FINAL STORMWATER REPORT

Detail Center
Town Center Drive & Independence Avenue
Lee's Summit, Missouri 64064

Prepared For:

City of Lee's Summit
220 SE Green St
Lee's Summit, MO 64063

Prepared by:

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Revised: 11.05.2020
Revised: 01.22.2021
Project No. 19076

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GENERAL INFORMATION

The proposed commercial development for Lee's Summit Town Center, LLC is located northwest of the intersection of Town Center Drive and Independence Avenue. The total area for the development is this property is approximately 5.57 acres.

The current site soil condition for this property is classified as "Greenton-Urban, 5 to 9 percent Slopes", with a Map Unit Symbol of '2qky4'. The hydrological soil group for this site is Class D. The site lies entirely within 'Zone X', areas determined to be outside the 0.2% annual chance floodplain as depicted on the FEMA Flood Insurance Rate Map (FIRM) no. 29095C0430G, Revision Date: January 20, 2017.

Figure 1 – Location Map (no scale)

METHODOLOGY

KCAPWA IDF curves were used to determine the rainfall intensity for 2, 10, and 100-year storm events. Hydraflow Hydrographs Extension for AutoCAD 2020 was used to determine runoff flow amounts for existing and proposed site conditions. Hydraflow computes the rational method runoff hydrographs by convoluting a rainfall hyetograph through a unit hydrograph. Convolution is known as linear superpositioning where each ordinate of the rainfall hyetograph is multiplied by each ordinate of the unit hydrograph, thus creating a series of hydrographs. These hydrographs are then summed to form the final runoff hydrograph.

EXISTING CONDITIONS

The existing project site location is 5.57 acres, with the entirety of the property being pervious area. Runoff from this site flows from the northwest of the property to east. For analysis, the majority of the undeveloped area, encompassed by NE Town Center Boulevard was taken into consideration for runoff volume contribution. The resulting area is approximately 29.35 acres of pervious area. The area for the two existing ponds was added to the overall impervious area contributing to runoff. The total runoff volume, including the areas for the existing ponds, will be considered for the detention ponds design.

An existing storm inlet at the east end of the property along NE Independence Avenue allows runoff to be conveyed east toward an existing dedicated drainage area. Refer to Sheet C3.1 "Existing Drainage Map" in Appendix A for the existing drainage patterns for the property.

Table 1 below shows the peak discharges for the 2, 10, and 100-year rainfall events. Refer to Appendix B for Complete Hydraflows Report and results for the existing site conditions.

Table 1 – Existing Site Runoff Hydraflow Results

Storm Event	Pre-developed Peak Flow (cfs)
2-Yr	34.18
10-Yr	47.72
100-Yr	71.89

PROPOSED CONDITIONS

The existing property will undergo development for a proposed commercial area for Lee's Summit Town Center LLC. The proposed development will increase the impervious area from 0.60 acres to 2.90 acres, with the remaining 29.35 acres as open grass area. Refer to sheet C3.2 "Proposed Drainage Map" in Appendix A for the proposed drainage patterns for the property. The runoff will be collected and conveyed to a detention pond by way of natural topography and proposed storm sewer network where the existing storm inlet, at the eastern edge of the property, will further convey the runoff towards the existing dedicated drainage area.

Table 2 shows the increase in peak discharge rates for the 2, 10, and 100-year storms rainfall events, due to the increase in impervious area.

Table 2 – Proposed Site Runoff Hydraflow Results without Detention	
Storm Event	Pre-developed Peak Flow (cfs)
2-Yr	39.21
10-Yr	53.77
100-Yr	89.21

In order to mitigate the increase in discharge rates from the site due to the increase in impervious area created by the proposed development, two separate storm networks are proposed to direct runoff to the existing drainage area via the existing storm inlet at the east edge of the property.

Table 3 shows the resulting discharge rates for the 2, 10, and 100-year rainfall events with the proposed storm networks and detention pond.

Table 3 – Proposed Site Runoff Hydraflow Results with Detention	
Storm Event	Post-developed Peak Flow (cfs)
2-Yr	1.00
10-Yr	2.60
100-Yr	17.38

Hydraflow Hydrographs Extension for AutoCAD civil 3D was used to model the post developed site with the proposed storm system. A complete hydrograph can be found in Appendix C.

The above mentioned methodology was used to design the proposed detention pond to effectively capture and discharge the total runoff from the contributing drainage area, per the requirements set by APWA Section 5601.5.A.4.a. The discharge rates are controlled by a proposed storm structure to maintain release rates less than the rates, while also achieving water quality requirements indicated within APWA Section 5608.4.C.1, where post-development peak discharge rates shall not exceed those indicated below:

- 50% storm peak rate less than or equal to 0.5 cfs per acre
  - Site specific allowable release rate: 14.68
- 10% storm peak rate less than or equal to 2.0 cfs per acre
  - Site specific allowable release rate: 58.7
- 1% storm peak rate less than or equal to 3.0 cfs per acre
  - Site specific allowable release rate: 88.05

The above site specific release rates are considerably high due to the large area that is under consideration for detention design. Using a larger time of concentration for the undeveloped areas provides skewed release rates as the developed area is conveyed through the system before the additional impact of the undeveloped areas, yielding in a reduction in release rates for post-development conditions. Adjusting time of concentration to allow for contribution from the undeveloped grass land before developed area is released allows a more intuitive understanding of overall volume of runoff to be detained and released.

The design of the detention basin and outlet elevations were determined by using varying rainfall events to both effectively discharge the collected runoff and meeting water quality requirements.

For water quality design consideration, a perforated riser is proposed to reach the water quality rainfall event elevation. Perforations within the riser allow for a controlled discharge from the detention pond through the proposed storm network, meeting the minimum forty-hour extended detention requirement for comprehensive control.

Any overflow from the existing pond to the west will be collected and routed via a proposed earthen drainage swale to the north of the proposed development, and then to the detention pond. Outlet pipes convey storm water to existing infrastructure leading to an existing detention area to the east.

A spillway for the proposed detention pond was designed using the 100-yr water surface elevation of 985.67’. Manipulating the design within the Hydraflows program to simulate clogged conditions and zero available storage the spillway crest elevation was set 0.5’ above the 100-yr water surface elevation at 986.37’. One foot of freeboard is available above the 100-yr water surface elevation to the top of the berm at 987’. The emergency spillway will allow the overflow to drain towards NE Independence Ave, and into the existing storm infrastructure.

SUMMARY

The proposed commercial development for Lee's Summit Town Center, LLC is located northwest of the intersection of Town Center Drive and Independence Avenue increases the amount of impervious area within the property. To account for the increase in runoff, storm networks and a detention basin have been designed to maintain the discharge rates below existing conditions flow rates.

Off-site contributions to runoff have been considered for the detention pond design. Outlet pipes and structures control peak discharge rates to less than that of existing conditions, while also meeting water quality requirements for the water quality rainfall event.

Table 4 below provides the discharge rates for the existing and post developed conditions for the 2, 10, and 100-year rainfall events for this site.

Table 4 – Total Runoff Volume Comparison

Storm Event (yr)	Pre-development Discharge (cfs)	Post-development Discharge (cfs)	Difference (cfs)
2	34.18	1.00	33.18
10	47.72	2.60	45.12
100	71.89	17.38	54.51

Appendix A

Supporting Data

Map Scale: 1:961 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 20, Sep 16, 2019

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

Date(s) aerial images were photographed: Sep 6, 2019—Nov 16, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10024	Greenton-Urban land complex, 5 to 9 percent slopes	4.0	98.8%
10128	Sharpsburg-Urban land complex, 2 to 5 percent slopes	0.0	1.2%
Totals for Area of Interest		**4.0**	**100.0%**

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Missouri State Plane West Zone (FIPS zone 2403). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from the U.S.D.A Farm Service National Agriculture ImageryProgram (NAIP) dated 2014. Produced at scale of 1:24,000.

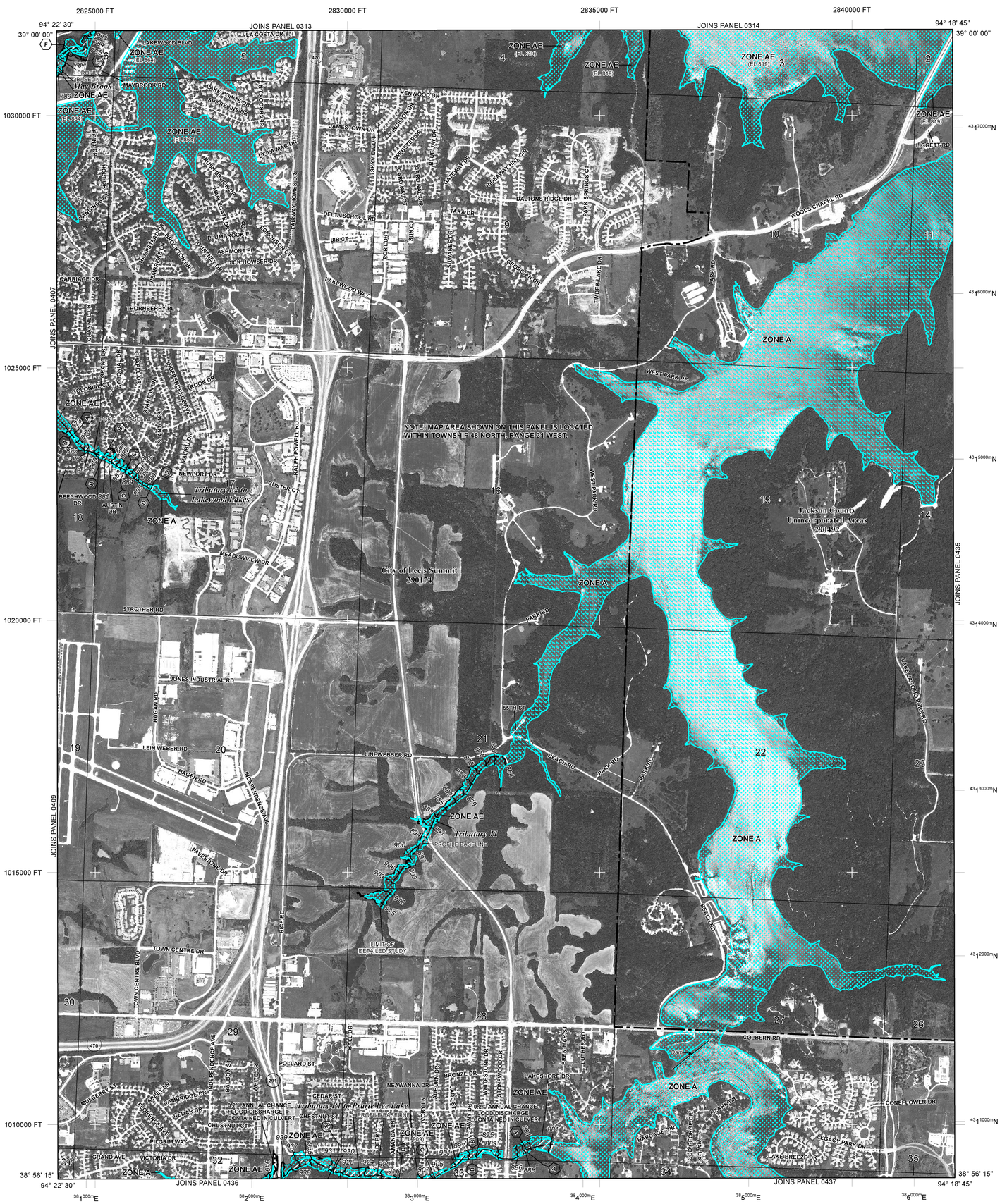
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.



LEGEND

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

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

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

FLOODWAY AREAS IN ZONE AE

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

OTHER FLOOD AREAS

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

OTHER AREAS

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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

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

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: Missouri State Plane West Zone (FIPS Zone 2403), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 29, 2006

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
January 20, 2017 - to change Special Flood Hazard Areas.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0430G

FIRM

FLOOD INSURANCE RATE MAP

JACKSON COUNTY, MISSOURI AND INCORPORATED AREAS

PANEL 430 OF 625
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
JACKSON COUNTY	290492	0430	G
LEE'S SUMMIT, CITY OF	290174	0430	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
29095C0430G
MAP REVISED
JANUARY 20, 2017

Federal Emergency Management Agency

Local Benchmarks: BM–#

BM–1: Storm Structure, Manhole Cover
Elevation: 982.05'
N: 1013823.1378
E: 2827361.8656

BM–2: Storm Structure, Manhole Cover
Elevation: 1001.21'
N: 1013384.7454
E: 2827199.0101

Floodplain Note:

The site lies entirely within 'Zone X', areas determined to be outside the 0.2% annual chance floodplain as depicted on the FEMA Flood Insurance Rate Map (FIRM) no. 29095C0430G, Revision Date: January 20, 2017.

Drainage Legend

- drainage area
- existing flow direction

Property Legend

- right of way
- property lines
- easements
- setbacks

Grading Legend

- existing minor contour
- existing major contour
- proposed minor contour
- proposed major contour

Utility Legend

- existing
- proposed

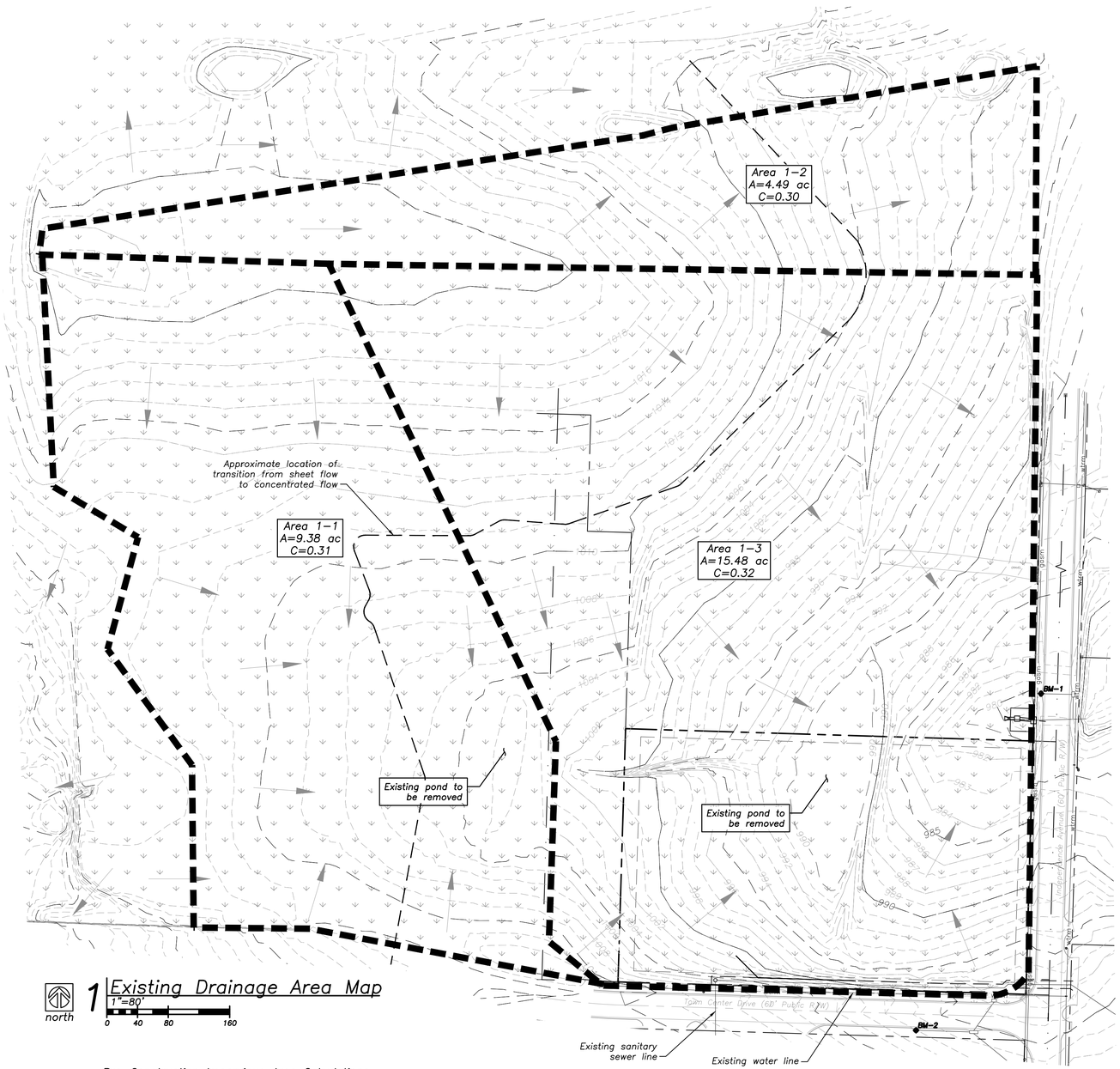
Linetypes

sanm	sanitary main
sans	sanitary service
	storm sewer (existing)
	storm sewer (solid wall, proposed)
stm	storm sewer (solid wall, proposed)
	storm sewer (perforated, proposed)
wtrm	water main
wtrf	water service (fire)
wtrd	water service (domestic)
wtri	water service (irrigation)
gasm	natural gas main
gass	natural gas service schematic
elpu	underground primary electric
elsu	underground secondary electric
elpo	overhead electric
datu	underground cable/phone/data
datsu	underground cable/phone/data service
	fence–chainlink
	fence–wood
	fence–barbed wire
	treeline

Symbol Legend

- sanitary manhole
- service cleanout
- force main release valve
- rectangular structure
- circular structure
- fire hydrant
- water valve
- water meter
- backflow preventer
- natural gas meter
- service transformer (pad mount)
- primary switch gear
- light pole
- cable/phone/data junction box
- street light
- pedestrian street light
- electric pole
- guy wire
- end section

north **2** Vicinity Map
No Scale



north **1** Existing Drainage Area Map
1"=80'
0 40 80 160

Pre–Construction Impervious Area Calculations

	Square Feet	Acres
Area of Site	1,252,503	28.75
Impervious Area	25,983	0.60
Pervious Area	1,278,486	29.35

Q: 2 year	34.18	cfs
10 year	47.72	cfs
100 year	71.89	cfs

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architecture&engineering
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STATE OF MISSOURI
SKYLER LEE MARTIN
NUMBER PE-2010021221
PROFESSIONAL ENGINEER
01/25/2021

Automotive Sales & Detail Center

A New Facility for

2100 NE Independence Ave
Lee's Summit, Missouri 64064

date

drawn by
SLM
checked by
PAM
revisions

03.24.2020	1
09.10.2020	2
11.13.2020	FDP
01.25.2021	FDP

sheet number
C3.1
drawing type
fdp
project number
19076

Local Benchmarks: BM–#

BM–1: Storm Structure, Manhole Cover
Elevation: 982.05'
N: 1013823.1378
E: 2827361.8656

BM–2: Storm Structure, Manhole Cover
Elevation: 1001.21'
N: 1013384.7454
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Floodplain Note:

The site lies entirely within 'Zone X', areas determined to be outside the 0.2% annual chance floodplain as depicted on the FEMA Flood Insurance Rate Map (FIRM) no. 29095C0430G, Revision Date: January 20, 2017.

Drainage Legend

- drainage area
- existing flow direction
- proposed flow direction

Property Legend

- right of way
- property lines
- easements
- setbacks

Grading Legend

- existing minor contour
- existing major contour
- proposed minor contour
- proposed major contour

Utility Legend

- existing
- proposed

Symbol Legend

- sanitary manhole
- service cleanout
- force main release valve
- rectangular structure
- circular structure
- fire hydrant
- water valve
- water meter
- backflow preventer
- natural gas meter
- service transformer (pad mount)
- primary switch gear
- light pole
- cable/phone/data junction box
- street light
- pedestrian street light
- electric pole
- guy wire
- end section

Linetypes

- sanm — sanitary main
- sans — sanitary service
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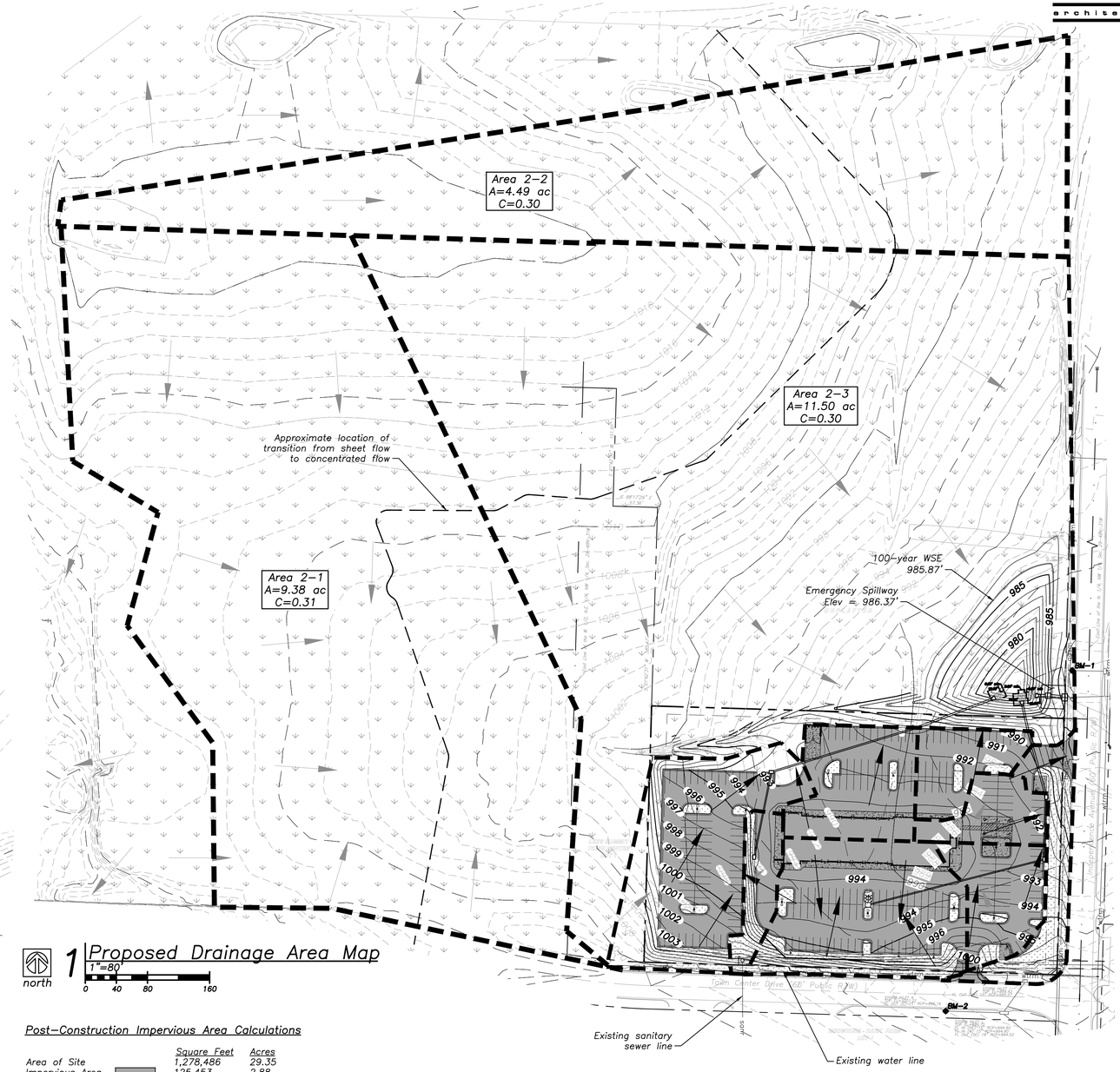
- storm sewer (solid wall, proposed)
- storm sewer (perforated, proposed)
- wtrm — water main
- wtrf — water service (fire)
- wtrd — water service (domestic)
- wtri — water service (irrigation)
- gasm — natural gas main
- gass — natural gas service schematic
- elpu — underground primary electric
- elsu — underground secondary electric
- elpo — overhead electric
- datu — underground cable/phone/data
- datsu — underground cable/phone/data service
- fence–chainlink
- fence–wood
- fence–barbed wire
- treeline



north 1 Proposed Drainage Area Map
1"=80'
0 40 80 160

north 2 Proposed Drainage Area Map Detail
1"=60'
0 30 60 120

Post–Construction Impervious Area Calculations

	Square Feet	Acres
Area of Site	1,278,486	29.35
Impervious Area	125,453	2.88
Pervious Area	1,153,033	26.47

Q: 2 year 1.81 cfs
10 year 9.18 cfs
100 year 24.56 cfs

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C3.2
drawing type
fdp
project number
19076

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BM–2: Storm Structure, Manhole Cover
Elevation: 1001.21'
N: 1013384.7454
E: 2827199.0101

Proposed Pipe and Structures
Existing Pipe and Structures
Compacted Fill

Note:
Compacted fill shall be placed to a minimum 18" above the top of the pipe prior to installation.

