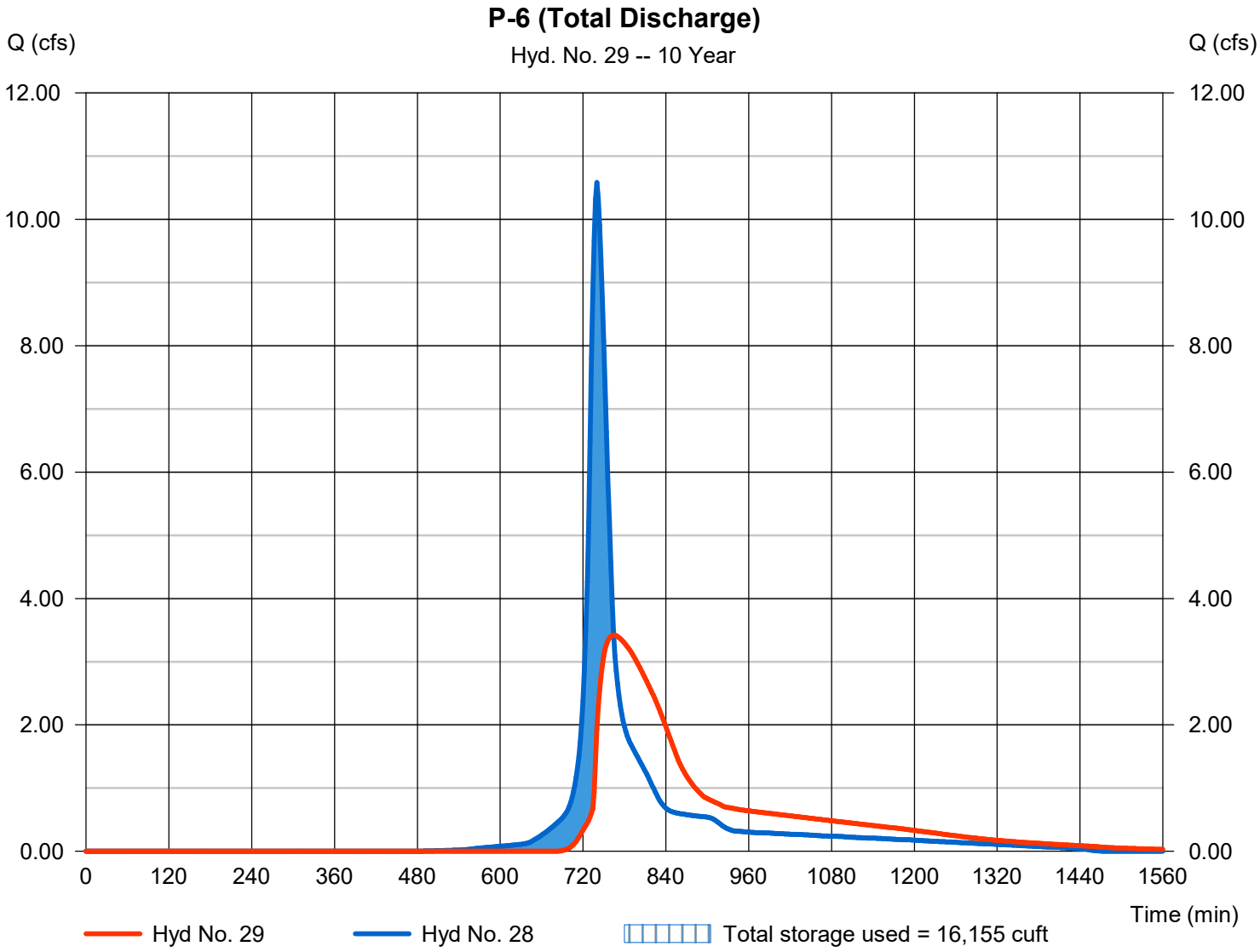
Hydrograph Report

Hyd. No. 29

P-6 (Total Discharge)

Hydrograph type	=	Reservoir	Peak discharge	=	3.422 cfs
Storm frequency	=	10 yrs	Time to peak	=	764 min
Time interval	=	2 min	Hyd. volume	=	35,962 cuft
Inflow hyd. No.	=	28 - Inflow to P-5	Max. Elevation	=	96.18 ft
Reservoir name	=	POND P-5	Max. Storage	=	16,155 cuft

Storage Indication method used.



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.448	2	734	7,560	------	------	------	E-1
2	SCS Runoff	6.961	2	736	23,606	------	------	------	E-2
3	SCS Runoff	7.610	2	746	32,677	------	------	------	E-3
4	SCS Runoff	2.897	2	748	14,020	------	------	------	OS-1
5	SCS Runoff	0.848	2	746	3,905	------	------	------	OS-2
6	SCS Runoff	0.905	2	730	2,337	------	------	------	OS-3
7	SCS Runoff	4.564	2	736	14,140	------	------	------	OS-4 (E-2 Courtyards)
9	Combine	8.904	2	736	35,720	1, 4, 7,	------	------	INFLOW TO K-1
10	Reservoir	4.387	2	760	23,531	9	113.33	14,543	EX. K-1
12	Combine	8.457	2	746	36,582	3, 5,	------	------	TOTAL TO WELSH OAKS SUB.
13	Combine	19.16	2	738	100,196	2, 3, 5, 6, 7, 10,	------	------	EX TOTAL FLOW
15	SCS Runoff	1.418	2	734	4,453	------	------	------	P-1
16	SCS Runoff	2.532	2	732	7,033	------	------	------	P-2
17	SCS Runoff	1.114	2	738	4,007	------	------	------	P-3
18	SCS Runoff	4.414	2	736	15,068	------	------	------	P-4
19	SCS Runoff	13.05	2	738	47,809	------	------	------	P-5
21	Combine	7.869	2	736	32,612	4, 7, 15,	------	------	Inflow to PR K-1
22	Reservoir	3.154	2	768	16,032	21	113.24	15,349	PR K-1
23	Combine	4.059	2	766	26,970	5, 16, 22	------	------	Inflow to RG-2
24	Reservoir	4.008	2	768	25,979	23	110.34	1,649	RG-2
25	Combine	4.271	2	768	29,986	17, 24	------	------	Inflow to RG-3
26	Reservoir	4.267	2	768	29,585	25	109.30	604	RG-3
27	Reservoir	4.310	2	738	13,659	18	102.45	1,945	RG-4
28	Combine	21.94	2	738	93,389	6, 19, 26, 27	------	------	Inflow to P-5
29	Reservoir	7.797	2	772	92,237	28	98.42	37,218	P-6 (Total Discharge)

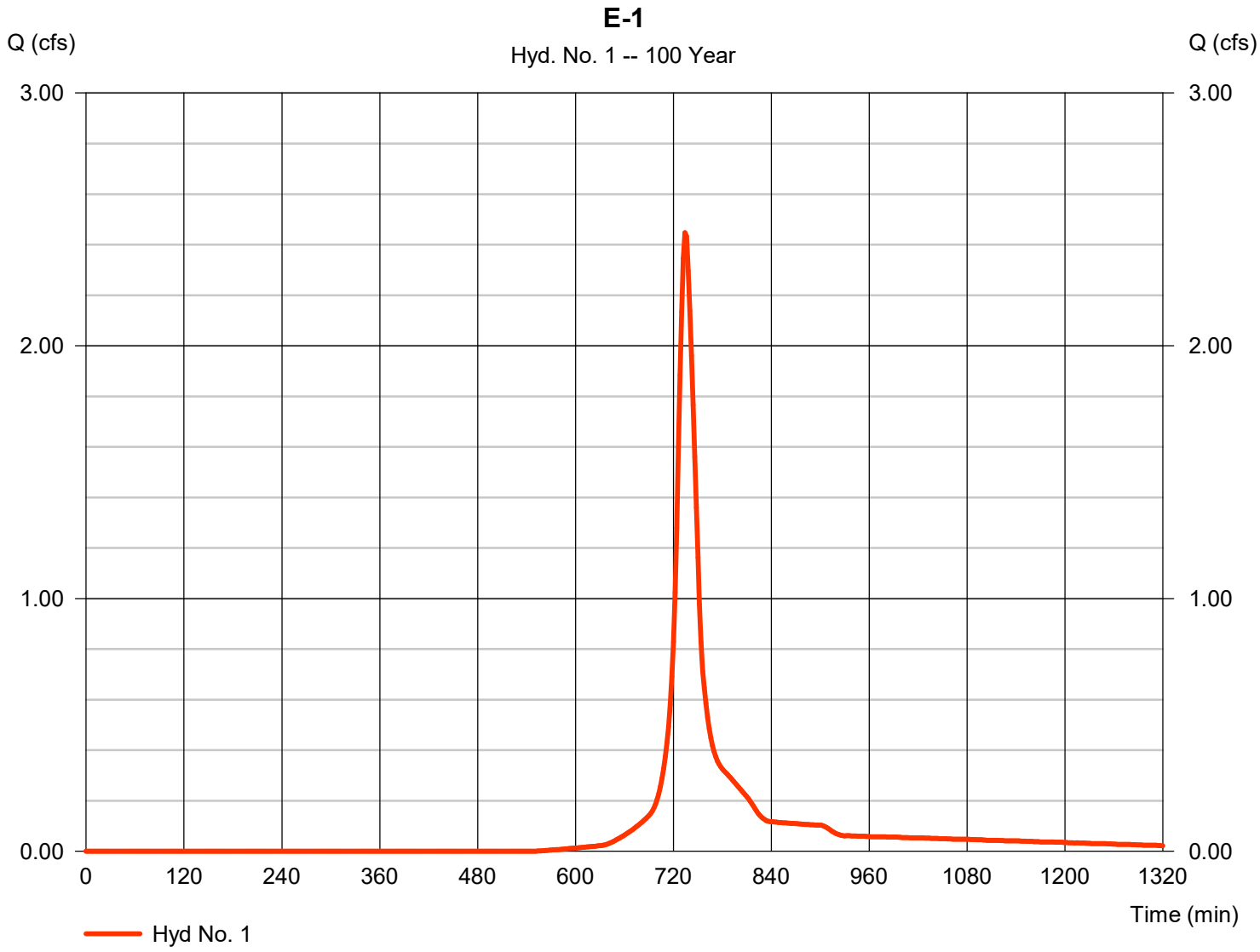
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 1

E-1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.448 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 7,560 cuft
Drainage area	= 0.589 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.00 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

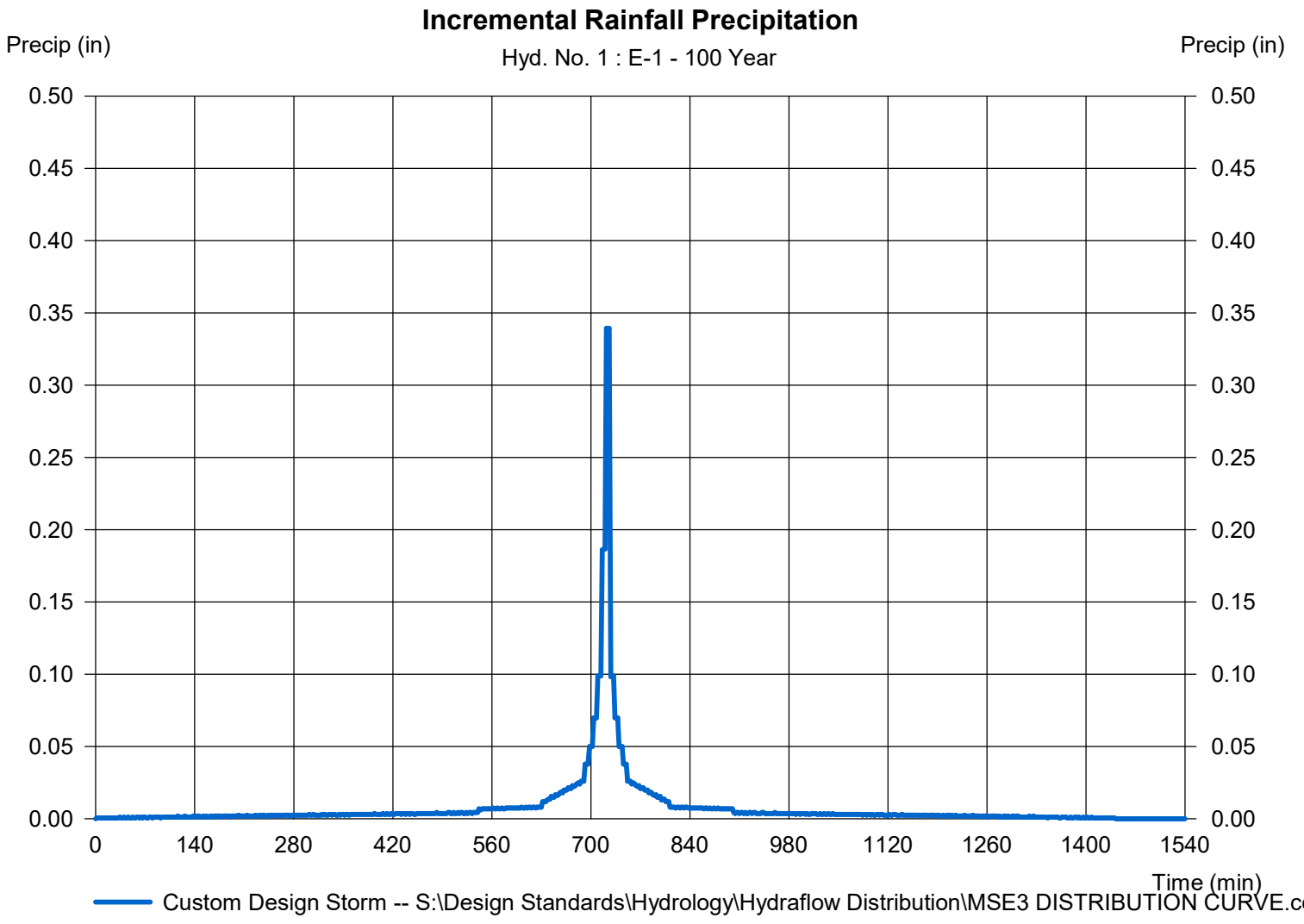


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



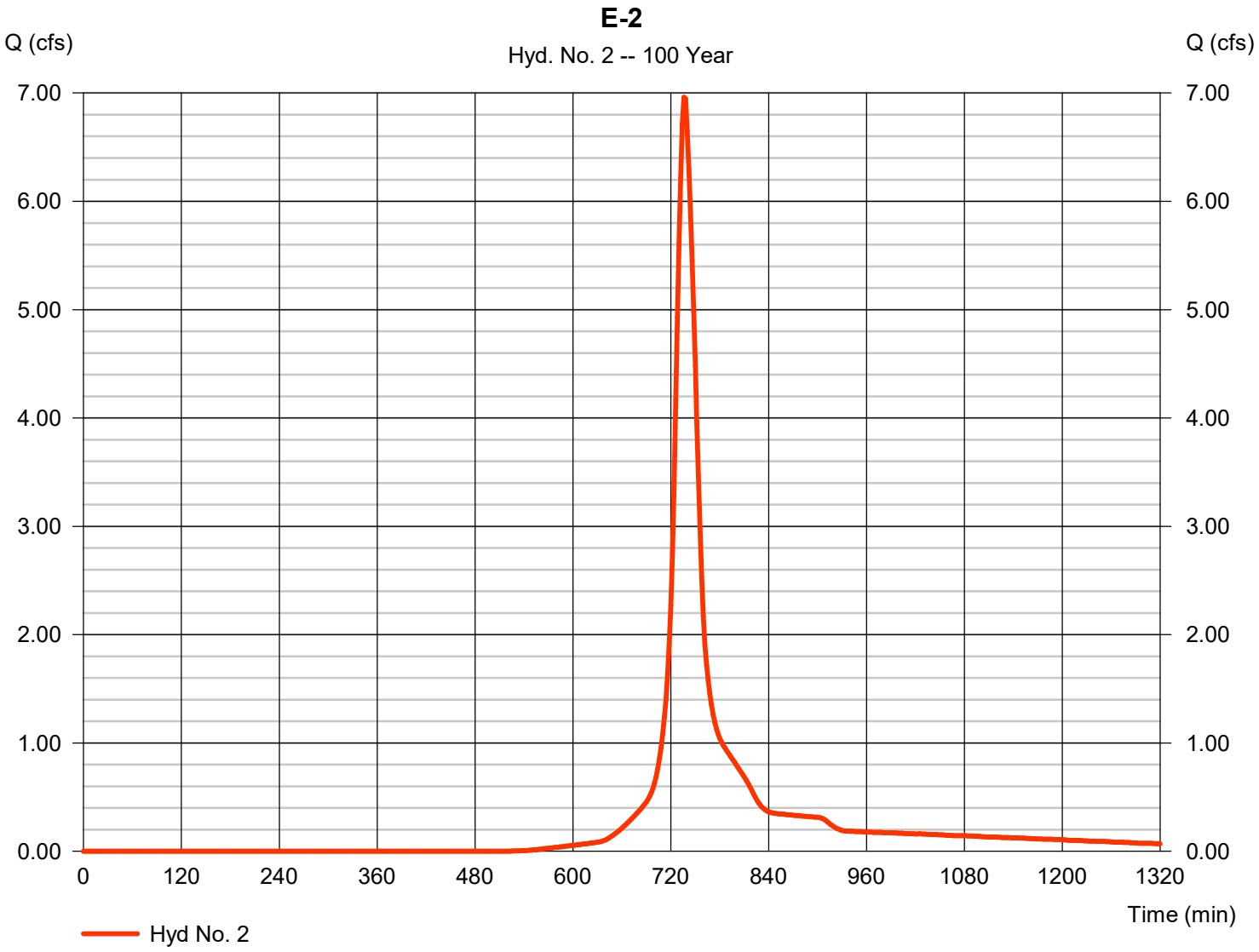
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 2

E-2

Hydrograph type	= SCS Runoff	Peak discharge	= 6.961 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 23,606 cuft
Drainage area	= 1.709 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

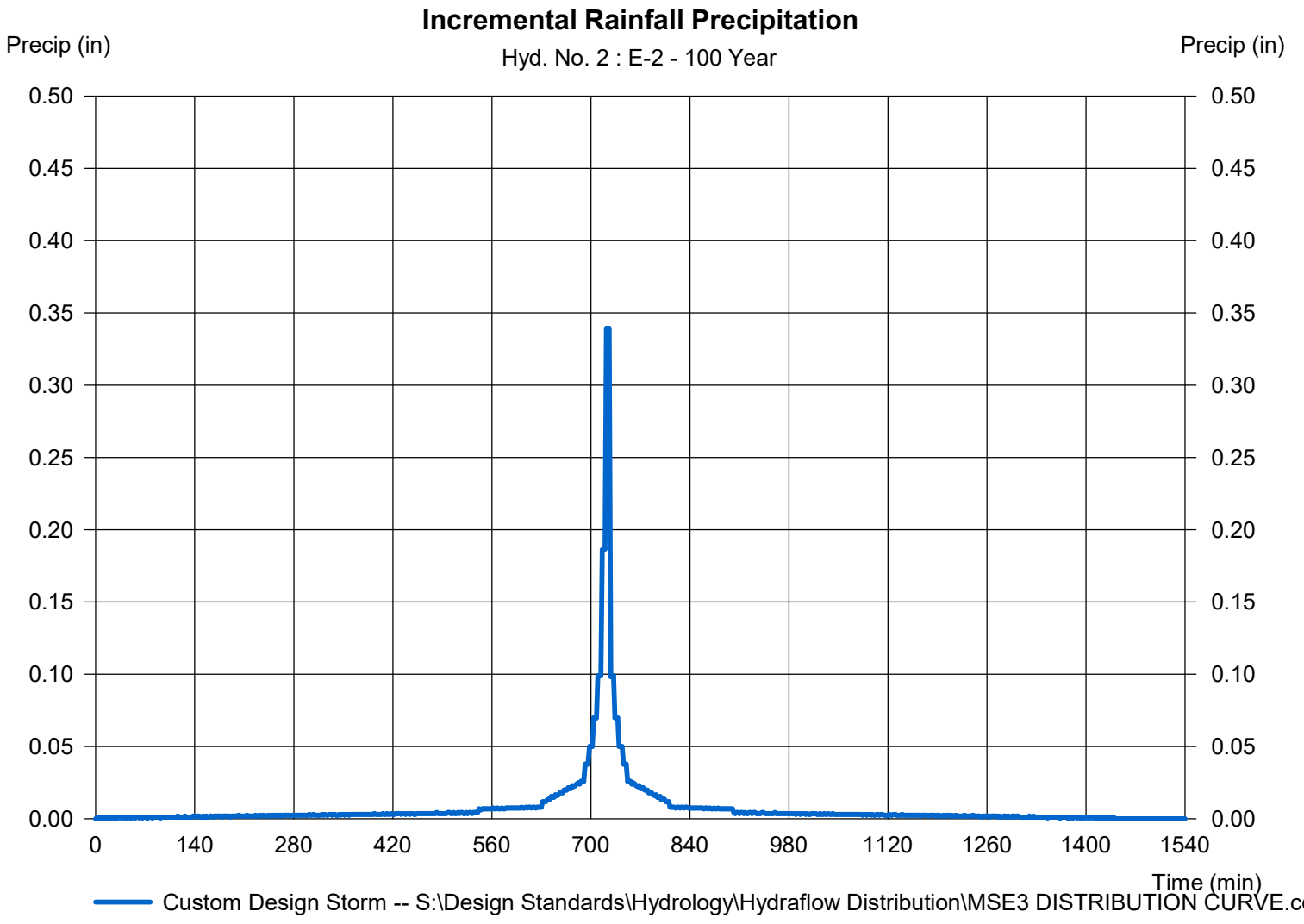


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



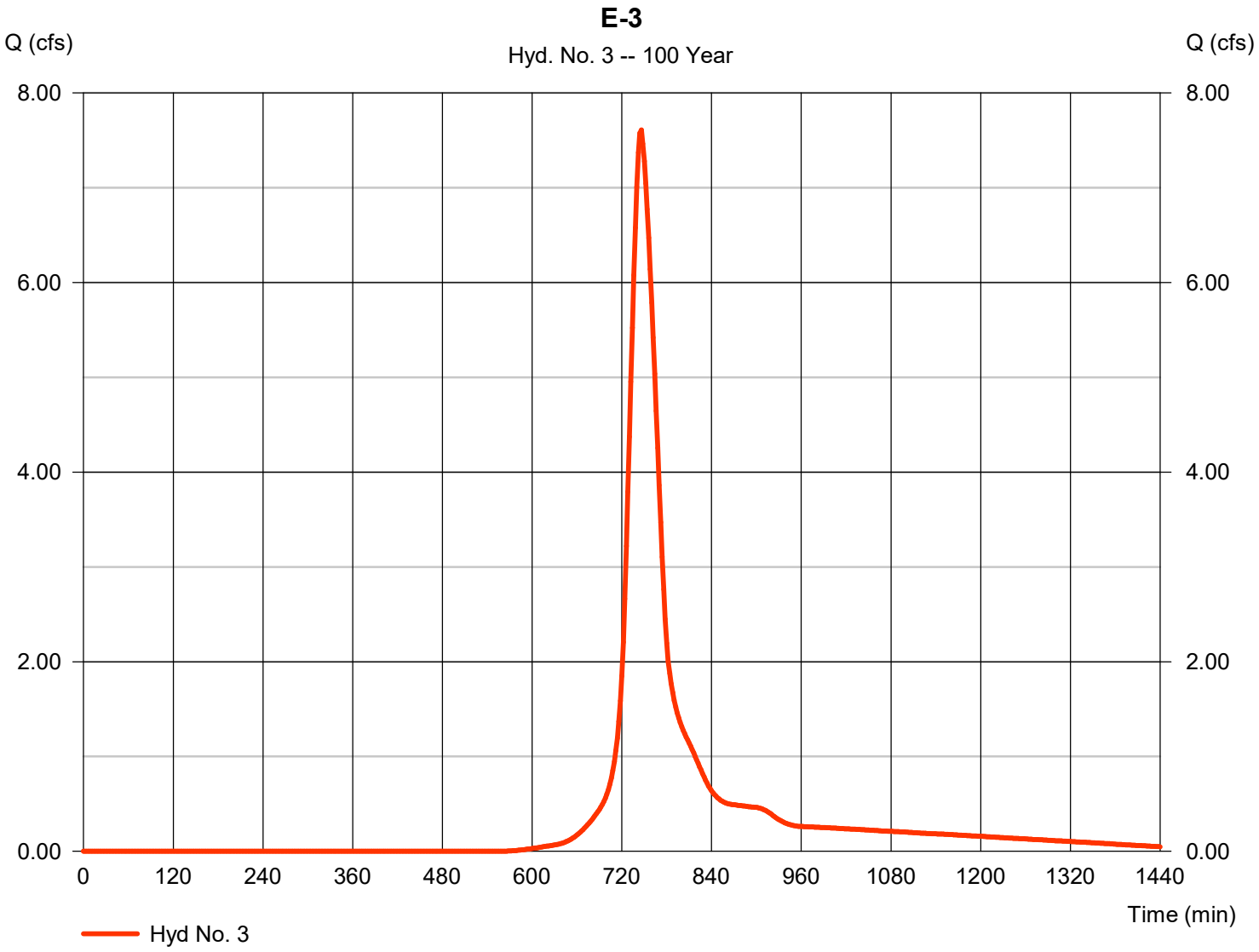
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 3

E-3

Hydrograph type	= SCS Runoff	Peak discharge	= 7.610 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 32,677 cuft
Drainage area	= 2.650 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.90 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