Property Legend
- right of way
- property lines
- easements
- setbacks

Grading Legend
- existing minor contour
- existing major contour
- proposed minor contour
- proposed major contour

Utility Legend
- existing
- proposed

Linetypes
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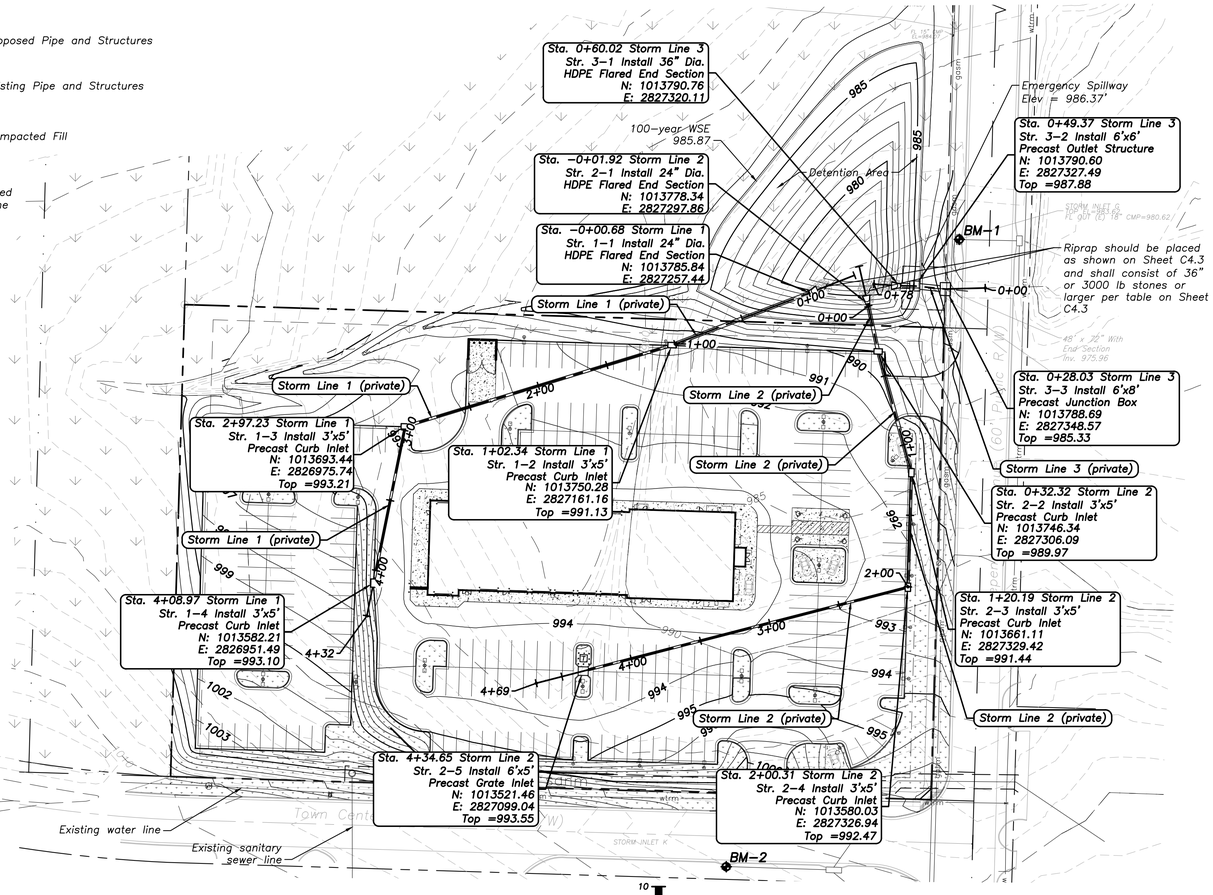
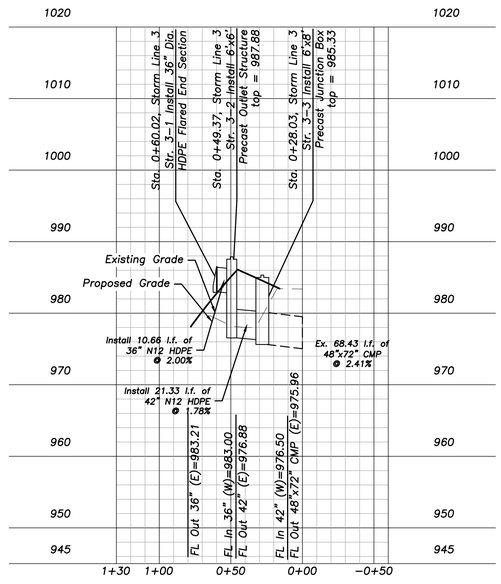
- wtrm — water main
- wtrf — water service (fire)
- wtrd — water service (domestic)
- wtri — water service (irrigation)
- gasm — gass — natural gas main / natural gas service schematic
- elpu — underground primary electric
- elsu — underground secondary electric
- elpo — overhead electric
- datu — underground cable/phone/data
- datsu — underground cable/phone/data service
- fence–chainlink
- fence–wood
- fence–barbed wire
- treeline

Symbols
- sanitary manhole
- service cleanout
- force main release valve
- rectangular structure
- circular structure
- fire hydrant
- water valve
- water meter
- BFP — backflow preventer
- natural gas meter
- T — service transformer
- S — primary switch gear
- light pole
- C — data junction box
- street light
- pedestrian street light
- electric pole
- guy wire
- end section

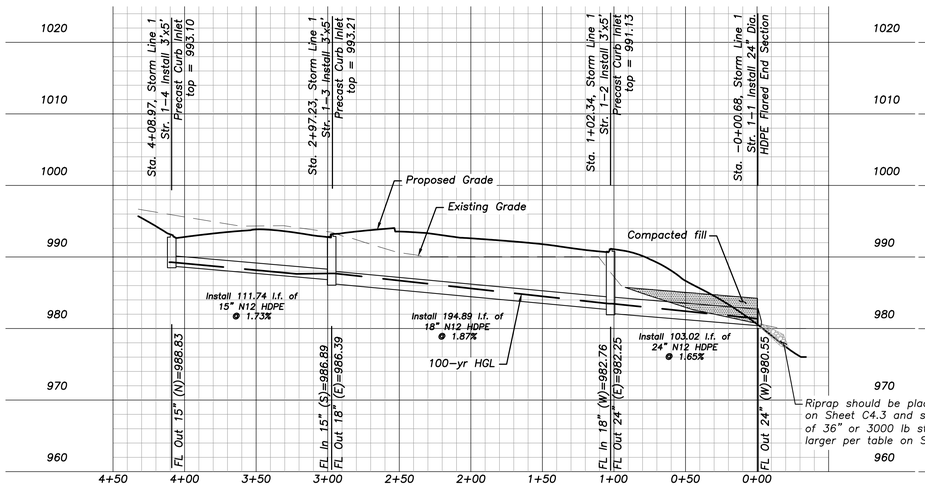


1 Storm Plan and Profile
V: 1"=10' H: 1"=50'

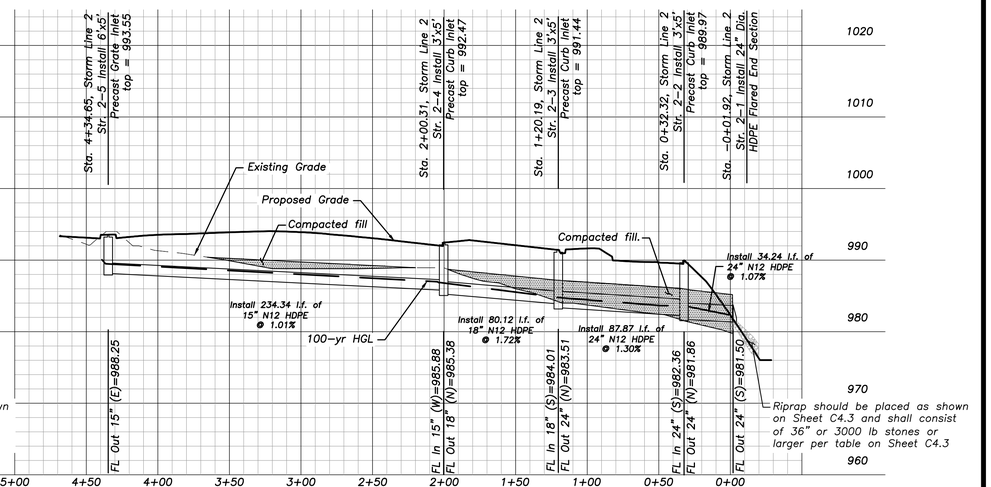
Storm Line 3



Storm Line 1



Storm Line 2



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A New Facility for
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2100 NE Independence Ave
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date 02.02.2020
drawn by SLM
checked by PAM
revisions

03.24.2020	1
09.10.2020	2
11.13.2020	FDP
01.25.2021	FDP

sheet number
C3.3
drawing type fdp
project number 19076

Appendix B

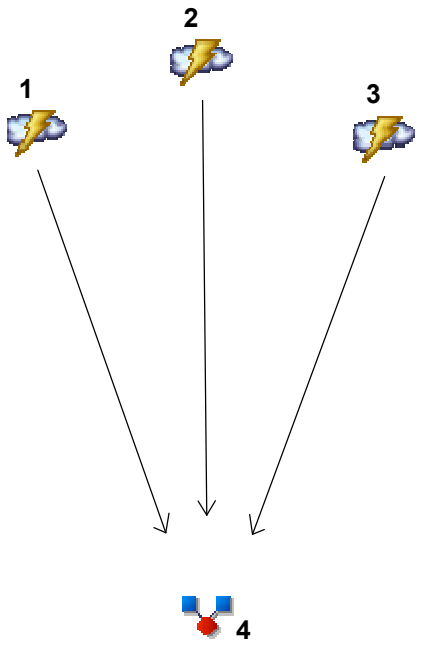
Existing Conditions Hydraflow Hydrograph Output Data

Hydraflow Table of Contents

19076.ExistingConditions.01.22.2021.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Friday, 01 / 22 / 2021

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Area 1-1
2	Rational	Area 1-2
3	Rational	Area 1-3
4	Combine	Total Existing

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	Rational	------	8.491	10.79	-------	-------	15.07	-------	19.47	22.70	Area 1-1
2	Rational	------	3.933	5.000	-------	-------	6.981	-------	9.020	10.52	Area 1-2
3	Rational	------	14.46	18.39	-------	-------	25.67	-------	33.17	38.67	Area 1-3
4	Combine	1, 2, 3	26.89	34.18	-------	-------	47.72	-------	61.66	71.89	Total Existing

Hydrograph Summary Report

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

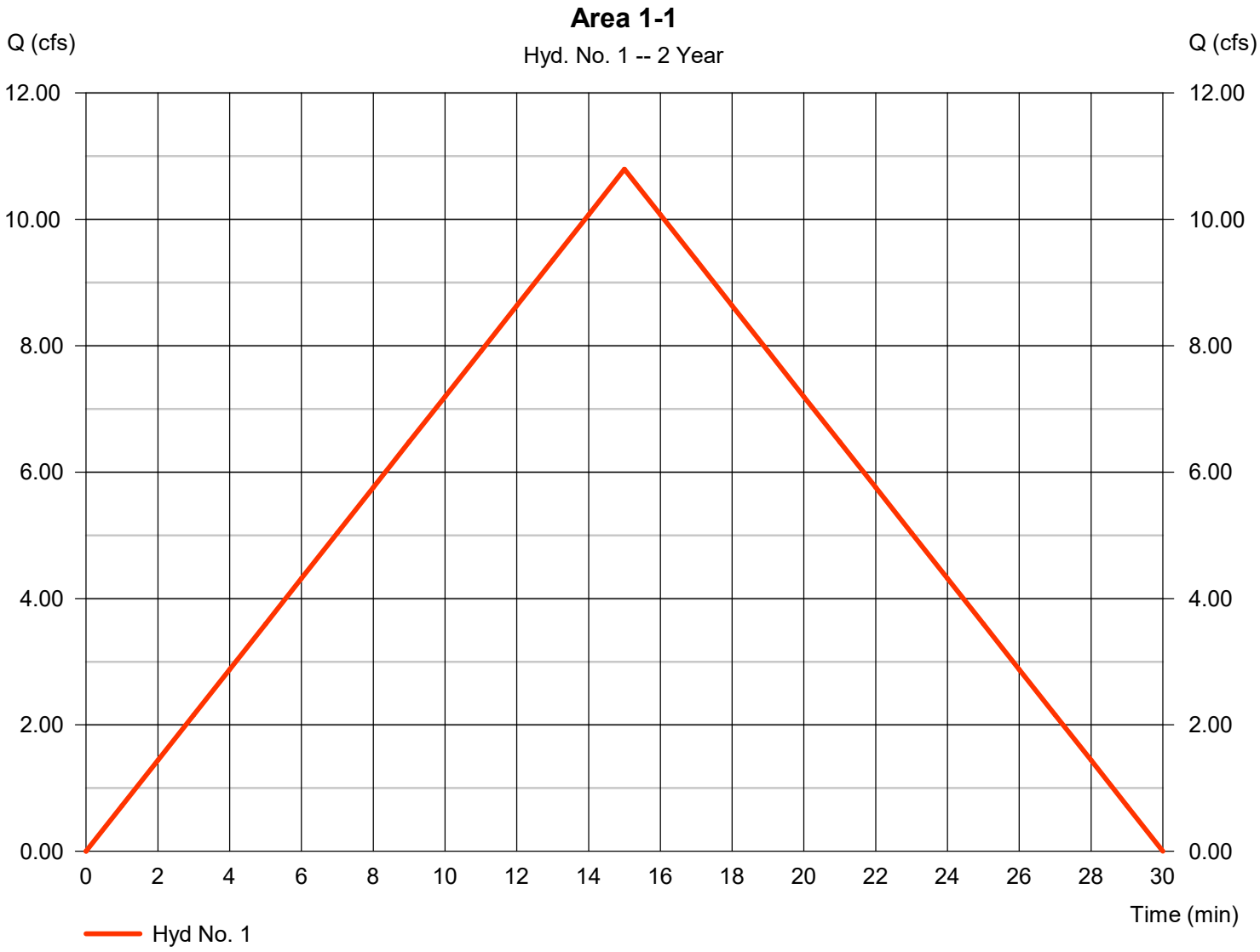
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	10.79	1	15	9,714	------	------	------	Area 1-1
2	Rational	5.000	1	15	4,500	------	------	------	Area 1-2
3	Rational	18.39	1	15	16,548	------	------	------	Area 1-3
4	Combine	34.18	1	15	30,762	1, 2, 3	------	------	Total Existing

Hydrograph Report

Hyd. No. 1

Area 1-1

Hydrograph type	= Rational	Peak discharge	= 10.79 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 9,714 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 3.712 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

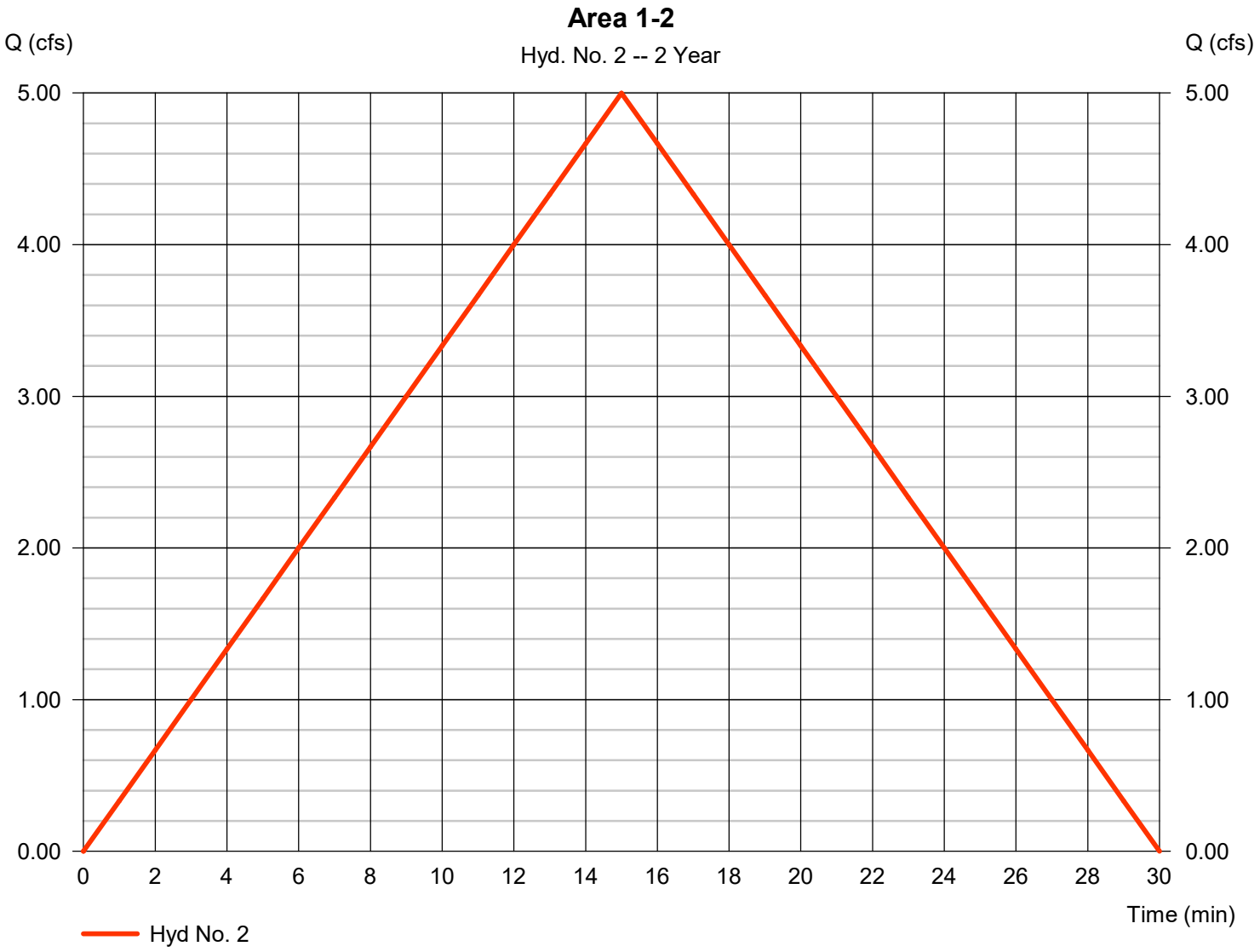


Hydrograph Report

Hyd. No. 2

Area 1-2

Hydrograph type	= Rational	Peak discharge	= 5.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 4,500 cuft
Drainage area	= 4.490 ac	Runoff coeff.	= 0.3
Intensity	= 3.712 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

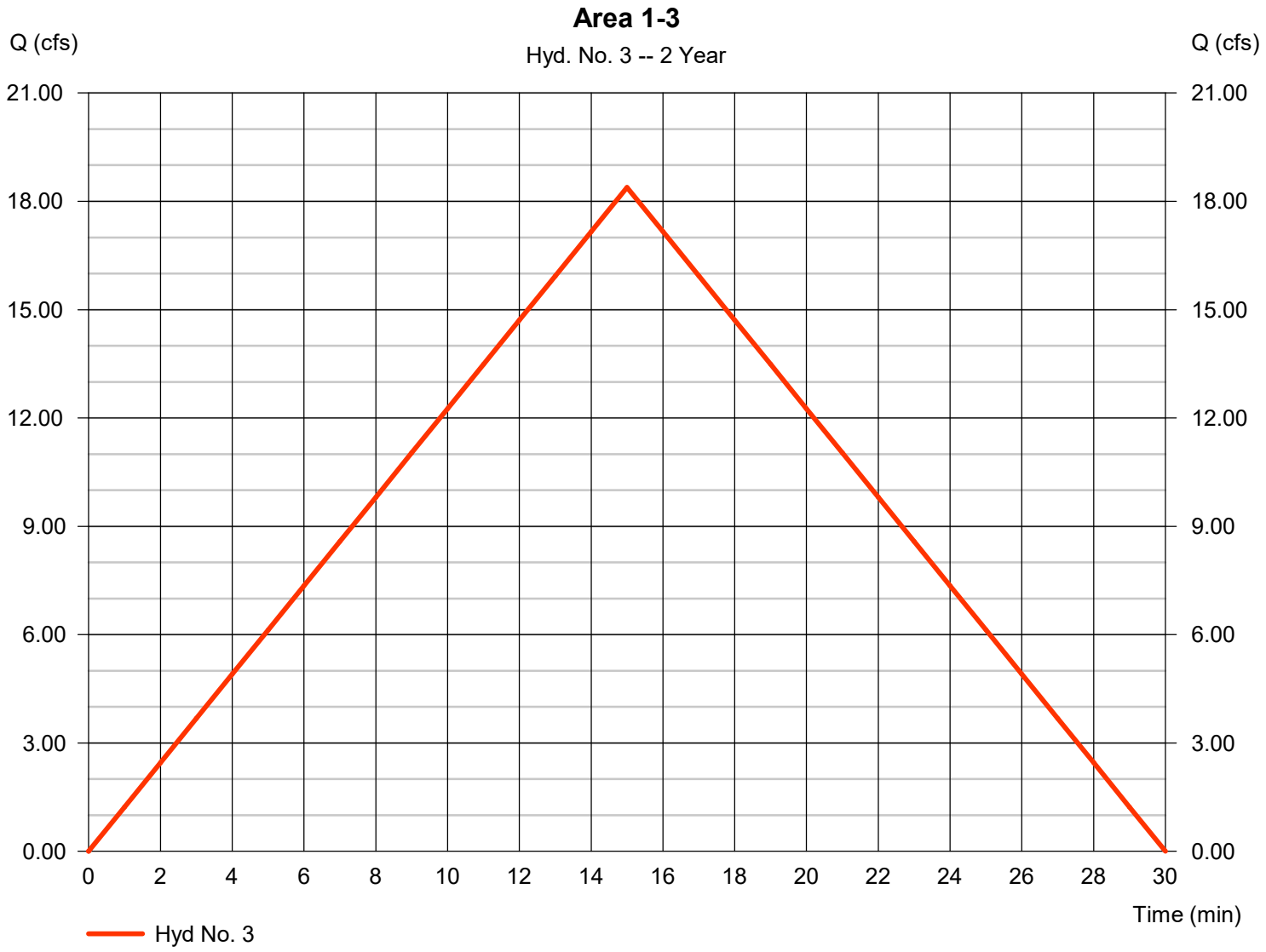


Hydrograph Report

Hyd. No. 3

Area 1-3

Hydrograph type	= Rational	Peak discharge	= 18.39 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 16,548 cuft
Drainage area	= 15.480 ac	Runoff coeff.	= 0.32
Intensity	= 3.712 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

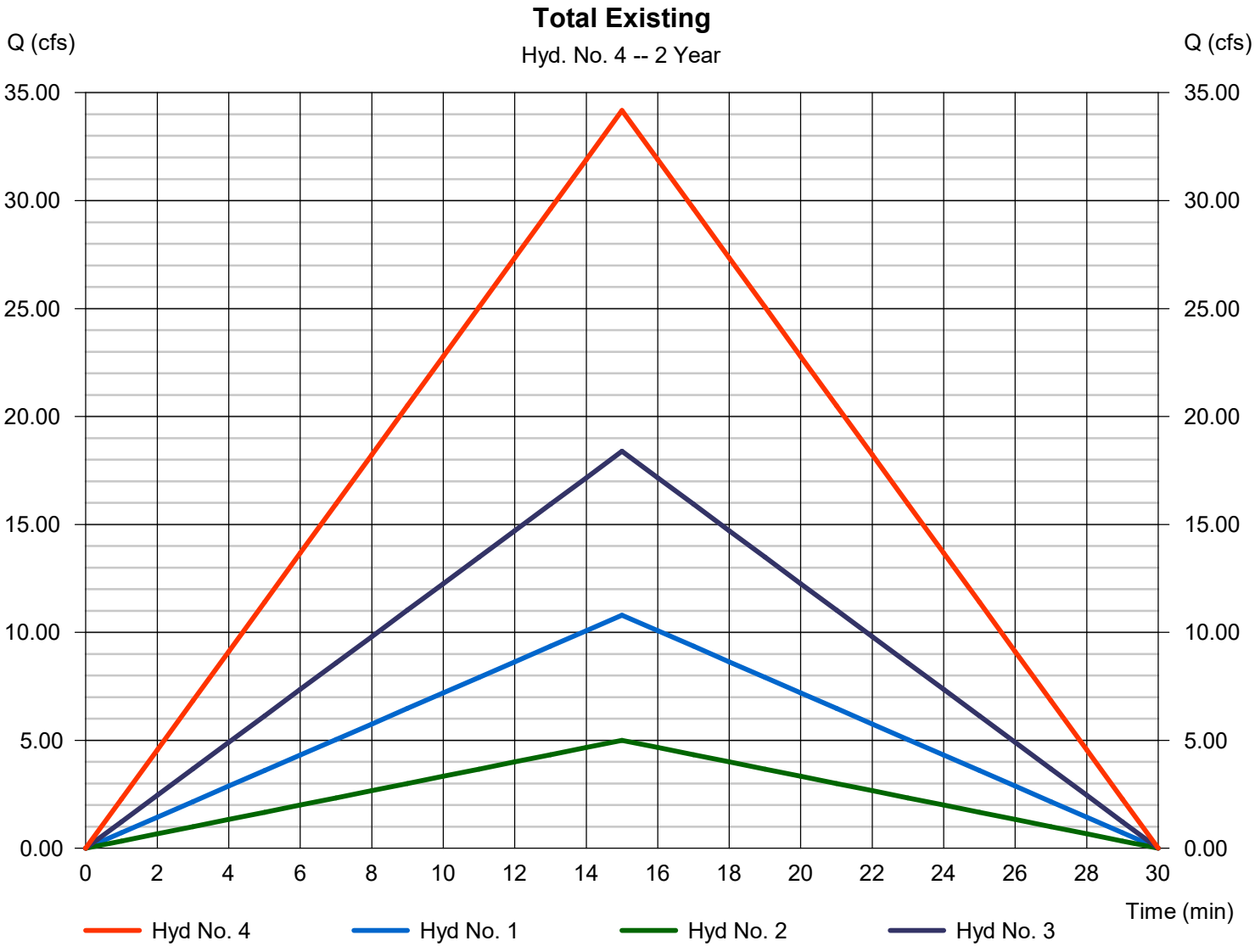


Hydrograph Report

Hyd. No. 4

Total Existing

Hydrograph type	= Combine	Peak discharge	= 34.18 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 30,762 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 29.350 ac



Hydrograph Summary Report

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

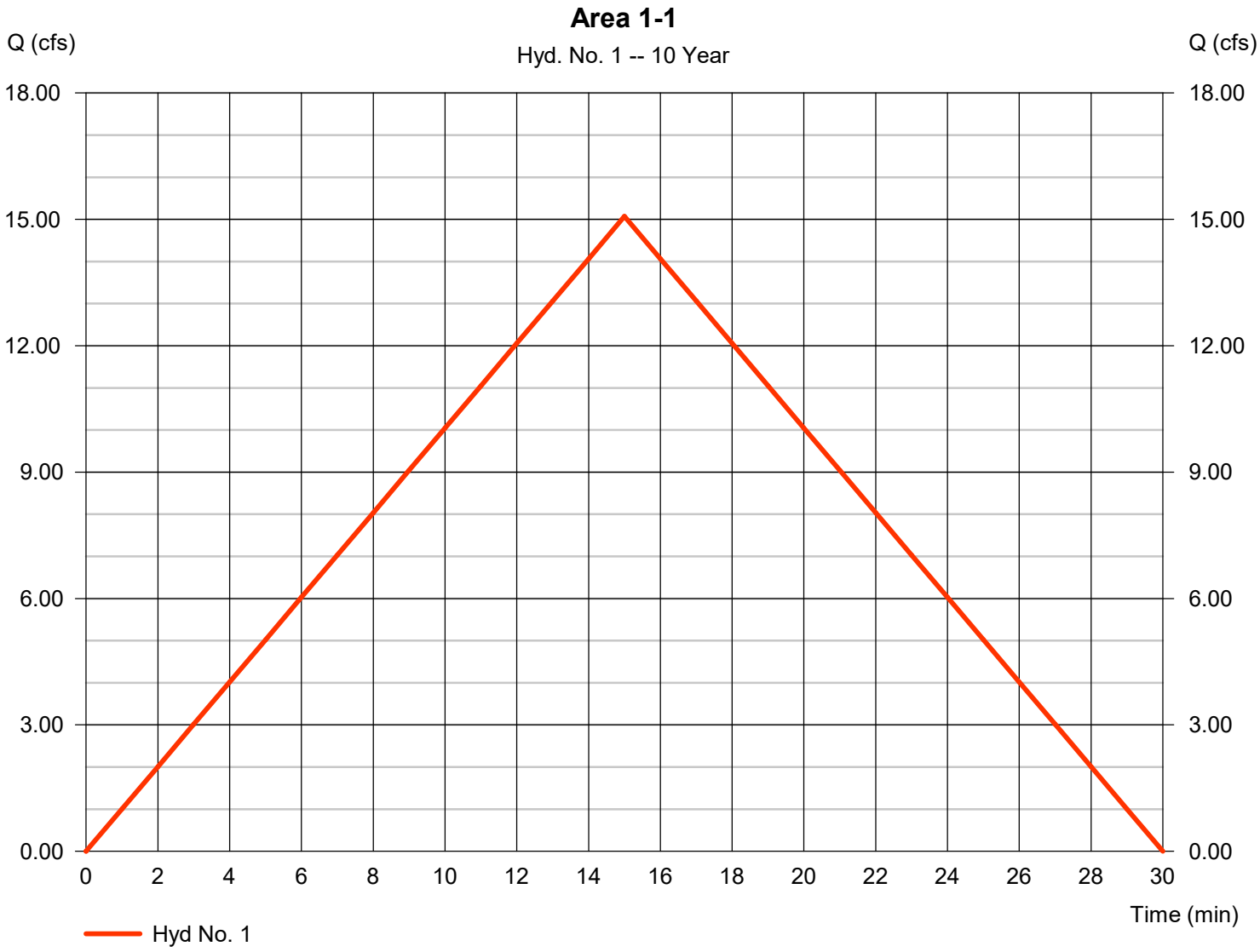
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	15.07	1	15	13,563	------	------	------	Area 1-1
2	Rational	6.981	1	15	6,283	------	------	------	Area 1-2
3	Rational	25.67	1	15	23,105	------	------	------	Area 1-3
4	Combine	47.72	1	15	42,951	1, 2, 3	------	------	Total Existing

Hydrograph Report

Hyd. No. 1

Area 1-1

Hydrograph type	= Rational	Peak discharge	= 15.07 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 13,563 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 5.183 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

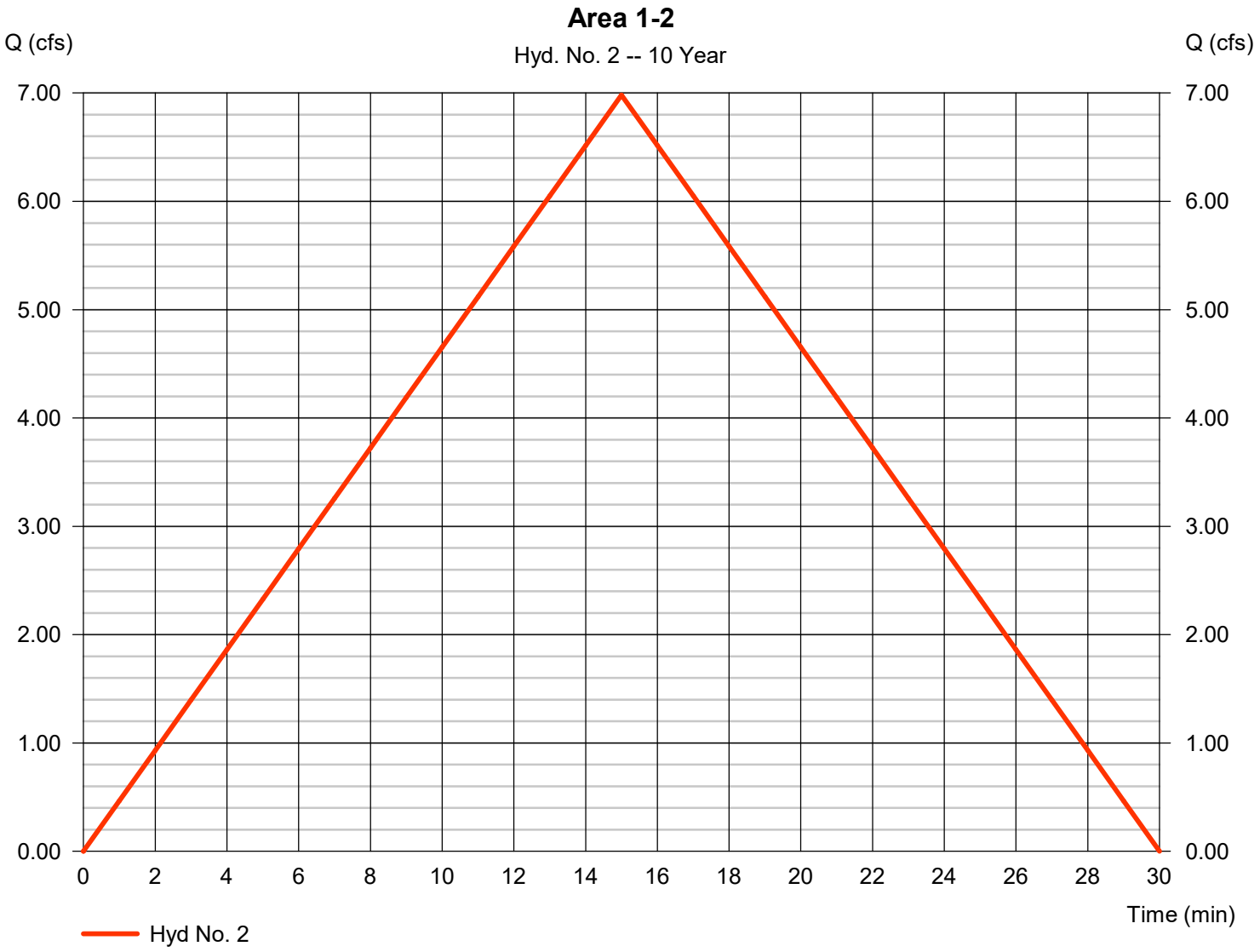


Hydrograph Report

Hyd. No. 2

Area 1-2

Hydrograph type	= Rational	Peak discharge	= 6.981 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,283 cuft
Drainage area	= 4.490 ac	Runoff coeff.	= 0.3
Intensity	= 5.183 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

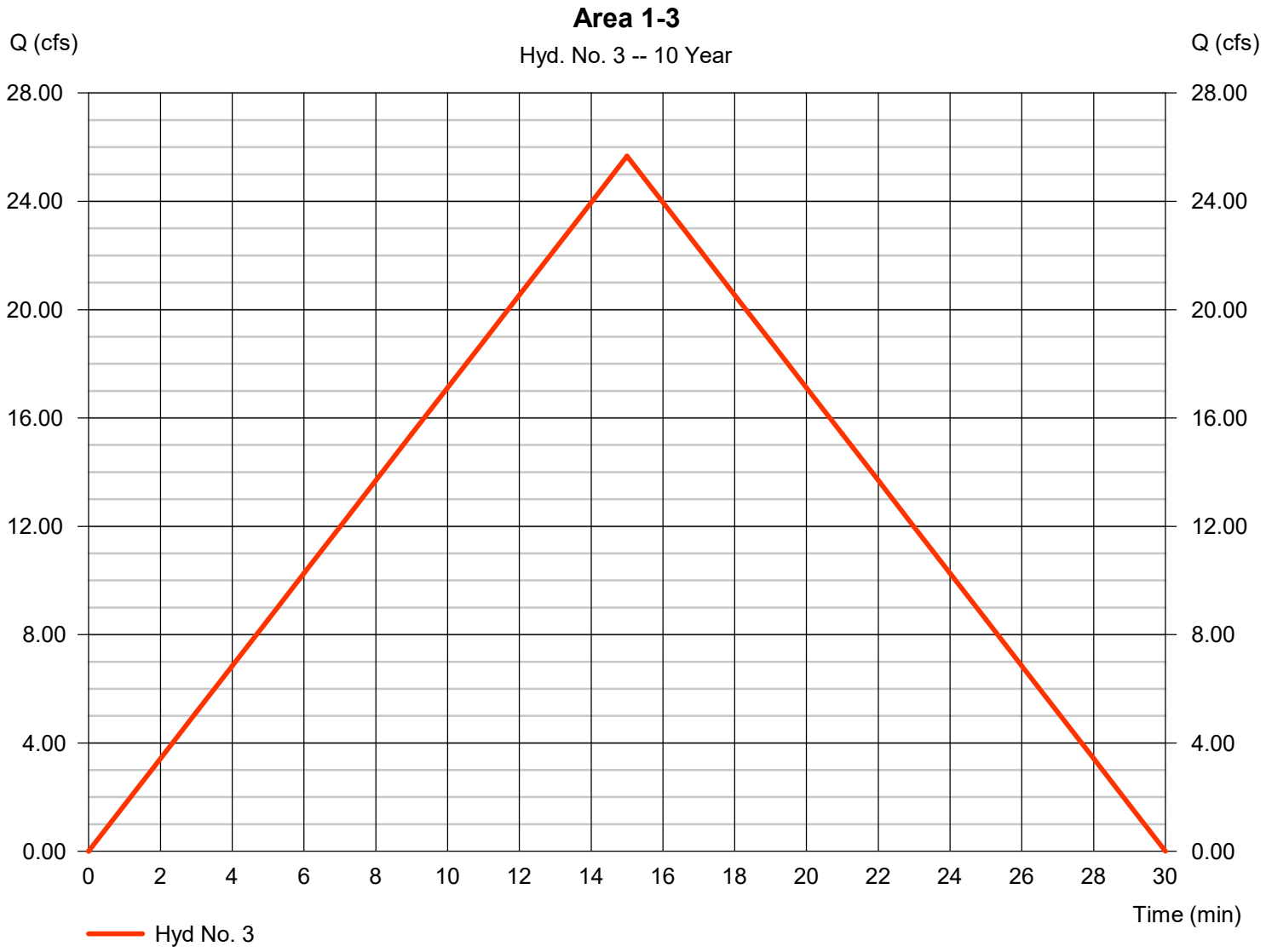


Hydrograph Report

Hyd. No. 3

Area 1-3

Hydrograph type	= Rational	Peak discharge	= 25.67 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 23,105 cuft
Drainage area	= 15.480 ac	Runoff coeff.	= 0.32
Intensity	= 5.183 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

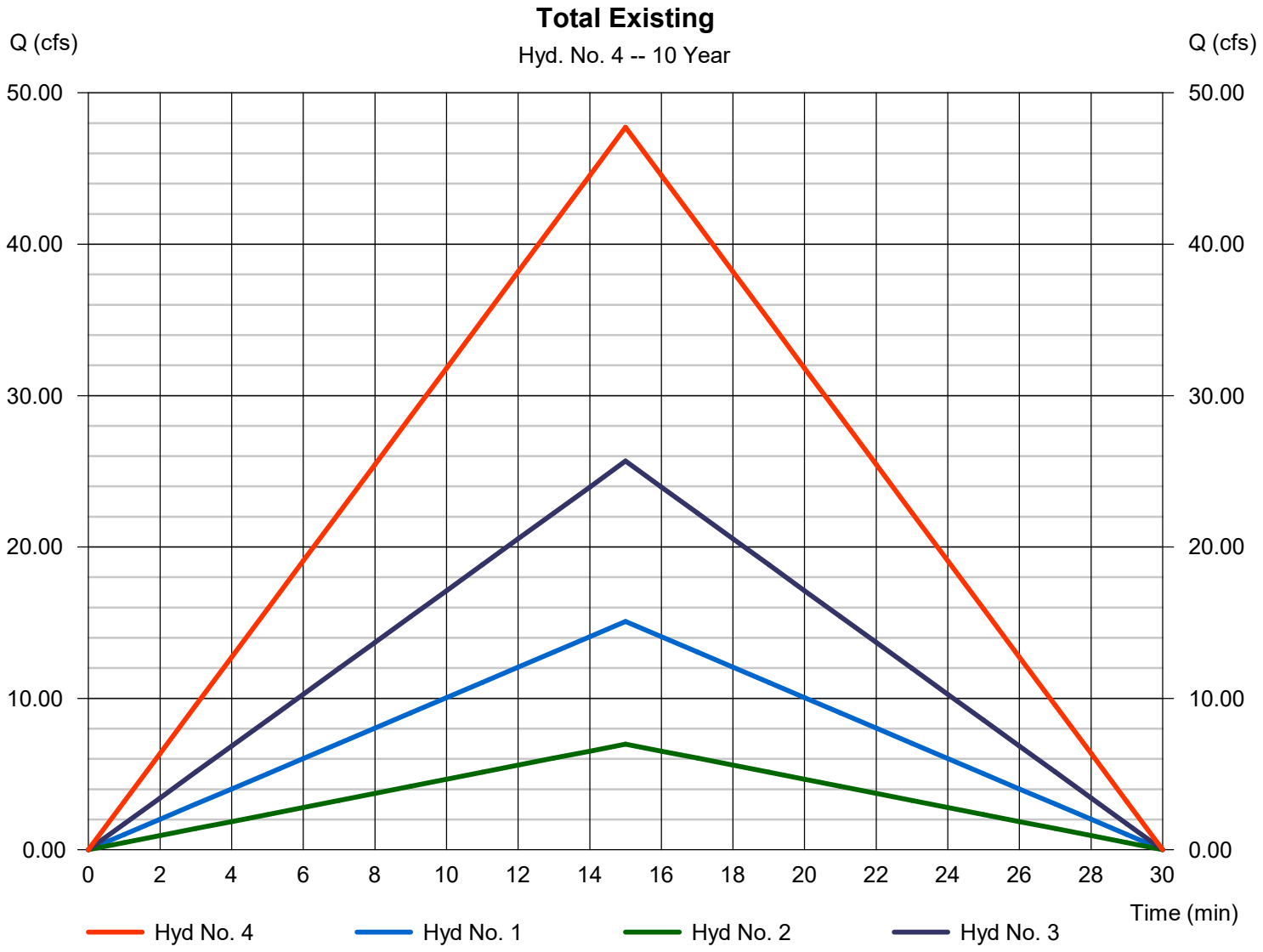


Hydrograph Report

Hyd. No. 4

Total Existing

Hydrograph type	= Combine	Peak discharge	= 47.72 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 42,951 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 29.350 ac



Hydrograph Summary Report

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

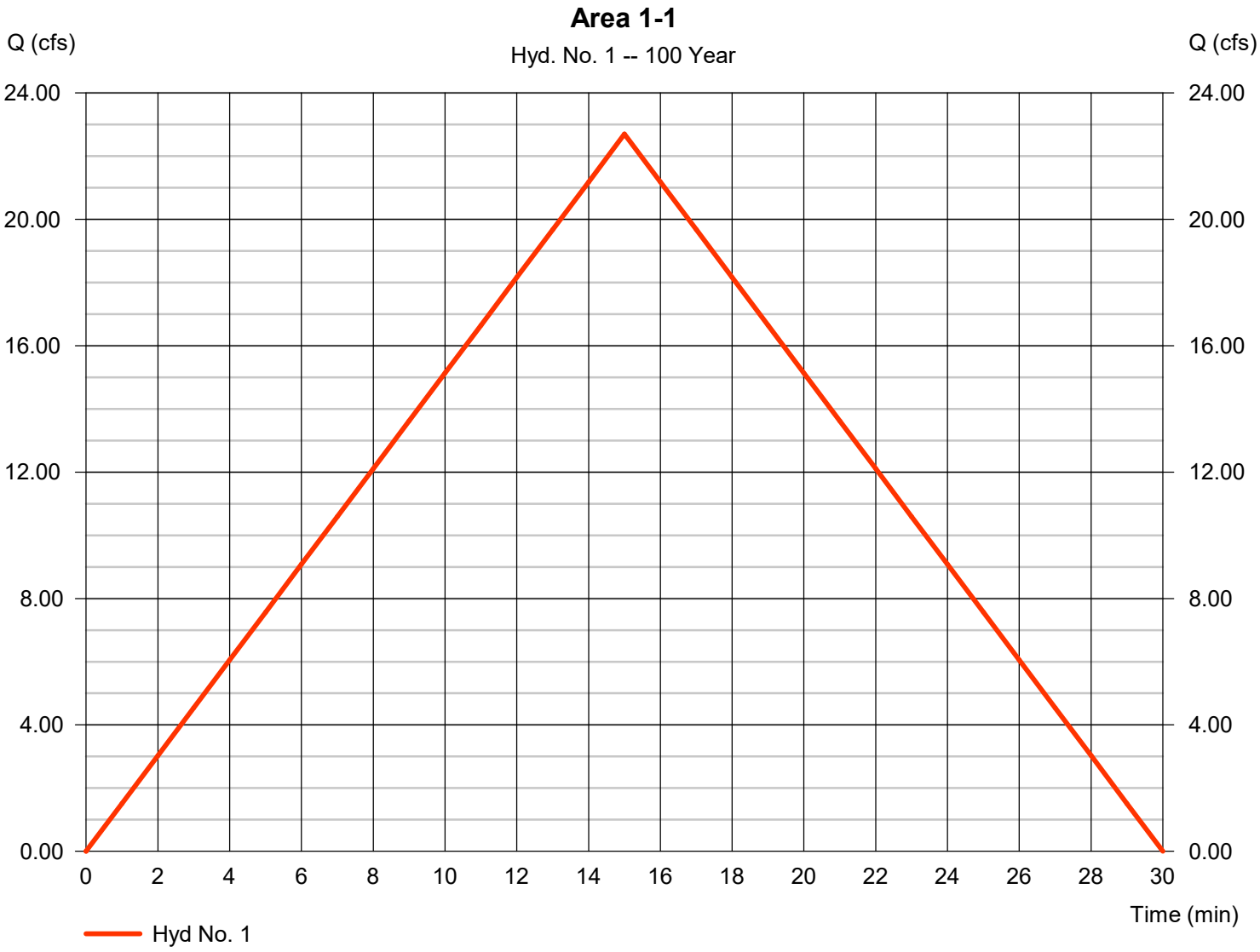
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	22.70	1	15	20,431	------	------	------	Area 1-1
2	Rational	10.52	1	15	9,464	------	------	------	Area 1-2
3	Rational	38.67	1	15	34,806	------	------	------	Area 1-3
4	Combine	71.89	1	15	64,701	1, 2, 3	------	------	Total Existing

Hydrograph Report

Hyd. No. 1

Area 1-1

Hydrograph type	= Rational	Peak discharge	= 22.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 20,431 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 7.807 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

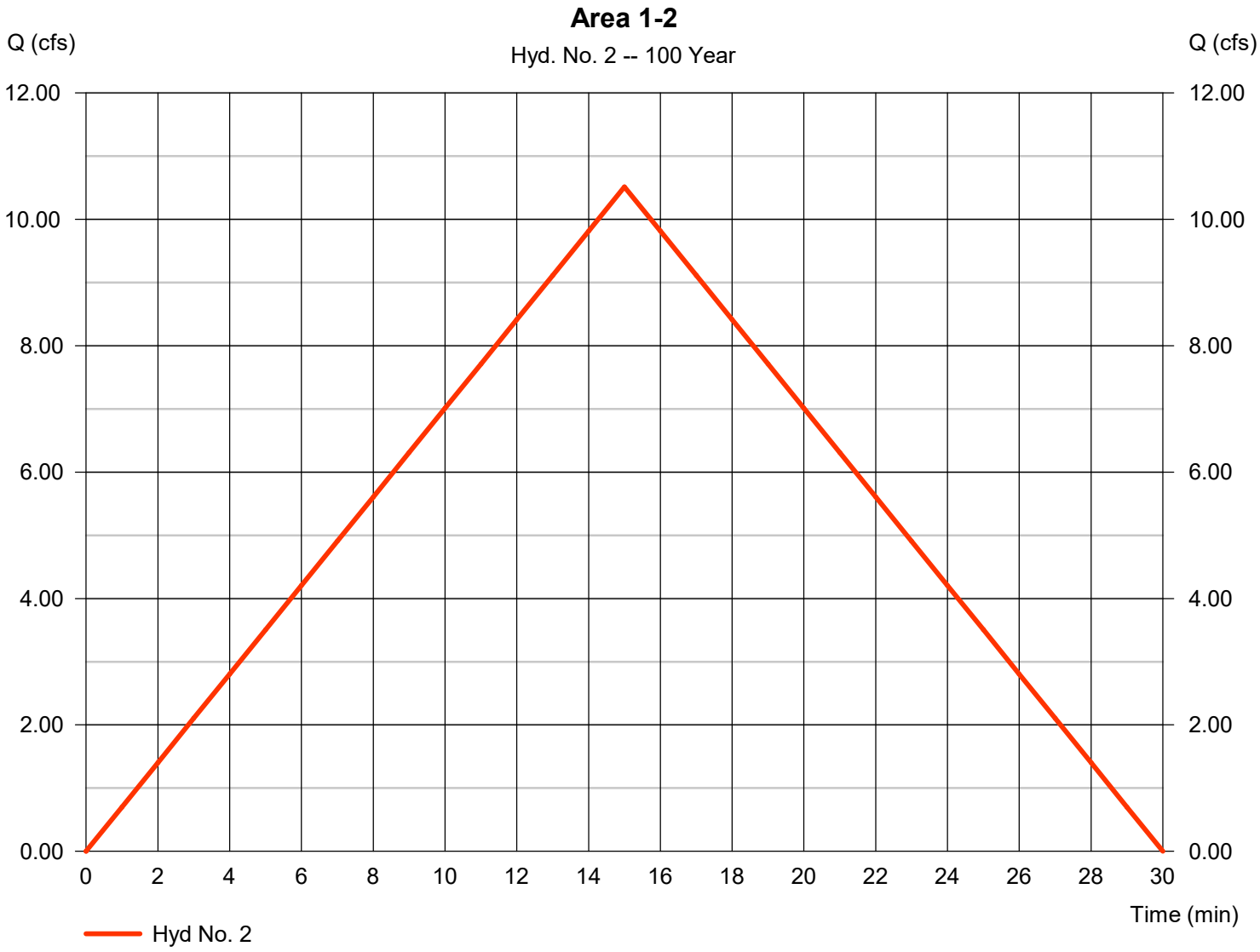


Hydrograph Report

Hyd. No. 2

Area 1-2

Hydrograph type	= Rational	Peak discharge	= 10.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 9,464 cuft
Drainage area	= 4.490 ac	Runoff coeff.	= 0.3
Intensity	= 7.807 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