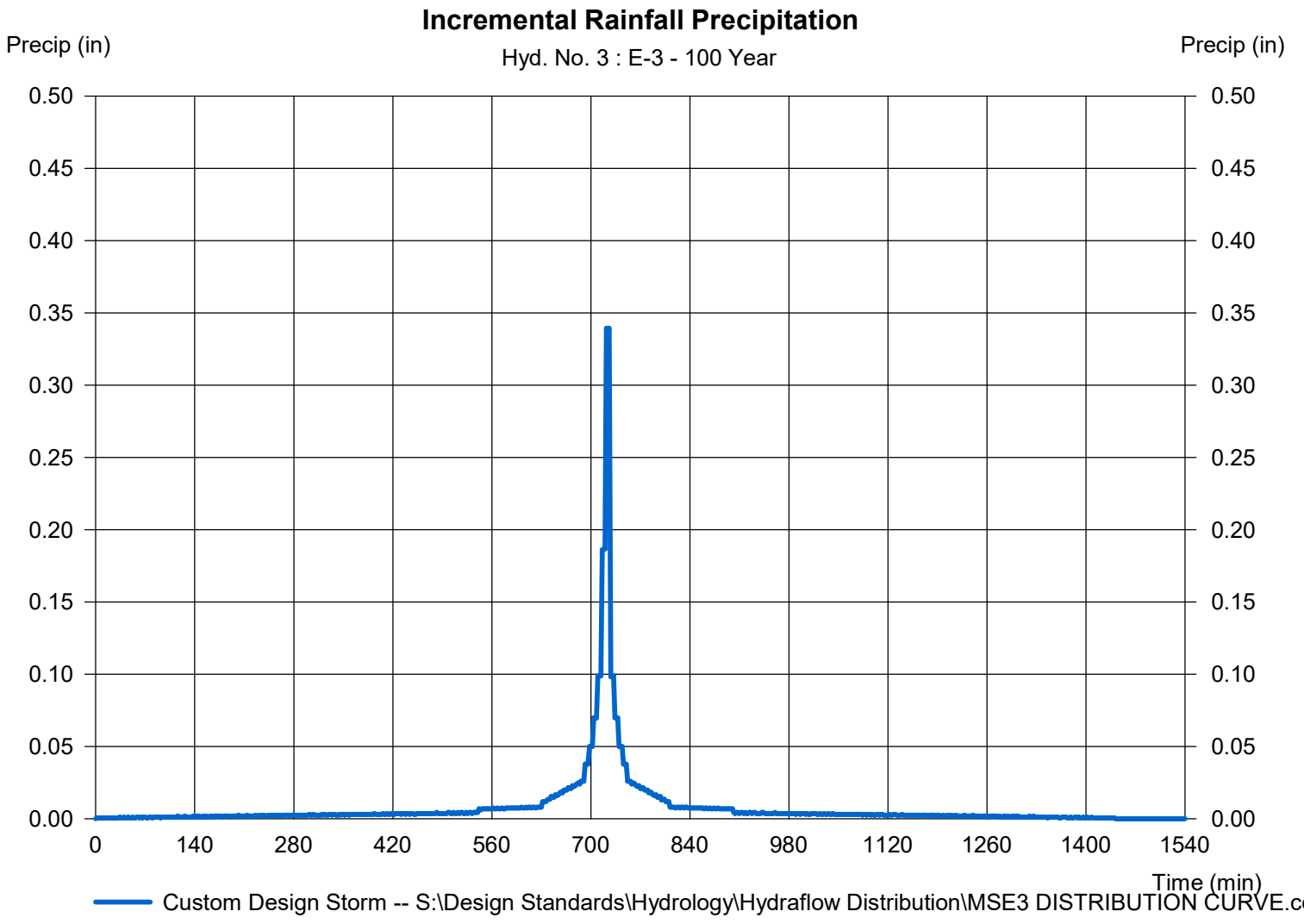


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

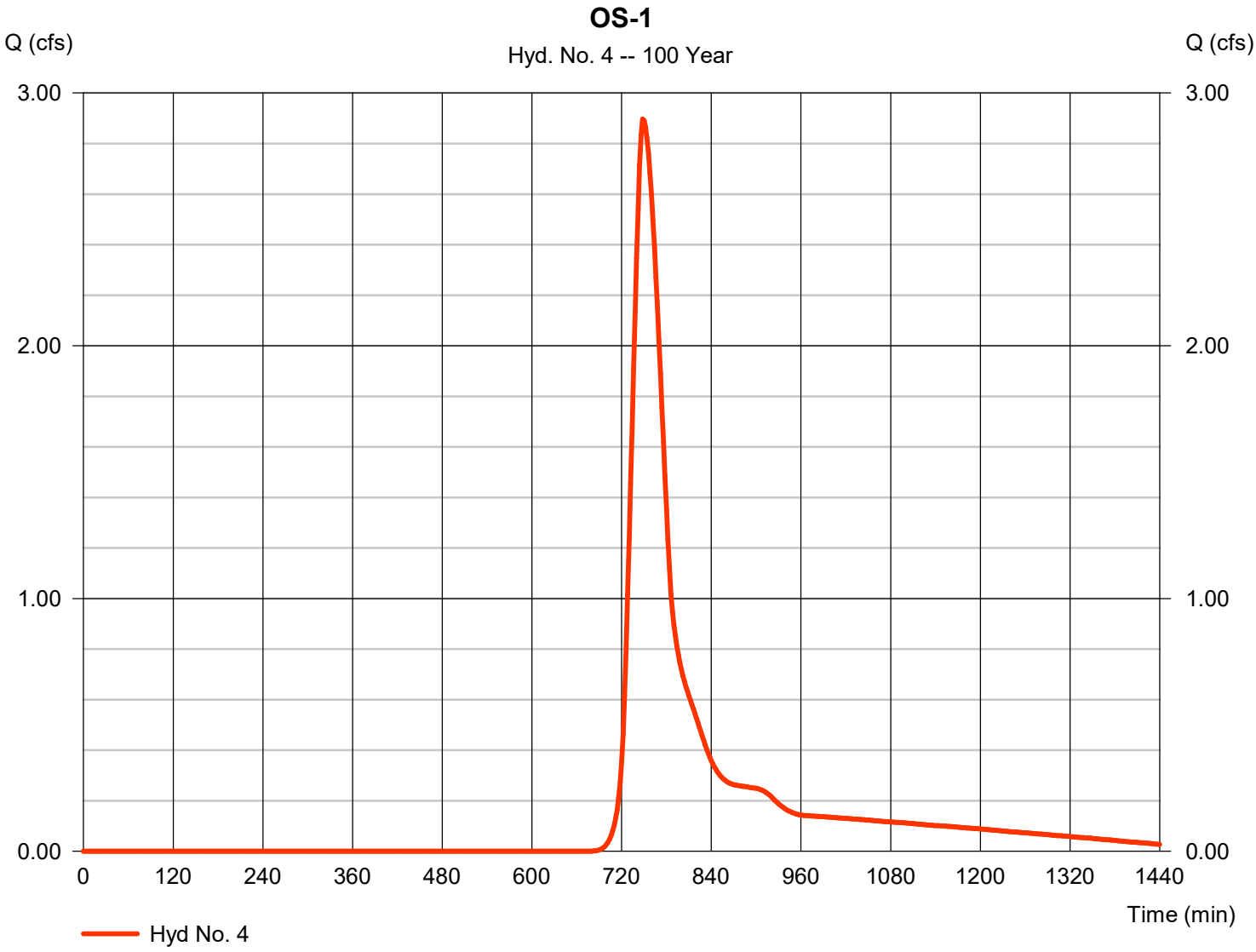


Hydrograph Report

Hyd. No. 4

OS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.897 cfs
Storm frequency	=	100 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	14,020 cuft
Drainage area	=	1.893 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.30 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

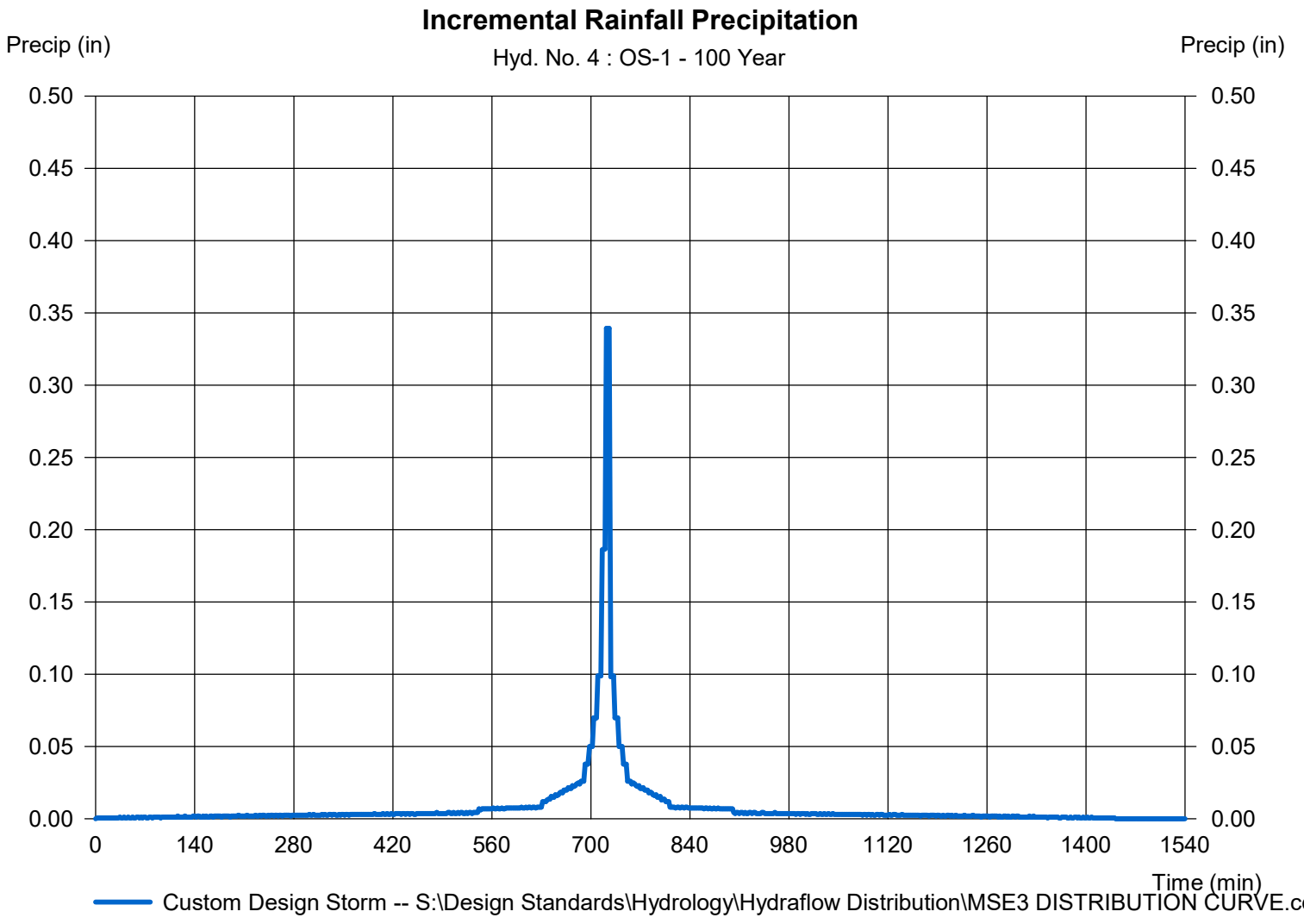


Precipitation Report

Hyd. No. 4

OS-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



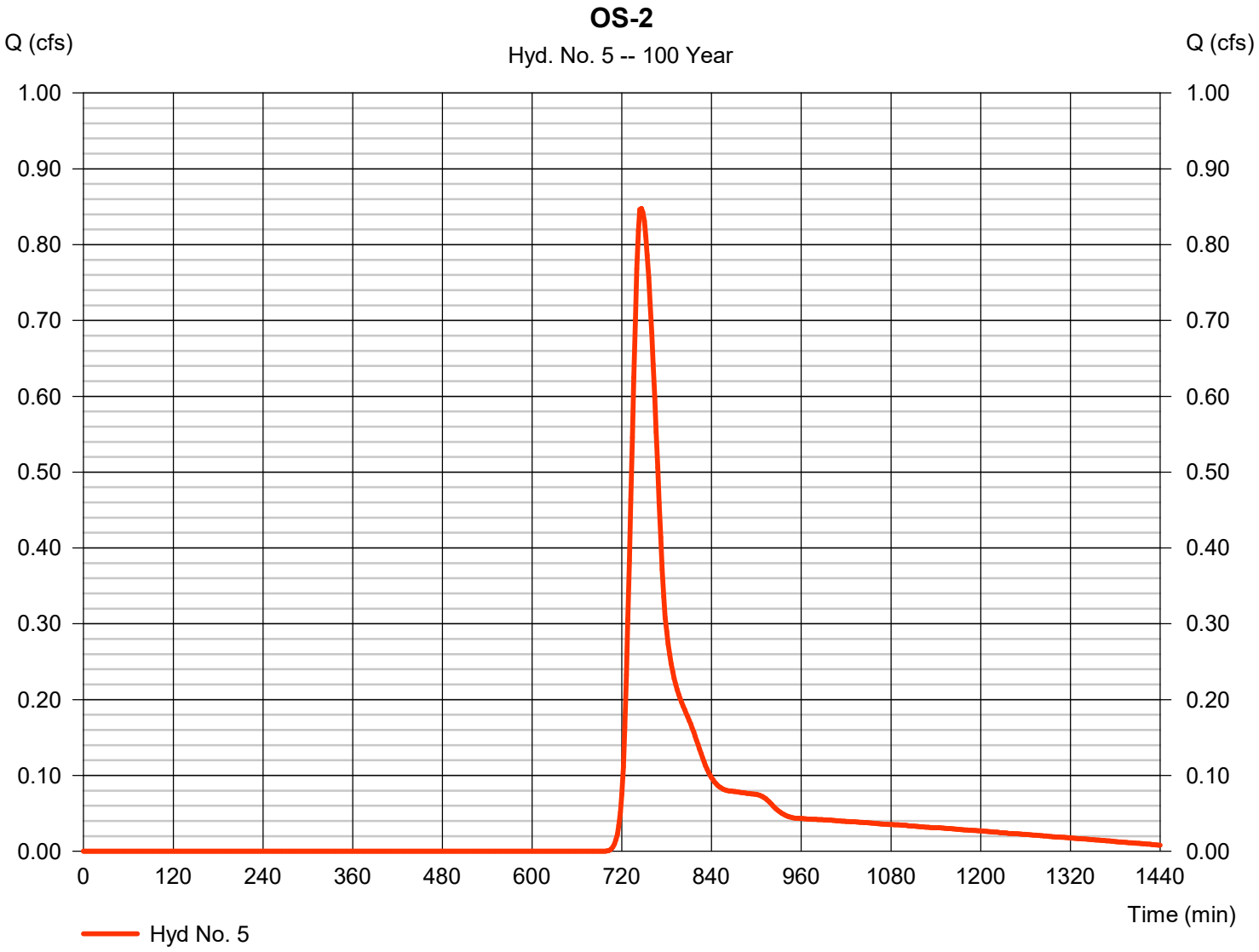
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 5

OS-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.848 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 3,905 cuft
Drainage area	= 0.655 ac	Curve number	= 55
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

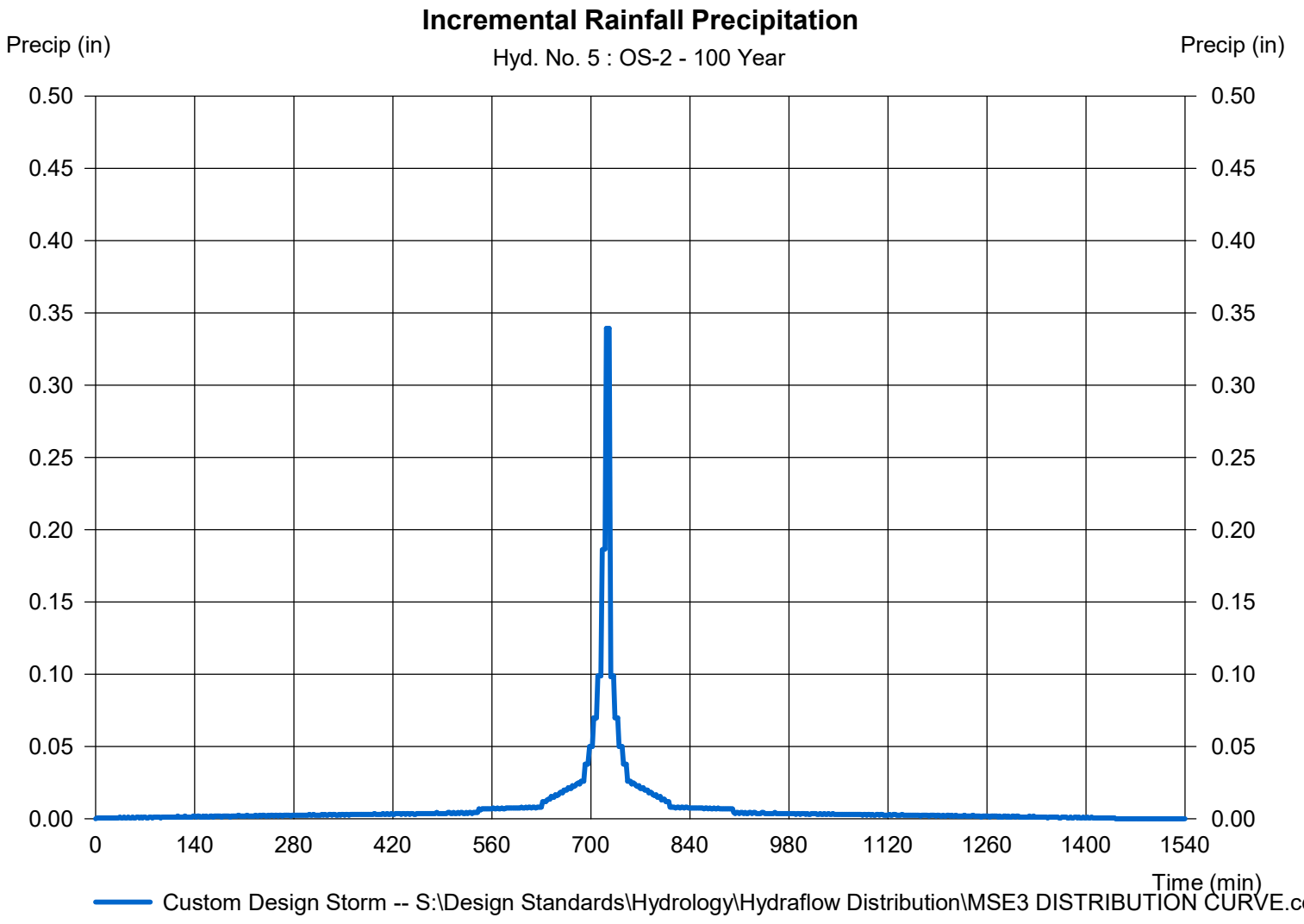


Precipitation Report

Hyd. No. 5

OS-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

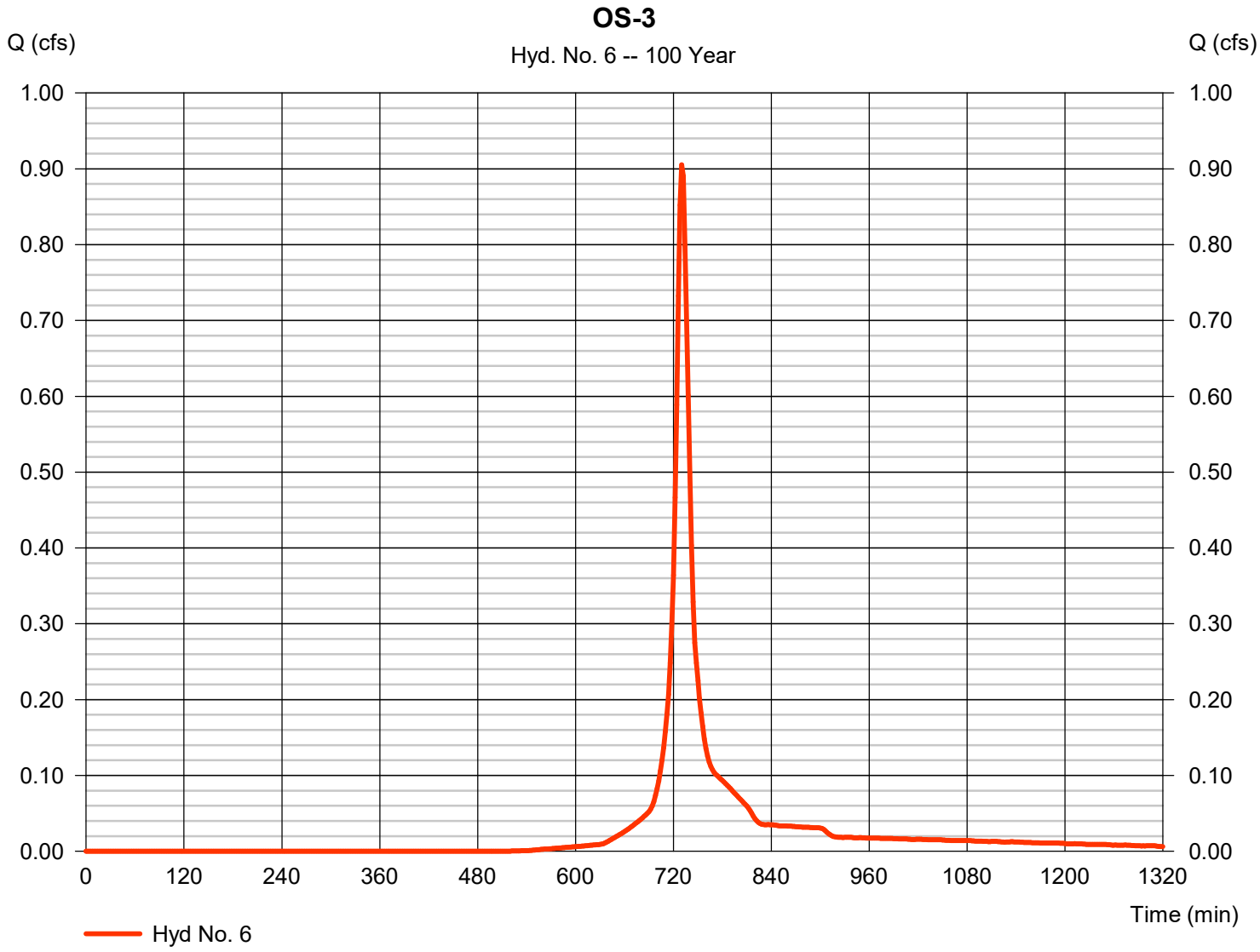


Hydrograph Report

Hyd. No. 6

OS-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.905 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	2,337 cuft
Drainage area	=	0.167 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

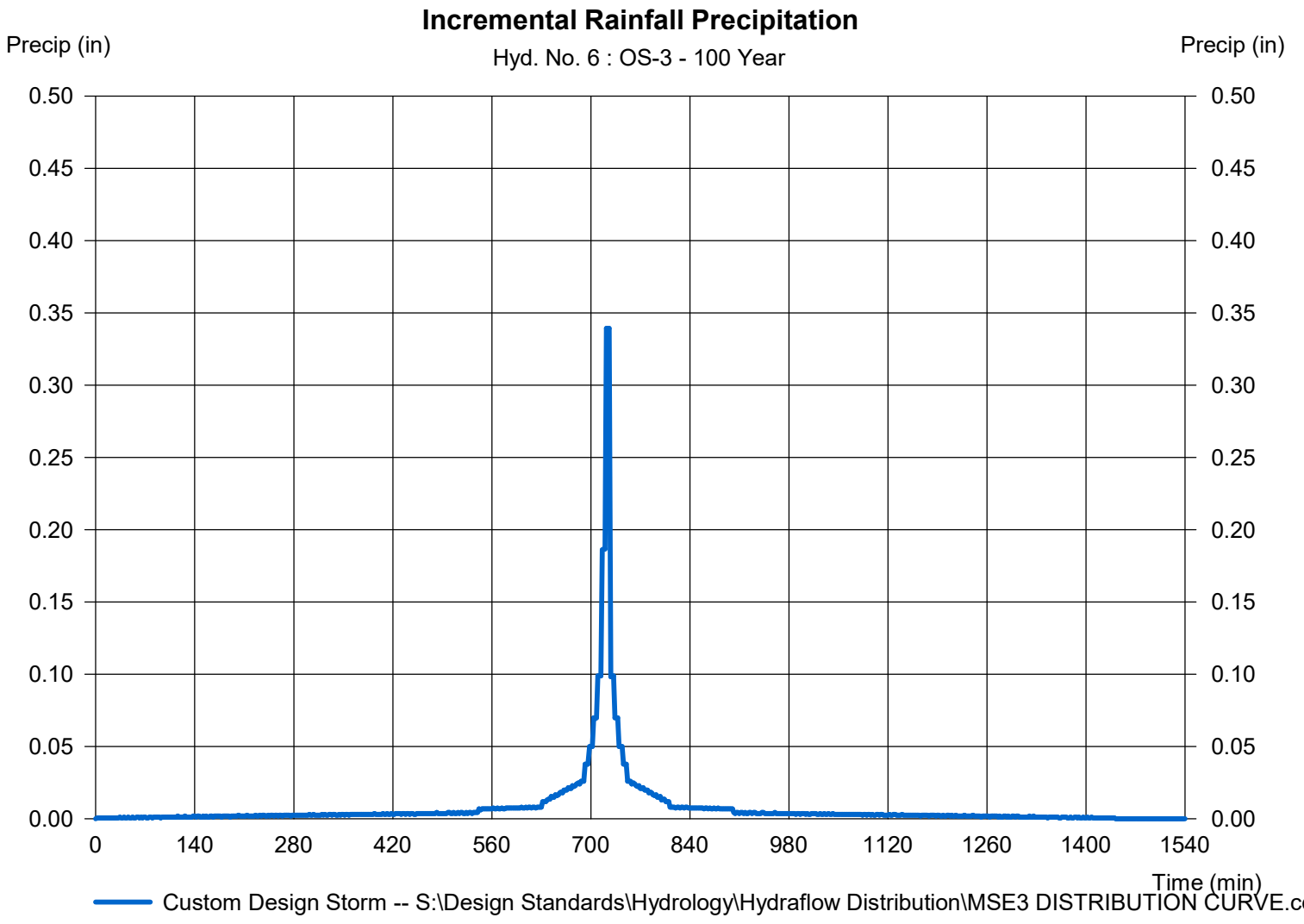


Precipitation Report

Hyd. No. 6

OS-3

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



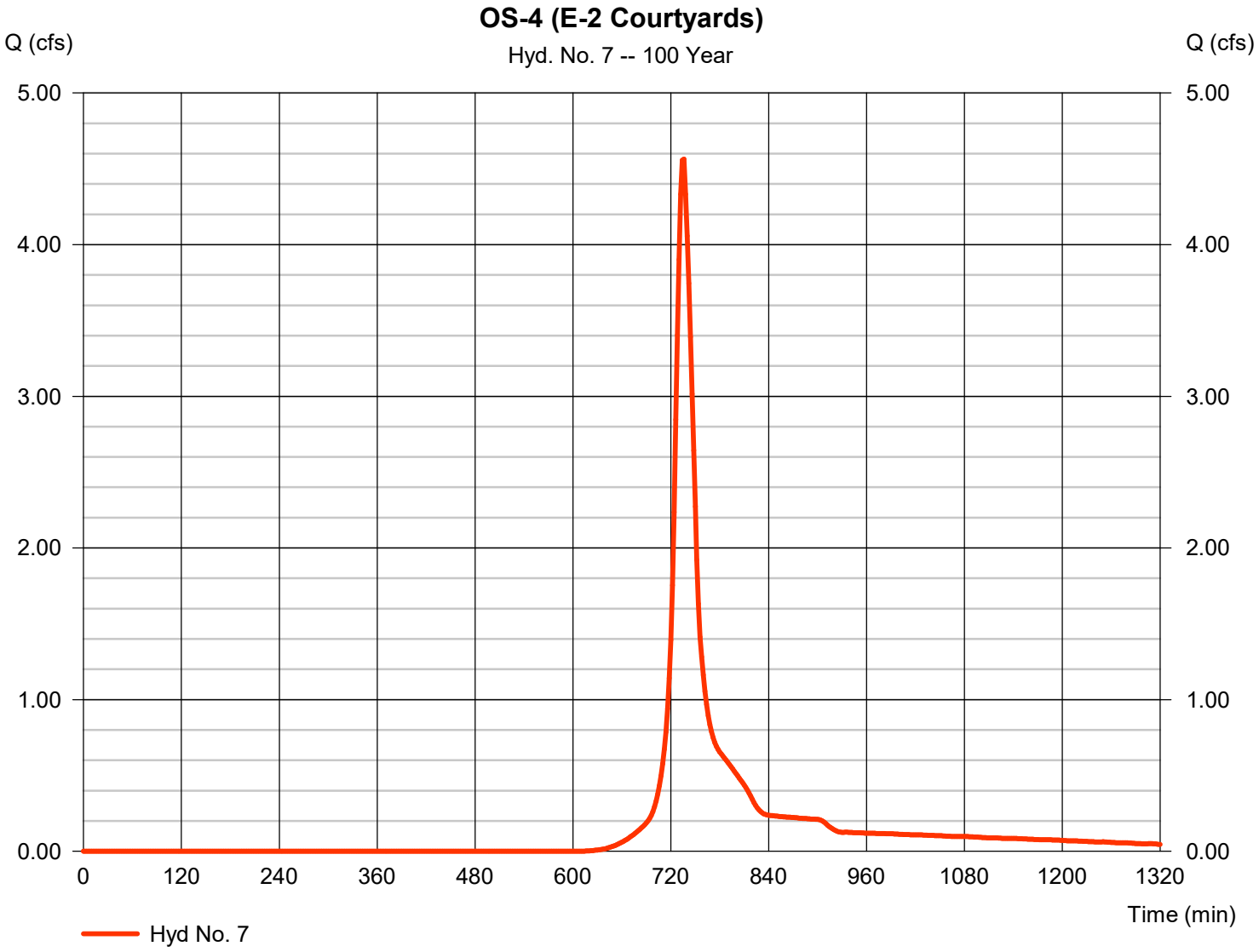
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 7