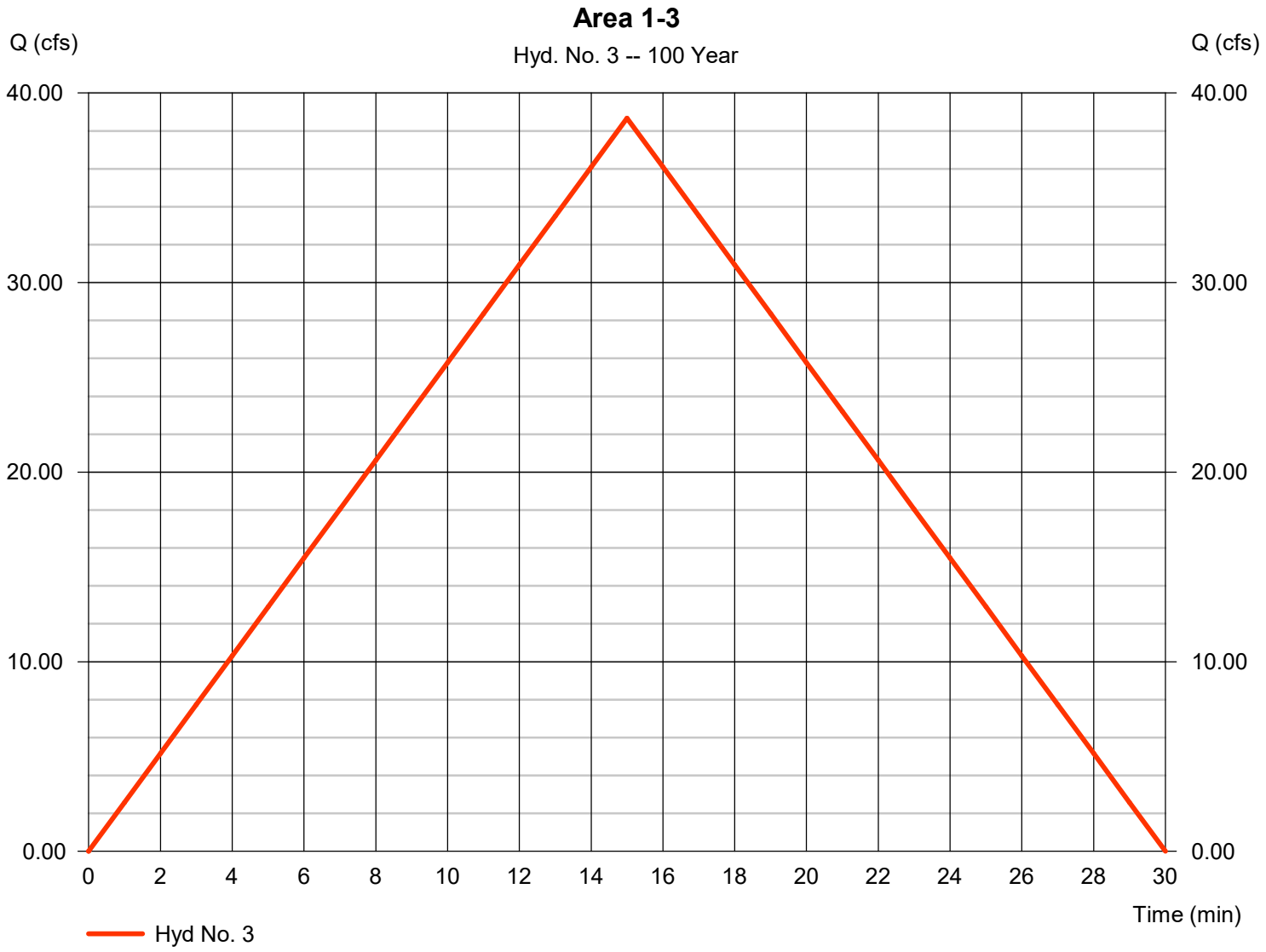


Hydrograph Report

Hyd. No. 3

Area 1-3

Hydrograph type	= Rational	Peak discharge	= 38.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 34,806 cuft
Drainage area	= 15.480 ac	Runoff coeff.	= 0.32
Intensity	= 7.807 in/hr	Tc by User	= 15.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

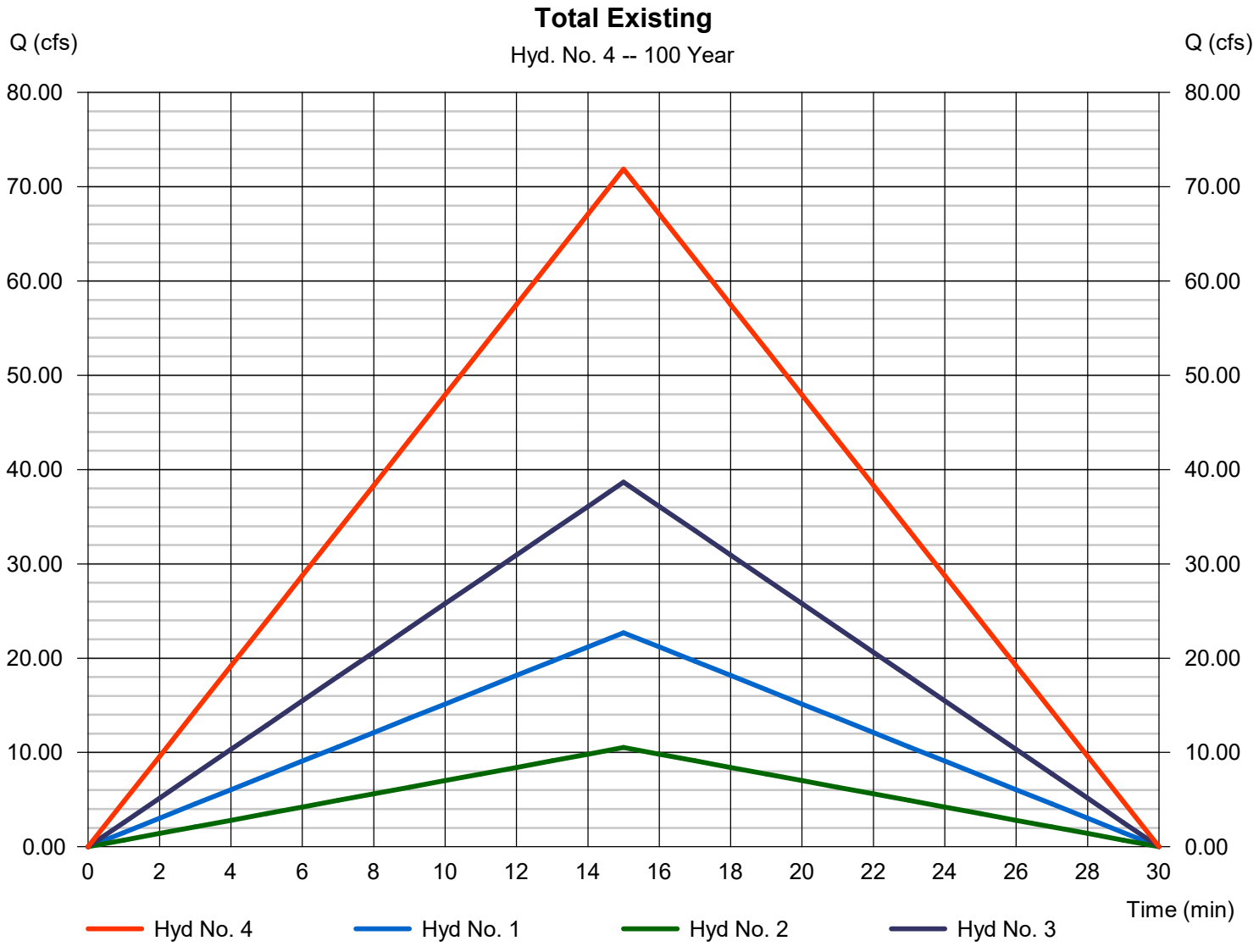


Hydrograph Report

Hyd. No. 4

Total Existing

Hydrograph type	= Combine	Peak discharge	= 71.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 64,701 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 29.350 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	2.9200	0.1000	0.0000	--------
2	110.7137	16.5000	0.9842	--------
3	0.0000	0.0000	0.0000	--------
5	168.3971	19.5000	1.0189	--------
10	183.3473	19.2000	1.0096	--------
25	103.5313	15.9000	0.8218	--------
50	235.4014	19.9000	1.0020	--------
100	83.7894	6.1000	0.7783	--------

File name: KCAPWA.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	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92
2	5.41	4.40	3.71	3.21	2.83	2.53	2.29	2.09	1.92	1.78	1.66	1.55
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	6.47	5.35	4.56	3.98	3.52	3.16	2.86	2.62	2.41	2.24	2.08	1.95
10	7.35	6.08	5.18	4.52	4.00	3.59	3.26	2.98	2.74	2.54	2.37	2.22
25	8.51	7.14	6.17	5.46	4.90	4.46	4.10	3.79	3.54	3.31	3.12	2.95
50	9.39	7.82	6.70	5.86	5.20	4.68	4.25	3.90	3.60	3.34	3.12	2.92
100	12.87	9.64	7.81	6.62	5.77	5.14	4.65	4.25	3.92	3.65	3.41	3.21

Tc = time in minutes. Values may exceed 60.

Precip. file name: P:\DAE Civil\Hydraflow Storm Sewer\SCS Custom Water Quality.pcp

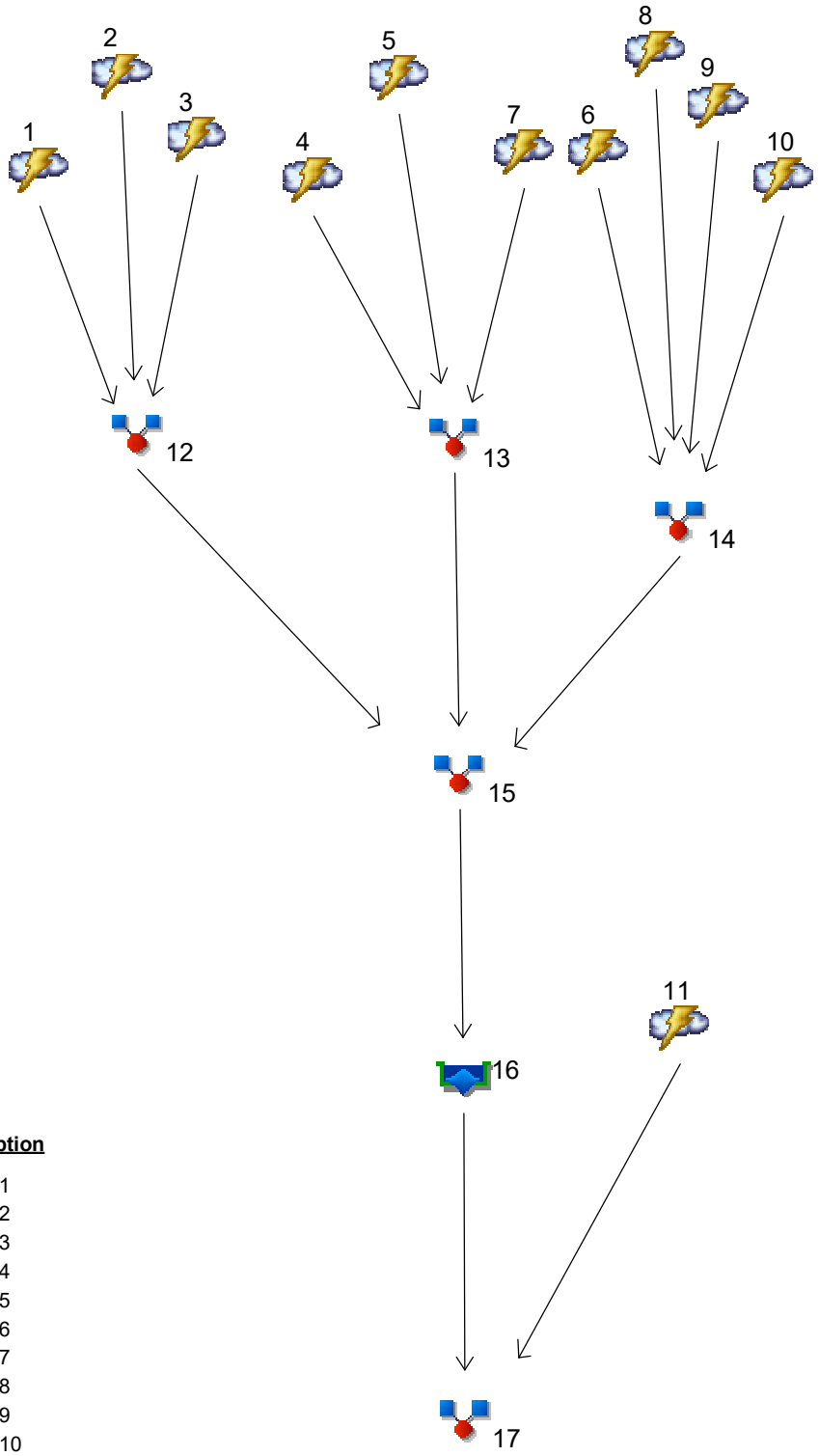
Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	1.37	3.50	0.00	4.50	5.30	6.10	6.90	7.50
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	2.90	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Appendix C

Proposed Conditions Hydraflow Output Data

Hydraflow Table of Contents

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Area 2-1
2	Rational	Area 2-2
3	Rational	Area 2-3
4	Rational	Area 2-4
5	Rational	Area 2-5
6	Rational	Area 2-6
7	Rational	Area 2-7
8	Rational	Area 2-8
9	Rational	Area 2-9
10	Rational	Area 2-10
11	Rational	Area 2-11
12	Combine	Combined 1
13	Combine	Combined 2
14	Combine	Combined 3
15	Combine	TOTAL TO DETENTION
16	Reservoir	TOTAL DETENTION
17	Combine	TOTAL RUNOFF

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	Rational	------	8.491	12.79	-------	15.57	17.68	21.26	-------	28.02	Area 2-1
2	Rational	------	3.933	5.927	-------	7.213	8.189	9.849	-------	12.98	Area 2-2
3	Rational	------	10.07	17.09	-------	20.61	23.40	27.61	-------	39.03	Area 2-3
4	Rational	------	1.993	3.689	-------	4.416	5.015	5.815	-------	8.784	Area 2-4
5	Rational	------	0.368	0.681	-------	0.815	0.926	1.074	-------	1.622	Area 2-5
6	Rational	------	2.197	4.067	-------	4.868	5.529	6.410	-------	9.684	Area 2-6
7	Rational	------	1.285	2.378	-------	2.847	3.233	3.749	-------	5.663	Area 2-7
8	Rational	------	0.728	1.348	-------	1.614	1.833	2.125	-------	3.210	Area 2-8
9	Rational	------	0.631	1.168	-------	1.398	1.587	1.840	-------	2.780	Area 2-9
10	Rational	------	0.918	1.700	-------	2.035	2.311	2.680	-------	4.048	Area 2-10
11	Rational	------	0.450	0.832	-------	0.996	1.132	1.312	-------	1.982	Area 2-11
12	Combine	1, 2, 3,	18.77	30.19	-------	36.55	41.51	49.38	-------	67.73	Combined 1
13	Combine	4, 5, 7,	3.646	6.749	-------	8.078	9.175	10.64	-------	16.07	Combined 2
14	Combine	6, 8, 9,	4.474	8.283	-------	9.914	11.26	13.06	-------	19.72	Combined 3
15	Combine	10, 12, 13, 14	23.64	39.21	-------	47.35	53.77	63.60	-------	89.21	TOTAL TO DETENTION
16	Reservoir	15	0.364	0.519	-------	0.931	2.589	6.576	-------	17.38	TOTAL DETENTION
17	Combine	11, 16	0.549	0.996	-------	1.194	2.589	6.576	-------	17.38	TOTAL RUNOFF

Hydrograph Summary Report

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

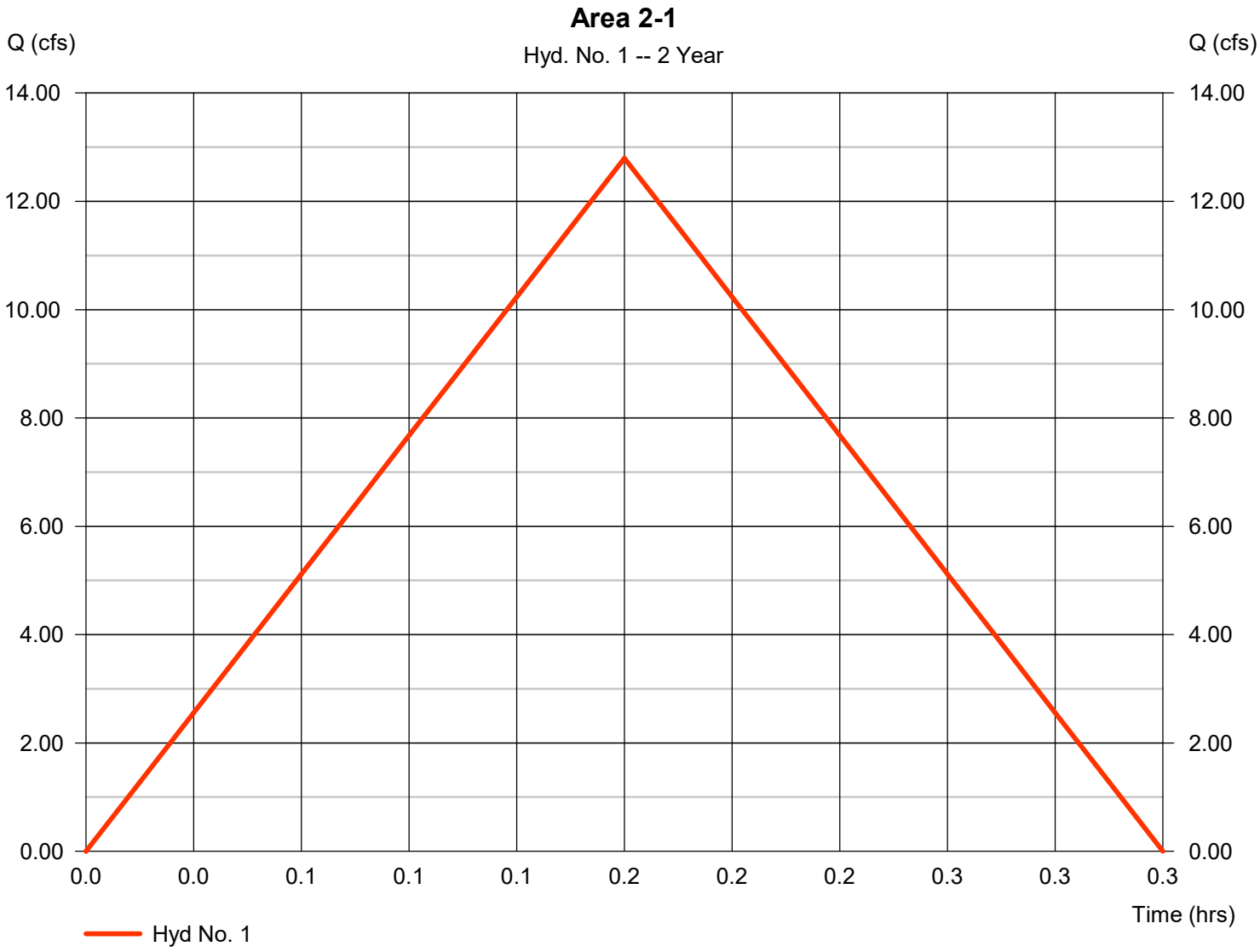
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	12.79	1	10	7,677	------	------	------	Area 2-1
2	Rational	5.927	1	10	3,556	------	------	------	Area 2-2
3	Rational	17.09	1	7	7,176	------	------	------	Area 2-3
4	Rational	3.689	1	5	1,107	------	------	------	Area 2-4
5	Rational	0.681	1	5	204	------	------	------	Area 2-5
6	Rational	4.067	1	5	1,220	------	------	------	Area 2-6
7	Rational	2.378	1	5	714	------	------	------	Area 2-7
8	Rational	1.348	1	5	404	------	------	------	Area 2-8
9	Rational	1.168	1	5	350	------	------	------	Area 2-9
10	Rational	1.700	1	5	510	------	------	------	Area 2-10
11	Rational	0.832	1	5	250	------	------	------	Area 2-11
12	Combine	30.19	1	7	18,409	1, 2, 3,	------	------	Combined 1
13	Combine	6.749	1	5	2,025	4, 5, 7,	------	------	Combined 2
14	Combine	8.283	1	5	2,485	6, 8, 9,	------	------	Combined 3
15	Combine	39.21	1	7	22,919	10, 12, 13, 14	------	------	TOTAL TO DETENTION
16	Reservoir	0.519	1	20	22,632	15	982.70	22,520	TOTAL DETENTION
17	Combine	0.996	1	5	22,882	11, 16	------	------	TOTAL RUNOFF

Hydrograph Report

Hyd. No. 1

Area 2-1

Hydrograph type	= Rational	Peak discharge	= 12.79 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 7,677 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 4.400 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

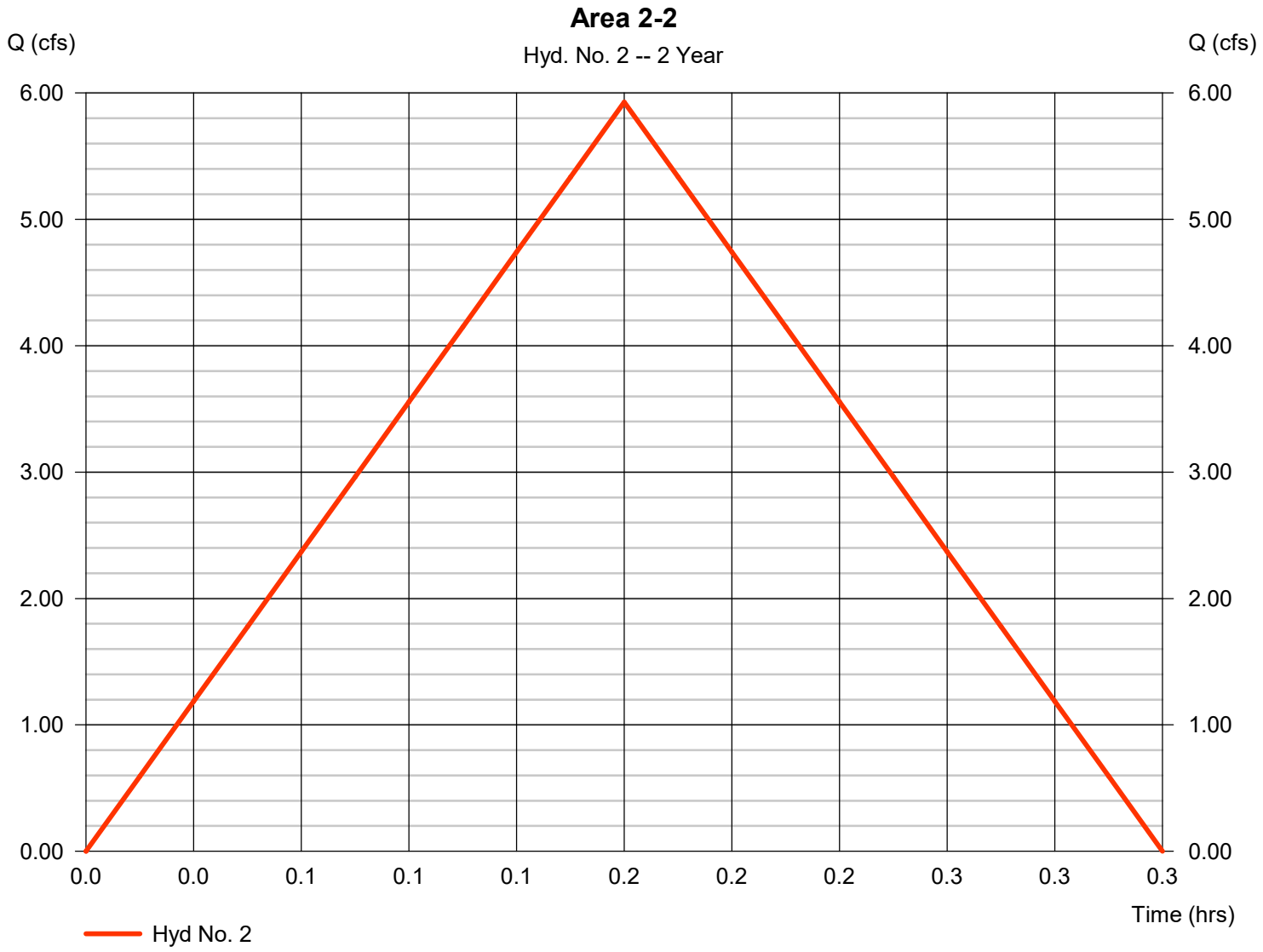


Hydrograph Report

Hyd. No. 2

Area 2-2

Hydrograph type	= Rational	Peak discharge	= 5.927 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 3,556 cuft
Drainage area	= 4.490 ac	Runoff coeff.	= 0.3
Intensity	= 4.400 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

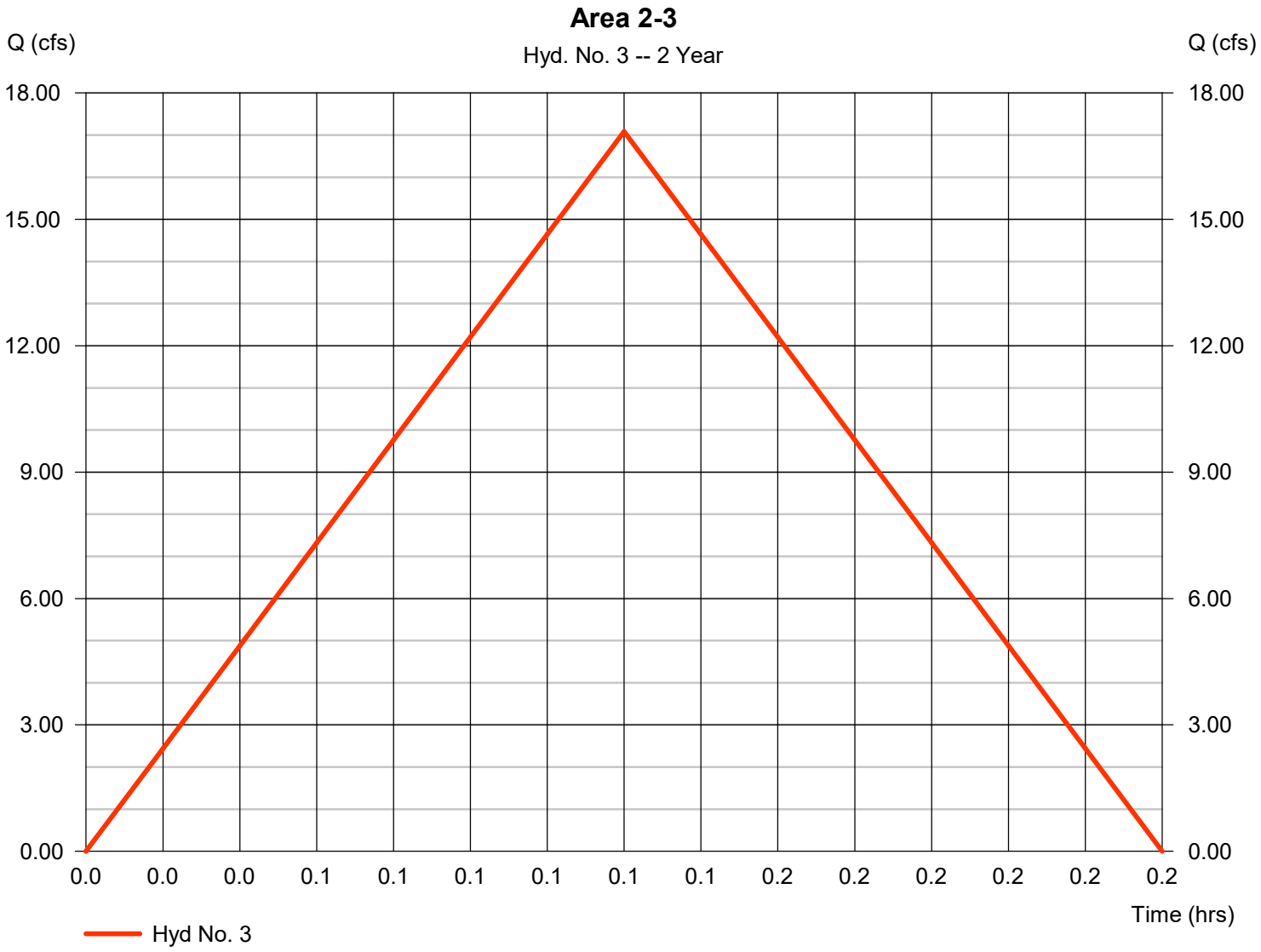


Hydrograph Report

Hyd. No. 3

Area 2-3

Hydrograph type	= Rational	Peak discharge	= 17.09 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 7,176 cuft
Drainage area	= 11.500 ac	Runoff coeff.	= 0.3
Intensity	= 4.952 in/hr	Tc by User	= 7.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