OS-4 (E-2 Courtyards)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.564 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 14,140 cuft
Drainage area	= 1.321 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.40 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

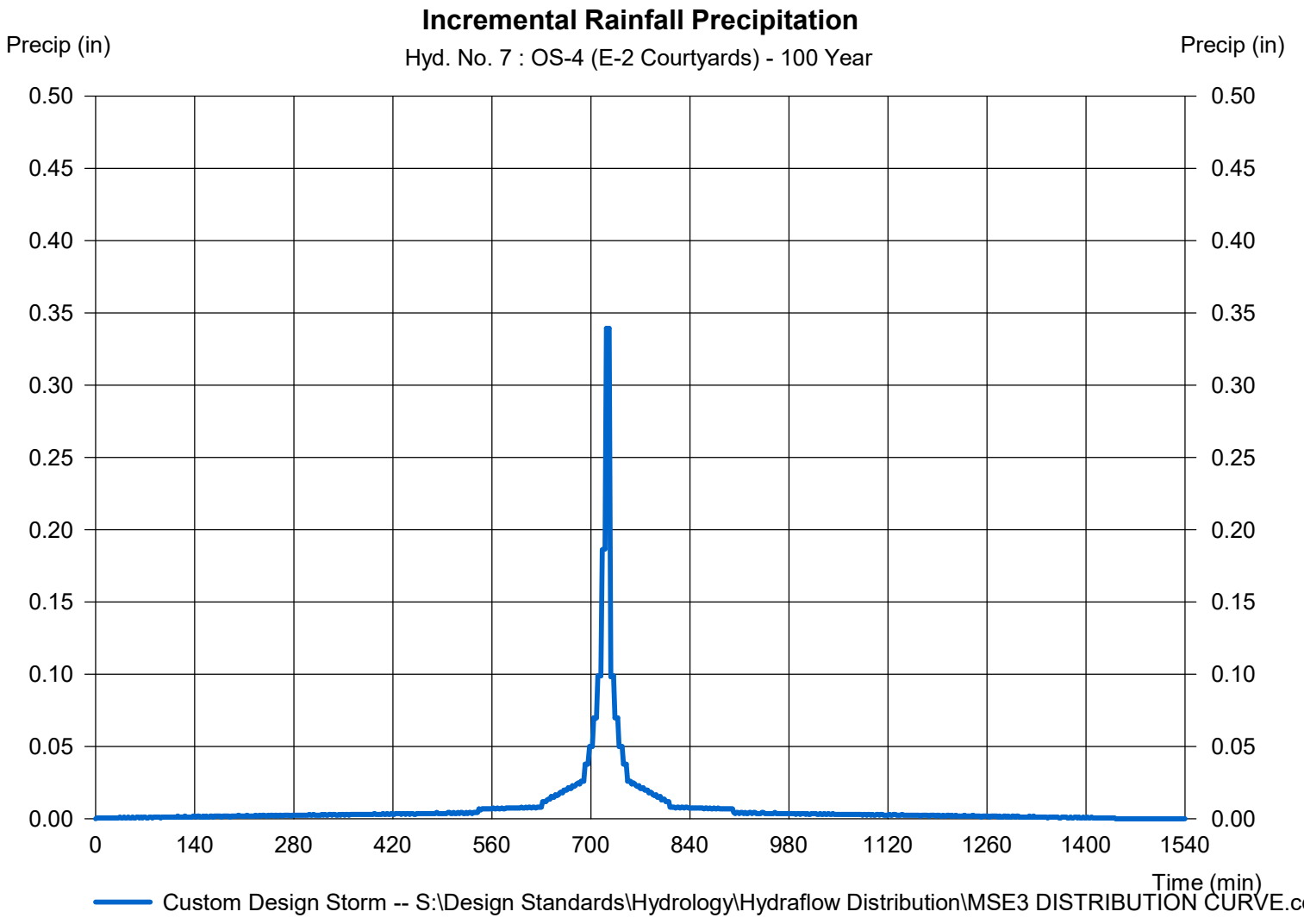


Precipitation Report

Hyd. No. 7

OS-4 (E-2 Courtyards)

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

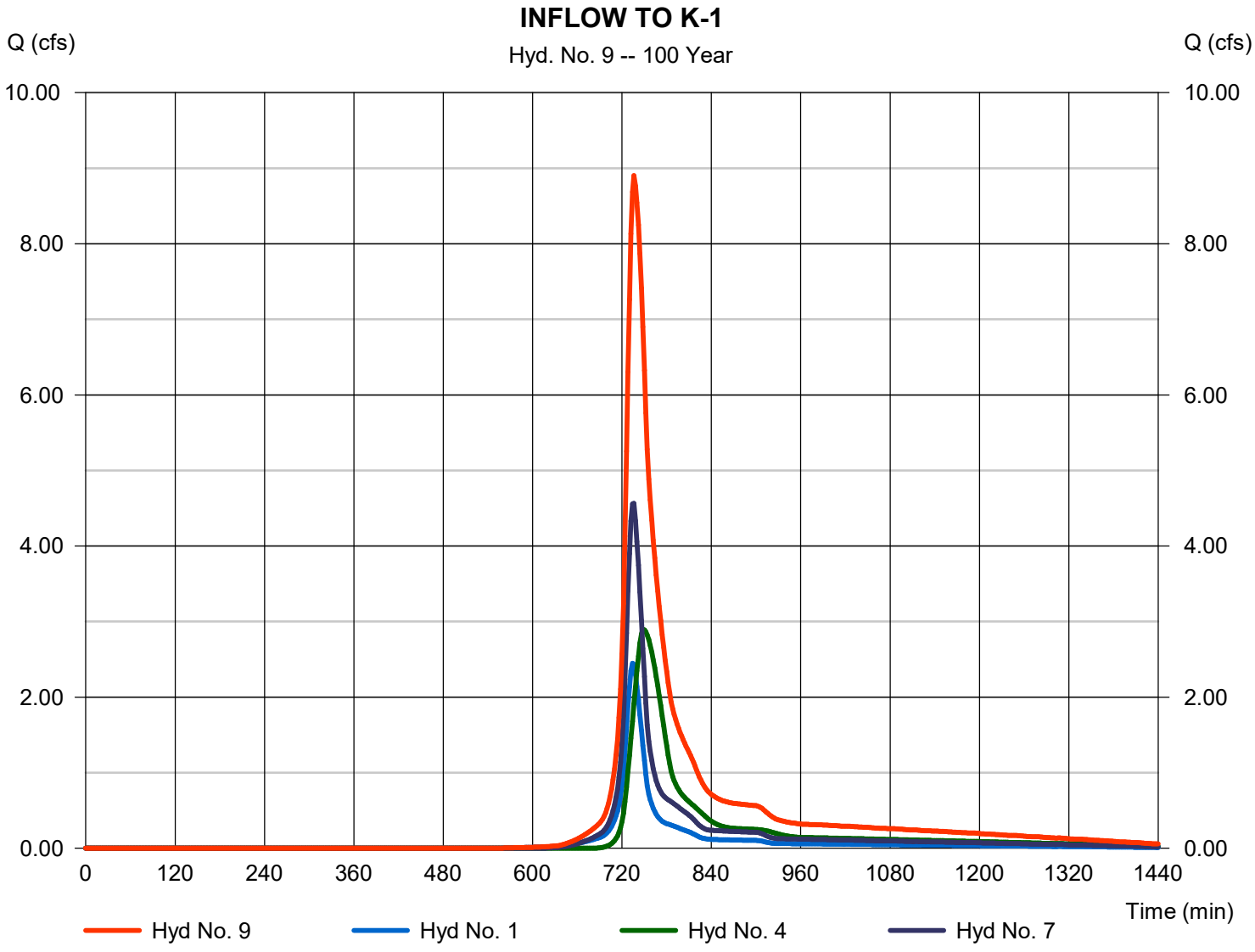


Hydrograph Report

Hyd. No. 9

INFLOW TO K-1

Hydrograph type	= Combine	Peak discharge	= 8.904 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 35,720 cuft
Inflow hyds.	= 1, 4, 7	Contrib. drain. area	= 3.803 ac



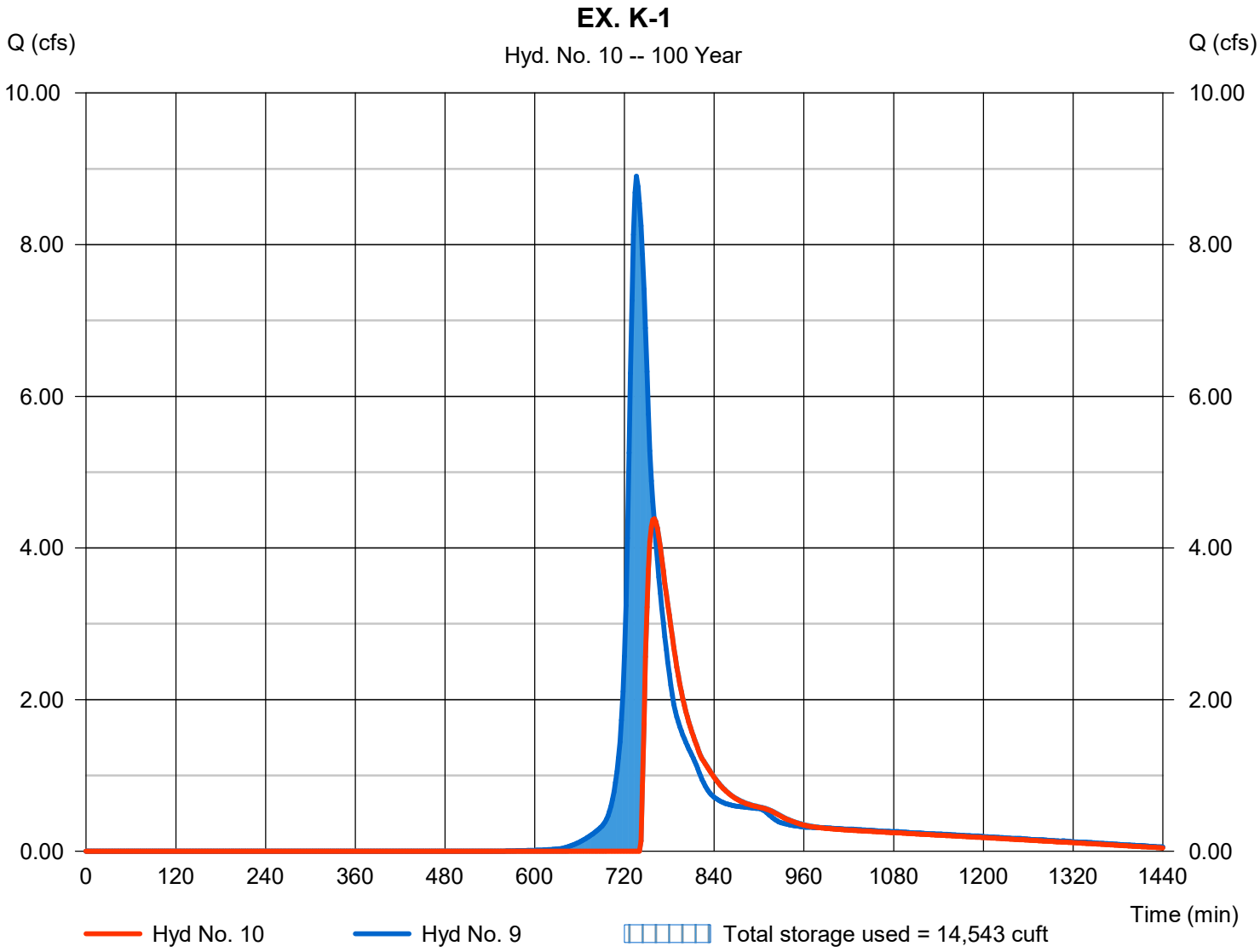
Hydrograph Report

Hyd. No. 10

EX. K-1

Hydrograph type	= Reservoir	Peak discharge	= 4.387 cfs
Storm frequency	= 100 yrs	Time to peak	= 760 min
Time interval	= 2 min	Hyd. volume	= 23,531 cuft
Inflow hyd. No.	= 9 - INFLOW TO K-1	Max. Elevation	= 113.33 ft
Reservoir name	= EX. KETTLE K-1	Max. Storage	= 14,543 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

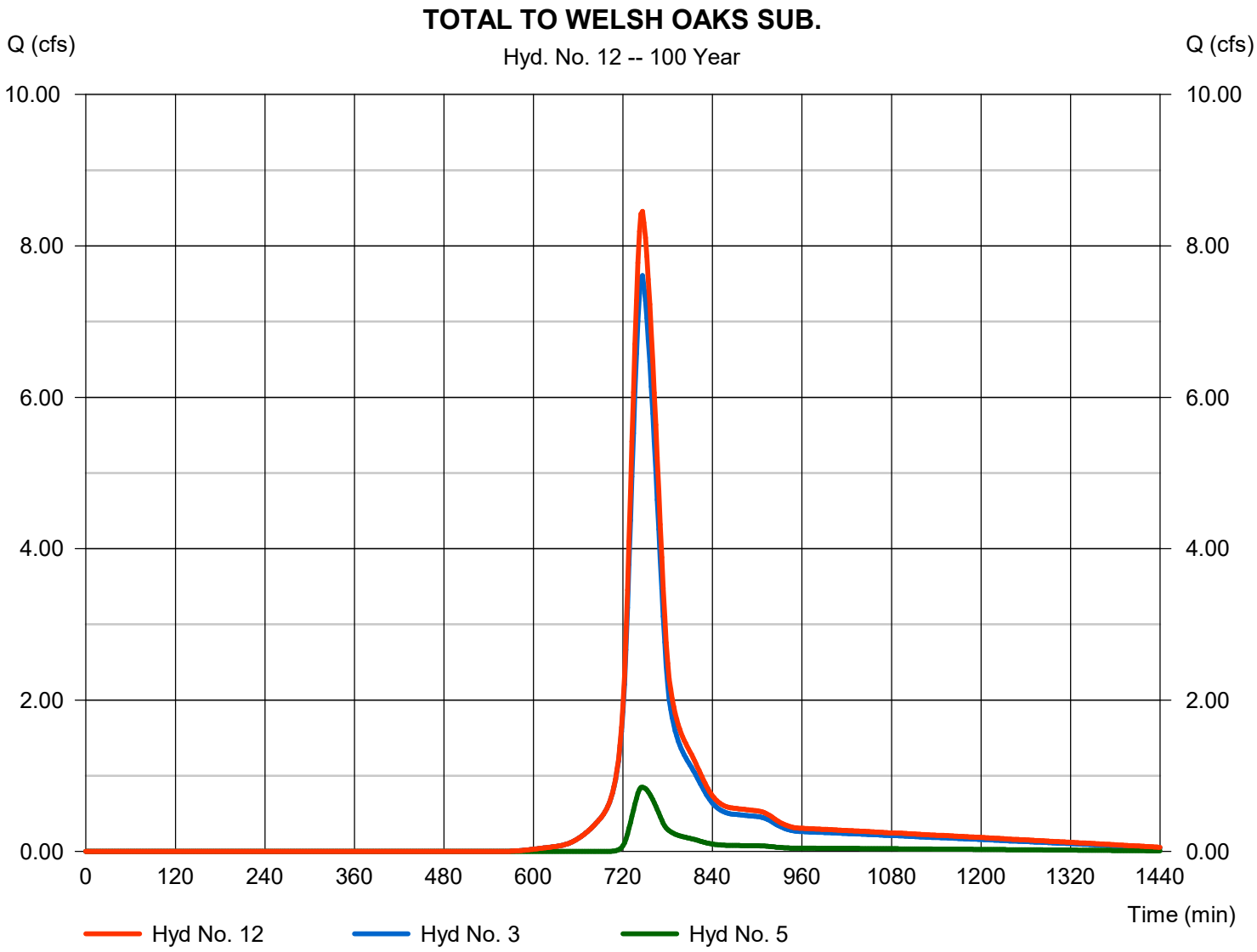


Hydrograph Report

Hyd. No. 12

TOTAL TO WELSH OAKS SUB.

Hydrograph type	= Combine	Peak discharge	= 8.457 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 36,582 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 3.305 ac

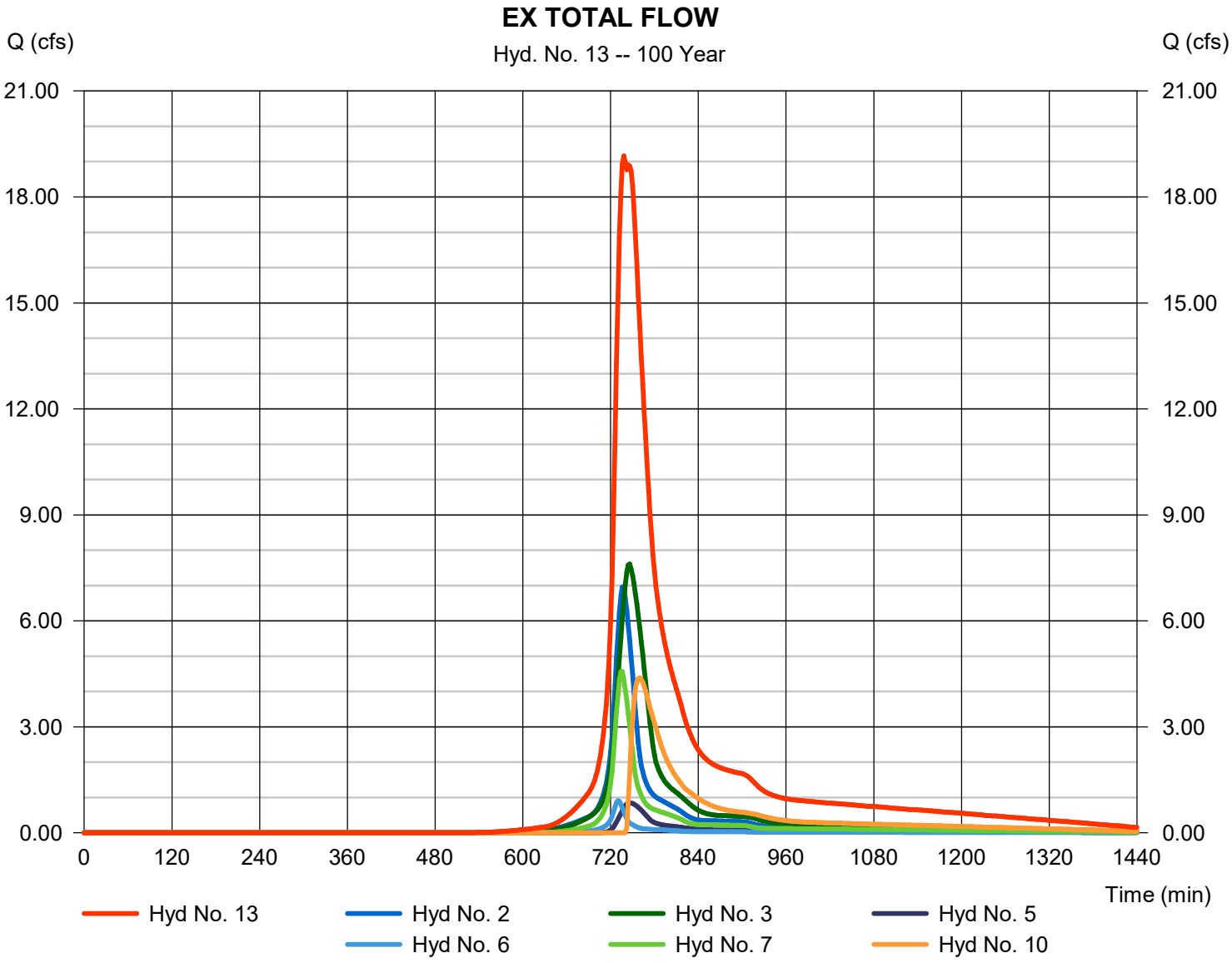


Hydrograph Report

Hyd. No. 13

EX TOTAL FLOW

Hydrograph type	= Combine	Peak discharge	= 19.16 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 100,196 cuft
Inflow hyds.	= 2, 3, 5, 6, 7, 10	Contrib. drain. area	= 6.502 ac



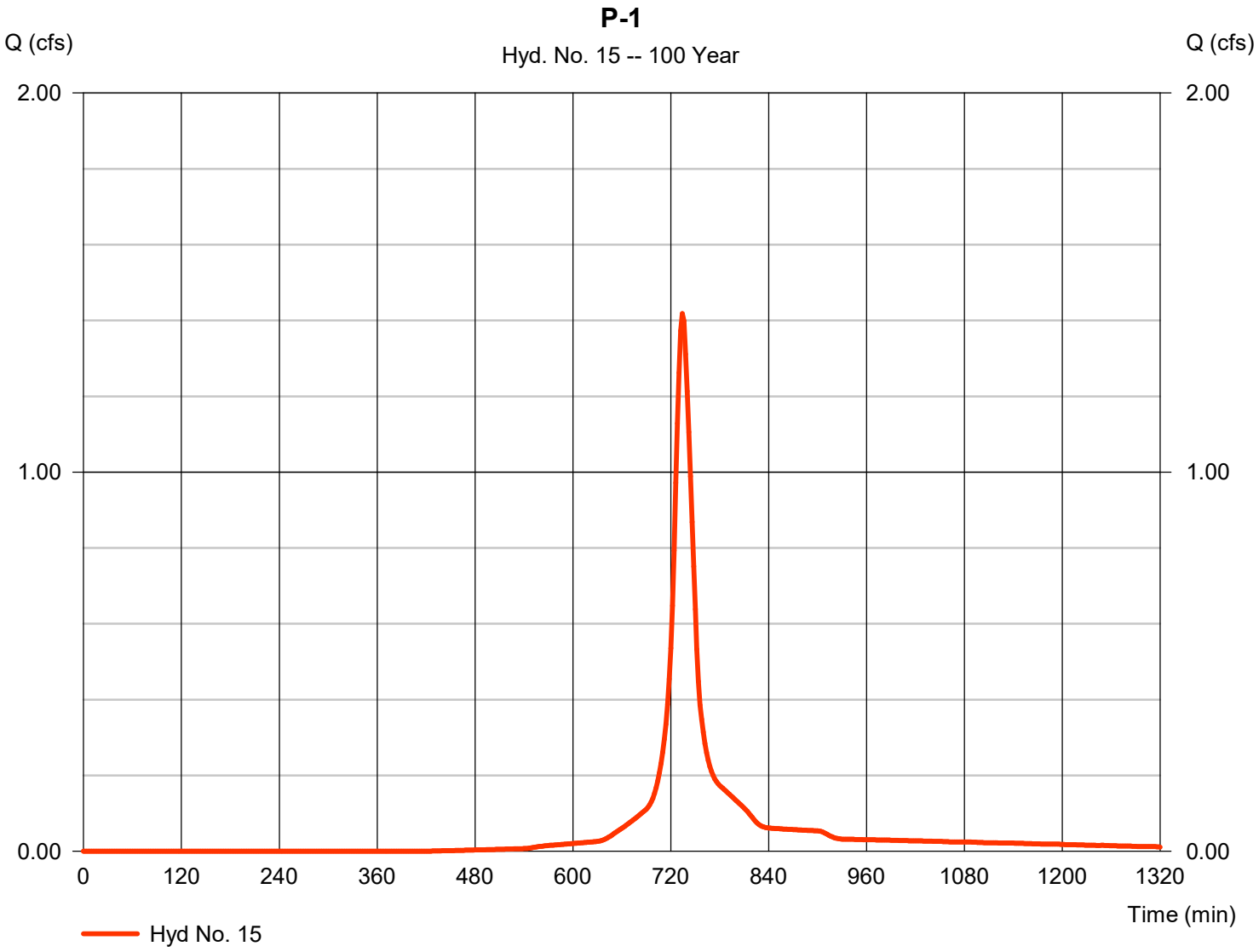
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 15

P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.418 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 4,453 cuft
Drainage area	= 0.281 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.80 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

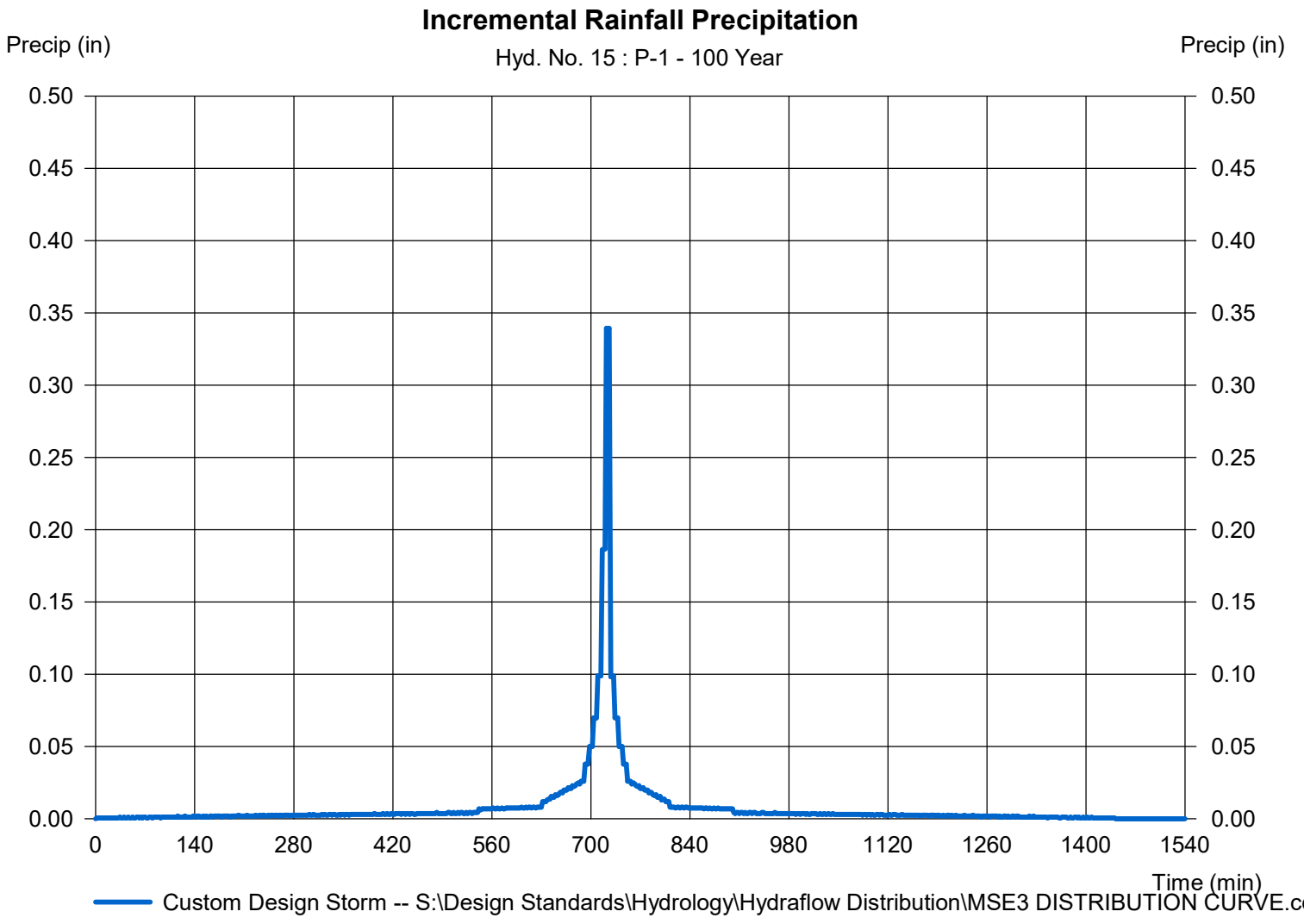


Precipitation Report

Hyd. No. 15

P-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



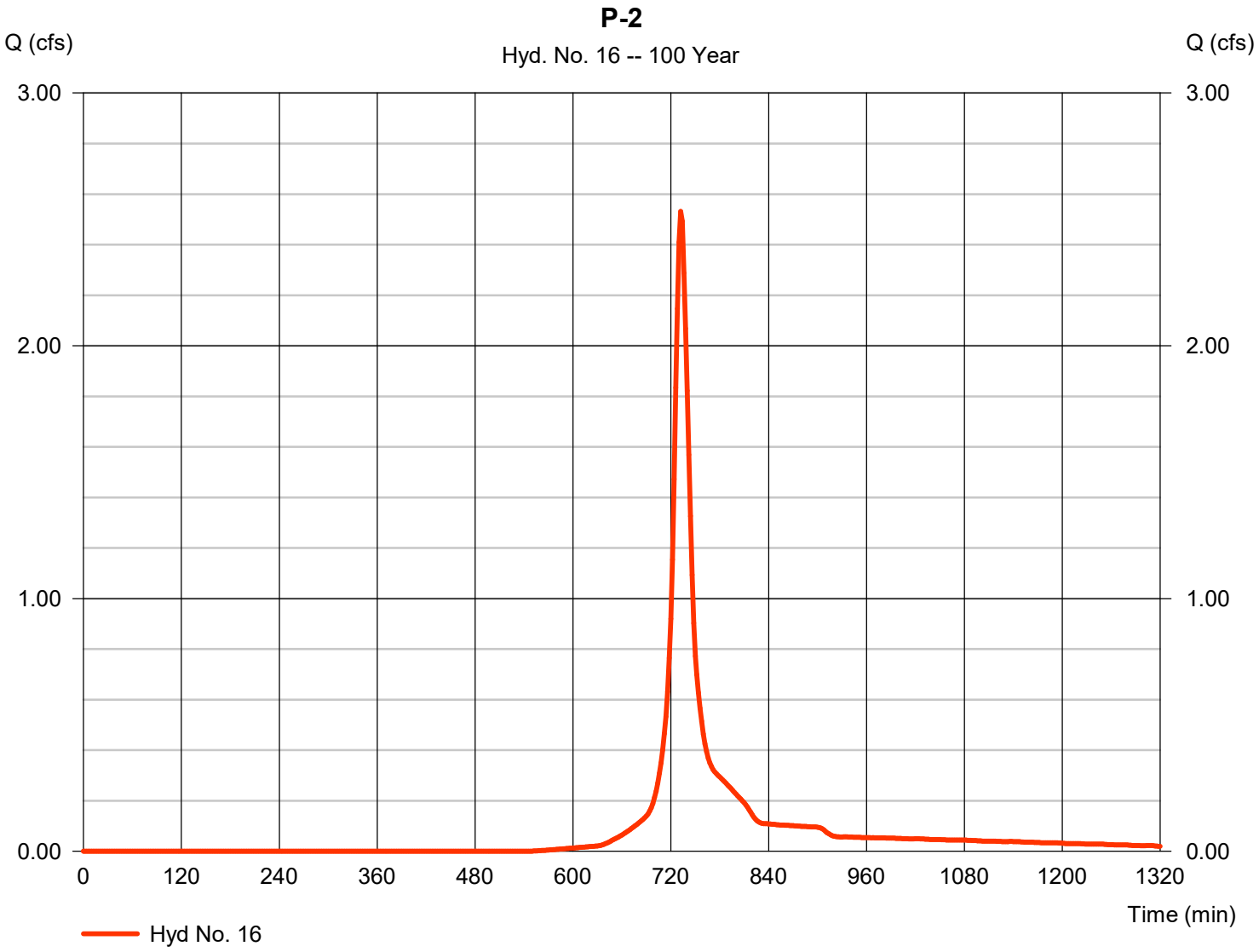
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 16

P-2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.532 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 7,033 cuft
Drainage area	= 0.562 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.70 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

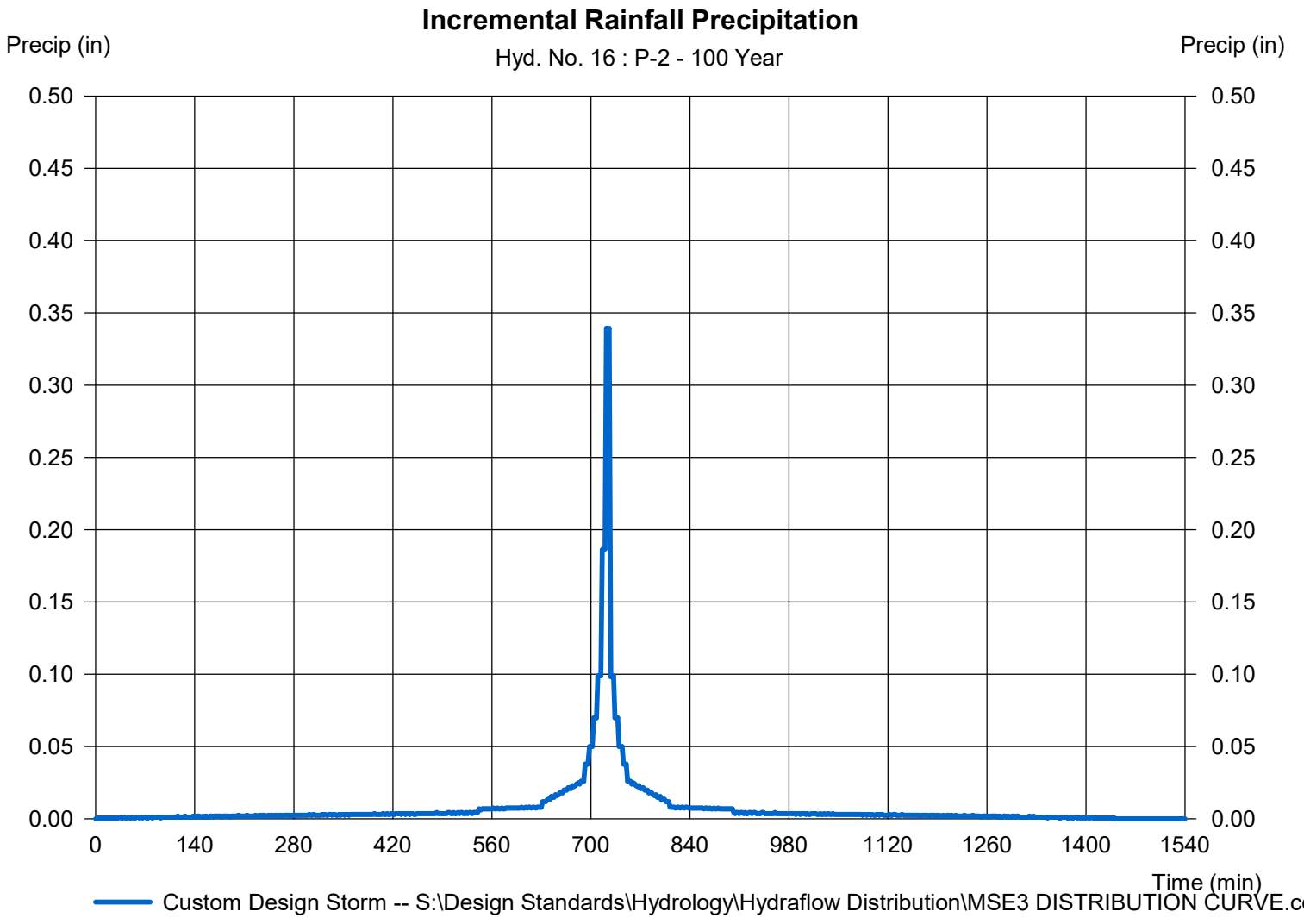


Precipitation Report

Hyd. No. 16

P-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



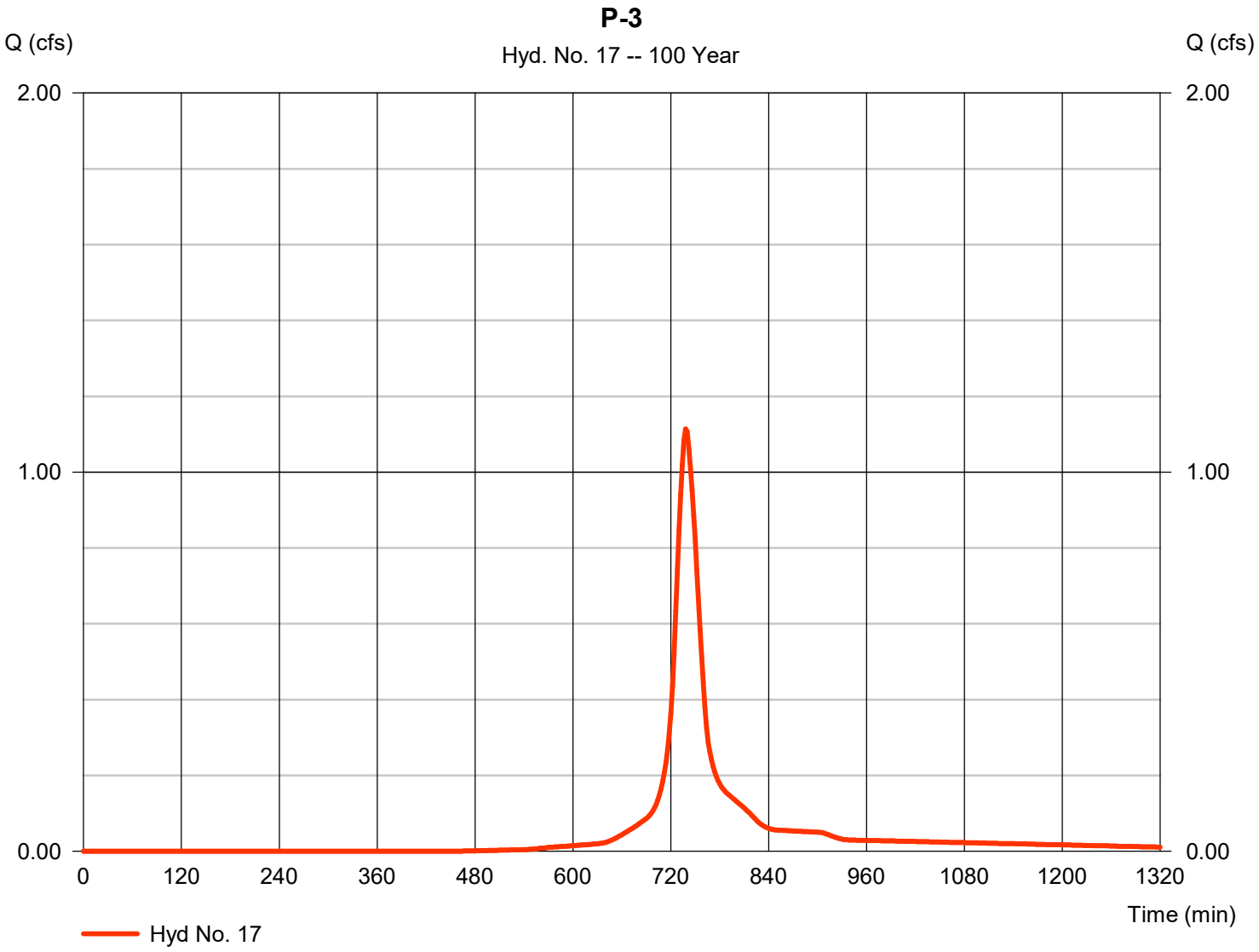
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 17

P-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.114 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 4,007 cuft
Drainage area	= 0.270 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.60 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

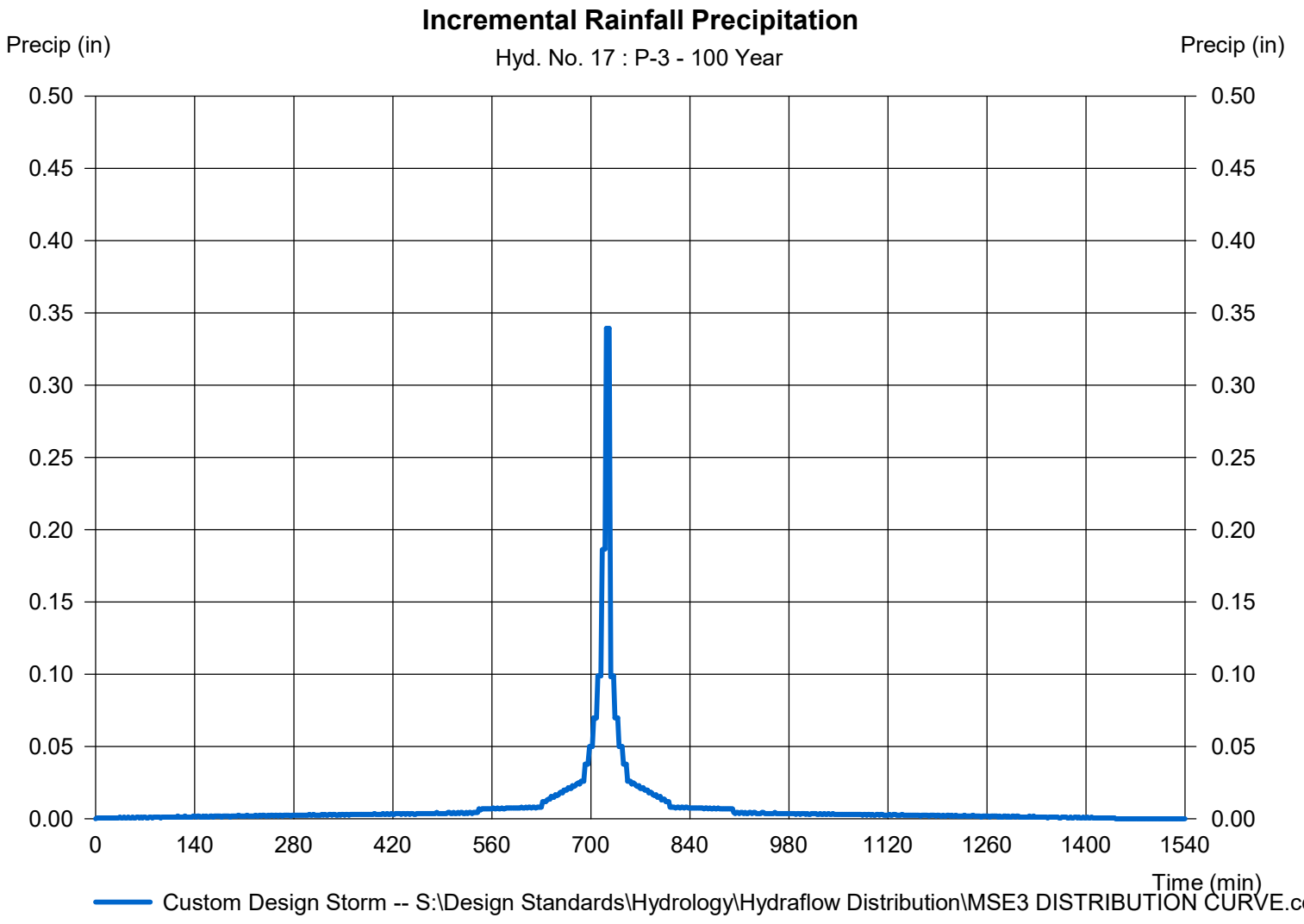


Precipitation Report

Hyd. No. 17

P-3

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



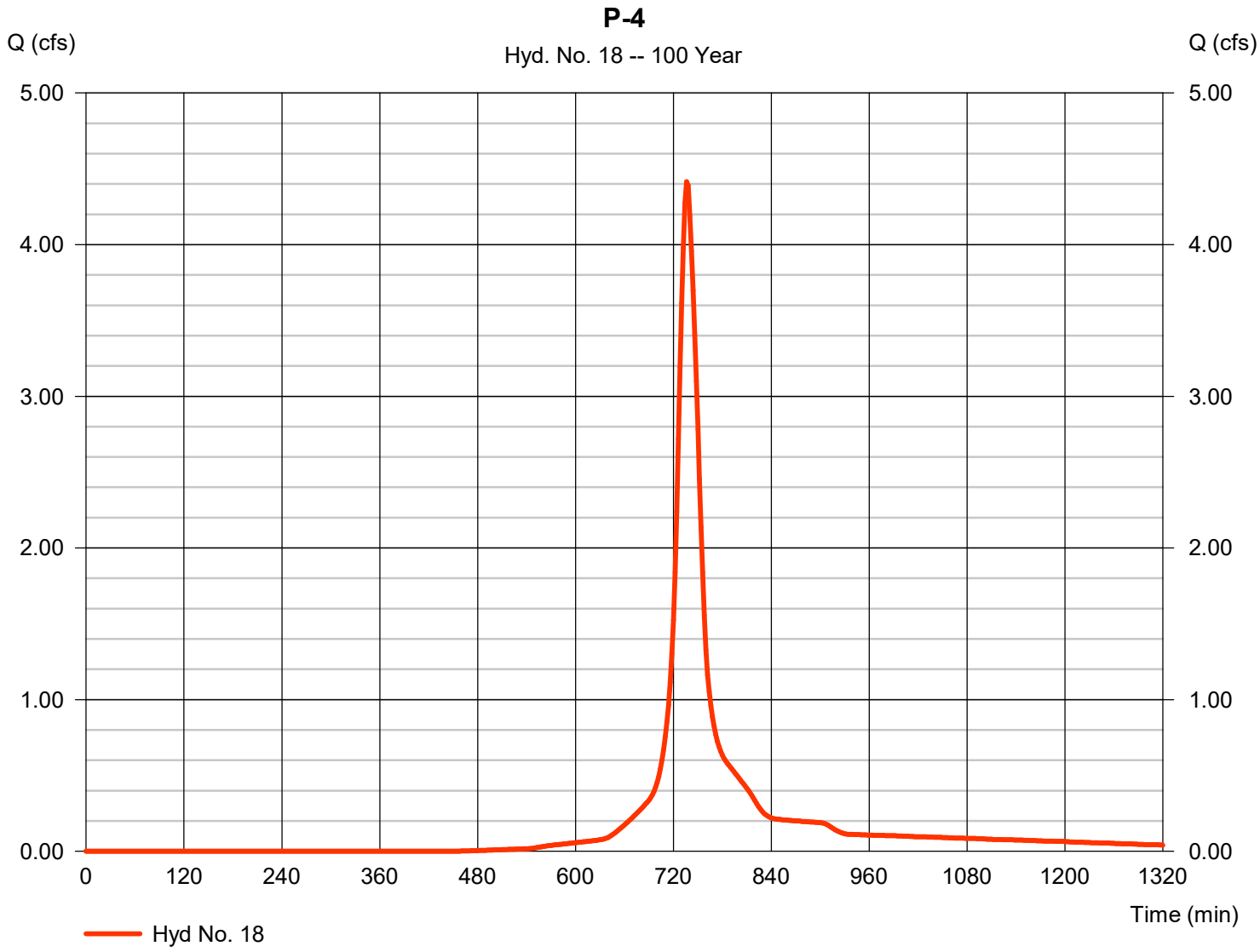
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 18

P-4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.414 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 15,068 cuft
Drainage area	= 0.982 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 20.40 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