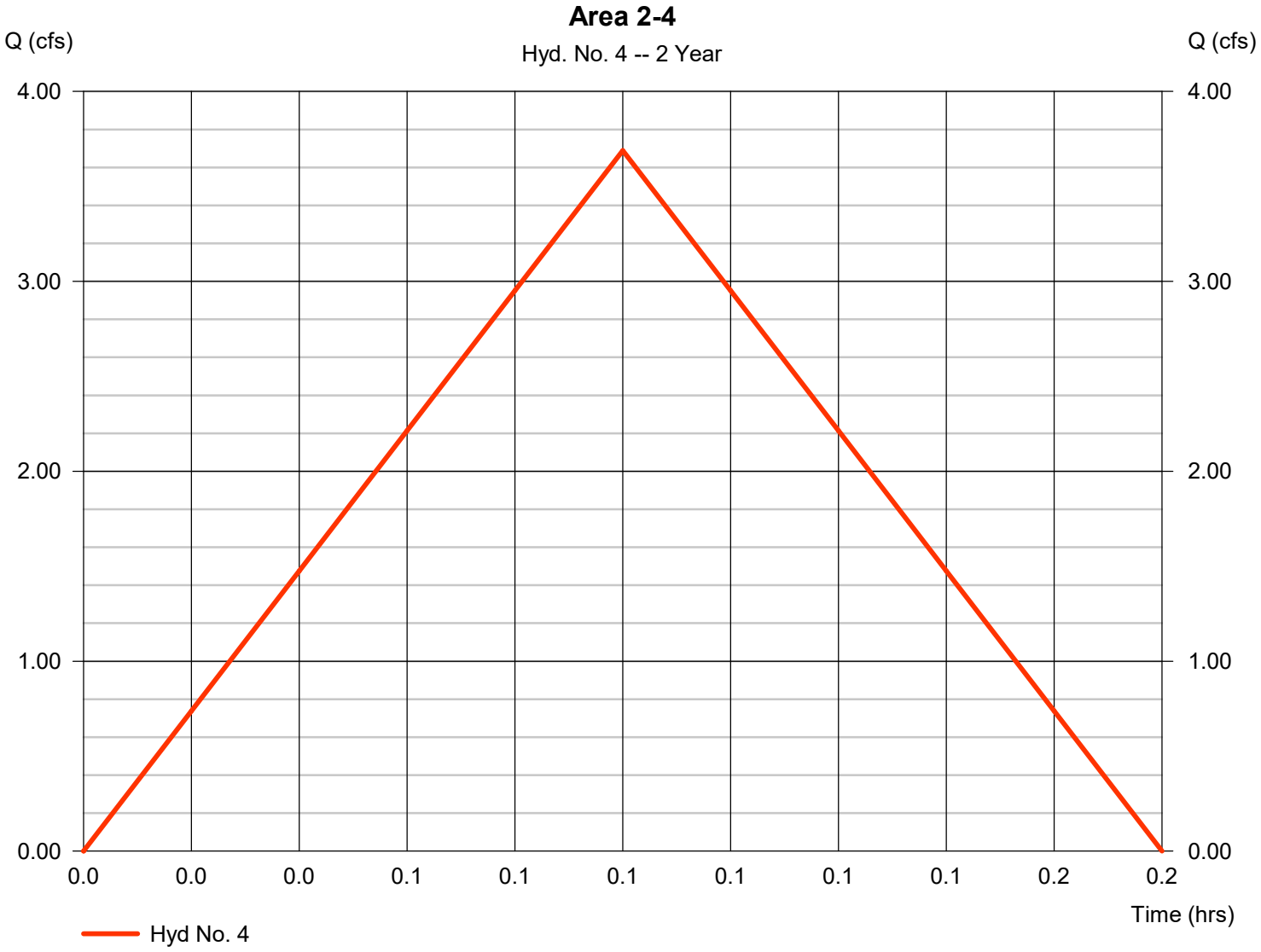


Hydrograph Report

Hyd. No. 4

Area 2-4

Hydrograph type	= Rational	Peak discharge	= 3.689 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,107 cuft
Drainage area	= 1.050 ac	Runoff coeff.	= 0.65
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

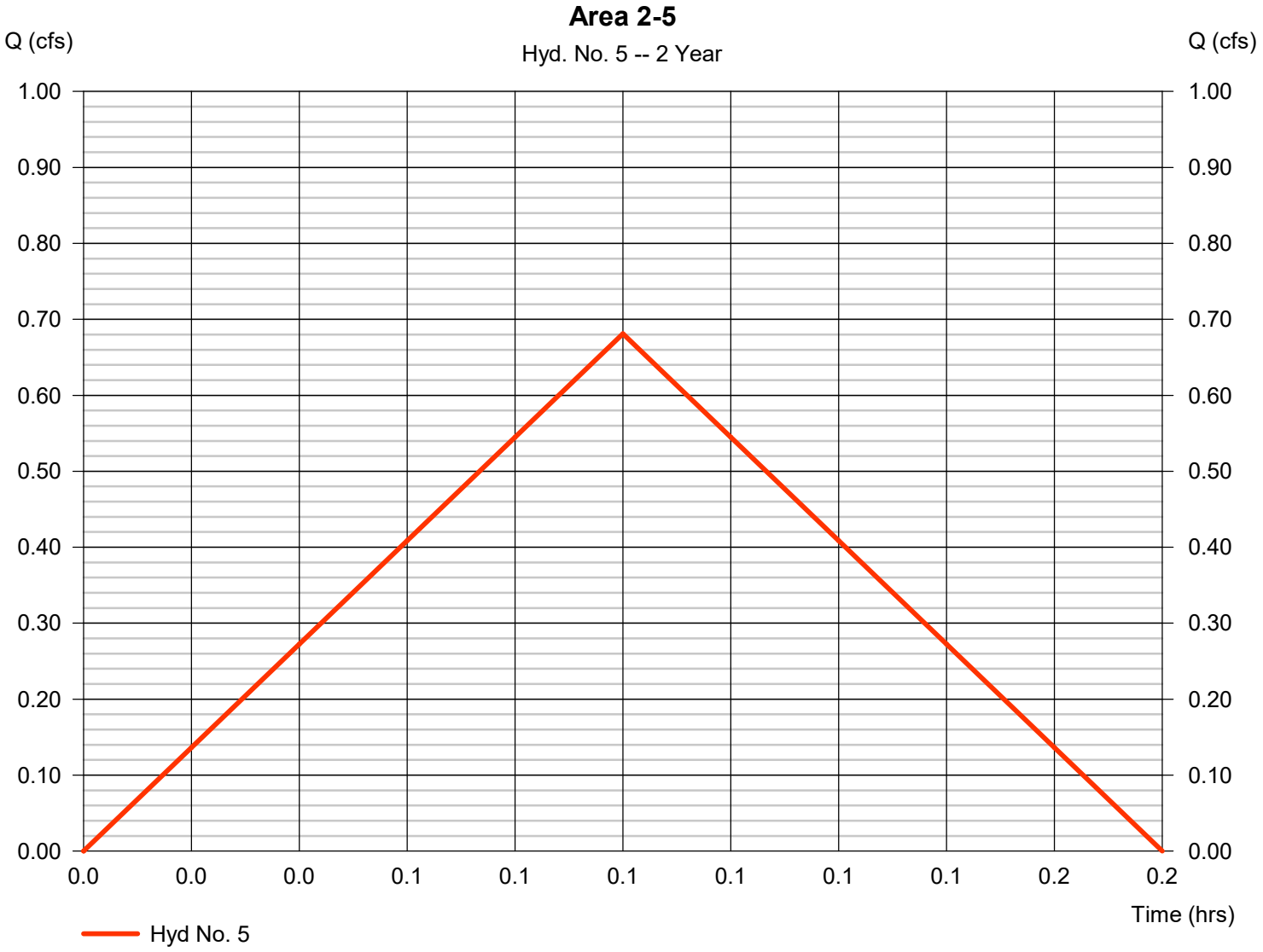


Hydrograph Report

Hyd. No. 5

Area 2-5

Hydrograph type	= Rational	Peak discharge	= 0.681 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 204 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.63
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

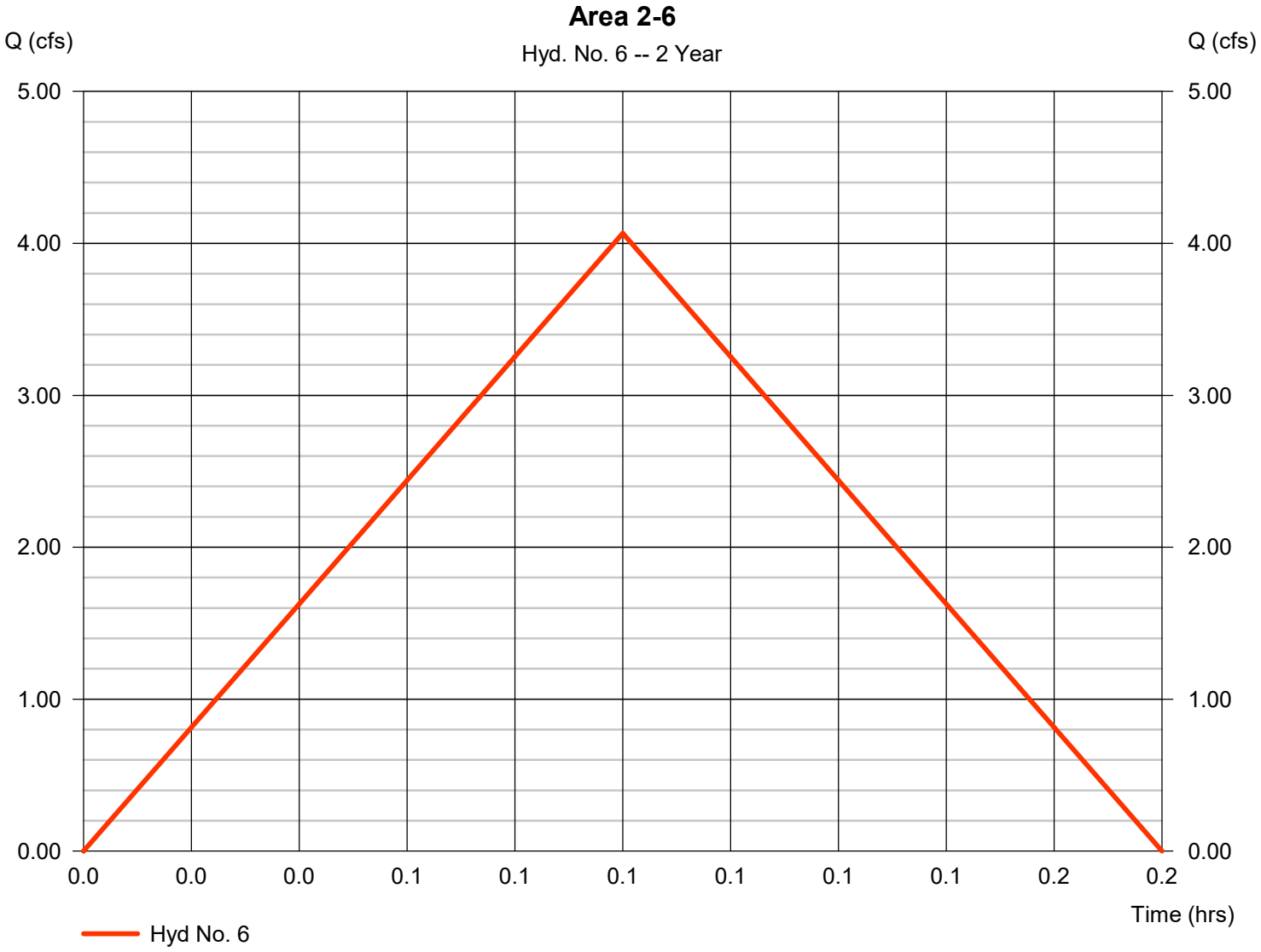


Hydrograph Report

Hyd. No. 6

Area 2-6

Hydrograph type	= Rational	Peak discharge	= 4.067 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,220 cuft
Drainage area	= 0.990 ac	Runoff coeff.	= 0.76
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

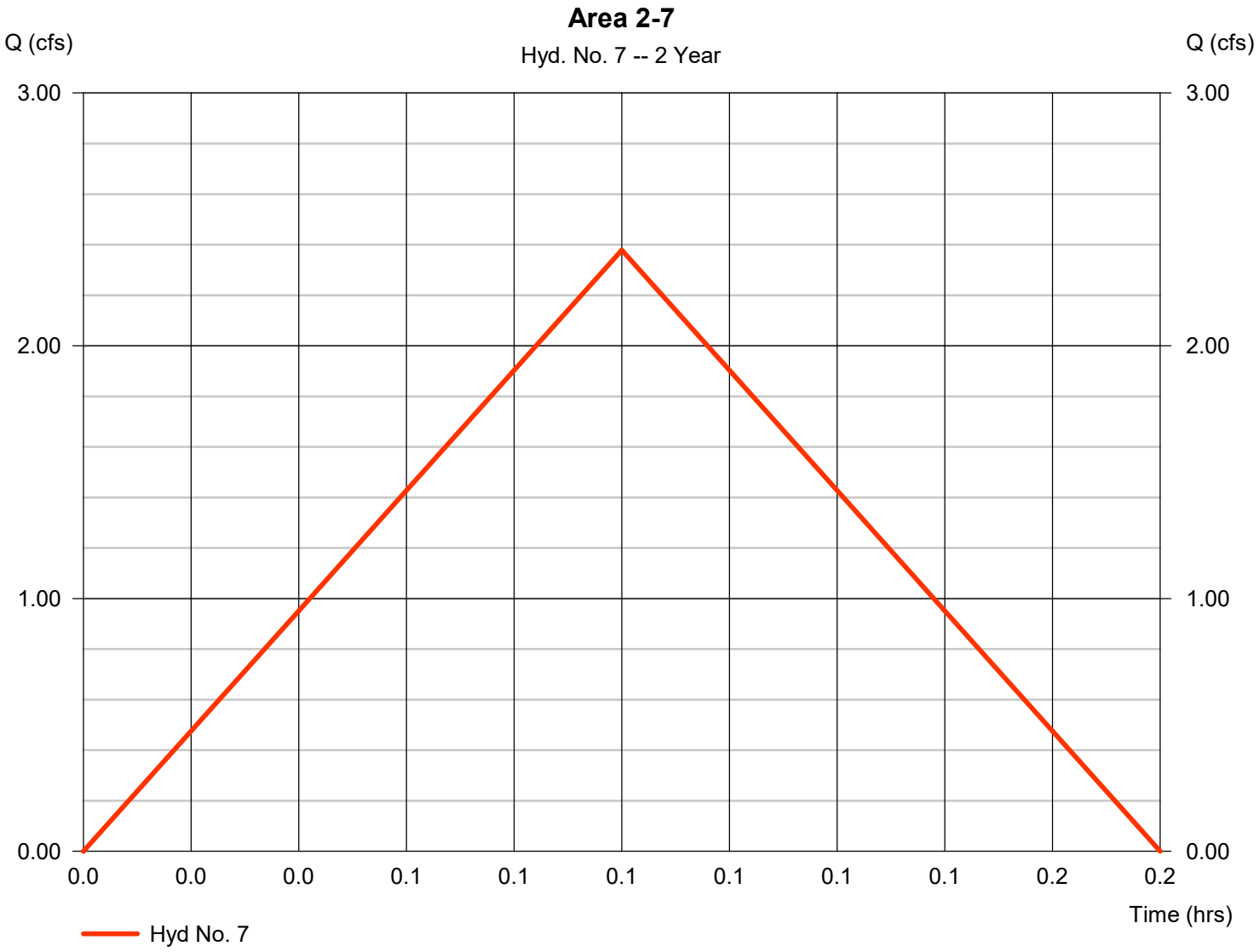


Hydrograph Report

Hyd. No. 7

Area 2-7

Hydrograph type	= Rational	Peak discharge	= 2.378 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 714 cuft
Drainage area	= 0.500 ac	Runoff coeff.	= 0.88
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

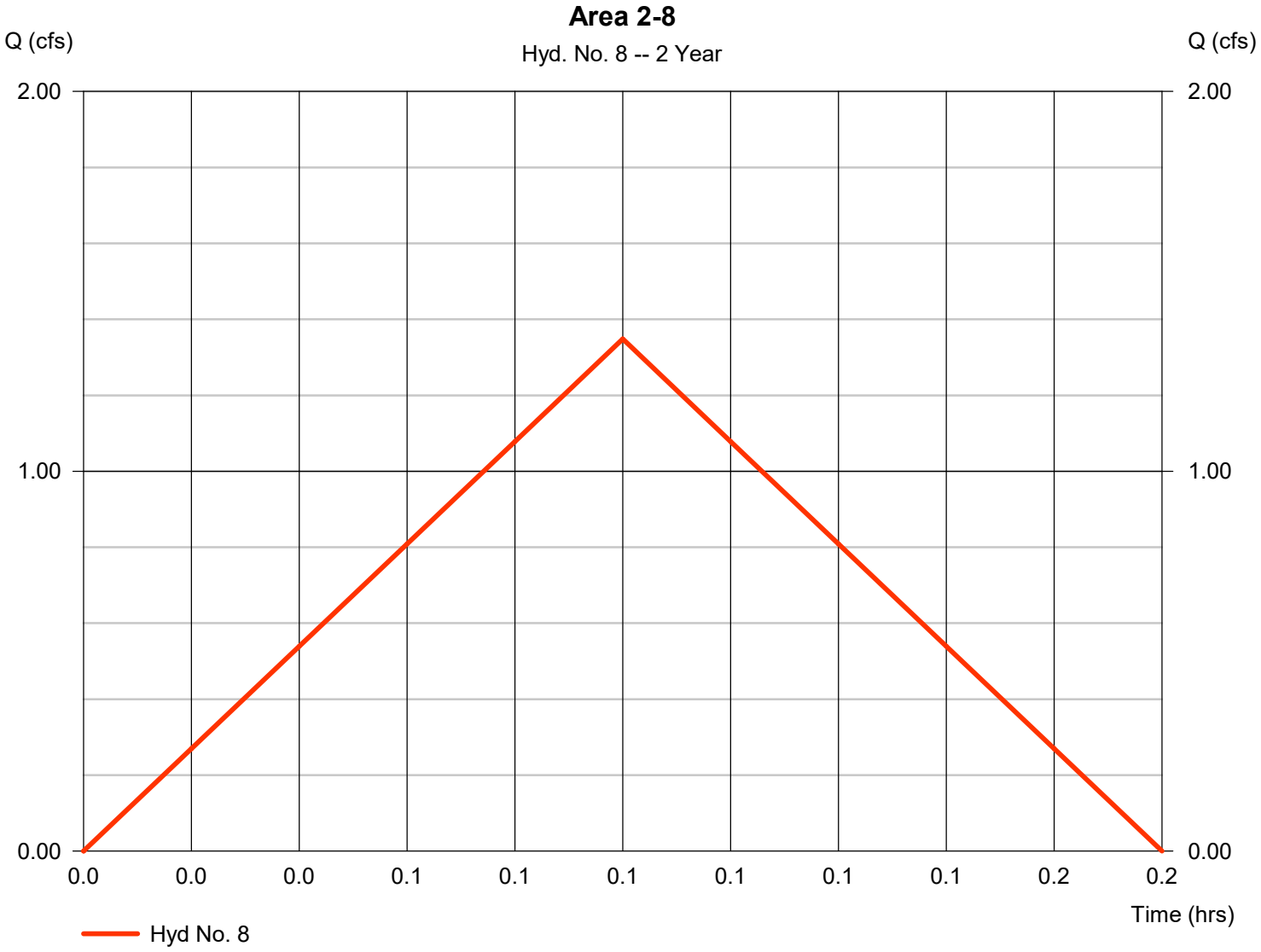


Hydrograph Report

Hyd. No. 8

Area 2-8

Hydrograph type	= Rational	Peak discharge	= 1.348 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 404 cuft
Drainage area	= 0.290 ac	Runoff coeff.	= 0.86
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

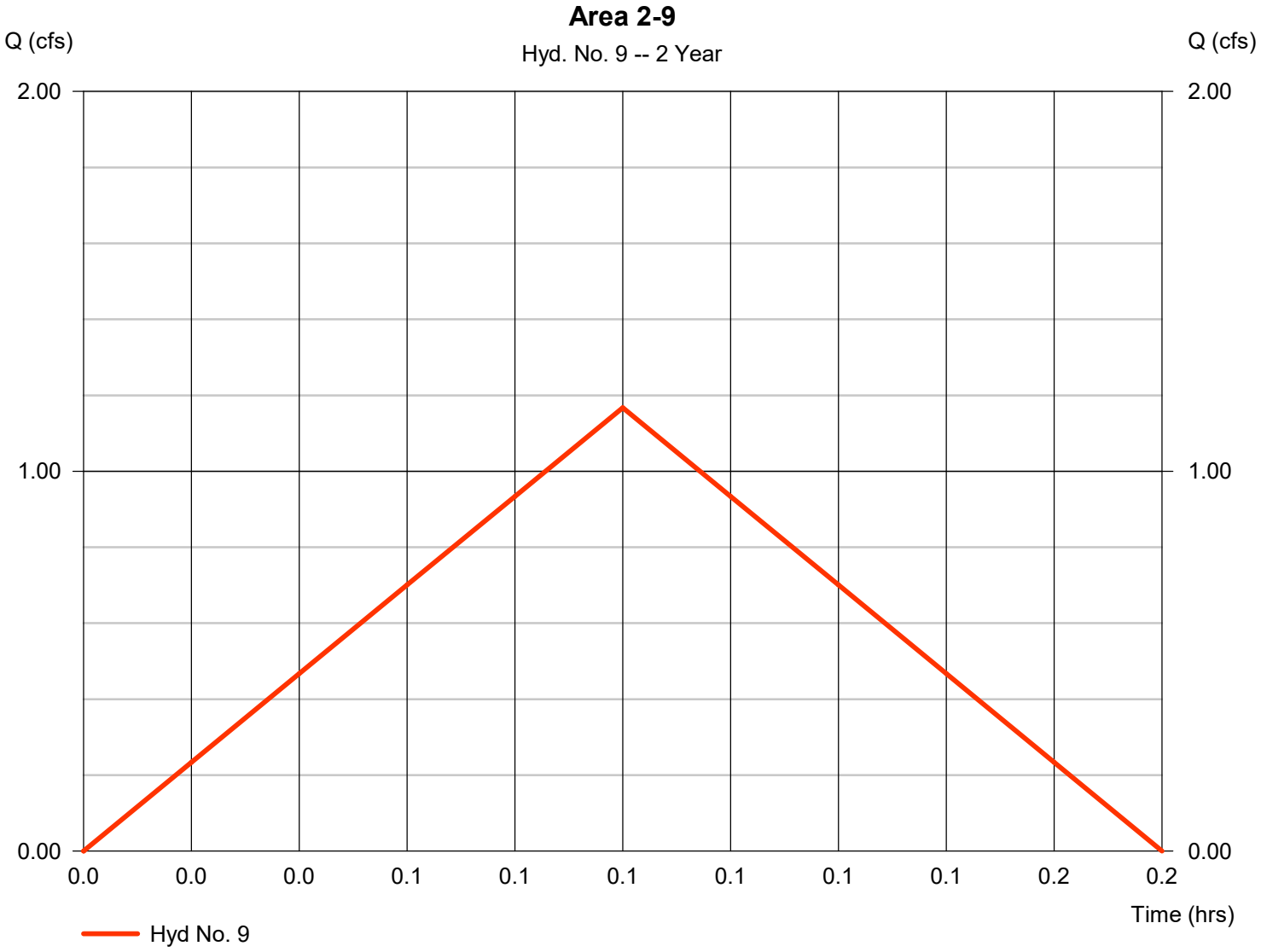


Hydrograph Report

Hyd. No. 9

Area 2-9

Hydrograph type	= Rational	Peak discharge	= 1.168 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 350 cuft
Drainage area	= 0.240 ac	Runoff coeff.	= 0.9
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