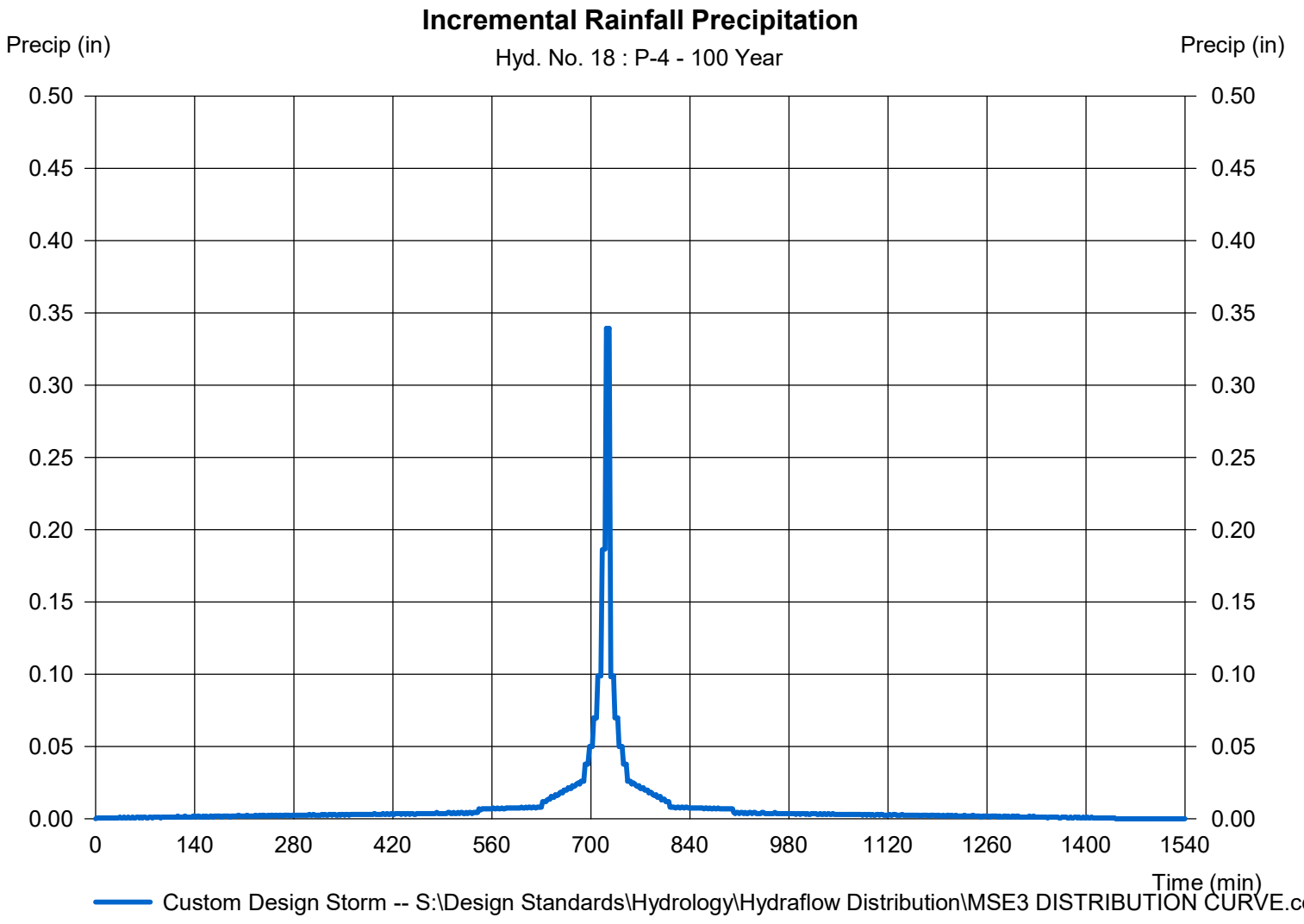


Precipitation Report

Hyd. No. 18

P-4

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



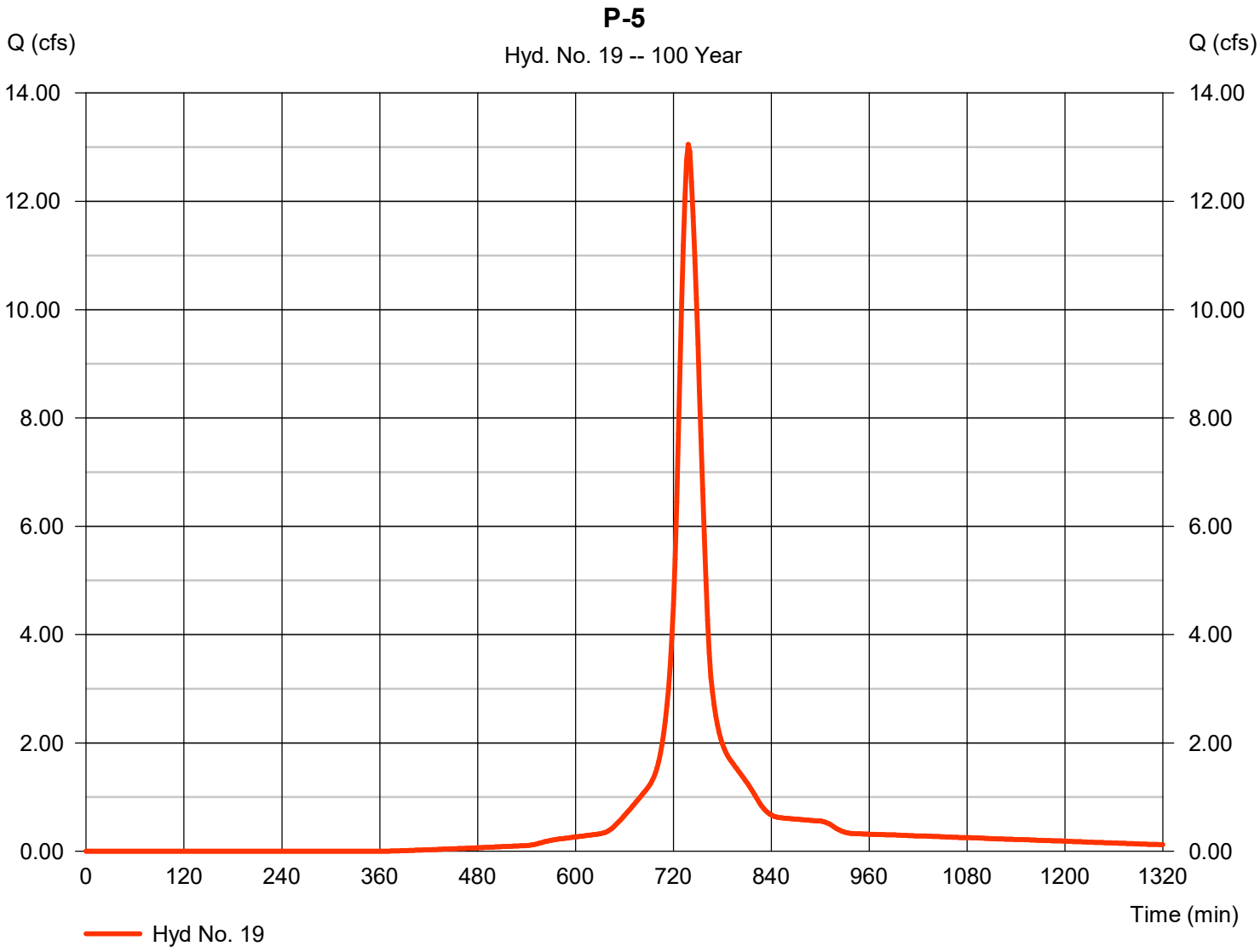
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Wednesday, 11 / 6 / 2019

Hyd. No. 19

P-5

Hydrograph type	= SCS Runoff	Peak discharge	= 13.05 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 47,809 cuft
Drainage area	= 2.853 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.00 min
Total precip.	= 6.18 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

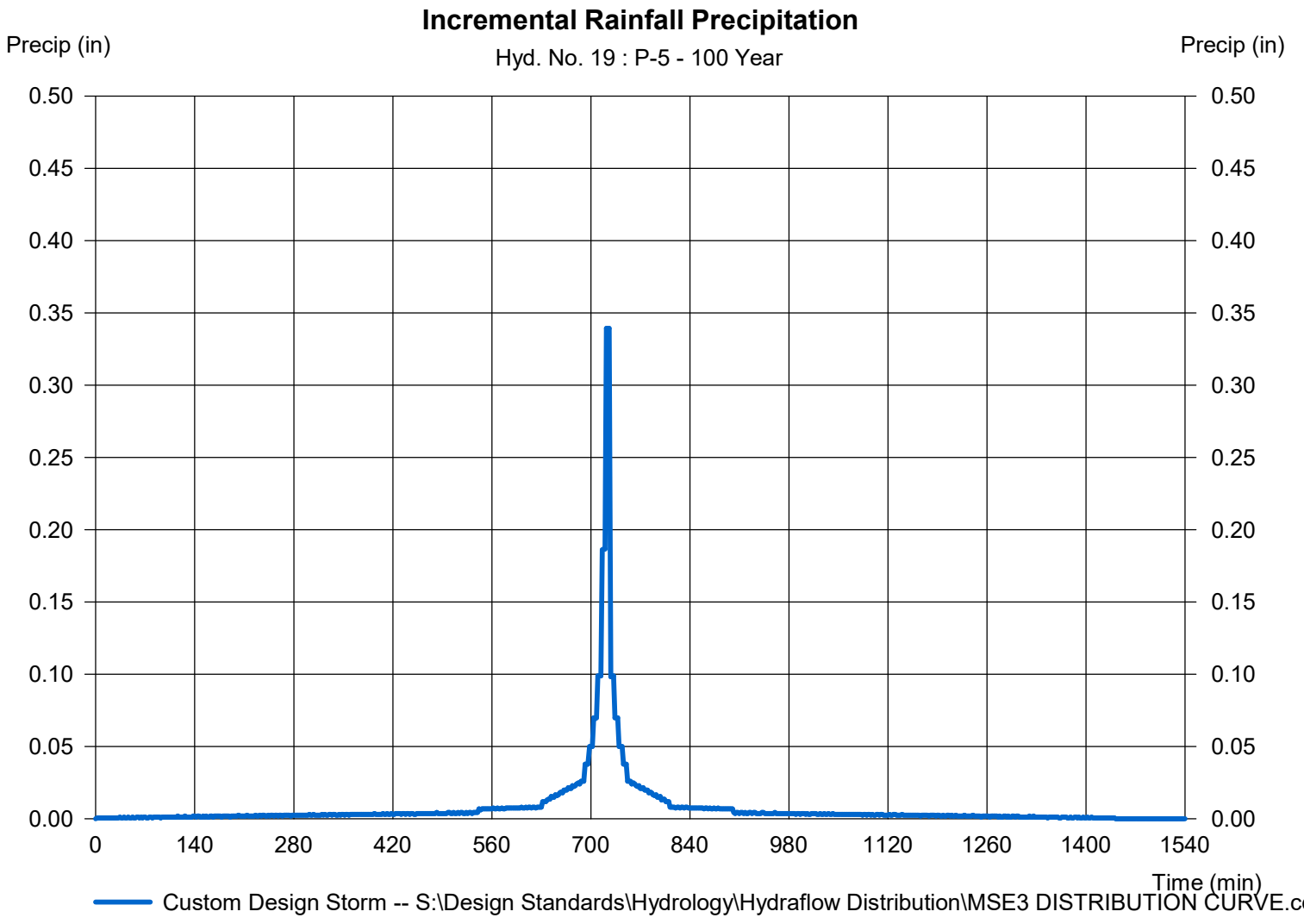


Precipitation Report

Hyd. No. 19

P-5

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

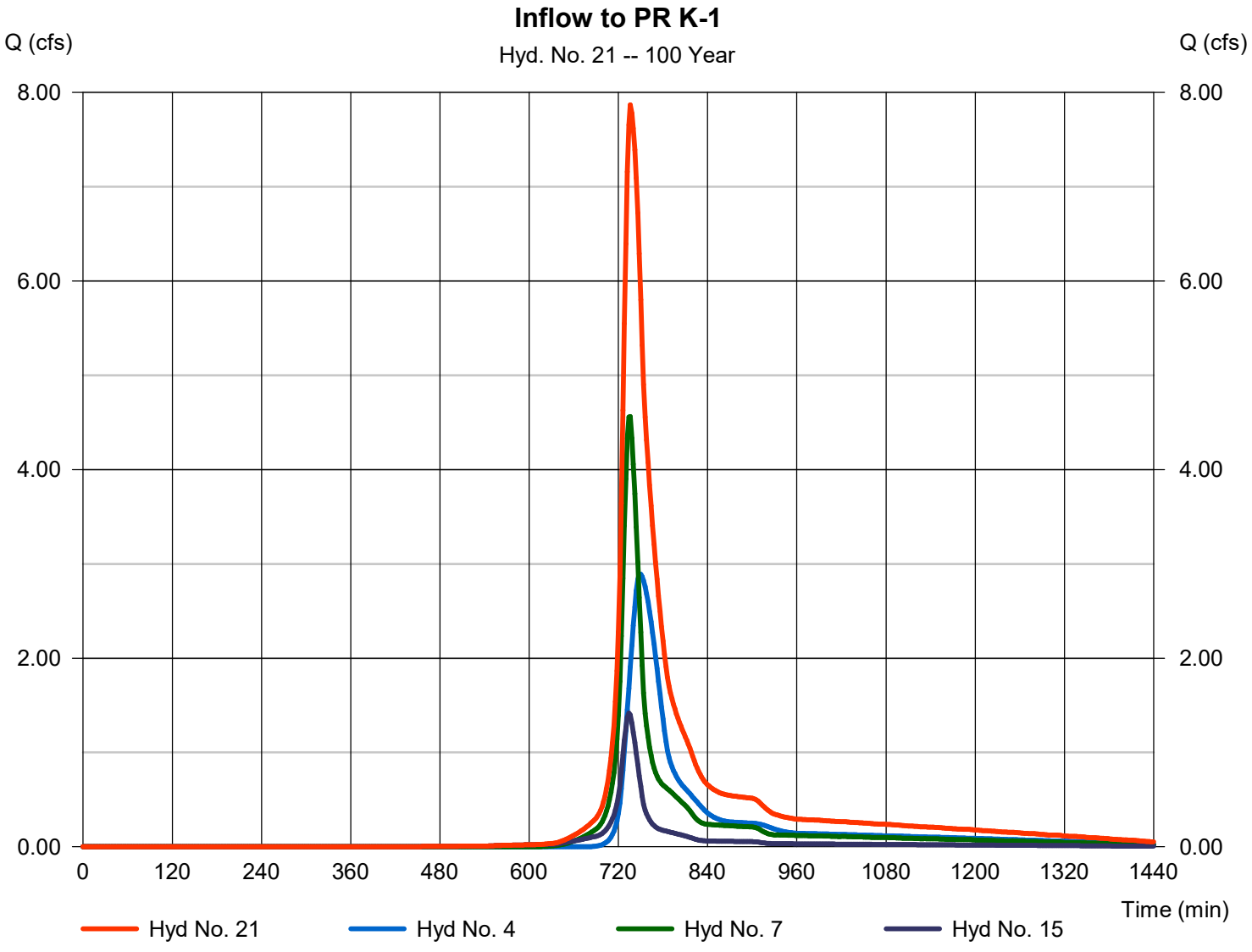


Hydrograph Report

Hyd. No. 21

Inflow to PR K-1

Hydrograph type	= Combine	Peak discharge	= 7.869 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 32,612 cuft
Inflow hyds.	= 4, 7, 15	Contrib. drain. area	= 3.495 ac



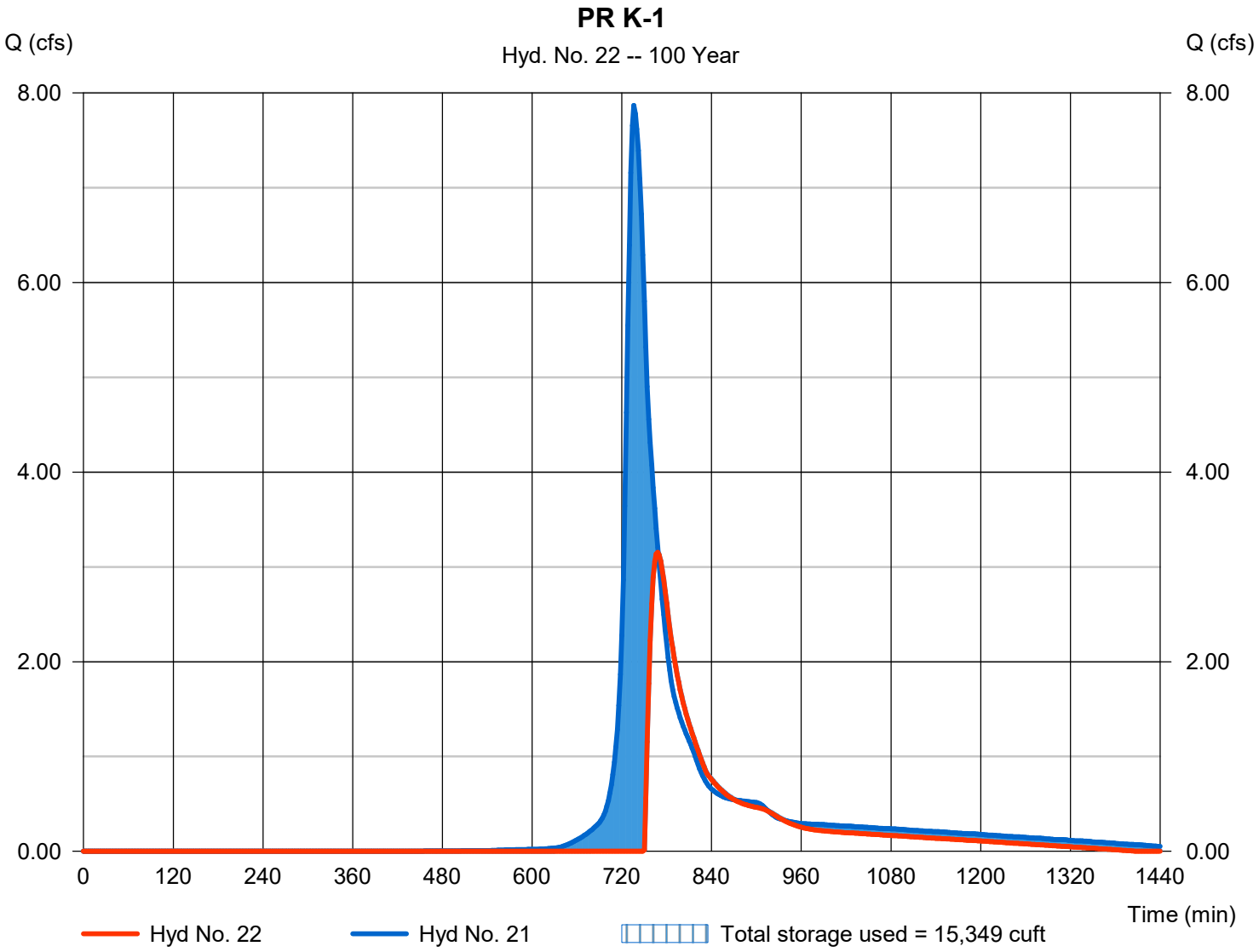
Hydrograph Report

Hyd. No. 22

PR K-1

Hydrograph type	=	Reservoir	Peak discharge	=	3.154 cfs
Storm frequency	=	100 yrs	Time to peak	=	768 min
Time interval	=	2 min	Hyd. volume	=	16,032 cuft
Inflow hyd. No.	=	21 - Inflow to PR K-1	Max. Elevation	=	113.24 ft
Reservoir name	=	PR KETTLE K-1	Max. Storage	=	15,349 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

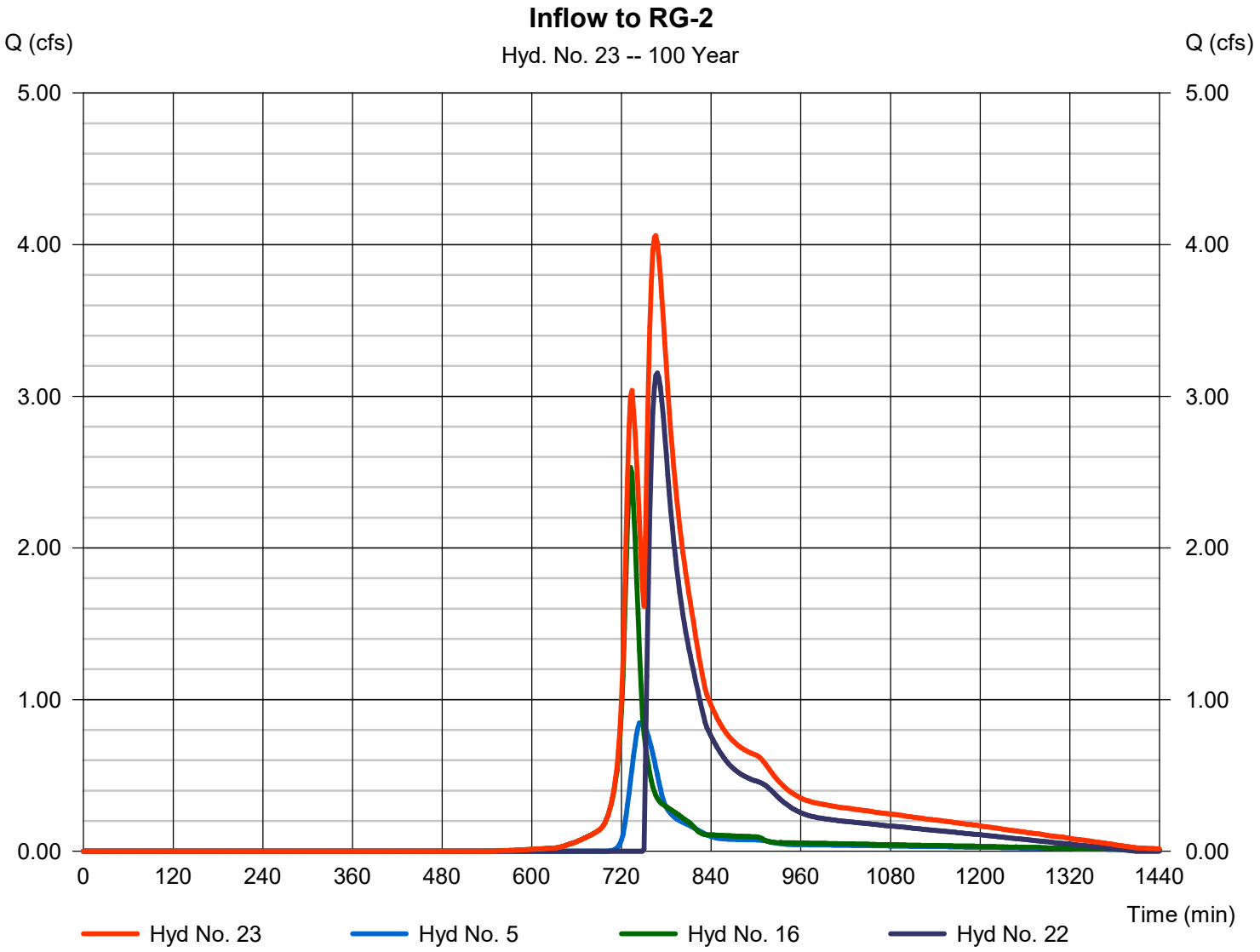


Hydrograph Report

Hyd. No. 23

Inflow to RG-2

Hydrograph type	= Combine	Peak discharge	= 4.059 cfs
Storm frequency	= 100 yrs	Time to peak	= 766 min
Time interval	= 2 min	Hyd. volume	= 26,970 cuft
Inflow hyds.	= 5, 16, 22	Contrib. drain. area	= 1.217 ac



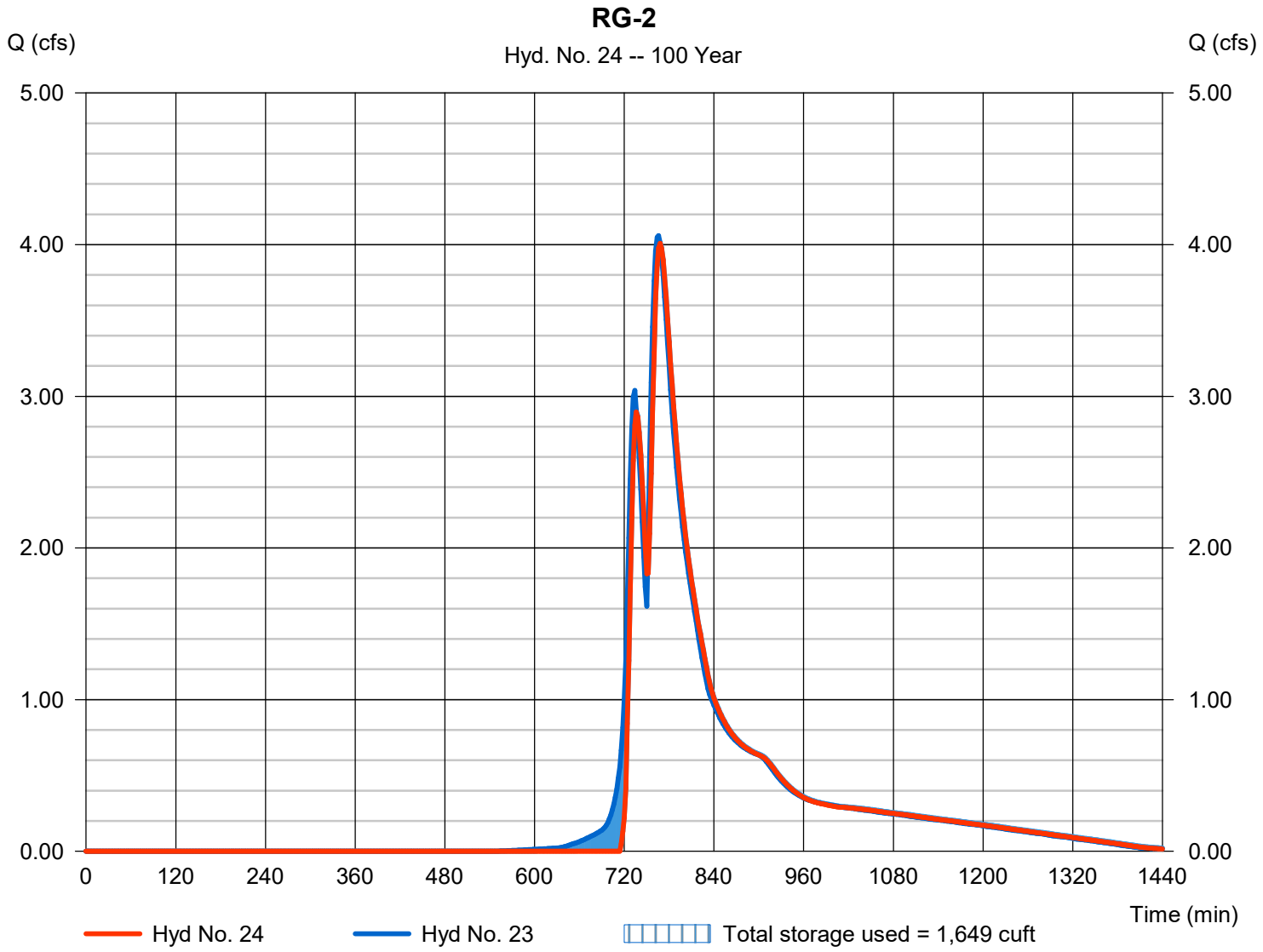
Hydrograph Report

Hyd. No. 24

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	4.008 cfs
Storm frequency	=	100 yrs	Time to peak	=	768 min
Time interval	=	2 min	Hyd. volume	=	25,979 cuft
Inflow hyd. No.	=	23 - Inflow to RG-2	Max. Elevation	=	110.34 ft
Reservoir name	=	RG-2	Max. Storage	=	1,649 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

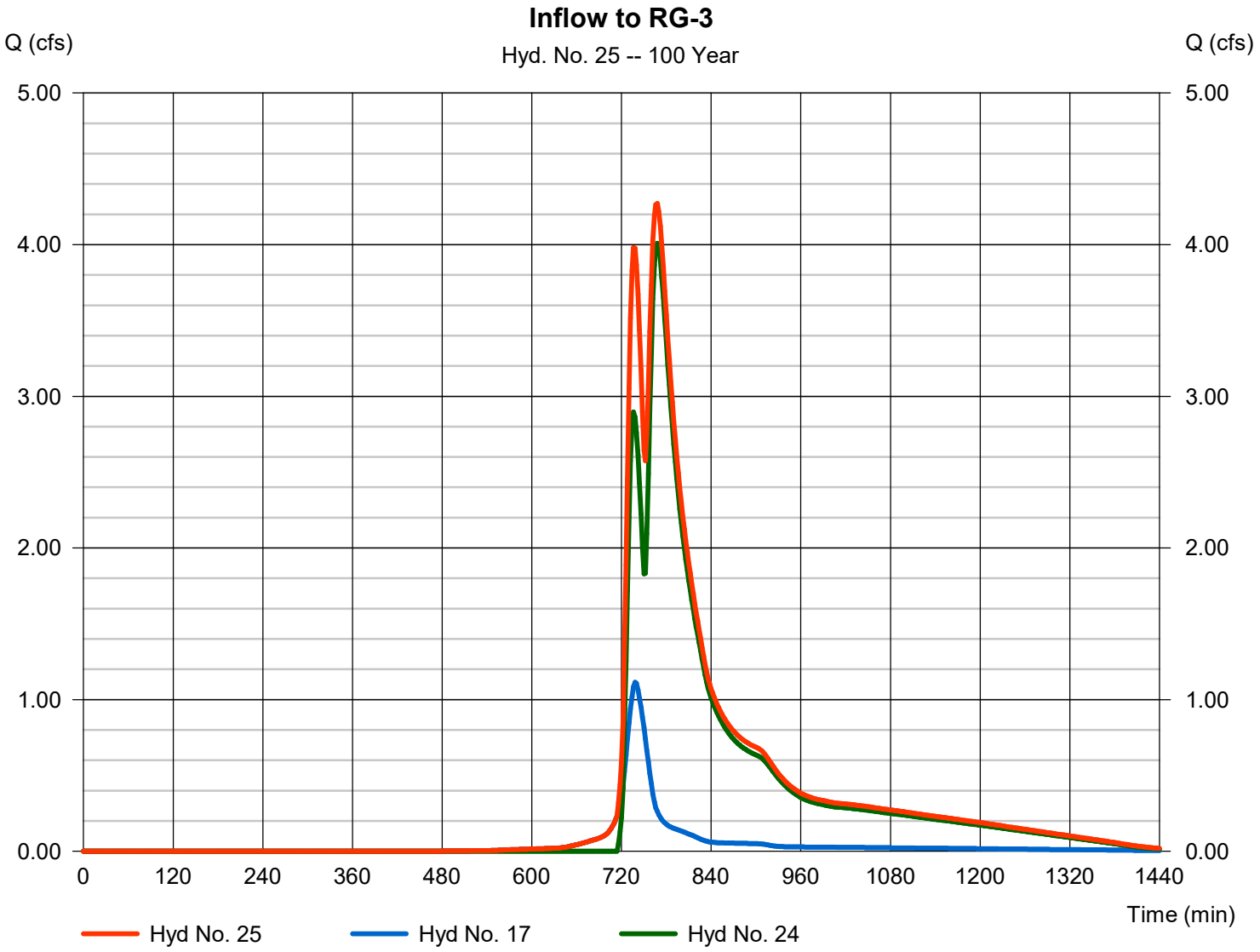


Hydrograph Report

Hyd. No. 25

Inflow to RG-3

Hydrograph type	= Combine	Peak discharge	= 4.271 cfs
Storm frequency	= 100 yrs	Time to peak	= 768 min
Time interval	= 2 min	Hyd. volume	= 29,986 cuft
Inflow hyds.	= 17, 24	Contrib. drain. area	= 0.270 ac



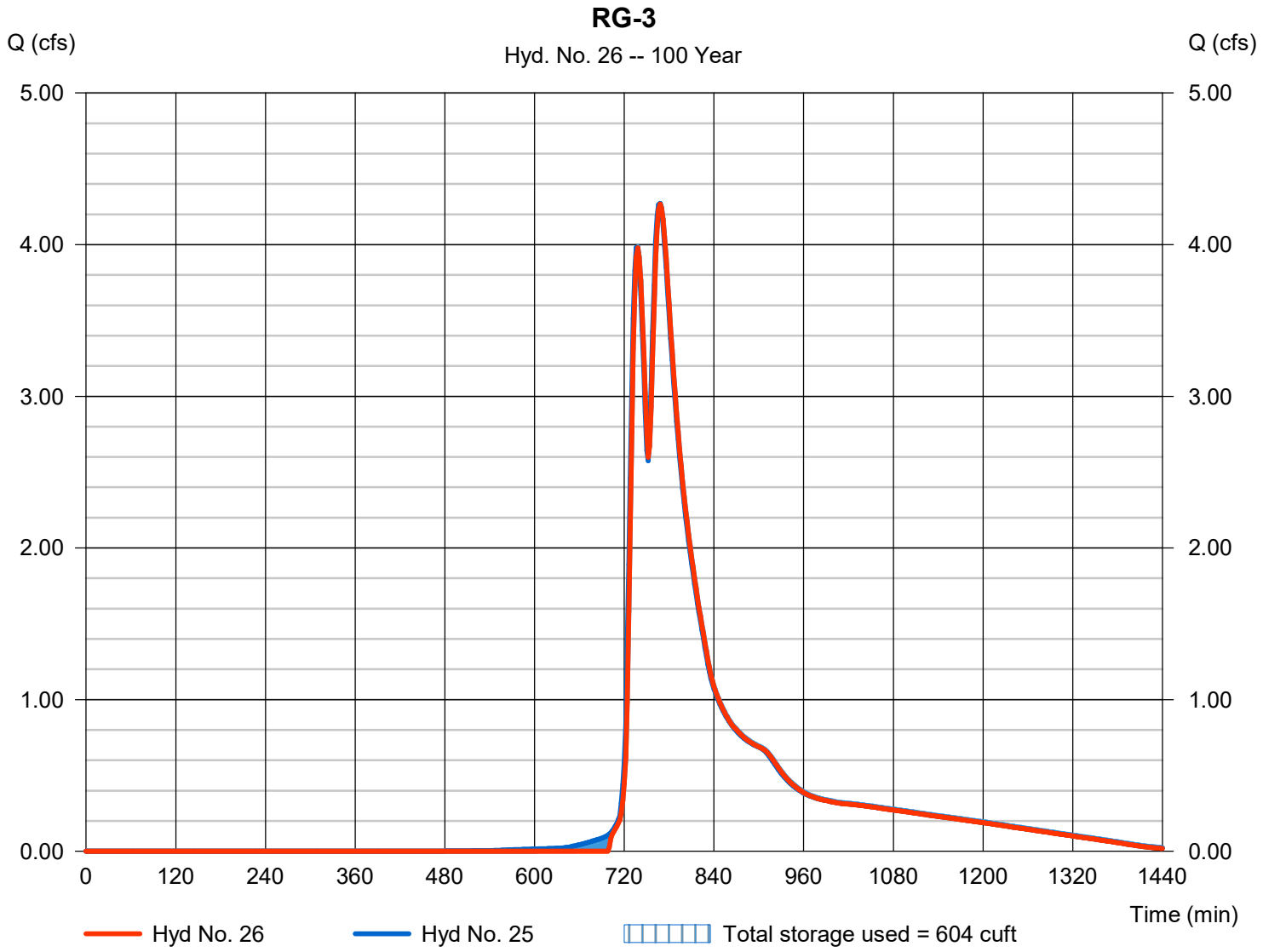
Hydrograph Report

Hyd. No. 26

RG-3

Hydrograph type	=	Reservoir	Peak discharge	=	4.267 cfs
Storm frequency	=	100 yrs	Time to peak	=	768 min
Time interval	=	2 min	Hyd. volume	=	29,585 cuft
Inflow hyd. No.	=	25 - Inflow to RG-3	Max. Elevation	=	109.30 ft
Reservoir name	=	RG-3	Max. Storage	=	604 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



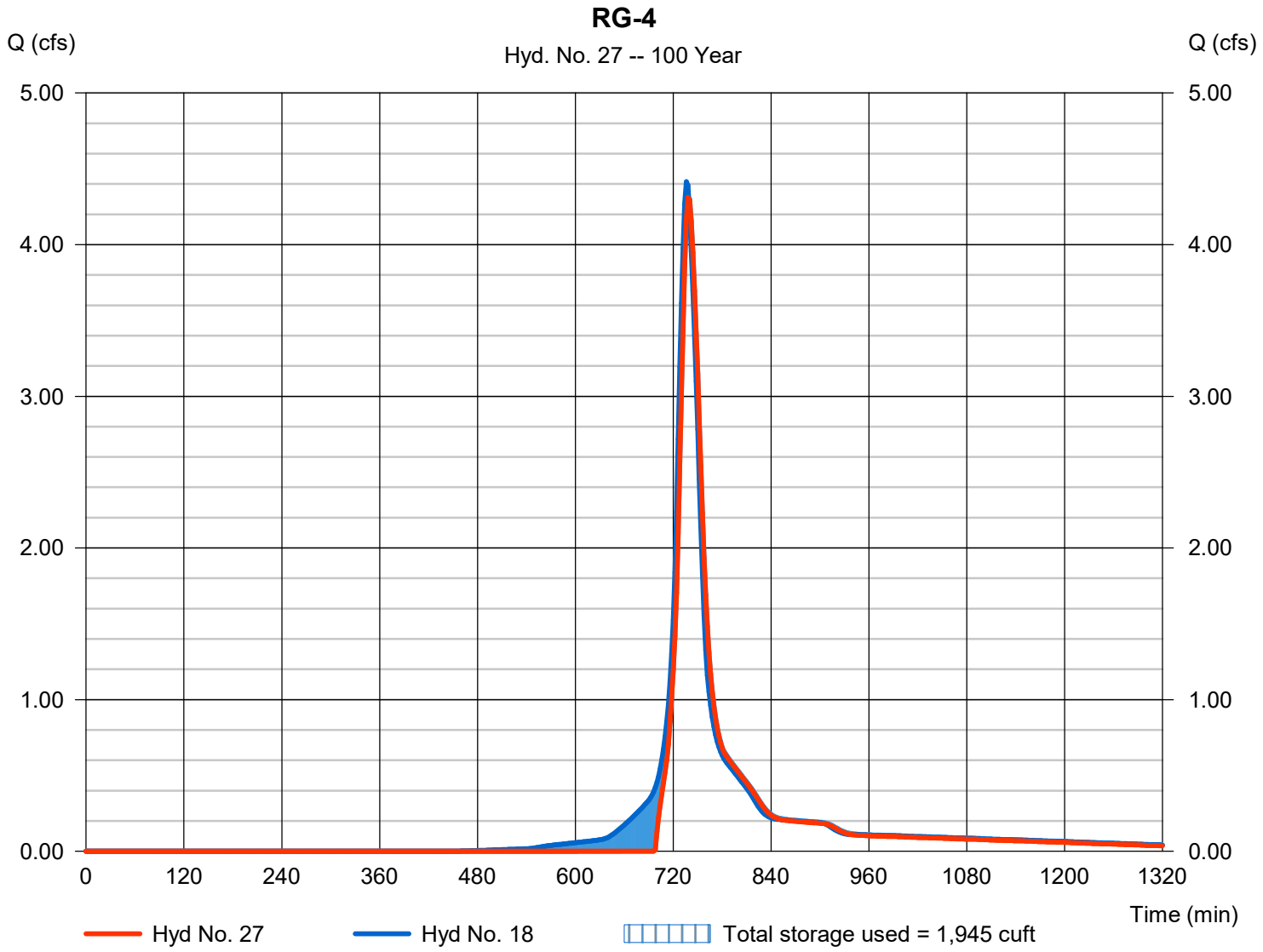
Hydrograph Report

Hyd. No. 27

RG-4

Hydrograph type	=	Reservoir	Peak discharge	=	4.310 cfs
Storm frequency	=	100 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	13,659 cuft
Inflow hyd. No.	=	18 - P-4	Max. Elevation	=	102.45 ft
Reservoir name	=	RG-4	Max. Storage	=	1,945 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

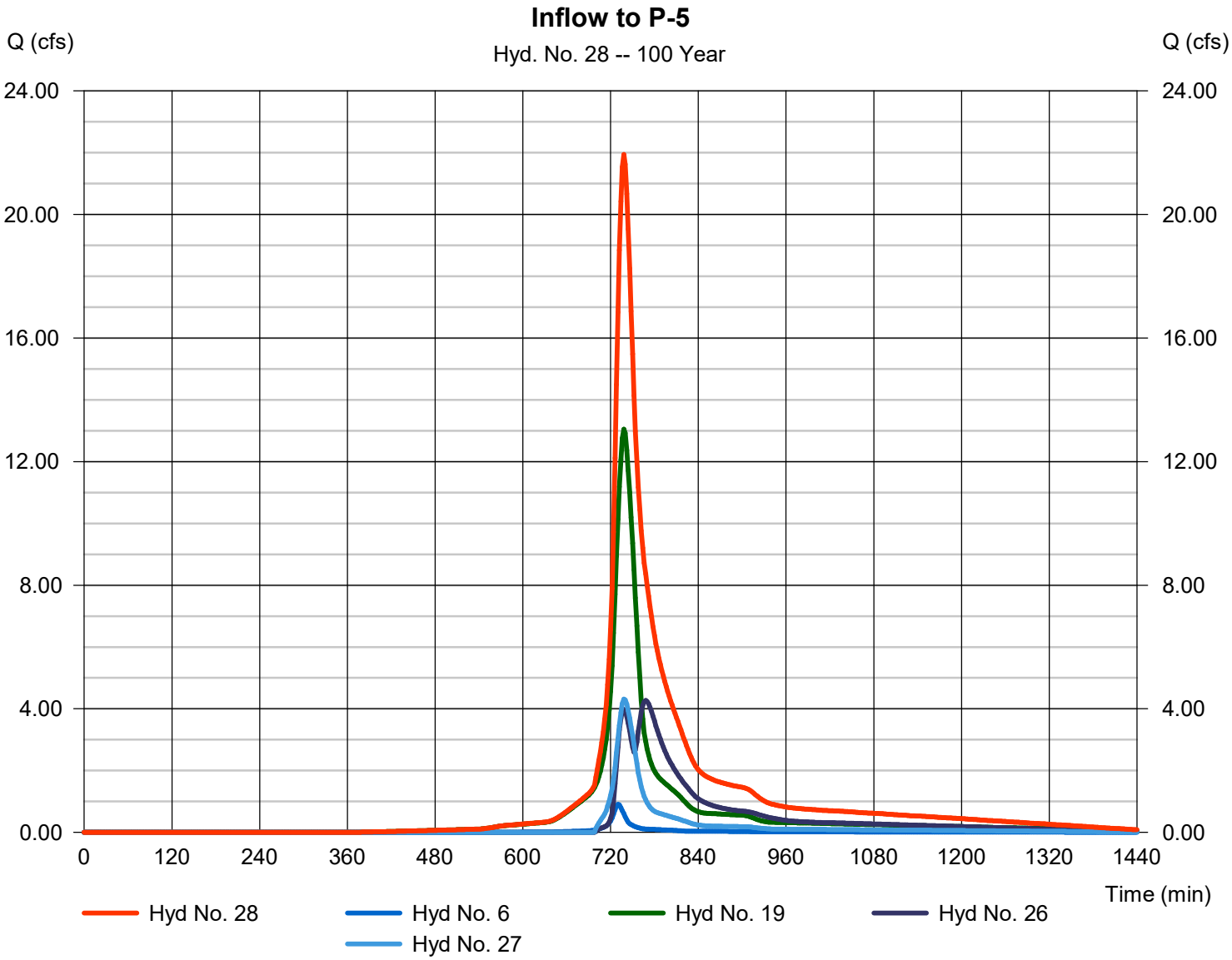


Hydrograph Report

Hyd. No. 28

Inflow to P-5

Hydrograph type	= Combine	Peak discharge	= 21.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 93,389 cuft
Inflow hyds.	= 6, 19, 26, 27	Contrib. drain. area	= 3.020 ac



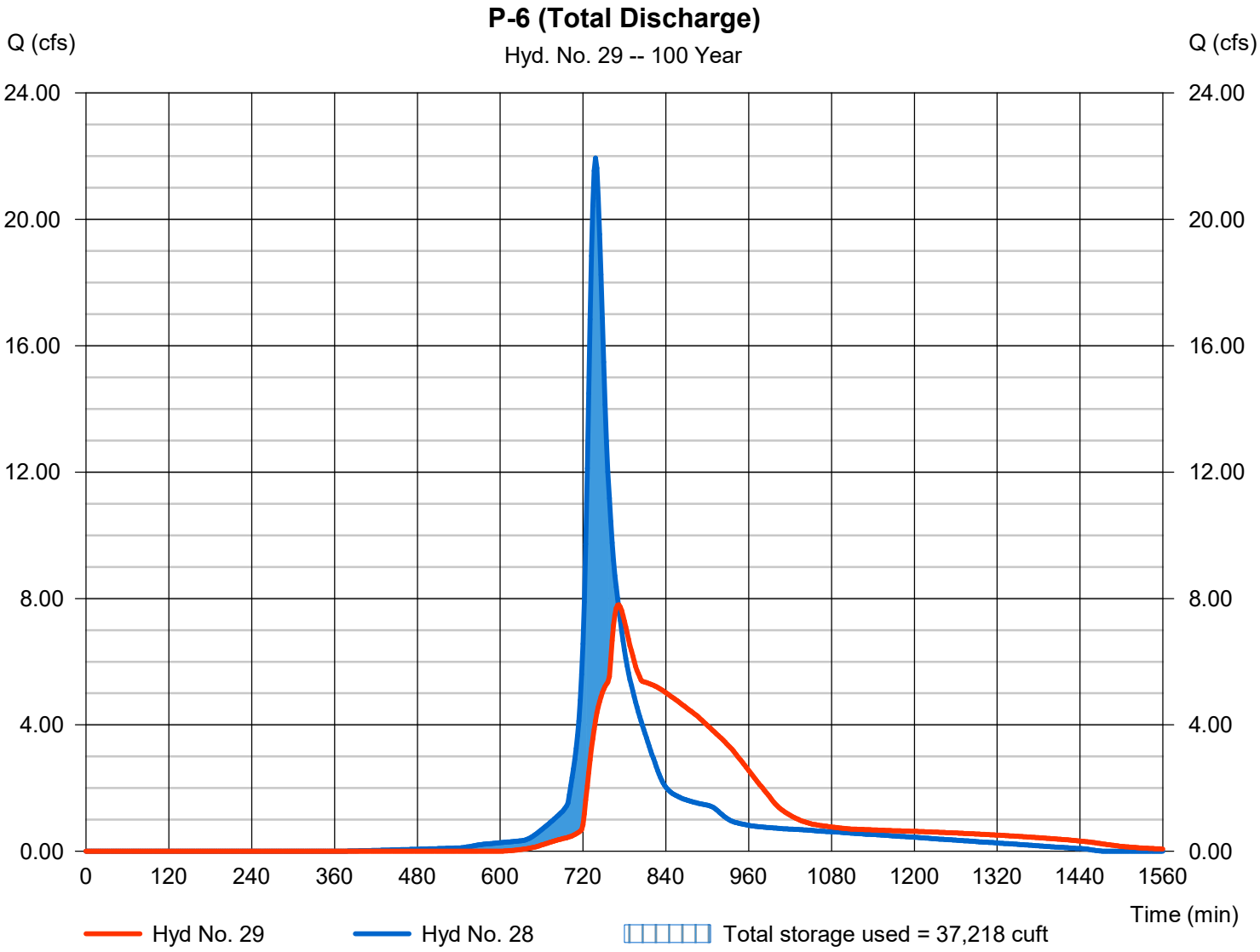
Hydrograph Report

Hyd. No. 29

P-6 (Total Discharge)

Hydrograph type	= Reservoir	Peak discharge	= 7.797 cfs
Storm frequency	= 100 yrs	Time to peak	= 772 min
Time interval	= 2 min	Hyd. volume	= 92,237 cuft
Inflow hyd. No.	= 28 - Inflow to P-5	Max. Elevation	= 98.42 ft
Reservoir name	= POND P-5	Max. Storage	= 37,218 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	22.8367	5.6000	0.7338	--------
2	25.4674	5.2000	0.7159	--------
3	0.0000	0.0000	0.0000	--------
5	30.5439	4.9000	0.7023	--------
10	33.5363	4.6000	0.6850	--------
25	36.2566	4.0000	0.6589	--------
50	35.2584	3.1000	0.6226	--------
100	34.0002	2.2000	0.5870	--------

File name: WAUKESHA ATLAS 14 IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.04	3.04	2.48	2.11	1.85	1.66	1.51	1.38	1.28	1.20	1.12	1.06
2	4.83	3.63	2.96	2.53	2.22	1.99	1.81	1.66	1.54	1.44	1.36	1.28
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	6.11	4.58	3.74	3.19	2.81	2.52	2.29	2.11	1.96	1.83	1.72	1.63
10	7.12	5.35	4.37	3.74	3.29	2.96	2.70	2.49	2.31	2.17	2.04	1.93
25	8.52	6.37	5.21	4.47	3.94	3.55	3.24	3.00	2.79	2.62	2.47	2.34
50	9.59	7.11	5.81	4.99	4.42	3.99	3.66	3.39	3.16	2.97	2.81	2.67
100	10.67	7.83	6.40	5.51	4.89	4.43	4.07	3.78	3.54	3.34	3.16	3.01

Tc = time in minutes. Values may exceed 60.

ign Standards\Hydrology\Hydraflow UPDATED ATLAS 14\STATIONS\WAUKESHA\WAUKESHA ATLAS 14 Precip.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	2.40	2.70	0.00	0.00	3.81	0.00	0.00	6.18

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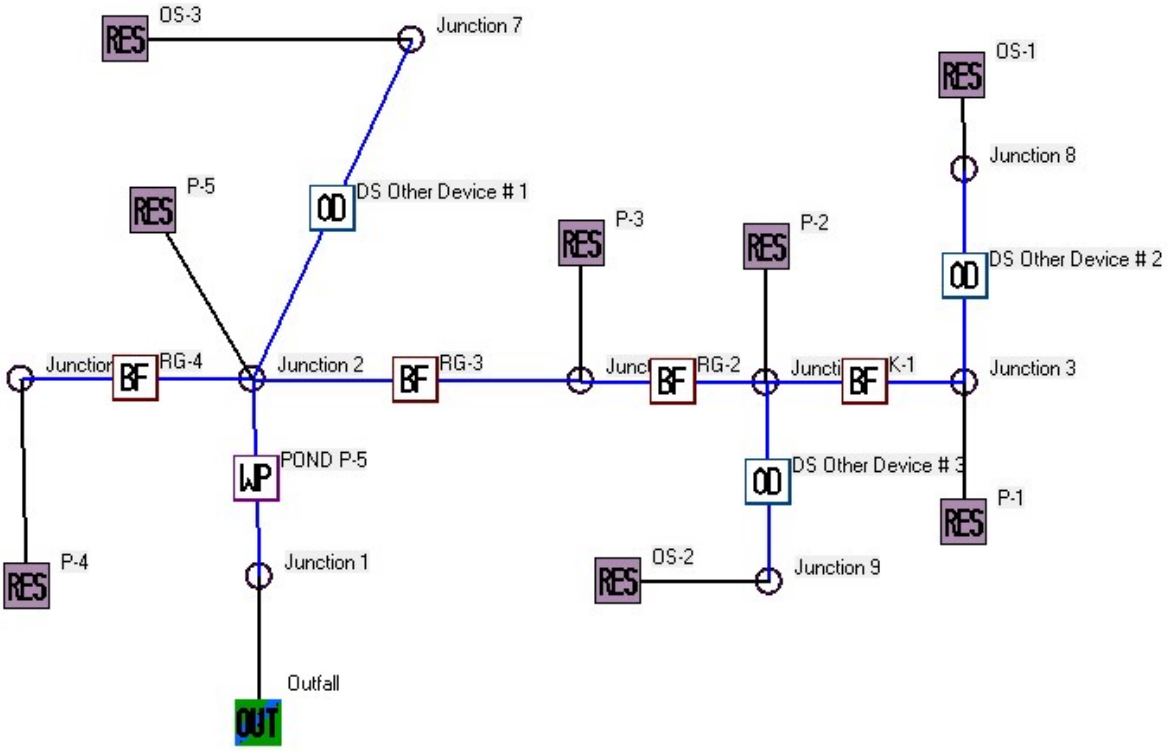
APPENDIX 4

WinSlamm Calculations

Modeling of Proposed Wet Pond & Rain Gardens



INPUT DATA

Data file name: L:\LOBBYS\WPDOCS\DOCUMENT\966\01006-KOENIG\284-Storm Water Management Plan\Villas at Prairie Song\WinSlamm Calc\2019-11-03_WINSLAMM CALC_PRAIRIE SONG VILLAS.mdb
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42

Study period starting date: 01/01/81 Study period ending date: 12/31/81
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 11-04-2019 Time: 11:19:49
Site information:

LU# 1 - Residential: P-1 Total area (ac): 0.281
1 - Roofs 1: 0.046 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.048 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.019 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.168 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: P-2 Total area (ac): 0.562
1 - Roofs 1: 0.121 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
25 - Driveways 1: 0.045 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.260 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.136 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 3 - Residential: P-3 Total area (ac): 0.270
1 - Roofs 1: 0.064 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.008 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.198 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 4 - Residential: P-4 Total area (ac): 0.982
1 - Roofs 1: 0.220 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.762 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 5 - Residential: P-5 Total area (ac): 2.853
1 - Roofs 1: 0.530 ac. Pitched Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.051 ac. Disconnected Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
37 - Streets 1: 0.767 ac. Smooth Street Length = 0.276 curb-mi Street Width (assuming two curb-mi per street mile) = 45.85326 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 1.452 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
70 - Water Body Areas: 0.053 ac. Source Area PSD File:

LU# 6 - Residential: OS-1 Total area (ac): 2.220
45 - Large Landscaped Areas 1: 1.616 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
46 - Large Landscaped Areas 2: 0.139 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
47 - Large Landscaped Areas 3: 0.465 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 7 - Residential: OS-2 Total area (ac): 0.655
45 - Large Landscaped Areas 1: 0.655 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 8 - Residential: OS-3 Total area (ac): 0.167
45 - Large Landscaped Areas 1: 0.167 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Biofilter CP# 1 (DS) - K-1
1. Top area (square feet) = 4278
2. Bottom aea (square feet) = 2278
3. Depth (ft): 2
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0.13
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:
Outlet type: Broad Crested Weir
1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 1.5