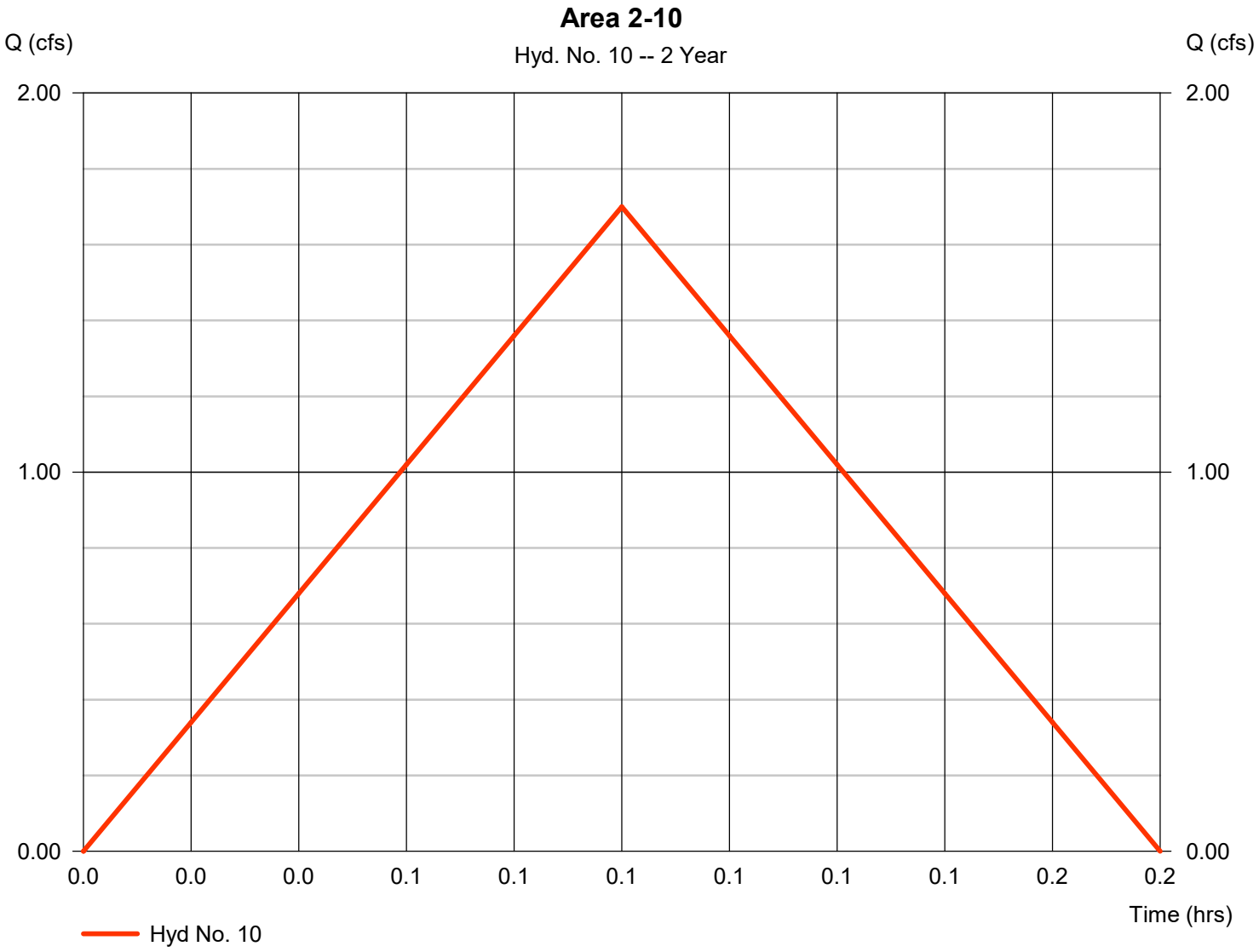


Hydrograph Report

Hyd. No. 10

Area 2-10

Hydrograph type	= Rational	Peak discharge	= 1.700 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 510 cuft
Drainage area	= 0.370 ac	Runoff coeff.	= 0.85
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

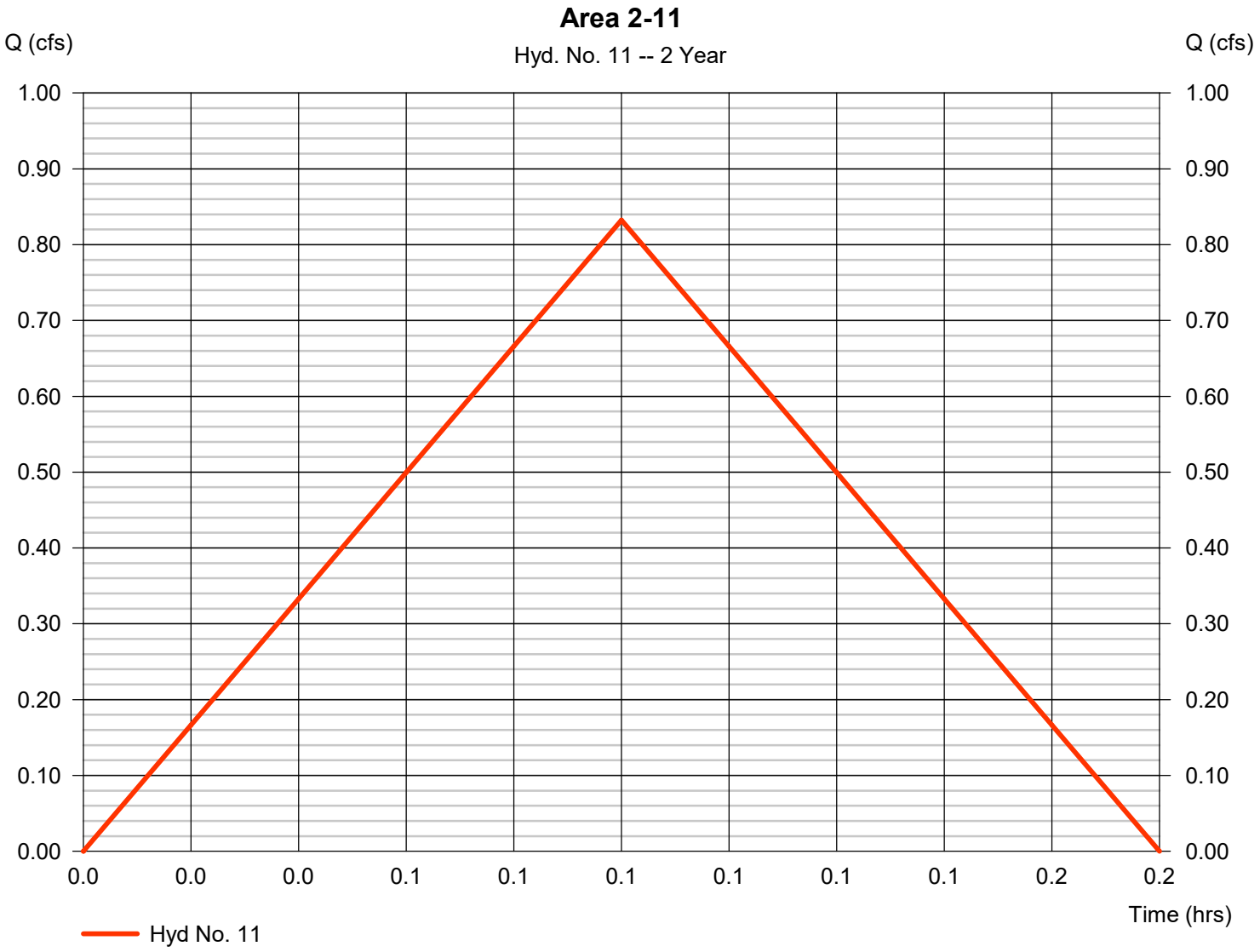


Hydrograph Report

Hyd. No. 11

Area 2-11

Hydrograph type	= Rational	Peak discharge	= 0.832 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 250 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.44
Intensity	= 5.406 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

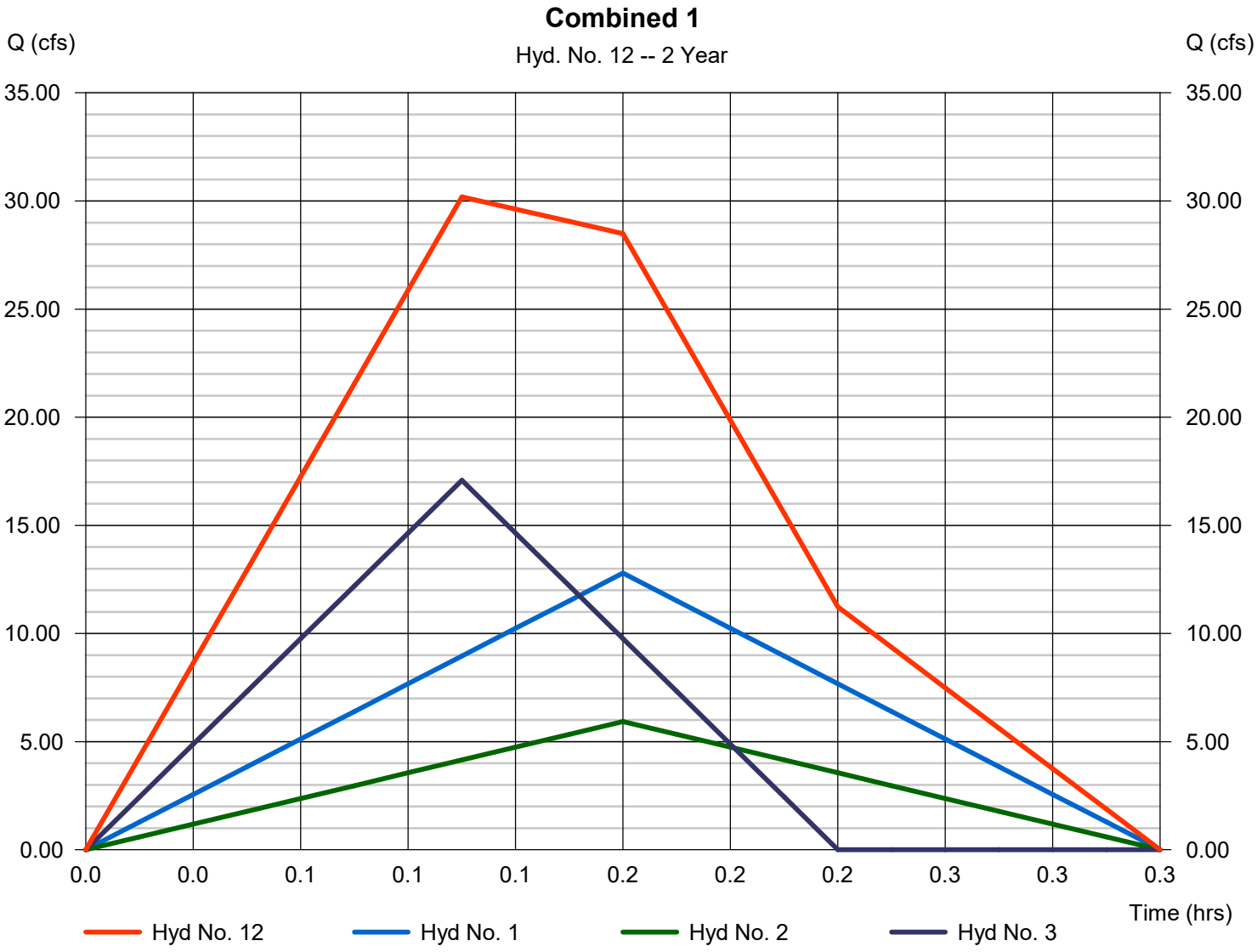


Hydrograph Report

Hyd. No. 12

Combined 1

Hydrograph type	= Combine	Peak discharge	= 30.19 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 18,409 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 25.370 ac

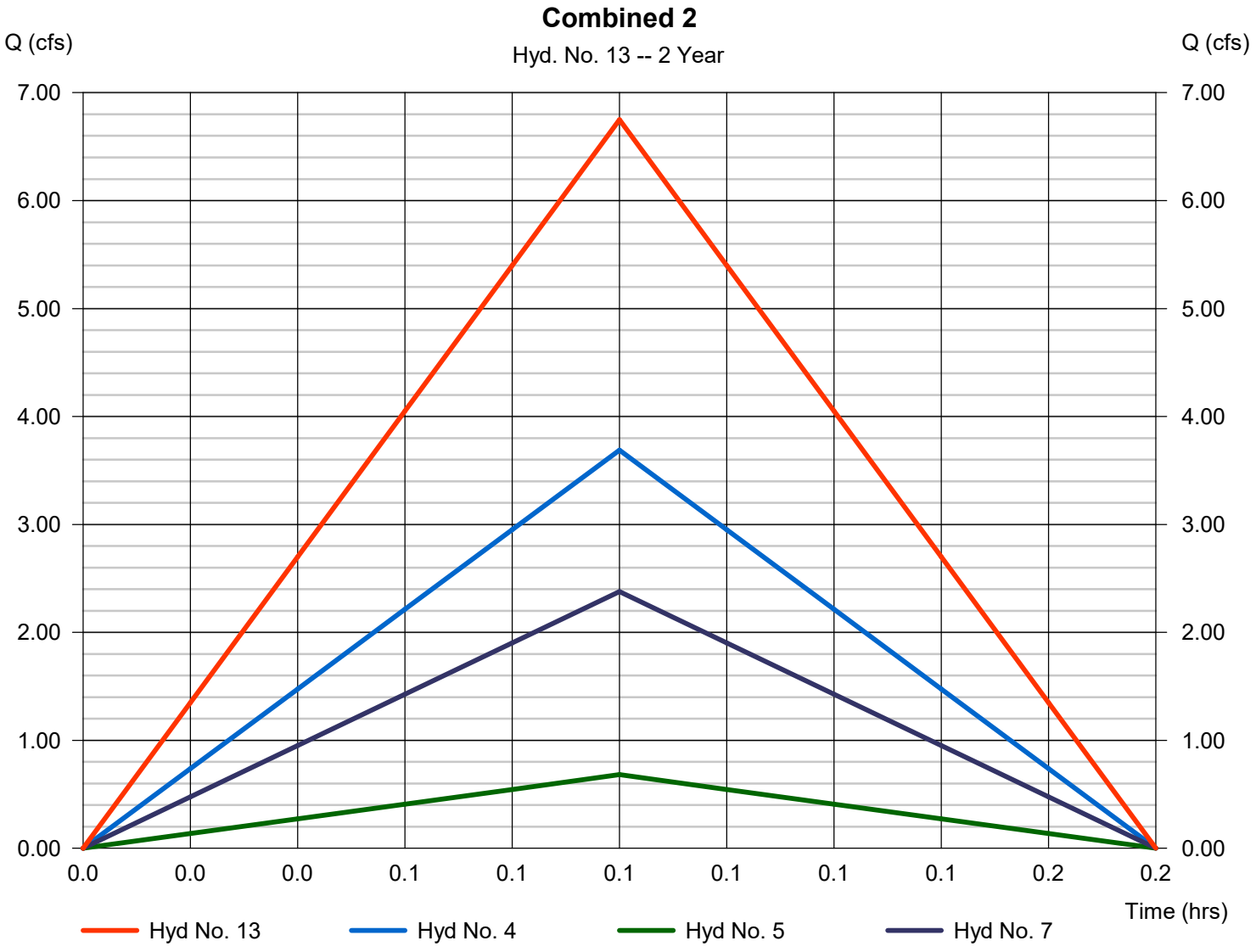


Hydrograph Report

Hyd. No. 13

Combined 2

Hydrograph type	= Combine	Peak discharge	= 6.749 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 2,025 cuft
Inflow hyds.	= 4, 5, 7	Contrib. drain. area	= 1.750 ac

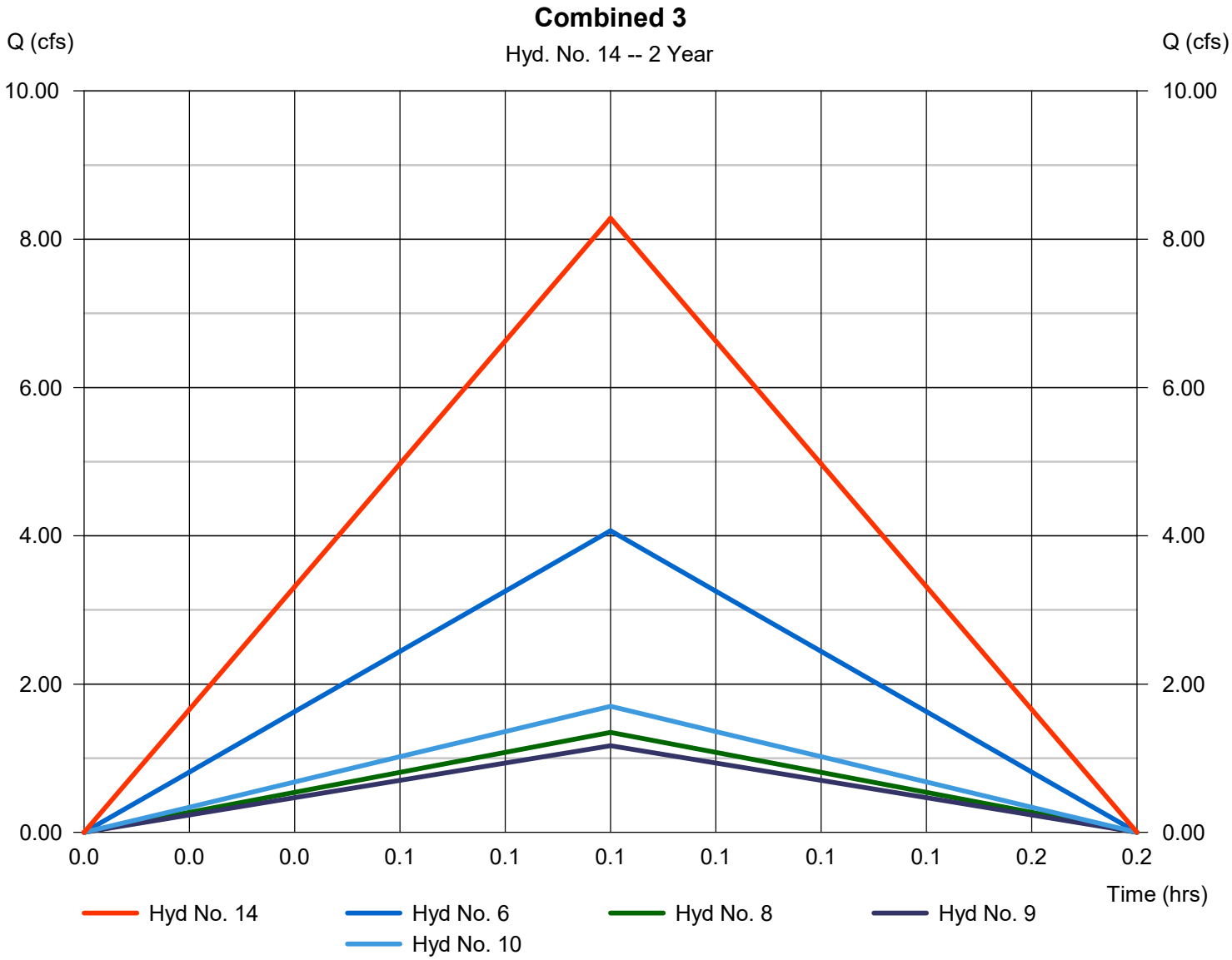


Hydrograph Report

Hyd. No. 14

Combined 3

Hydrograph type	=	Combine	Peak discharge	=	8.283 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	2,485 cuft
Inflow hyds.	=	6, 8, 9, 10	Contrib. drain. area	=	1.890 ac

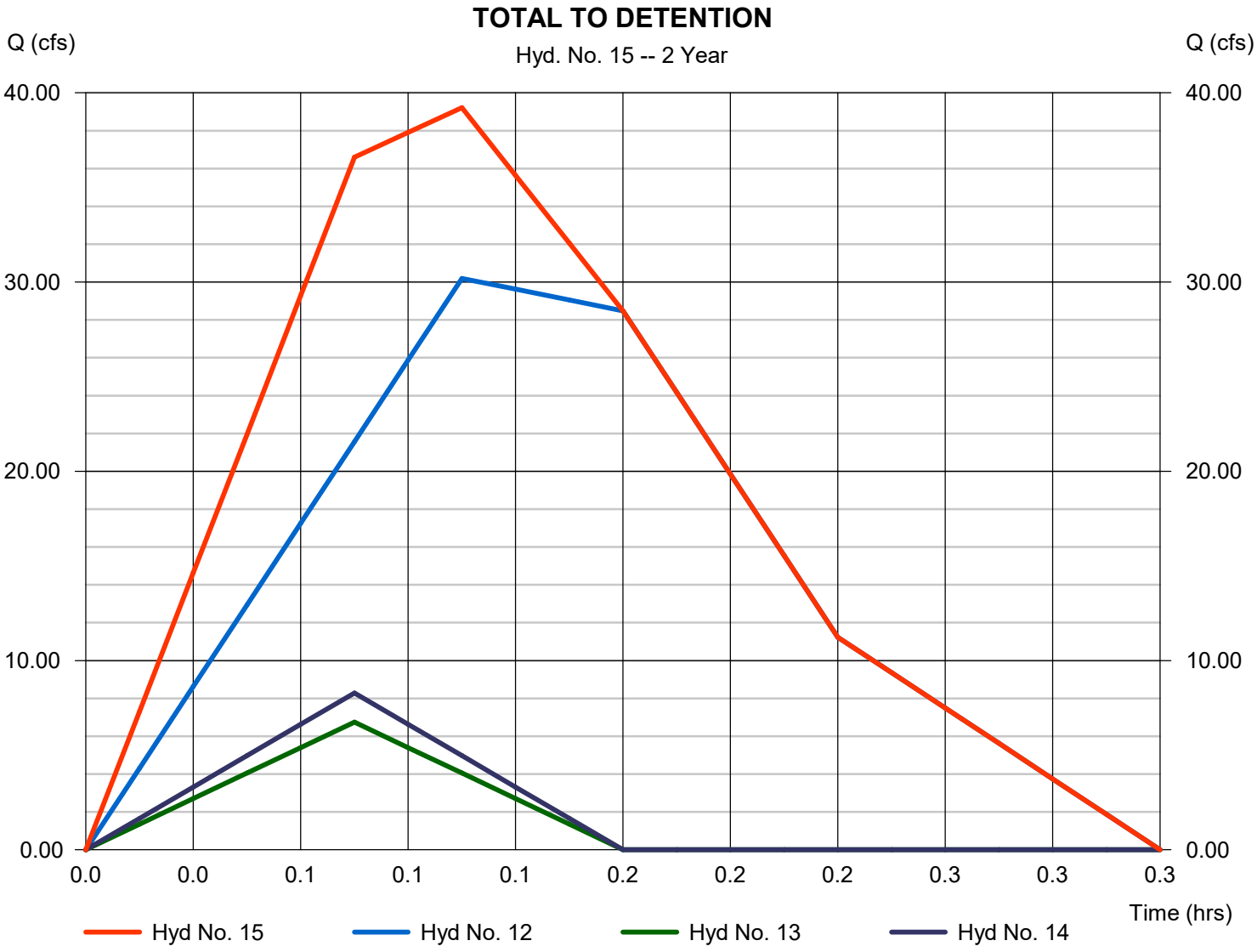


Hydrograph Report

Hyd. No. 15

TOTAL TO DETENTION

Hydrograph type	=	Combine	Peak discharge	=	39.21 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.12 hrs
Time interval	=	1 min	Hyd. volume	=	22,919 cuft
Inflow hyds.	=	12, 13, 14	Contrib. drain. area	=	0.000 ac



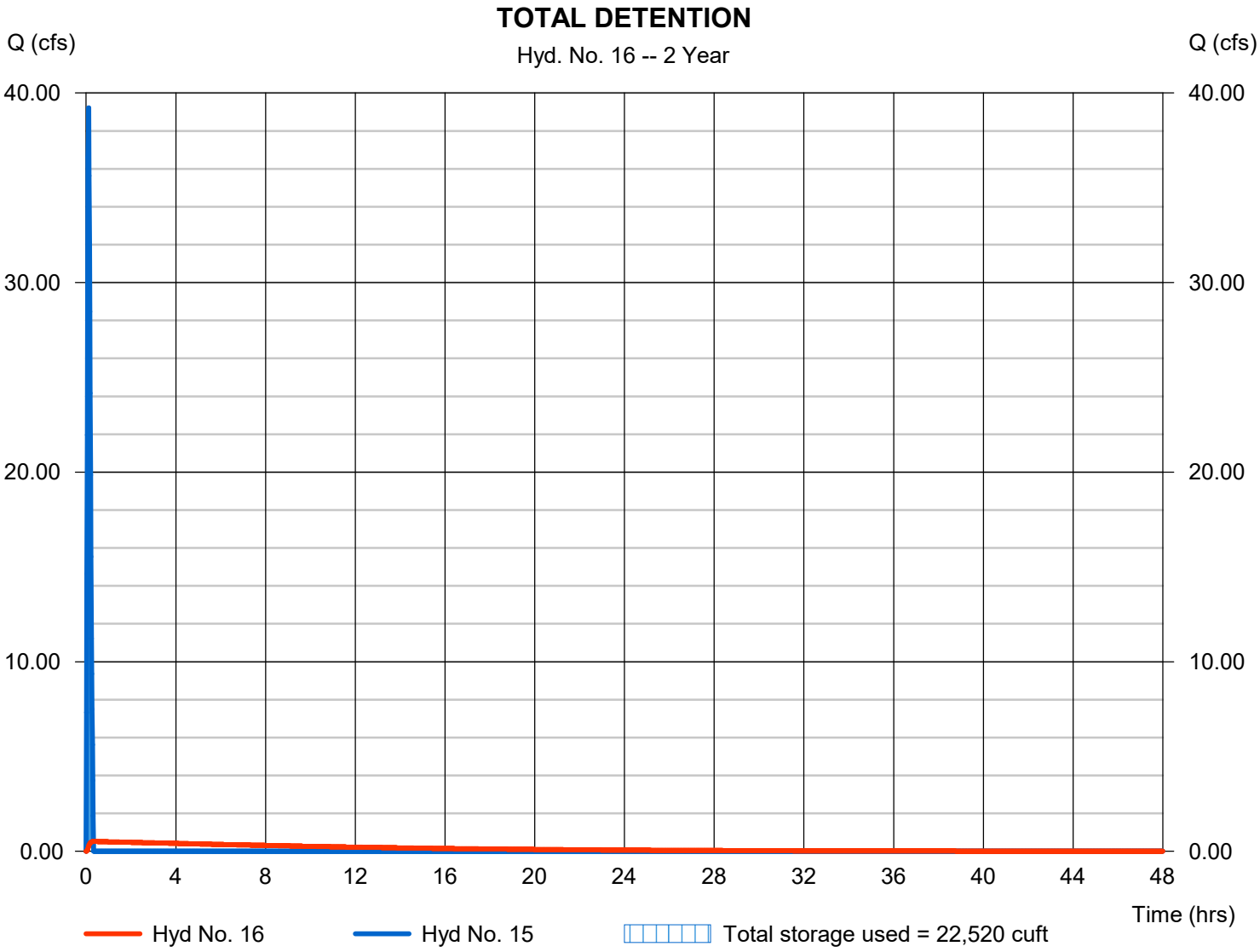
Hydrograph Report

Hyd. No. 16

TOTAL DETENTION

Hydrograph type	=	Reservoir	Peak discharge	=	0.519 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.33 hrs
Time interval	=	1 min	Hyd. volume	=	22,632 cuft
Inflow hyd. No.	=	15 - TOTAL TO DETENTION	Max. Elevation	=	982.70 ft
Reservoir name	=	Detention	Max. Storage	=	22,520 cuft

Storage Indication method used.