Control Practice 2: Biofilter CP# 2 (DS) - RG-2
1. Top area (square feet) = 3962
2. Bottom aea (square feet) = 1064
3. Depth (ft): 1.5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 1.63
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0

13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 0.55

Control Practice 3: Biofilter CP# 3 (DS) - RG-3

1. Top area (square feet) = 1403
2. Bottom aea (square feet) = 476
3. Depth (ft): 1.5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 1.63
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0
10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 0.5

Control Practice 4: Biofilter CP# 4 (DS) - RG-4

1. Top area (square feet) = 2939
2. Bottom aea (square feet) = 1559
3. Depth (ft): 1.5
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 1.63
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 1
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0

10. Porosity of rock filled volume = 0
11. Engineered soil infiltration rate: 0
12. Engineered soil depth (ft) = 0
13. Engineered soil porosity = 0
14. Percent solids reduction due to flow through engineered soil = 0
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height of datum to bottom of weir opening: 0.6

Control Practice 5: Other Device CP# 1 (DS) - DS Other Device # 1

Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0

Control Practice 6: Other Device CP# 2 (DS) - DS Other Device # 2

Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0

Control Practice 7: Other Device CP# 3 (DS) - DS Other Device # 3

Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 1.00
Runoff volume reduction fraction = 0

Control Practice 8: Wet Detention Pond CP# 1 (DS) - POND P-5

Particle Size Distribution file name: Not needed - calculated by program
Initial stage elevation (ft): 5
Peak to Average Flow Ratio: 3.8
Maximum flow allowed into pond (cfs): No maximum value entered
Outlet Characteristics:

Outlet type: Sharp Crested Weir

1. Sharp crested weir length (ft): 0.29
2. Sharp crested weir height from invert: 3.45
3. Sharp crested weir invert elevation above datum (ft): 7.55

Outlet type: Orifice 1

1. Orifice diameter (ft): 0.42
2. Number of orifices: 1

3. Invert elevation above datum (ft): 5

Outlet type: Orifice 2

1. Orifice diameter (ft): 0.5
2. Number of orifices: 2
3. Invert elevation above datum (ft): 6.3

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 10
2. Weir crest width (ft): 10
3. Height from datum to bottom of weir opening: 10

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 3
2. Stand pipe height above datum (ft): 9.8

Pond stage and surface area

Entry Number	Stage (ft)	Pond Area (acres)	Natural Seepage (in/hr)	Other Outflow (cfs)
0	0.00	0.0000	0.00	0.00
1	0.01	0.0030	0.00	0.00
2	1.00	0.0060	0.00	0.00
3	2.00	0.0090	0.00	0.00
4	3.00	0.0140	0.00	0.00
5	4.00	0.0190	0.00	0.00
6	4.50	0.0590	0.00	0.00
7	5.00	0.0870	0.00	0.00
8	5.50	0.1030	0.00	0.00
9	6.50	0.1330	0.00	0.00
10	7.50	0.1610	0.00	0.00
11	8.50	0.2050	0.00	0.00
12	9.50	0.2470	0.00	0.00
13	10.00	0.2670	0.00	0.00
14	10.50	0.2960	0.00	0.00
15	11.00	0.3270	0.00	0.00

OUTPUT SUMMARYSLAMM for Windows Version 10.4.1

SLAMM for Windows Version 10.4.1
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Data file name: L:\LOBBYS\WPDOCS\DOCUMENT\966\01006-KOENIG\284-Storm Water Management Plan\Villas at Prairie Song\WinSlamm Calc\2019-11-03_WINSLAMM CALC_PRAIRIE SONG VILLAS.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Madison WI 1981.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std

Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/01/81 Model Run End Date: 12/31/81
Date of run: 11-04-2019 Time of run: 11:14:10
Total Area Modeled (acres): 7.990
Years in Model Run: 1.00

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Solids Reduction
Total of all Land Uses without Controls:	123737	-	111.2	858.8	-
Outfall Total with Controls:	86276	30.27%	29.68	159.9	**81.38%**
Annualized Total After Outfall Controls:	86513			160.3	

APPENDIX 5

Welsh Oaks Storm Water & Storm Sewer Information

Welsh Oaks

Madison Street
City of Waukesha, Waukesha, WI

Storm Water Management Report

Prepared By:
Losik Engineering Design Group, Ltd.

3815 N. Brookfield Road
Brookfield WI 53045-1950
262-790-1480 (voice)
262-790-1481 (fax)

9 February 2005
REVISED: 25 April 2005

Storm Water Management Report

Welsh Oaks

Analysis Overview

In accordance with the City of Waukesha's Stormwater Management program, we are submitting the following Stormwater Management calculations for the Welsh Oaks subdivision for your review and approval. We have designed one stormwater detention pond, located along the southern edge of the development adjacent to Madison Street, to serve both the Welsh Oaks Subdivision and the Oakmont II development. Located immediately north of the Welsh Oaks site, the Oakmont II development was approved by the City in 2004 and is currently in the final stages of construction. As part of the Welsh Oaks development, the temporary wet detention basin serving Oakmont II will be removed and the stormwater will be routed to the Welsh Oaks basin. The Welsh Oaks basin will discharge to a proposed infiltration basin, located in the southeast corner of the development.

Existing and post development stormwater runoff conditions for Welsh Oaks and Oakmont II have been analyzed for**:** runoff volume, peak volume, discharge, pond storage capacity required, outlet structures and storm sewer system requirements. The software package used for modeling and analysis is Hydraflow Hydrographs 2004 by Intelisolve. Hydraflow uses TR-55 methodology "Urban Hydrology for Small Watersheds" to generate runoff and pond routing hydrographs. Hydraflow's capabilities include: modeling simple or complex watersheds, combining hydrographs to determine runoff and storage requirements, pond and outlet sizing.

The computer model analyzed the two, ten, and one hundred-year events, with TR-55 Type II rainfall distribution used for modeling. The necessary hydrographs were generated to determine the stormwater runoff rates, depths and volumes for pre and post development conditions. This information is used to calculate detention basin size and outlet requirements. Flow rates from the developed site will be reduced; outflow rates from the post-developed site for the 2, 10 and 100-year events will be less than the corresponding event under existing conditions. The 1-year event was used to determine the extended detention volume release time from the proposed pond.

Run-off curve numbers were determined using the requirements outlined in the NRCS TR-55 Manual, with composite curve numbers calculated based on present cover types (see attachments). The existing soils on the site are Type B loams: Hochheim Loam (HmB2, HmC2, and HmE2), Mayville Silt Loam (MoB), and Kendall Silt Loam (KlA).

Owner/ Developer

The owner, developer, and responsible entity for installation and maintenance of the storm water management practices is:

Oakmont Development LLC
12760 West North Avenue
Brookfield, WI 53008

Existing Site and Watershed Description

The Site is located between Summit Avenue (USH 18) and Madison Street, in the City of Waukesha. The existing site is analyzed as four sub areas, named EX-1, EX-2, EX-3 and OS-2 in the Hydraflow model. The boundary for the existing site extends from the limits of Oakmont Phase I to the west (at the limit of runoff capture) to the east property line of Welsh Oaks. The site contains an existing depression area (illustrated as DEPRESSION AREA on the plan) which does not directly runoff from the site; therefore the corresponding area was not included in the existing site calculations. The existing site is a mixture of Meadow and Woods. A composite curve number was calculated for each sub area based on the percentage of the following cover types present: Woods (good) with a CN = 55 and Meadow with a CN = 58. Refer to the Hydraflow data sheets for details on the composite curve number calculations. Runoff on the site generally goes west to east and north to south.

Area EX-1

This sub area, comprised of 46.13 acres, encompasses a majority of the Welsh Oaks and Oakmont II developments and some INRA classified wooded area. The time of concentration path runs from the northwest corner of the sub area southeast to the east edge of the site, then south to an existing culvert crossing Madison Street. The time of concentration is 44.4 minutes and the composite curve number is 57.

Area EX-2

This 7.51 acre sub area is located along the northern edge of the Oakmont II development and generally slopes to the northeast. The time of concentration path runs from the west to the northeast and leaves the site in the northeast corner of the development. The time of concentration is 28.4 minutes and composite curve number is 56.

Area EX-3

Sub area EX-3 includes 8.19 acres of the Welsh Oaks site that flows east to Pebble Creek. This sub area, located along the eastern edge of Welsh Oaks, has a time of concentration of 23.3 minutes and a composite curve number of 56.

DEPRESSION AREA

The 2.03 acre watershed area for the DEPRESSION AREA encompasses both on-site and off-site lands. This area has not been included in the existing site Hydraflow model because the runoff does not directly discharge from the site.

Area OS-2

Off site sub area OS-2, containing 37.6 acres, is situated to the west of Welsh Oaks and is comprised primarily of woods with some meadow. The time of concentration path runs southeast onto the Welsh Oaks site and discharges to the existing culvert under Madison Street. The time of concentration is 46.5 minutes and the composite curve number is 57. This off-site area will be diverted through the Welsh Oaks development as part of the proposed project; therefore the runoff from this area is not included in the allowable release rate computations.

Table 1: Pre Development Sub-Area Watershed Summary

Sub-area Name	Gross Area (Acre)	Soil Type (Cover)	Soil Names	Curve Number	Time of Concentration (minutes)	**Peak Flows** cfs **(Runoff Volume)** acre-feet 2 yr (2.7")	10 yr (4.0")	100yr (5.6")
EX-1	46.13	Type B (Woods, meadow)	Hochheim Loam, Kendall Silt Loam, Mayville Silt Loam	57	44.4	1.64 (0.619)	12.86 (2.356)	38.23 (5.481)
EX-2	7.51	Type B (Woods, meadow)	Hochheim Loam, Mayville Silt Loam	56	28.4	0.24 (0.089)	2.54 (0.359)	8.00 (0.855)
EX-3	8.19	Type B (Woods, meadow)	Hochheim Loam, Mayville Silt Loam	56	23.3	0.28 (0.098)	3.33 (0.398)	10.45 (0.949)
Total Existing Release Rate (EX-1 + EX-2 + EX-3)						2.07 (0.806)	17.28 (3.113)	51.27 (7.284)
OS-2	37.6	Type B (Woods, meadow)	Hochheim Loam, Kendall Silt Loam, Mayville Silt Loam	57	46.5	1.34 (0.504)	10.48 (1.920)	31.16 (4.467)

Post Development Watershed Description

Development of the Welsh Oaks subdivision will include 40 single family lots with an average lot size of >1/3-acre. The Oakmont II development will include 30 two-family lots with an average lot size of >1/3-acre. Storm water facilities include one wet pond and one infiltration basin, located along the southeast property lines of Welsh Oaks. The temporary wet pond currently serving Oakmont II will be removed as part of the Welsh Oaks project.

The post-developed site will be analyzed with one outfall with 6 sub areas. The runoff from sub areas P-1, P-2, P-3, and OS-1 will be directed to the wet pond; sub area P-4 will runoff directly to the infiltration basin; and sub area P-5 will be released undetained. Runoff from the off-site sub-area OS-2 to the west will be diverted through the Welsh Oaks site via a combined swale and storm sewer system that outfalls to the same general location as the existing culvert pipe under Madison Street.

Area P-1

Sub area P-1 includes a majority of the developable area within Oakmont II, and totals 19.89 acres. The time of concentration path follows the drainage swale along the east edge of the property to the storm sewer system.

Area P-2

Sub area P-2 encompasses the Welsh Oaks development, totaling 18.60 acres in size. The time of concentration path follows the rear yard drainage swale of lot 35 to the storm sewer system.

Area P-3

Sub area P-3 primarily includes 17.34 acres of steep sloped woods (classified as INRA), located immediately west of the Oakmont II developable area. The time of concentration path flows west to east along the southern edge of the area.

Area P-4

Sub area P-4 includes the infiltration basin and the rear yards of lots 8 and 9 in Welsh Oaks. This 1.49 acres flows overland directly to the infiltration basin, and has been incorporated in to the Hydraflow model accordingly.

Area P-5

Sub area P-5 is comprised of the rear yards of the lots along the east edge of Welsh Oaks, and includes some undisturbed, wooded PEC areas at the rear of the lots. This 4.12 acres is released undetained from the site, and has a composite CN based on percentage of land types present.

Area OS-1

Sub area OS-1 includes 2.42 acres of off site runoff accepted into the Welsh Oaks storm sewer system at a rear yard field inlet along the north property line of Welsh Oaks.

Area OS-2

A drainage swale and berm has been designed along the west edge of Welsh Oaks to divert the runoff from sub area OS-2. A separate storm sewer system will direct this runoff to the south side of Madison Street, discharging at the same location as the predeveloped condition.

Table 2: Post Development Sub-Area Watershed Summary

Sub-Area Name	Gross Area (Acre)	Soil Type (Cover)	Curve Number	Time of Concentration (minutes)	**Peak Flows** cfs **(Runoff Volume)** acre-feet 2 yr (2.7")	10 yr (4.0")	100 yr (5.60")
P-1	19.89	Type B (1/3 Acre Residential)	72	35.6	8.40 (1.042)	21.97 (2.393)	41.60 (4.374)
P-2	18.60	Type B (1/3 Acre Residential)	72	21.9	9.86 (0.970)	25.41 (2.228)	47.91 (4.073)
P-3	17.34	Type B (Woods, Meadow)	56	46.3	0.51 (0.202)	5.07 (0.819)	15.95 (1.951)
OS-1	2.42	Type B (Woods, Meadow)	58	46.4	0.11 (0.037)	0.76 (0.133)	2.15 (0.302)
Combined Pond Inflow (P-1 + P-2 + P-3 + OS-1)					17.81 (2.251)	50.46 (5.572)	102.80 (10.700)
P-4	1.49	Type B (1/3 Acre Residential)	72	12.0	1.25 (0.081)	3.08 (0.187)	5.73 (0.342)
P-5	4.12	Type B (1/3 Acre Residential, Woods)	64	13.3	1.36 (0.122)	5.31 (0.344)	11.55 (0.702)
OS-2	37.6	Type B (Woods, meadow)	57	46.5	1.34 (0.504)	10.48 (1.920)	31.16 (4.467)

Basin Description & Summary

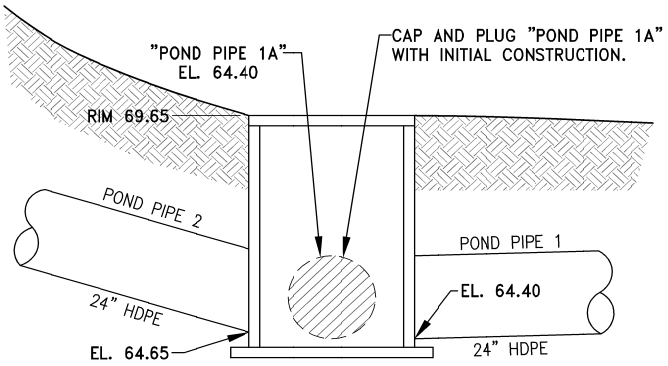
The site will contain one wet detention basin, designated as Pond P-1, located along the southern property line of Welsh Oaks, adjacent to Madison Street. Pond P-1 will detain and

treat runoff from the Oakmont II and Welsh Oaks developments, INRA woods, and one off-site area, for a total of 58.25 acres.

Upon substantial build-out of the developments, Pond P-1 will discharge to an infiltration basin located in the southeast corner of the Welsh Oaks development. Prior to substantial build-out, the pond outflow will be diverted past the infiltration basin, discharging to uplands tributary to Pebble Creek. The infiltration basin will be kept off-line until one of the following conditions is met:

- 90% build-out is achieved (within the first 3 years)
- 75% build-out (within years 4-5)
- 5 years from construction

The following diagram illustrates the methodology for bypassing the infiltration basin. Note that Pond Pipe 1A is directed to the infiltration basin and will remain capped and plugged with initial construction until one of the previous conditions is met. Refer to the construction plans for additional information.



NOTES:

- "POND PIPE 1A" TO BE CAPPED AND PLUGGED WITH INITIAL CONSTRUCTION. TO REMAIN CAPPED AND PLUGGED UNTIL ONE OF THE CRITERIA IN THE "INFILTRATION BASIN TIMELINE" IS MET.
- TO BRING THE INFILTRATION BASIN ON-LINE:
  1. REMOVE "POND PIPE 1A" CAP AND PLUG.
  2. CAP AND PLUG "POND PIPE 1".

"POND MANHOLE 1" DETAIL

The following presents the results of our detention pond design.

Design Storms

1 Years 2.3 Inches*
(*WDNR Technical Standard 1001, Table 4)
2 Years 2.7 Inches
10 Years 4.0 Inches
100 Years 5.6 Inches

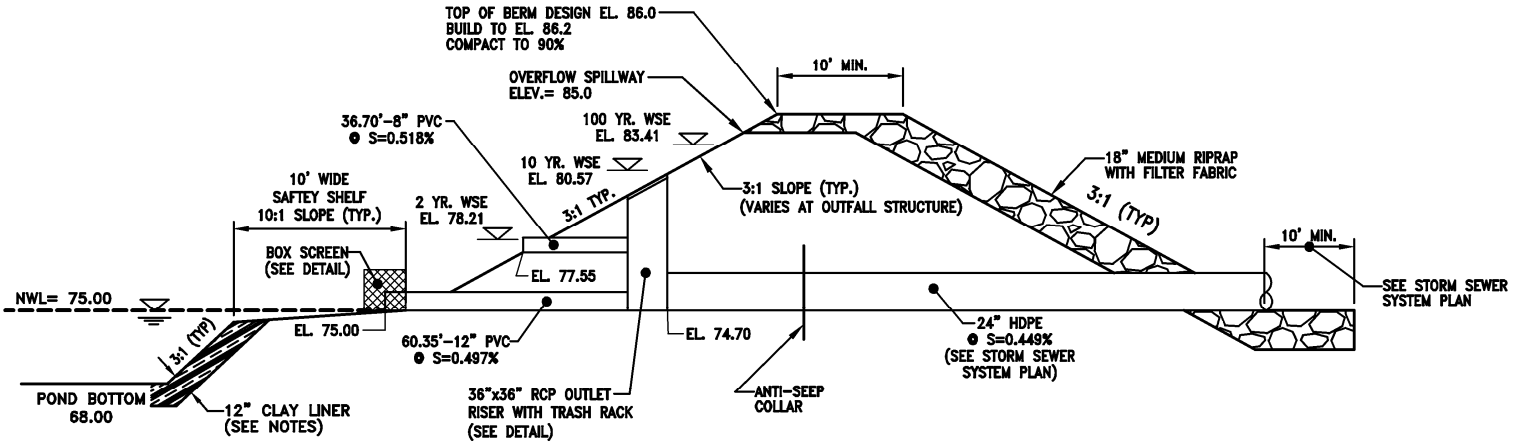
The following presents the results of our detention pond design.

Welsh Oaks
Pond P-1
Executive Summary 25 April 2005
Basin Rim Height 86.0: Normal WSEL 75.0: Maximum WSEL 83.41
Available Dry Storage 4.387 Acre-Feet

Storm	Peak Inflow (postdev)	Peak Outflow (postdev.)	Total Dry Storage	Peak Water Surface Elev.
(Year)	(cfs)	(cfs)	(acre-ft)	
1	*10.60*	*0.64*	*0.863*	*77.51*
2	17.81	1.69	1.144	78.21
10	50.46	16.39	2.269	80.57
100	102.80	34.19	3.984	83.41

Outlet Structure

The outlet structure for this wet detention basin is a 36"x36" concrete riser which is drained by a 24" HDPE pipe. The concrete riser will be constructed in the embankment of the pond with two PVC pipes extending out from it; a 12" PVC pipe extending from the normal water surface of the pond (at elevation 75.0) to the concrete riser at a 0.5% slope and an 8" PVC pipe extending from elevation 77.55 to the concrete riser as a 0.5% slope. The 12" PVC pipe has a capped end with a 4" diameter orifice in it at elevation 75.0. This orifices will be protected from blockage by a box screen around the end of the pipe. Higher frequency storms of the one year magnitude and less are controlled by the 4" orifice; the 2-year storm is controlled by the 8" diameter PVC pipe. Storm events of the 10-year magnitude and greater weir flow through the riser structure, with the 100-year event ultimately controlled by the 24" HDPE outlet pipe. In the substantial build-out condition, the 24" HDPE outlet pipe will discharge to a level spreader which discharges to the infiltration basin. Please refer to the Storm Sewer System Plan for design information on the outlet pipe storm sewer network. An overflow spillway has been provided for extreme hydrologic events. Refer to the construction plans for additional information.



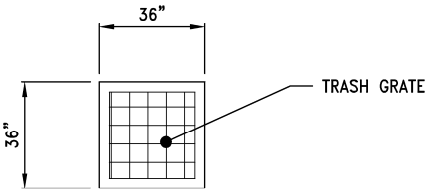
CLAY LINER NOTES:

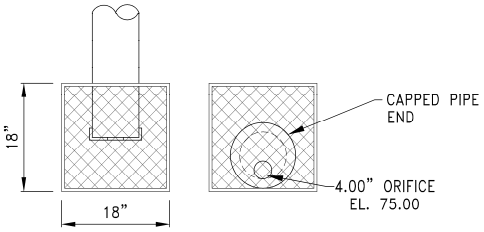
1. PLACE CLAY LINER IN ONE 1-FT LIFT PERPENDICULAR TO SLOPE.
2. TOLERANCE: MAXIMUM ACCEPTABLE VARIATION IS 2 INCHES.
3. MINIMUM COMPACTION: 85% OF MAXIMUM DRY DENSITY AS DETERMINED BY MODIFIED PROCTOR.

NOTES:

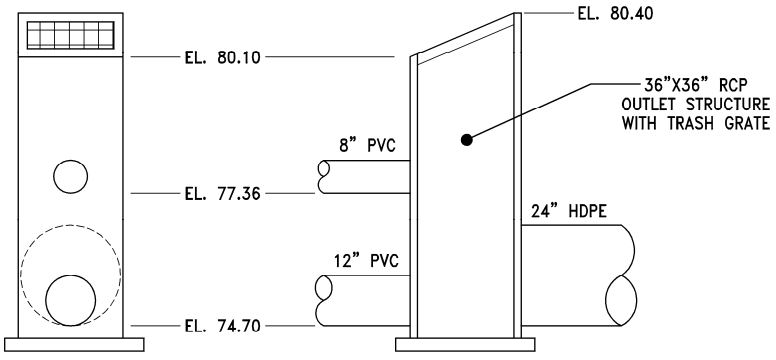
1. COMPACT POND SLOPES TO 90% PROCTOR.
2. SEE STORM SEWER SYSTEM PLAN AND "POND MANHOLE 1" DETAIL FOR OUTFALL PIPE SYSTEM CONSTRUCTION.

POND OUTLET STRUCTURE DETAIL





BOX SCREEN DETAIL



PERMANENT OUTLET STRUCTURE DETAIL

Infiltration Basin Description & Summary

The infiltration basin receives treated stormwater from Pond P-1 and rear yard runoff from sub area P-4, which meets DNR pretreatment standards. The infiltration basin was sized according to the "Technical Note for Sizing to Meet State of Wisconsin Stormwater Infiltration Performance Standards" provided by the DNR. This method incorporates charts to determine the target stay-on depth for infiltration basins and the effective infiltration area requirements for infiltration basins. Chart 1: Target Stay-on (Annual Infiltration) Requirement was used to derive the Target Stay-on Depth of 25.75 inches/yr, which was determined by applying a Pre-Development Curve Number (CN) of 57 to the NR 151 Residential Requirement design curve. To size the infiltration basin, Chart 8: Infiltration Basin Design Curve Loamy Sand Soil: Kd=1.63 in/hr and 24-inch Ponding Depth was utilized. Applying the Target Stay-on Requirement of 25.75 inches/yr and interpolating between the 40% Impervious design curves for a CN of 72, the required Infiltration Basin Area (% of Drainage Basin) equals 0.94%. This requires a minimum surface area of 7,616 S.F. for the 18.6 acre drainage area for Welsh Oaks; our design provides 8,500 S.F. of surface area in the infiltration basin.

Soil tests taken in the basin area show a sand layer overlaid by 12 to 13 feet of silty soil. Our design proposes excavating down to the existing sand layer and backfilling the basin area with sand. Over this sand layer will be a planting mixture, composed of 40% sand, 30% topsoil and 30% compost and planted with a native planting mixture. This layer will be separated from the sand layer by geotextile fabric. 6" perforated underdrain pipe will be installed 6 feet below the basin in the sand backfill layer. The discharge pipe for this underdrain will be capped. The pond outfall pipe has been designed to discharge to a riprap-lined level spreader prior to reaching the infiltration basin. A concrete curb will be embedded in the spreader lip to prevent erosion under higher storm events. The east embankment of the infiltration basin will be lined with riprap to protect against erosion. The proposed basin bottom longitudinal slope is 0.2%. Refer to the construction plan sheets for additional information.

The information provided below conservatively assumes zero infiltration in the basin and assumes that the basin is 99% full. Refer to the attached sheets for additional information.

Welsh Oaks

Infiltration Basin

Executive Summary 25 April 2005

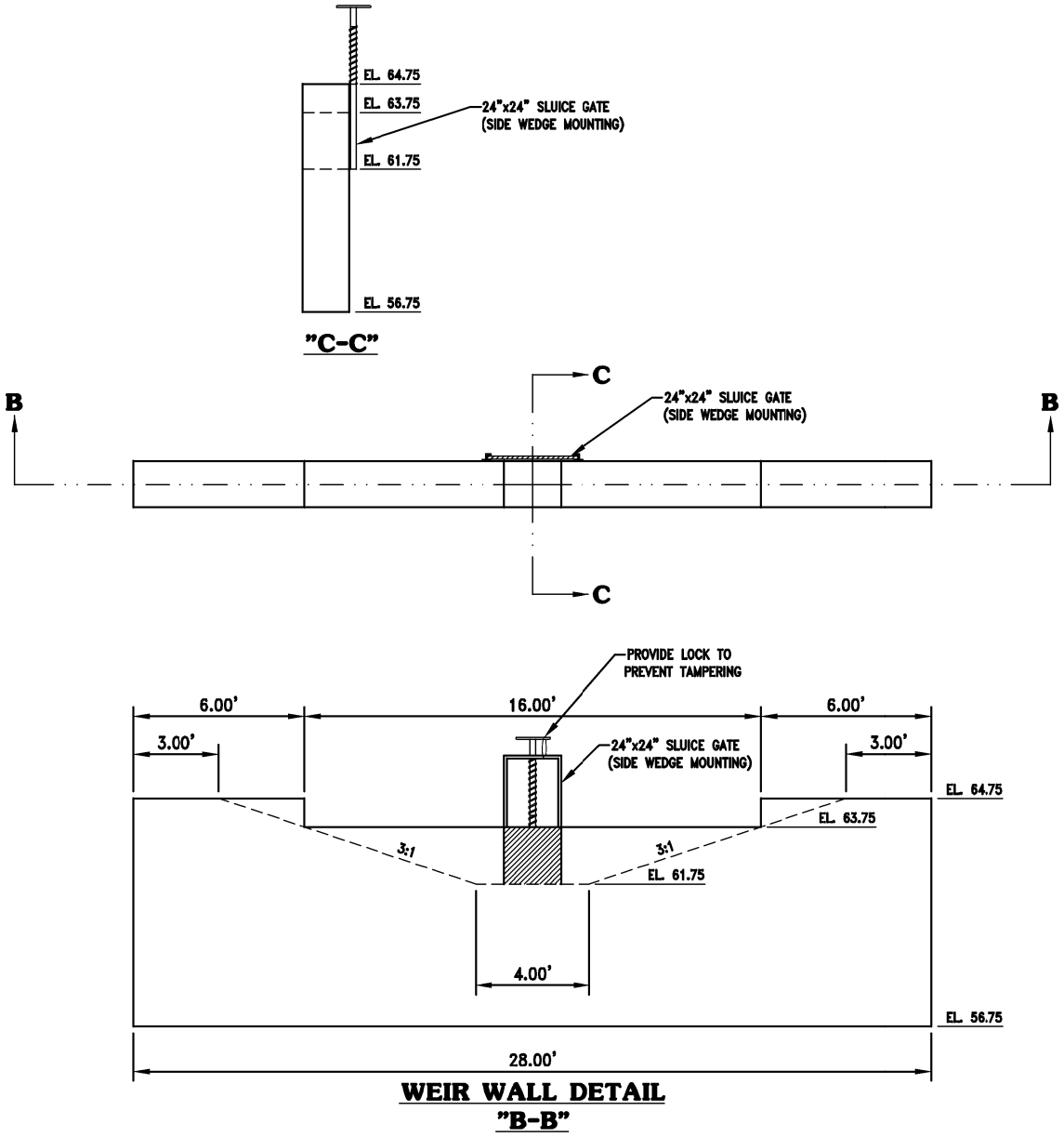
Basin Rim Height 65.0: Basin Rim Width: 10': Maximum WSEL 64.50*
Available Dry Storage 0.444 Acre-Feet

*Assuming zero infiltration

Storm	Peak Inflow (postdev)	Peak Outflow (postdev)	Total Dry Storage	Peak Water Surface Elev.
(Year)	(cfs)	(cfs)	(acre-ft)	
1	*0.83*	*0.67*	*0.397*	*63.80*
2	1.74	1.74	0.407	63.85
10	16.70	16.01	0.495	64.20
100	34.73	34.70	0.574	64.50

Outlet Structure

The outlet structure for the infiltration basin is a rectangular weir with a crest elevation of 63.75. The rectangular weir has a crest length of 16 feet, a crest elevation of 63.75, and a top of structure elevation of 64.75. The width of the weir wall is 28 feet and the height is 8 feet, with the bottom of the weir wall set to 5 feet below the bottom of the basin. The 2, 10, and 100 year storm events will pass through the rectangular weir once the basin has filled, as modeled in Hydraflow. The draw-down device proposed is a 24"x24" Side Wedge Mounted Sluice Gate, which controls flow through a 2' by 2' opening in the weir wall. This device can be closed to provide infiltration and easily opened to provide drawdown for maintenance (and will be locked to prevent tampering). Refer to the construction plans and the figure below for additional information.



Total Site Discharge

The total proposed release rate for the site combines the outflow from the infiltration basin and the runoff from sub area P-5, comprised of rear yard drainage, PEC area, and area along the east property line that will be allowed to release undetained. The total proposed release rates and the allowable release rates are provided in the table below.

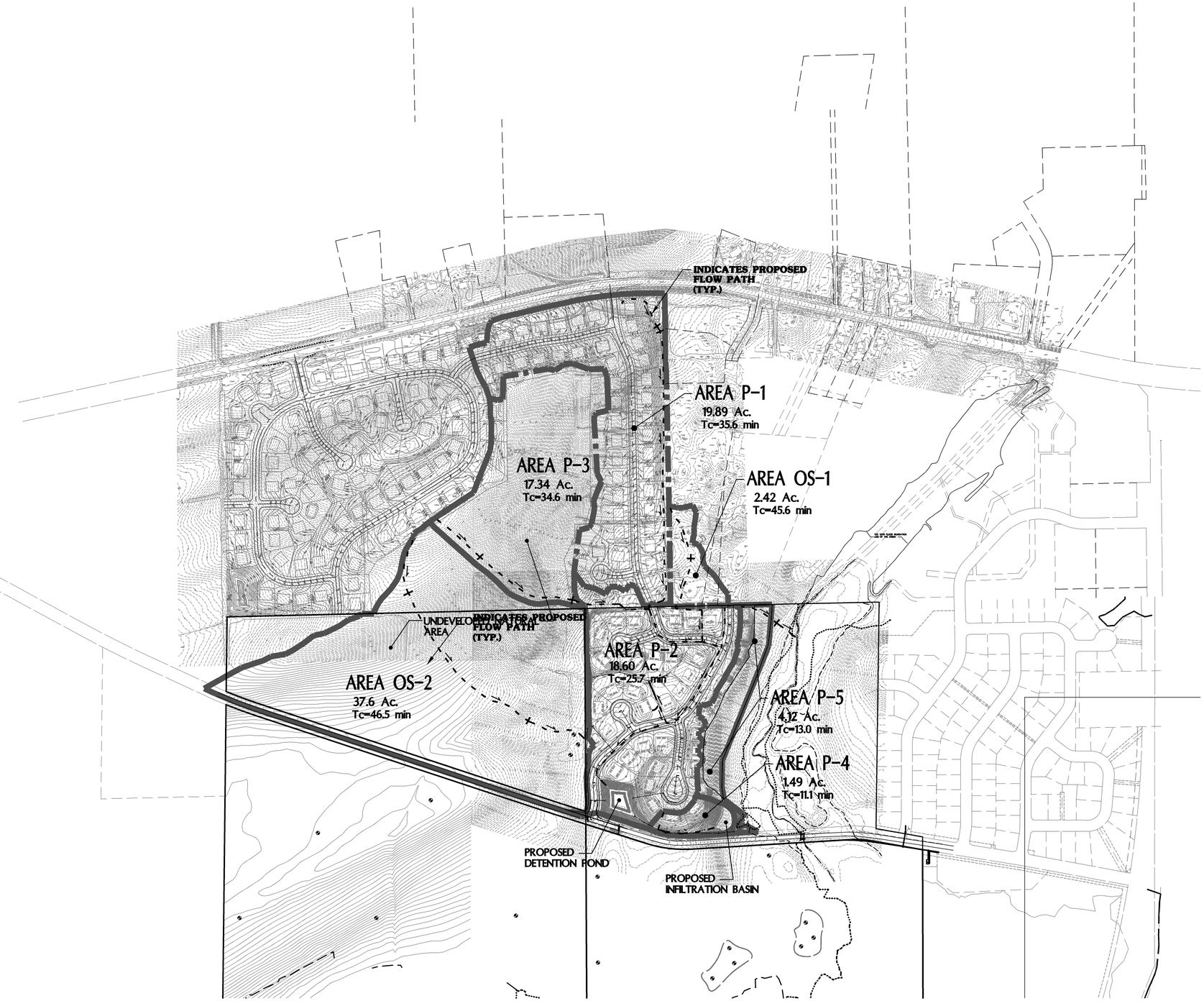
Storm Event	Infiltration Basin Release Rate	Area P-5 Release Rate	**Total Proposed Release Rate**	**Allowable Release Rate**
(Year)	*(cfs)*	*(cfs)*	***(cfs)***	***(cfs)***
2	1.74	1.36	**1.84**	**2.07**
10	16.01	5.31	**16.60**	**17.28**
100	34.70	11.55	**35.88**	**51.27**

Water Quality

Water quality will be provided by the grass swales which convey runoff to the storm sewer system. The wet detention pond will be the primary water quality best management practice. The detention pond has a normal water elevation of 75.0, which has a water surface area of 12,857 S.F. To provide an 80% reduction in TSS, WDNR recommends a discharge rate of 5.12×10^{-5} cfs/ft^2 under the 1-year 24-hour storm event to ensure the precipitation of the five micron particle. Multiplying this factor by the water surface area, the proposed pond has a water quality discharge rate of 0.66 cfs. The 1-year storm event produces a discharge rate of 0.64 cfs; therefore the proposed pond meets WDNR water quality standards.

WDNR Technical Standard 1001 also requires that the outfall structure be designed to release the extended detention volume, defined as the runoff volume produced by the 1-year 24-hour storm event, over a period of 24 hours or greater. In the Hydraflow model, the peak water surface elevation of 77.51 and the peak discharge of 0.64 cfs for the pond is reached at hour 20.10; 24 hours later, at hour 44.10, the water surface elevation is 75.43 with a discharge of 0.22 cfs; at hour 51.10, the water surface elevation is 75.18 with a discharge of 0.08 cfs. This information illustrates that the extended detention volume is released in a period greater than 24 hours and the pond is drawn down to near the normal water surface elevation by the 31st hour. Refer to the Extended Detention Volume Hydrograph Discharge Table for additional information.

PROPOSED DRAINAGE MAP



SCALE: 1" = 200'

295/01006-S/342DRA02

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revisions

date	description
08-03-04	
02-14-05	PER COUNTY REVIEW

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A PLANNED RESIDENTIAL COMMUNITY
"WELSH OAKS"
BY
THOMPSON CORPORATION
BROOKFIELD, WISCONSIN

PROPOSED DRAINAGE MAP

SHEET 2 OF 2

SEPT 1, 2003

PROJECT: WELSH OAKS STORM SEWER CALCULATIONS

LOCATION: CITY OF WAUKESHA, WI

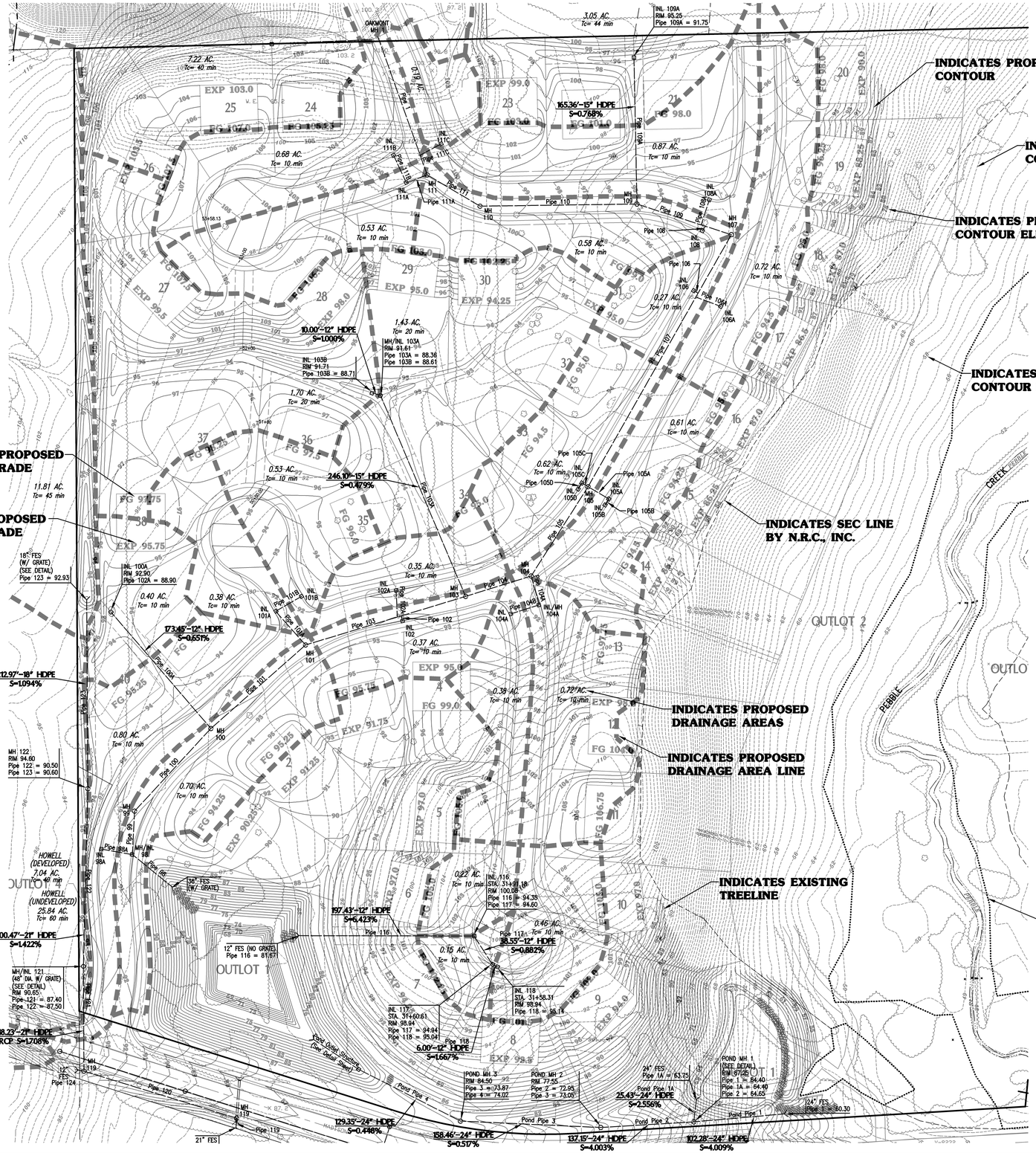
DATE: 6/10/2005

BY: J.D.P.

PIPE		FROM	TO	SUB AREA (ac)	TOTAL AREA (ac)	FLOW COEF (C)	OVERLAND TIME (T) (min)	TOTAL TIME (T_c) (min)	INTENSITY (I) (in/hr) **(10 YR)**	**TOTAL FLOW (Q) (cfs)**	LENGTH (ft)	DROP (ft)	REQ'D DROP (ft)	SLOPE (%)	**SIZE (in)**	FLOW FULL (cfs)	**PARTS FULL (q/Q)**	UNIFORM VELOCITY UP (ft/s)	UNIFORM VELOCITY DOWN (ft/s)	INVERT UP (EL.)	INVERT DOWN (EL.)	RIM UP (EL.)	RIM DOWN (EL.)
Century Oak Drive											↙ Flow rate from Oakmont II												
Pipe	**3**	MH 3 (OAKMNT)	MH 1 (OAKMNT)	22.76	22.76	0.26	42	42	2.48	**14.8**	188.31	4.2	0.81	2.23	**24**	34.224	**0.432**	0	10.5	101.2	97	106.2	101.94
Pipe	**1C**	INL 1C	INL 1A (OAKMNT)	7.22	7.22	0.2	40	40	2.55	**3.71**	112.54	0.57	0.37	0.506	**15**	4.649	**0.798**	0	4.21	96.8	96.23	100.05	101.8
Pipe	**1A**	INL 1A (OAKMNT)	MH 1 (OAKMNT)	0.13	7.35	0.35	10	40.62	2.52	**3.79**	8	0.08	0.03	1	**15**	8.858	**0.428**	6.94	9.76	96.13	96.05	101.8	101.94
Pipe	**1**	MH 1 (OAKMNT)	MH 111	7.04	37.15	0.26	42	42.3	2.47	**22.99**	165.4	1.33	0.91	0.804	**27**	28.189	**0.816**	7.91	7.91	95.05	93.72	101.94	100.01
Pipe	**111C**	INL 111C	MH 111	0.19	0.19	0.35	10	10	5.1	**0.34**	36.38	1.09	0.00	2.997	**12**	6.508	**0.052**	0	13.49	96.06	94.97	100.06	100.01
Pipe	**111B**	INL 111B	INL 111A	0.68	0.68	0.35	10	10	5.1	**1.22**	34.76	0.2	0.04	0.575	**12**	2.787	**0.438**	0	3.25	95.62	95.42	99.55	99.55
Pipe	**111A**	INL 111A	MH 111	0.53	1.21	0.35	10	10.46	5.02	**2.14**	25.19	0.2	0.09	0.794	**12**	3.439	**0.622**	4.5	8.29	95.17	94.97	99.55	100.01
Pipe	**111**	MH 111	MH 110	0	38.55	0.2	10	42.78	2.45	**24.02**	69.18	0.57	0.42	0.824	**27**	29.172	**0.823**	8.2	8.2	93.47	92.9	100.01	99.63
Pipe	**110**	MH 110	MH 109	0	38.55	0.2	10	42.97	2.44	**23.95**	177.15	3.12	1.06	1.761	**27**	41.672	**0.575**	10.85	10.85	92.65	89.53	99.63	94.78
Pipe	**109A**	INL 109A	MH 109	3.05	3.05	0.25	44	44	2.41	**1.85**	168.67	1.22	0.14	0.723	**15**	5.554	**0.333**	0	7.58	91.75	90.53	95.25	94.78
Pipe	**109**	MH 109	MH/INL 108	0	41.6	0.2	10	45.61	2.35	**24.87**	78.42	1.88	0.51	2.397	**27**	49.698	**0.500**	12.51	12.51	89.38	87.5	94.78	92.25
Pipe	**108A**	INL 108A	MH/INL 108	0.87	0.87	0.35	10	10	5.1	**1.57**	36.55	0.2	0.07	0.547	**12**	2.802	**0.560**	0	6.98	88.85	88.65	92.28	92.25
Pipe	**108**	MH/INL 108	MH 107	0.58	43.05	0.35	10	45.72	2.35	**26.04**	30.49	0.3	0.12	0.984	**30**	45.377	**0.574**	9.54	9.54	87.25	86.95	92.25	92.8
Prairie Song Drive																							
Pipe	**107**	MH 107	MH 105	0.99	44.04	0.35	10	45.77	2.35	**26.84**	314.33	0.8	0.51	0.255	**36**	33.96	**0.790**	5.33	5.33	86.45	85.65	92.8	92.07
Pipe	**105D**	INL 105D	INL 105C	0.31	0.31	0.35	10	10	5.1	**0.56**	8	0.05	0.00	0.625	**12**	3.278	**0.171**	0	3.05	88.11	88.06	91.9	91.88
Pipe	**105C**	INL 105C	MH 105	0.31	0.62	0.35	10	10.11	5.08	**1.11**	8.52	0.16	0.01	1.878	**12**	6.891	**0.161**	6.37	14.41	87.81	87.65	91.88	92.07
Pipe	**105B**	INL 105B	INL 105A	0.3	0.3	0.35	10	10	5.1	**0.54**	8	0.05	0.00	0.625	**12**	3.278	**0.165**	0	3.03	88.11	88.06	91.9	91.88
Pipe	**105A**	INL 105A	MH 105	0.31	0.61	0.35	10	10.04	5.09	**1.1**	27.48	0.16	0.03	0.582	**12**	2.956	**0.372**	3.45	7.77	87.81	87.65	91.88	92.07
Pipe	**105**	MH 105	MH 104	0	45.27	0.2	10	46.86	2.31	**27.37**	119.44	0.31	0.20	0.26	**36**	34.851	**0.785**	5.46	5.46	85.55	85.24	92.07	92.52
Pipe	**104B**	INL 104B	INL 104A	0.38	0.38	0.35	10	10	5.1	**0.68**	34	0.2	0.01	0.588	**12**	2.82	**0.241**	0	2.88	87.99	87.79	91.79	91.79
Pipe	**104A**	INL 104A	MH 104	0.72	1.1	0.35	10	10.27	5.05	**1.96**	33.8	0.24	0.10	0.71	**12**	3.209	**0.611**	4.13	8.3	87.59	87.35	91.79	92.52
Pipe	**104**	MH 104	MH 103	0	46.37	0.2	10	47.27	2.29	**28.1**	77.47	0.21	0.14	0.271	**36**	36.14	**0.778**	5.65	5.65	84.99	84.78	92.52	92.51
Pipe	**103B**	INL 103B	INL 103A	1.7	1.7	0.3	20	20	3.82	**1.96**	10	0.1	0.03	1	**12**	4.504	**0.435**	0	5.54	88.71	88.61	91.71	91.61
Pipe	**103A**	INL 103A	MH 103	1.43	3.13	0.3	20	20.05	3.82	**3.61**	246.1	1.1	0.77	0.447	**15**	4.366	**0.827**	3.98	6.73	88.36	87.26	91.61	92.51
Pipe	**103**	MH 103	MH 101	0.72	50.22	0.35	10	47.54	2.28	**30.74**	187.78	0.54	0.40	0.288	**36**	36.337	**0.846**	5.77	5.77	84.68	84.14	92.51	92.5
Pipe	**101B**	INL 101B	INL 101A	0.53	0.53	0.35	10	10	5.1	**0.95**	34	0.17	0.02	0.5	**12**	2.6	**0.365**	0	2.93	87.99	87.82	91.74	91.74
Pipe	**101A**	INL 101A	MH 101	0.38	0.91	0.35	10	10.21	5.06	**1.63**	52.86	0.27	0.11	0.511	**12**	2.654	**0.614**	3.5	7.4	87.57	87.3	91.74	92.5
Pipe	**101**	MH 101	MH 100	0	51.13	0.2	10	48.12	2.27	**31.22**	142.47	0.41	0.31	0.288	**36**	36.542	**0.854**	5.81	5.81	83.99	83.58	92.5	91.77
Pipe	**100A**	INL 100A	MH 100	0.4	0.4	0.3	10	10	5.1	**0.62**	175.45	1.13	0.05	0.644	**12**	2.893	**0.214**	0	7.94	88.9	87.77	92.9	91.77
Pipe	**100**	MH 100	MH 99	0	51.53	0.2	10	48.55	2.25	**31.25**	129.11	0.38	0.28	0.294	**36**	37.04	**0.844**	5.88	5.88	83.48	83.1	91.77	91.04
Pipe	**99**	MH 99	MH/INL 98	0	51.53	0.5	10	48.92	2.23	**31.05**	45.84	0.17	0.10	0.371	**36**	43.55	**0.713**	6.69	6.69	82.85	82.68	91.04	90.61
Pipe	**98A**	INL 98A	MH/INL 98	0.8	0.8	0.35	10	10	5.1	**1.44**	36	0.18	0.06	0.5	**12**	2.681	**0.537**	0	7.48	86.61	86.43	90.61	90.61
Pipe	**98**	MH 98	Outfall	0.7	53.03	0.35	10	49.05	2.23	**32.17**	57.75	0.2	0.13	0.346	**36**	40.294	**0.798**	6.32	0	82.43	82.23	90.61	82.23
Griffith Court																							
Pipe	**118**	INL 118	INL 117	0.46	0.46	0.35	10	10	5.1	**0.83**	6	0.1	0.00	1.67	**12**	6.19	**0.134**	0	5.27	95.1	95	98.9	98.9
Pipe	**117**	INL 117	INL 116	0.15	0.61	0.35	10	10.06	5.09	**1.1**	42.51	0.34	0.04	0.8	**12**	3.27	**0.336**	3.75	3.75	94.9	94.56	98.9	100.04
Pipe	**116**	INL 116	Outfall	0.22	0.83	0.35	10	10.51	5.01	**1.47**	192.69	12.64	0.33	6.56	**12**	9.14	**0.161**	8.52	0	94.31	81.67	100.04	81.67
Madison Street																							
Pipe	**202B**	INL 202B	MH 202	0.61	0.61	0.4	10	10	5.1	**1.25**	6	0.17	0.01	2.83	**12**	11.07	**0.113**	0	8.77	81.55	81.38	85.55	85.63
Pipe	**202A**	INL 202A	MH 202	0.31	0.31	0.5	5	5	6.48	**1.01**	32	0.17	0.03	0.53	**12**	2.79	**0.362**	0	3.26	81.55	81.38	85.55	85.63
Pipe	**202**	MH 202	MH 201	0	0.92	0.5	10	10.04	5.09	**2.05**	200.28	5.7	0.66	2.85	**12**	6.1	**0.336**	7	7	81.13	75.43	85.63	79.72
Pipe	**201B**	INL 201B	MH 201	0.48	0.48	0.4	10	10	5.1	**0.99**	6.02	0.17	0.00	2.82	**12**	11	**0.090**	0	10.72	75.6	75.43	79.6	79.72
Pipe	**201A**	INL 201A	MH 201	0.18	0.18	0.5	5	5	6.48	**0.59**	31.98	0.17	0.01	0.53	**12**	2.79	**0.211**	0	3.88	75.6	75.43	79.6	79.72
Pipe	**201**	MH 201	MH 200	0	1.58	0.5	5	11.03	4.93	**3.39**	216.34	14.89	1.96	6.88	**12**	9.45	**0.359**	11.04	11.04	75.18	60.29	79.72	64.75
Pipe	**200B**	INL 200B	MH 200	0.4	0.4	0.4	10	10	5.1	**0.82**	6.62	0.16	0.00	2.42	**12**	8.41	**0.098**	0	10.13	60.6	60.44	64.6	64.75
Pipe	**200A**	INL 200A	MH 200	0.16	0.16	0.5	5	5	6.48	**0.52**	31.38	0.16	0.01	0.51	**12**	2.71	**0.192**	0	4.31	60.6	60.44	64.6	64.75

STORM SEWER SYSTEM PLAN

SCALE: 1" = 60'



STORM SEWER NOTE:

CONTRACTOR SHALL HAVE THE OPTION OF USING H.D.P.E. OR R.C.P. PIPE FOR ALL PROPOSED STORM SEWER PIPE.

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revisions

date	description
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06-14-05	PER CITY REVIEW

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"WELSH OAKS"
WAUKESHA, WISCONSIN
BY:
THE THOMSON CORPORATION
BROOKFIELD, WISCONSIN

STORM SEWER SYSTEM PLAN

SHEET 7 OF 18

FEBRUARY 11, 2005

295/01006-S/170STS01