Pond No. 1 - Detention

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 977.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	977.00	803	0	0
1.00	978.00	1,645	1,199	1,199
2.00	979.00	2,795	2,195	3,394
3.00	980.00	3,493	3,137	6,531
4.00	981.00	5,097	4,269	10,800
5.00	982.00	7,032	6,038	16,838
6.00	983.00	9,333	8,155	24,993
7.00	984.00	12,041	10,657	35,650
8.00	985.00	15,215	13,596	49,246
9.00	986.00	18,928	17,036	66,282
10.00	987.00	23,407	21,126	87,408

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	36.00	Inactive	1.50
Span (in)	= 42.00	36.00	0.00	1.50
No. Barrels	= 1	1	0	6
Invert El. (ft)	= 977.00	983.00	0.00	977.00
Length (ft)	= 0.00	0.00	0.00	5.80
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	Yes	No	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 985.88	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= Yes	No	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	977.00	0.00	0.00	---	0.00	0.00	---	---	---	---	---	0.000
0.10	120	977.10	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	---	0.001
0.20	240	977.20	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	---	0.003
0.30	360	977.30	0.01 ic	0.00	---	0.01	0.00	---	---	---	---	---	0.006
0.40	480	977.40	0.01 ic	0.00	---	0.01	0.00	---	---	---	---	---	0.009
0.50	599	977.50	0.01 ic	0.00	---	0.01	0.00	---	---	---	---	---	0.013
0.60	719	977.60	0.02 ic	0.00	---	0.02	0.00	---	---	---	---	---	0.017
0.70	839	977.70	0.02 ic	0.00	---	0.02	0.00	---	---	---	---	---	0.021
0.80	959	977.80	0.03 ic	0.00	---	0.03	0.00	---	---	---	---	---	0.026
0.90	1,079	977.90	0.03 ic	0.00	---	0.03	0.00	---	---	---	---	---	0.031
1.00	1,199	978.00	0.04 ic	0.00	---	0.04	0.00	---	---	---	---	---	0.037
1.10	1,418	978.10	0.05 ic	0.00	---	0.04	0.00	---	---	---	---	---	0.043
1.20	1,638	978.20	0.05 ic	0.00	---	0.05	0.00	---	---	---	---	---	0.049
1.30	1,857	978.30	0.06 ic	0.00	---	0.06	0.00	---	---	---	---	---	0.055
1.40	2,077	978.40	0.06 ic	0.00	---	0.06	0.00	---	---	---	---	---	0.061
1.50	2,296	978.50	0.07 ic	0.00	---	0.07	0.00	---	---	---	---	---	0.069
1.60	2,516	978.60	0.09 ic	0.00	---	0.08	0.00	---	---	---	---	---	0.075
1.70	2,735	978.70	0.09 ic	0.00	---	0.08	0.00	---	---	---	---	---	0.083
1.80	2,955	978.80	0.09 ic	0.00	---	0.09	0.00	---	---	---	---	---	0.090
1.90	3,174	978.90	0.10 ic	0.00	---	0.10	0.00	---	---	---	---	---	0.098
2.00	3,394	979.00	0.11 ic	0.00	---	0.11	0.00	---	---	---	---	---	0.106
2.10	3,707	979.10	0.12 ic	0.00	---	0.11	0.00	---	---	---	---	---	0.114
2.20	4,021	979.20	0.12 ic	0.00	---	0.12	0.00	---	---	---	---	---	0.123
2.30	4,335	979.30	0.14 ic	0.00	---	0.13	0.00	---	---	---	---	---	0.131
2.40	4,648	979.40	0.14 ic	0.00	---	0.14	0.00	---	---	---	---	---	0.140
2.50	4,962	979.50	0.15 ic	0.00	---	0.15	0.00	---	---	---	---	---	0.148
2.60	5,276	979.60	0.17 ic	0.00	---	0.16	0.00	---	---	---	---	---	0.158
2.70	5,590	979.70	0.17 ic	0.00	---	0.17	0.00	---	---	---	---	---	0.167
2.80	5,903	979.80	0.19 ic	0.00	---	0.18	0.00	---	---	---	---	---	0.176
2.90	6,217	979.90	0.19 ic	0.00	---	0.19	0.00	---	---	---	---	---	0.186
3.00	6,531	980.00	0.20 ic	0.00	---	0.20	0.00	---	---	---	---	---	0.196
3.10	6,958	980.10	0.22 ic	0.00	---	0.21	0.00	---	---	---	---	---	0.206

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Detention

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
3.20	7,385	980.20	0.22 ic	0.00	---	0.22	0.00	---	---	---	---	---	0.216
3.30	7,812	980.30	0.23 ic	0.00	---	0.23	0.00	---	---	---	---	---	0.227
3.40	8,238	980.40	0.26 ic	0.00	---	0.24	0.00	---	---	---	---	---	0.237
3.50	8,665	980.50	0.26 ic	0.00	---	0.25	0.00	---	---	---	---	---	0.248
3.60	9,092	980.60	0.26 ic	0.00	---	0.26	0.00	---	---	---	---	---	0.259
3.70	9,519	980.70	0.29 ic	0.00	---	0.27	0.00	---	---	---	---	---	0.269
3.80	9,946	980.80	0.29 ic	0.00	---	0.28	0.00	---	---	---	---	---	0.281
3.90	10,373	980.90	0.29 ic	0.00	---	0.29	0.00	---	---	---	---	---	0.292
4.00	10,800	981.00	0.30 ic	0.00	---	0.30	0.00	---	---	---	---	---	0.303
4.10	11,404	981.10	0.33 ic	0.00	---	0.31	0.00	---	---	---	---	---	0.315
4.20	12,008	981.20	0.33 ic	0.00	---	0.33	0.00	---	---	---	---	---	0.327
4.30	12,612	981.30	0.34 ic	0.00	---	0.34	0.00	---	---	---	---	---	0.339
4.40	13,215	981.40	0.38 ic	0.00	---	0.35	0.00	---	---	---	---	---	0.350
4.50	13,819	981.50	0.38 ic	0.00	---	0.36	0.00	---	---	---	---	---	0.363
4.60	14,423	981.60	0.38 ic	0.00	---	0.38	0.00	---	---	---	---	---	0.376
4.70	15,027	981.70	0.39 ic	0.00	---	0.39	0.00	---	---	---	---	---	0.387
4.80	15,631	981.80	0.43 ic	0.00	---	0.40	0.00	---	---	---	---	---	0.400
4.90	16,234	981.90	0.43 ic	0.00	---	0.41	0.00	---	---	---	---	---	0.413
5.00	16,838	982.00	0.43 ic	0.00	---	0.43	0.00	---	---	---	---	---	0.426
5.10	17,654	982.10	0.44 ic	0.00	---	0.44	0.00	---	---	---	---	---	0.438
5.20	18,469	982.20	0.48 ic	0.00	---	0.45	0.00	---	---	---	---	---	0.451
5.30	19,285	982.30	0.48 ic	0.00	---	0.47	0.00	---	---	---	---	---	0.465
5.40	20,100	982.40	0.48 ic	0.00	---	0.48	0.00	---	---	---	---	---	0.479
5.50	20,915	982.50	0.49 ic	0.00	---	0.49	0.00	---	---	---	---	---	0.491
5.60	21,731	982.60	0.54 ic	0.00	---	0.51	0.00	---	---	---	---	---	0.505
5.70	22,546	982.70	0.54 ic	0.00	---	0.52	0.00	---	---	---	---	---	0.519
5.80	23,362	982.80	0.54 ic	0.00	---	0.53	0.00	---	---	---	---	---	0.534
5.90	24,177	982.90	0.55 ic	0.00	---	0.55	0.00	---	---	---	---	---	0.547
6.00	24,993	983.00	0.60 ic	0.00	---	0.56	0.00	---	---	---	---	---	0.561
6.10	26,058	983.10	0.67 ic	0.08 ic	---	0.57	0.00	---	---	---	---	---	0.657
6.20	27,124	983.20	0.91 ic	0.33 ic	---	0.58	0.00	---	---	---	---	---	0.909
6.30	28,190	983.30	1.29 ic	0.69 ic	---	0.59	0.00	---	---	---	---	---	1.274
6.40	29,256	983.40	1.82 ic	1.24 ic	---	0.59	0.00	---	---	---	---	---	1.823
6.50	30,321	983.50	2.59 ic	1.91 ic	---	0.59	0.00	---	---	---	---	---	2.498
6.60	31,387	983.60	3.38 ic	2.77 ic	---	0.59	0.00	---	---	---	---	---	3.364
6.70	32,453	983.70	4.32 ic	3.69 ic	---	0.60	0.00	---	---	---	---	---	4.284
6.80	33,518	983.80	5.41 ic	4.76 ic	---	0.60	0.00	---	---	---	---	---	5.359
6.90	34,584	983.90	6.40 ic	5.80 ic	---	0.60	0.00	---	---	---	---	---	6.397
7.00	35,650	984.00	7.76 ic	7.16 ic	---	0.60	0.00	---	---	---	---	---	7.758
7.10	37,010	984.10	9.23 ic	8.43 ic	---	0.60	0.00	---	---	---	---	---	9.032
7.20	38,369	984.20	10.92 ic	10.06 ic	---	0.60	0.00	---	---	---	---	---	10.66
7.30	39,729	984.30	12.29 ic	11.54 ic	---	0.60	0.00	---	---	---	---	---	12.14
7.40	41,088	984.40	13.74 ic	13.10 ic	---	0.61	0.00	---	---	---	---	---	13.71
7.50	42,448	984.50	15.35 ic	14.74 ic	---	0.61	0.00	---	---	---	---	---	15.35
7.60	43,807	984.60	17.44 ic	16.74 ic	---	0.61	0.00	---	---	---	---	---	17.35
7.70	45,167	984.70	19.14 ic	18.49 ic	---	0.61	0.00	---	---	---	---	---	19.11
7.80	46,527	984.80	20.90 ic	20.28 ic	---	0.61	0.00	---	---	---	---	---	20.90
7.90	47,886	984.90	23.32 ic	22.40 ic	---	0.61	0.00	---	---	---	---	---	23.01
8.00	49,246	985.00	25.19 ic	24.21 ic	---	0.62	0.00	---	---	---	---	---	24.83
8.10	50,949	985.10	27.09 ic	26.31 ic	---	0.62	0.00	---	---	---	---	---	26.93
8.20	52,653	985.20	29.02 ic	28.08 ic	---	0.62	0.00	---	---	---	---	---	28.70
8.30	54,356	985.30	30.96 ic	30.07 ic	---	0.62	0.00	---	---	---	---	---	30.70
8.40	56,060	985.40	32.90 ic	31.98 ic	---	0.63	0.00	---	---	---	---	---	32.61
8.50	57,764	985.50	34.83 ic	34.00 ic	---	0.63	0.00	---	---	---	---	---	34.63
8.60	59,467	985.60	36.75 ic	35.83 ic	---	0.63	0.00	---	---	---	---	---	36.47
8.70	61,171	985.70	38.64 ic	37.62 ic	---	0.64	0.00	---	---	---	---	---	38.26
8.80	62,875	985.80	39.88 ic	39.14 ic	---	0.65	0.00	---	---	---	---	---	39.79
8.90	64,578	985.90	41.71 ic	40.58 ic	---	0.65	0.12	---	---	---	---	---	41.35
9.00	66,282	986.00	44.06 ic	41.68 ic	---	0.65	1.73	---	---	---	---	---	44.06
9.10	68,394	986.10	47.98 ic	43.05 ic	---	0.64	4.29	---	---	---	---	---	47.98
9.20	70,507	986.20	52.62 ic	44.37 ic	---	0.63	7.53	---	---	---	---	---	52.53
9.30	72,619	986.30	57.72 ic	45.66 ic	---	0.60	11.32	---	---	---	---	---	57.58
9.40	74,732	986.40	63.07 ic	46.91 ic	---	0.57	15.59	---	---	---	---	---	63.07
9.50	76,845	986.50	68.96 ic	48.13 ic	---	0.53	20.30	---	---	---	---	---	68.96
9.60	78,957	986.60	75.21 ic	49.31 ic	---	0.49	25.41	---	---	---	---	---	75.21
9.70	81,070	986.70	81.79 ic	50.47 ic	---	0.43	30.88	---	---	---	---	---	81.79
9.80	83,182	986.80	88.68 ic	51.61 ic	---	0.37	36.70	---	---	---	---	---	88.68
9.90	85,295	986.90	95.87 ic	52.72 ic	---	0.31	42.84	---	---	---	---	---	95.87
10.00	87,408	987.00	103.36 ic	53.81 ic	---	0.24	49.31	---	---	---	---	---	103.36

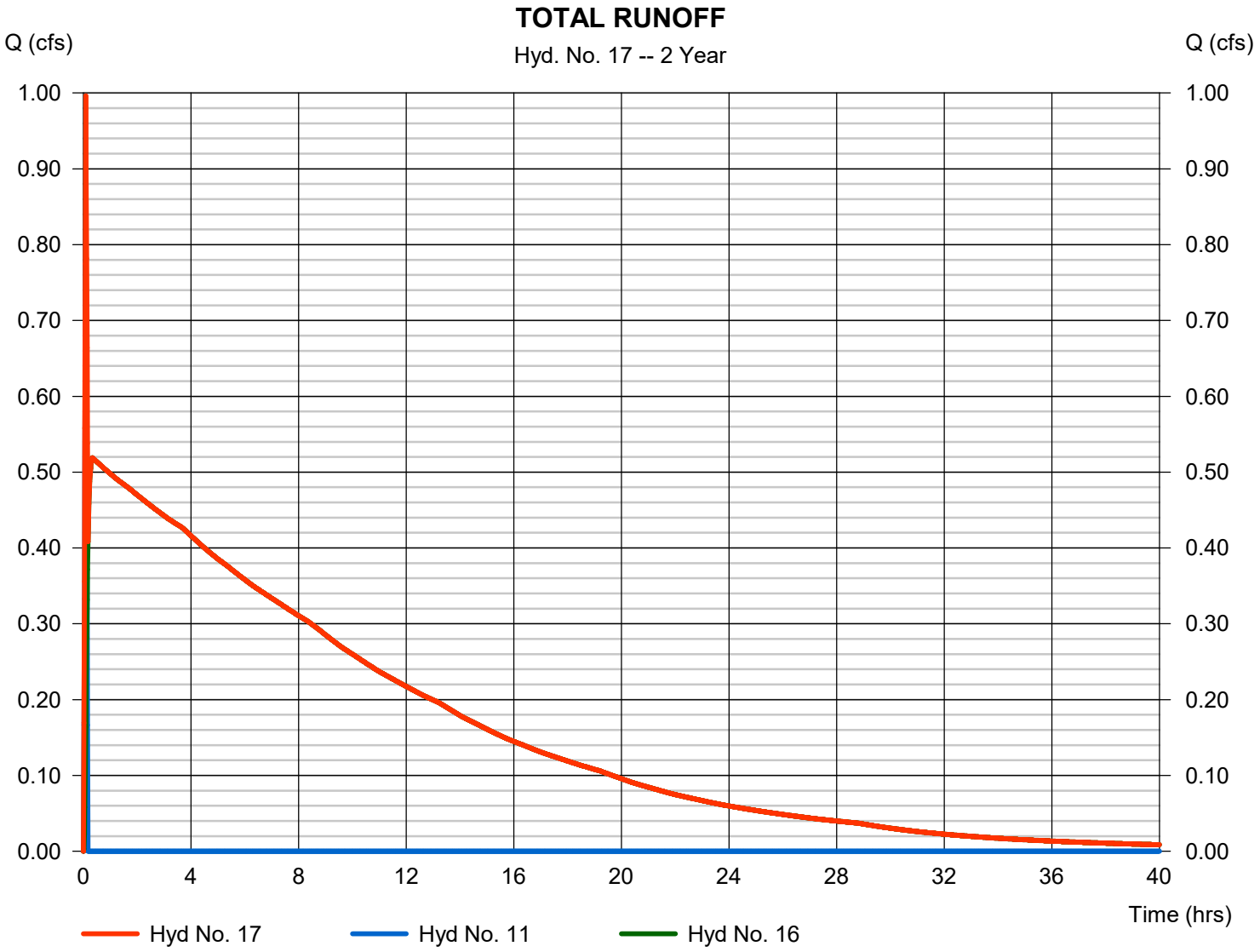
...End

Hydrograph Report

Hyd. No. 17

TOTAL RUNOFF

Hydrograph type	=	Combine	Peak discharge	=	0.996 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	22,882 cuft
Inflow hyds.	=	11, 16	Contrib. drain. area	=	0.350 ac



Hydrograph Summary Report

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

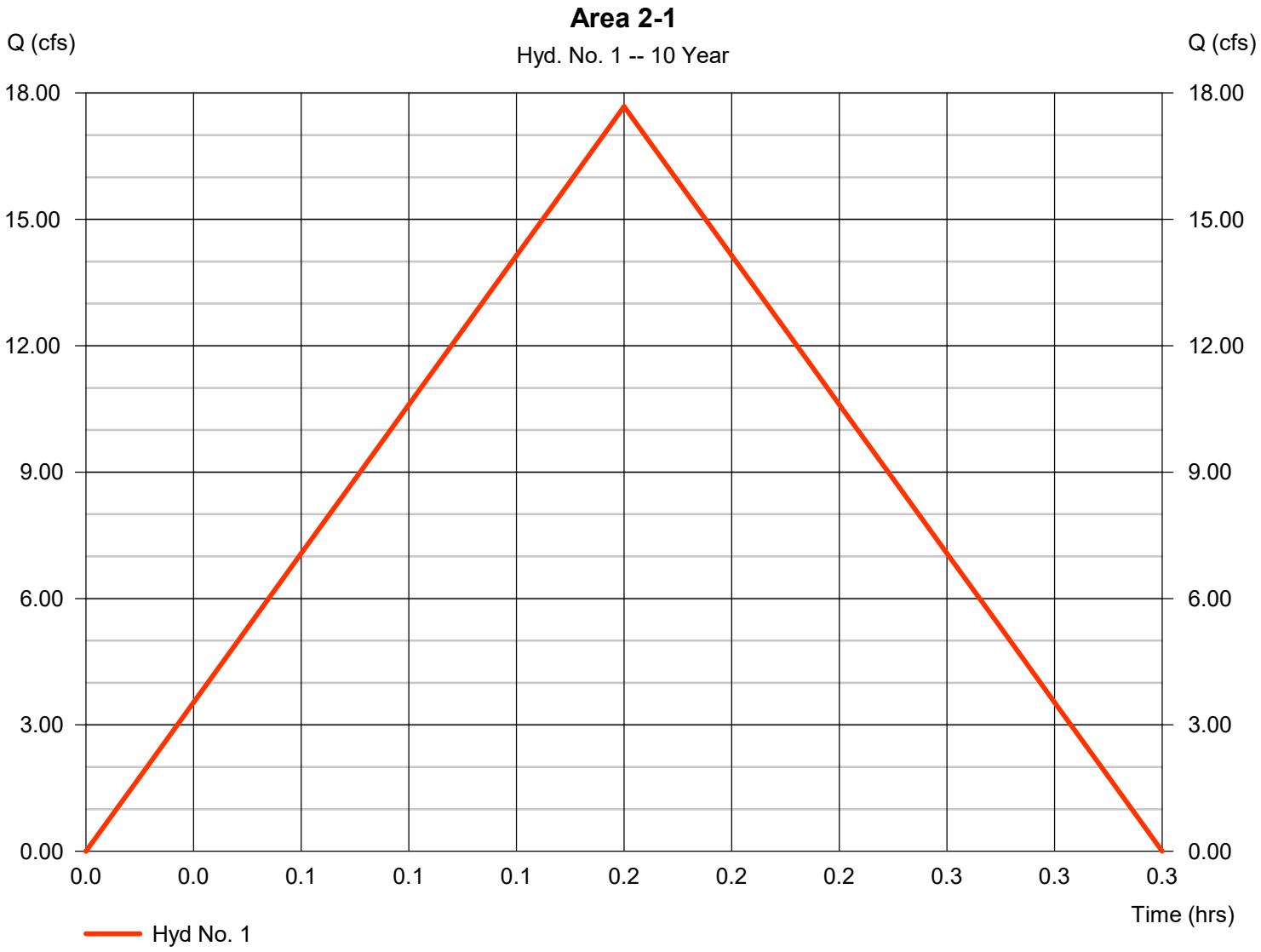
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	17.68	1	10	10,606	------	------	------	Area 2-1
2	Rational	8.189	1	10	4,913	------	------	------	Area 2-2
3	Rational	23.40	1	7	9,828	------	------	------	Area 2-3
4	Rational	5.015	1	5	1,505	------	------	------	Area 2-4
5	Rational	0.926	1	5	278	------	------	------	Area 2-5
6	Rational	5.529	1	5	1,659	------	------	------	Area 2-6
7	Rational	3.233	1	5	970	------	------	------	Area 2-7
8	Rational	1.833	1	5	550	------	------	------	Area 2-8
9	Rational	1.587	1	5	476	------	------	------	Area 2-9
10	Rational	2.311	1	5	693	------	------	------	Area 2-10
11	Rational	1.132	1	5	339	------	------	------	Area 2-11
12	Combine	41.51	1	7	25,347	1, 2, 3,	------	------	Combined 1
13	Combine	9.175	1	5	2,752	4, 5, 7,	------	------	Combined 2
14	Combine	11.26	1	5	3,378	6, 8, 9,	------	------	Combined 3
15	Combine	53.77	1	7	31,478	10, 12, 13, 14	------	------	TOTAL TO DETENTION
16	Reservoir	2.589	1	19	31,144	15	983.51	30,433	TOTAL DETENTION
17	Combine	2.589	1	19	31,484	11, 16	------	------	TOTAL RUNOFF

Hydrograph Report

Hyd. No. 1

Area 2-1

Hydrograph type	= Rational	Peak discharge	= 17.68 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 10,606 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 6.079 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

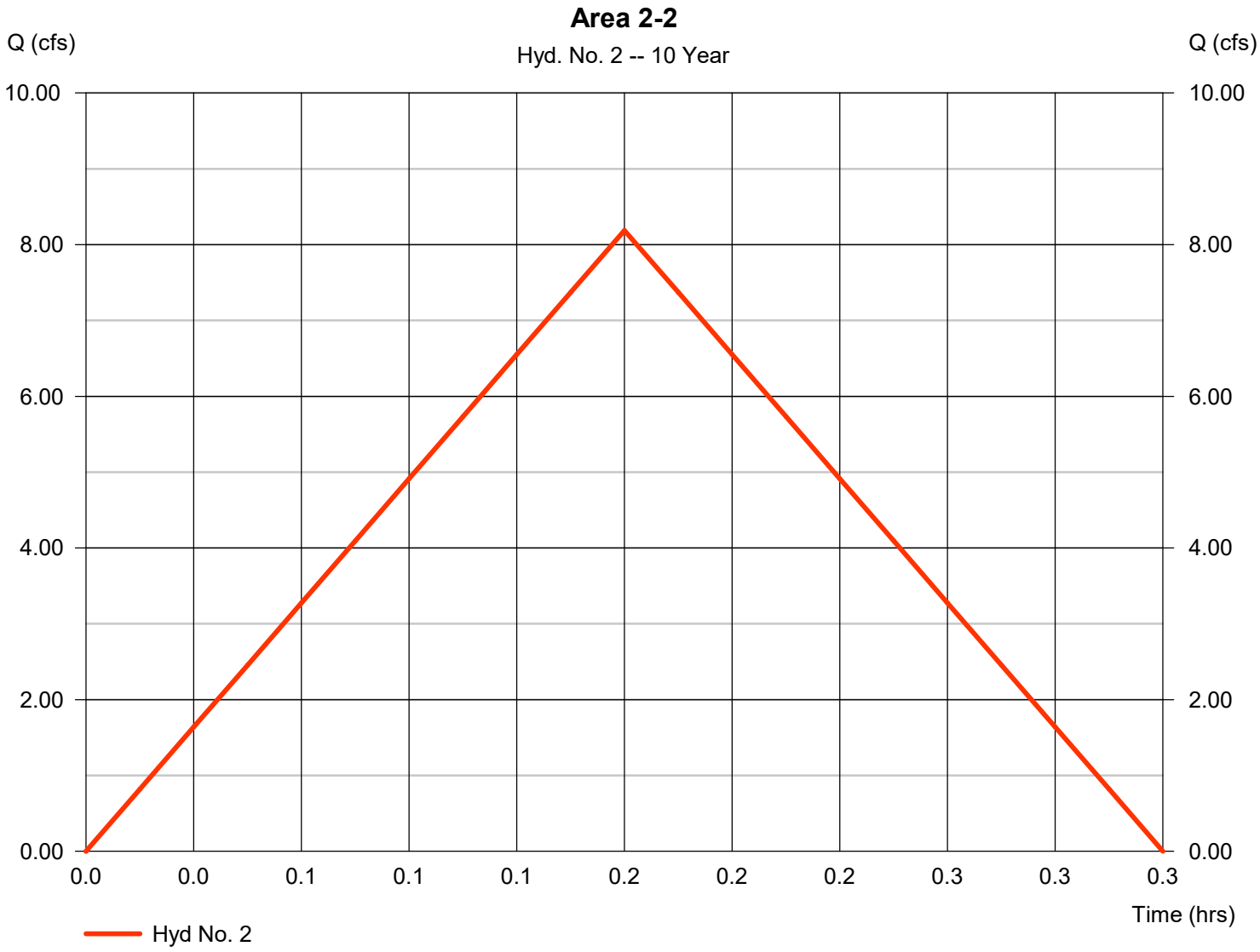


Hydrograph Report

Hyd. No. 2

Area 2-2

Hydrograph type	= Rational	Peak discharge	= 8.189 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 4,913 cuft
Drainage area	= 4.490 ac	Runoff coeff.	= 0.3
Intensity	= 6.079 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

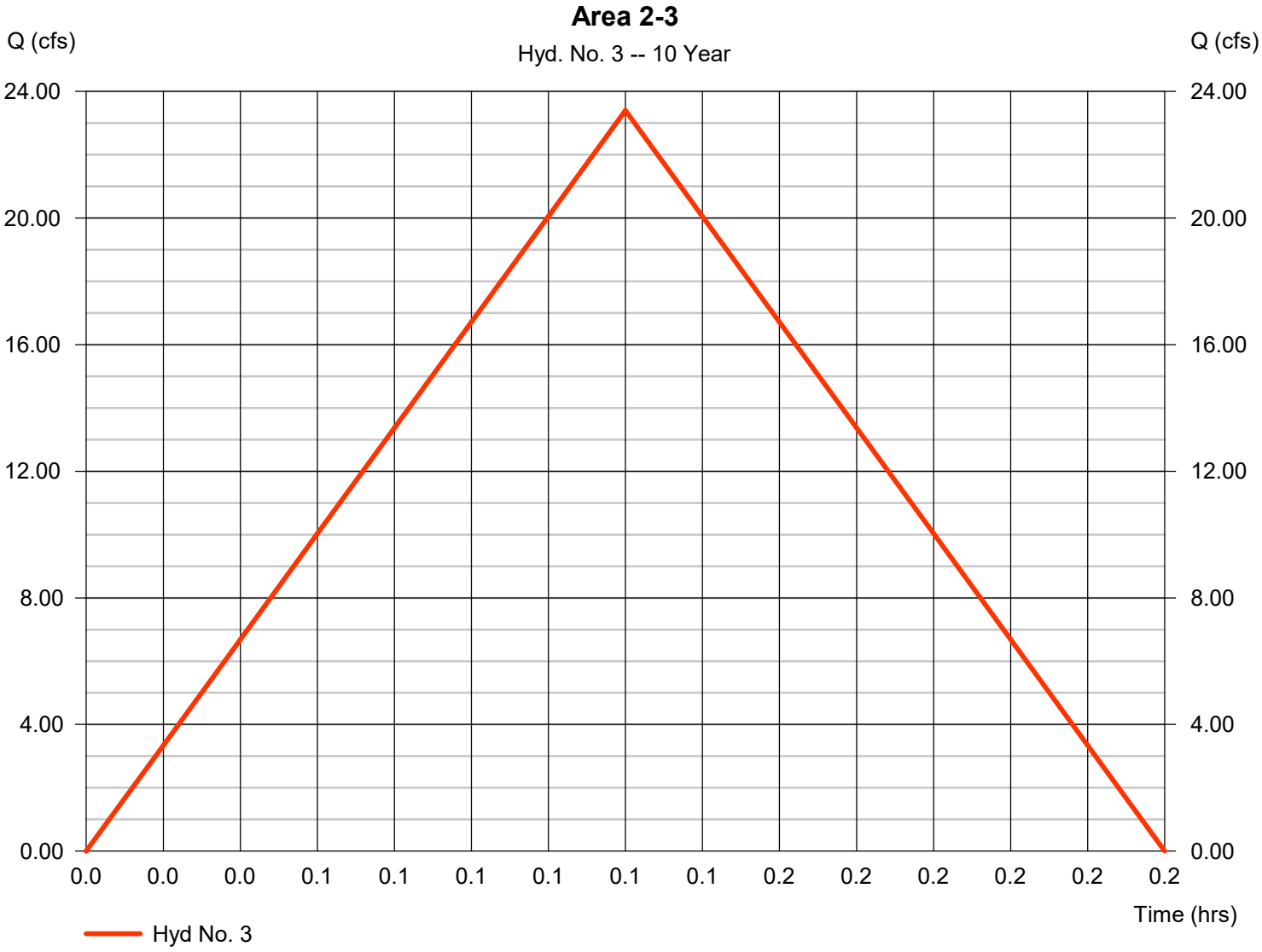


Hydrograph Report

Hyd. No. 3

Area 2-3

Hydrograph type	=	Rational	Peak discharge	=	23.40 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.12 hrs
Time interval	=	1 min	Hyd. volume	=	9,828 cuft
Drainage area	=	11.500 ac	Runoff coeff.	=	0.3
Intensity	=	6.782 in/hr	Tc by User	=	7.00 min
IDF Curve	=	KCAPWA.IDF	Asc/Rec limb fact	=	1/1

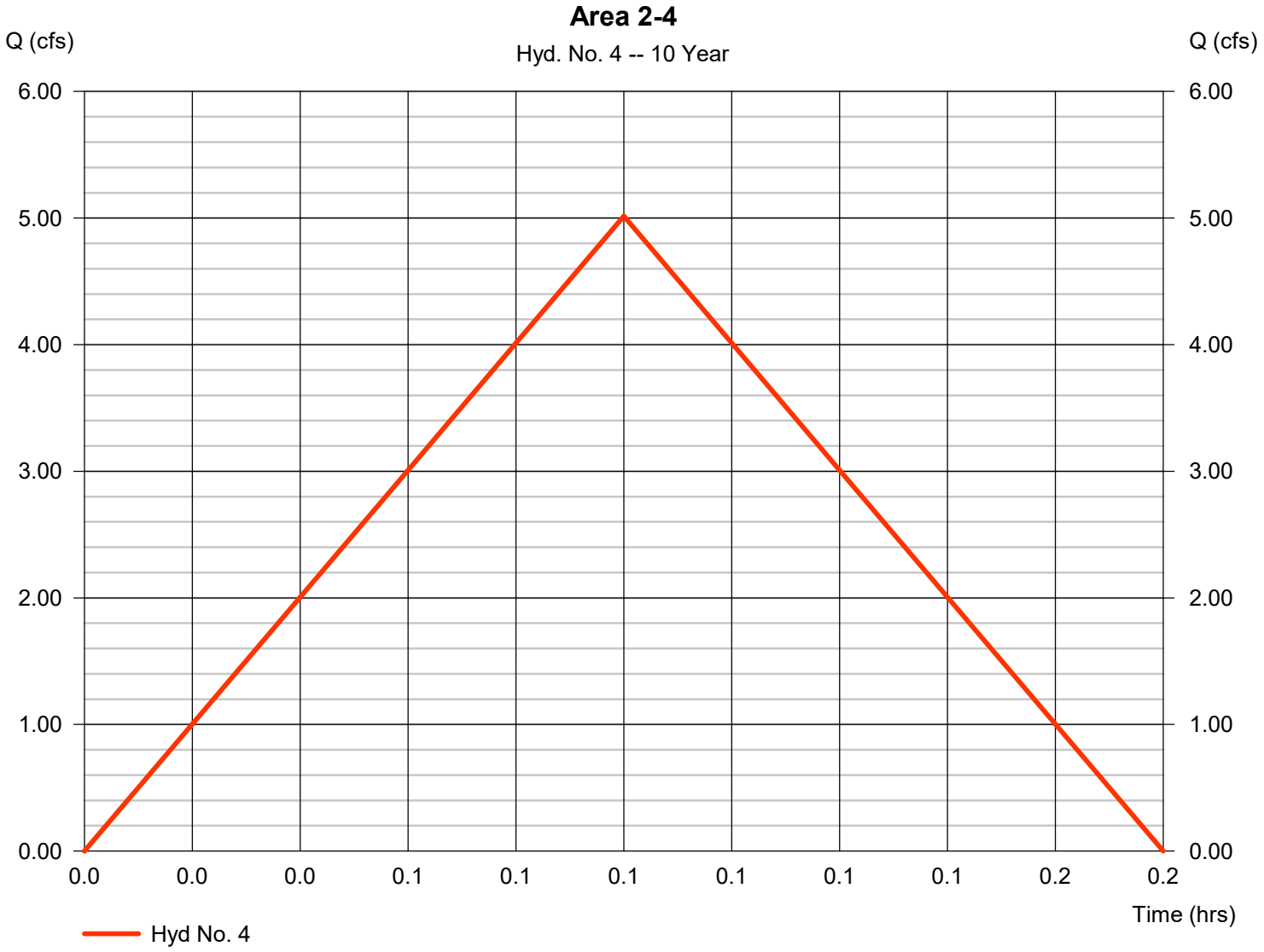


Hydrograph Report

Hyd. No. 4

Area 2-4

Hydrograph type	= Rational	Peak discharge	= 5.015 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,505 cuft
Drainage area	= 1.050 ac	Runoff coeff.	= 0.65
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

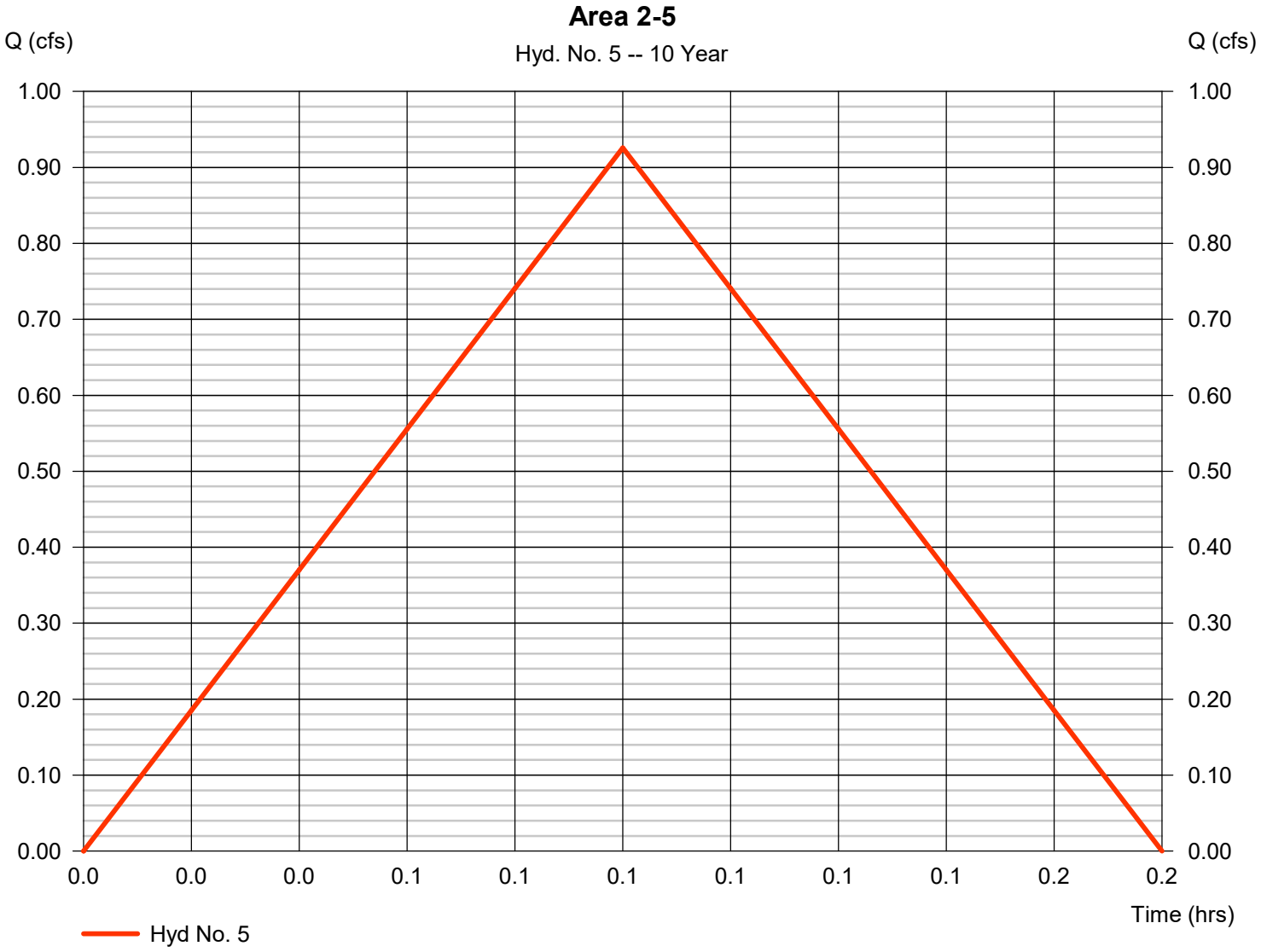


Hydrograph Report

Hyd. No. 5

Area 2-5

Hydrograph type	= Rational	Peak discharge	= 0.926 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 278 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.63
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

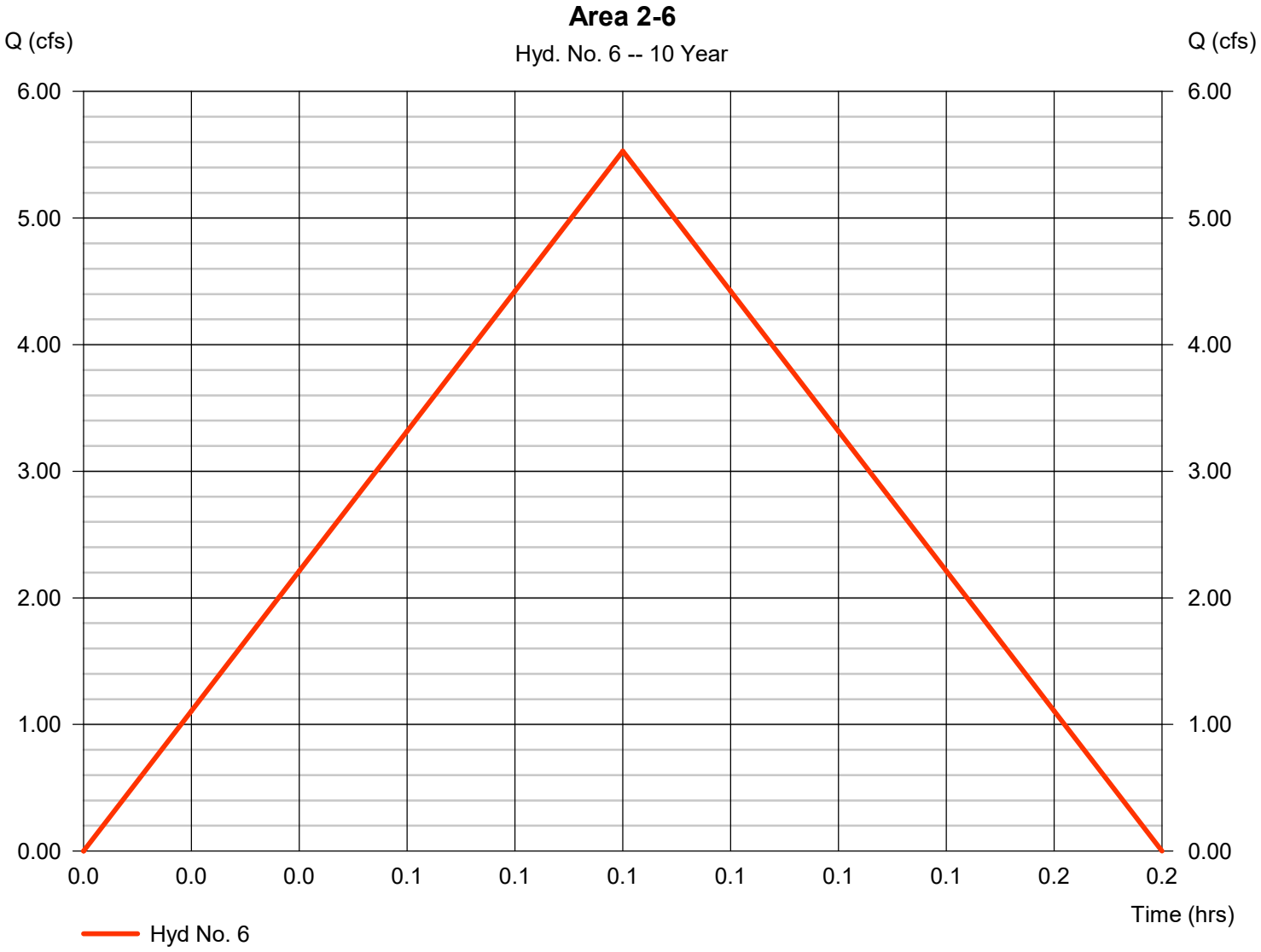


Hydrograph Report

Hyd. No. 6

Area 2-6

Hydrograph type	= Rational	Peak discharge	= 5.529 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,659 cuft
Drainage area	= 0.990 ac	Runoff coeff.	= 0.76
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

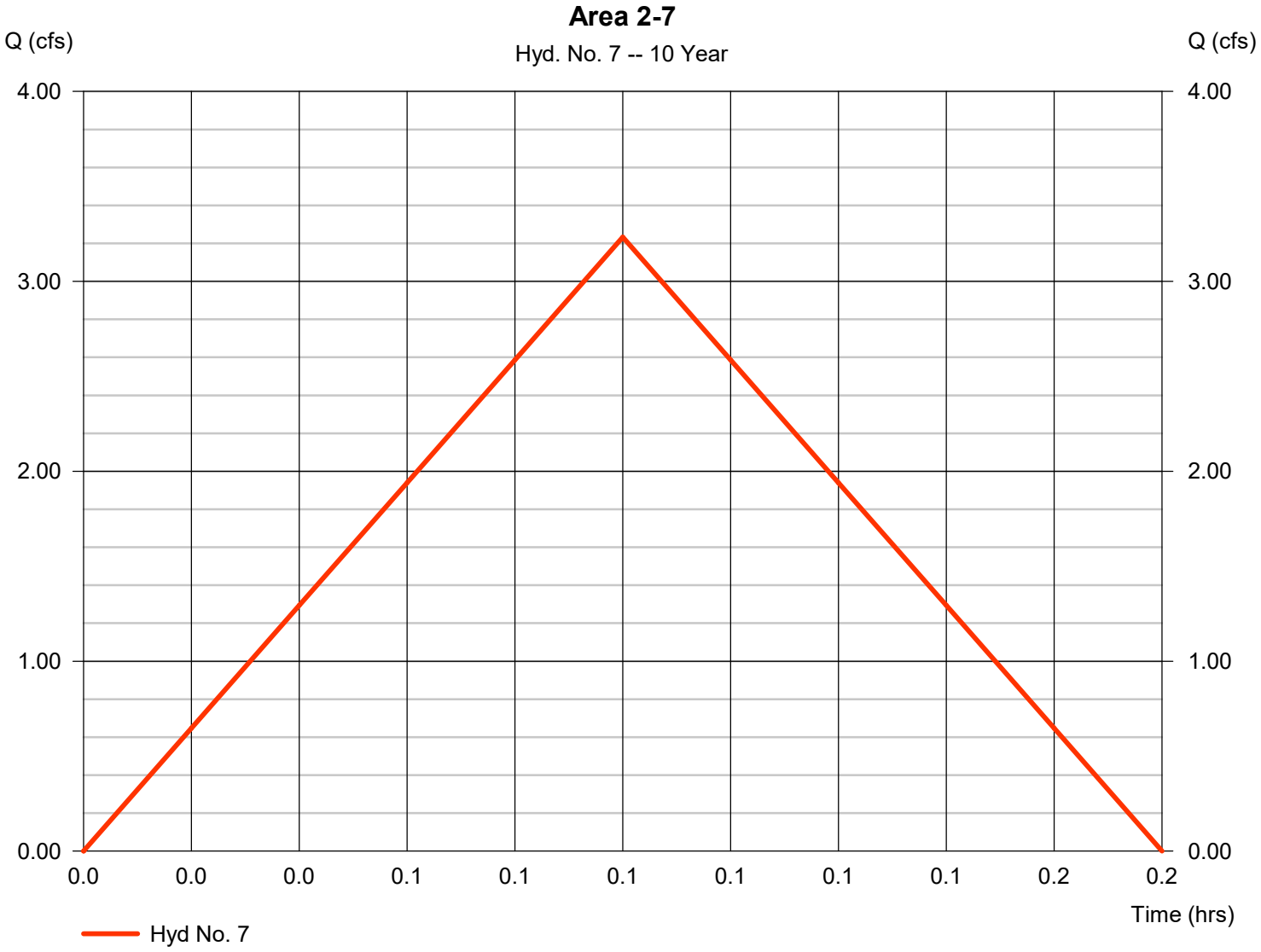


Hydrograph Report

Hyd. No. 7

Area 2-7

Hydrograph type	= Rational	Peak discharge	= 3.233 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 970 cuft
Drainage area	= 0.500 ac	Runoff coeff.	= 0.88
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

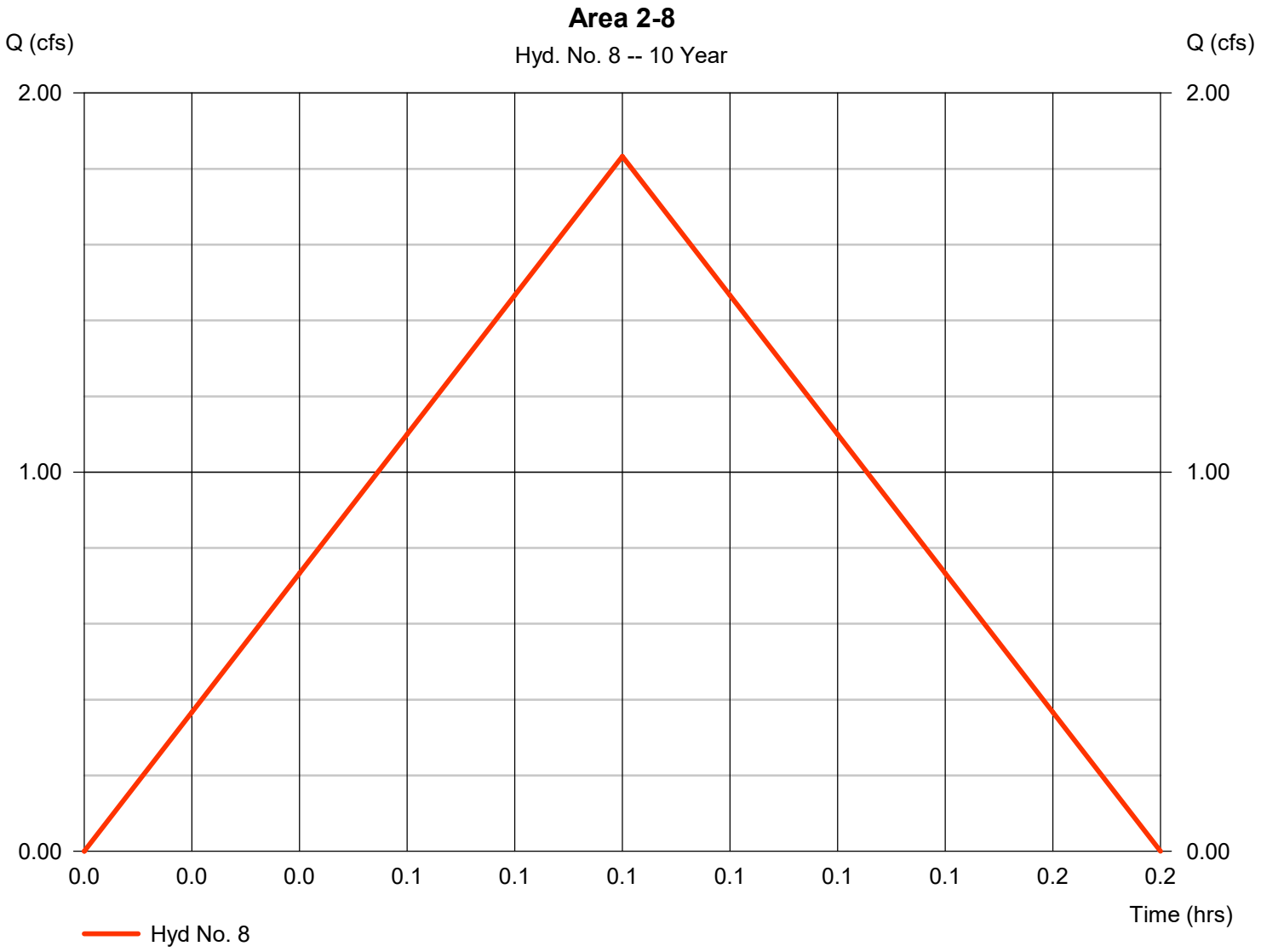


Hydrograph Report

Hyd. No. 8

Area 2-8

Hydrograph type	=	Rational	Peak discharge	=	1.833 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	550 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.86
Intensity	=	7.348 in/hr	Tc by User	=	5.00 min
IDF Curve	=	KCAPWA.IDF	Asc/Rec limb fact	=	1/1

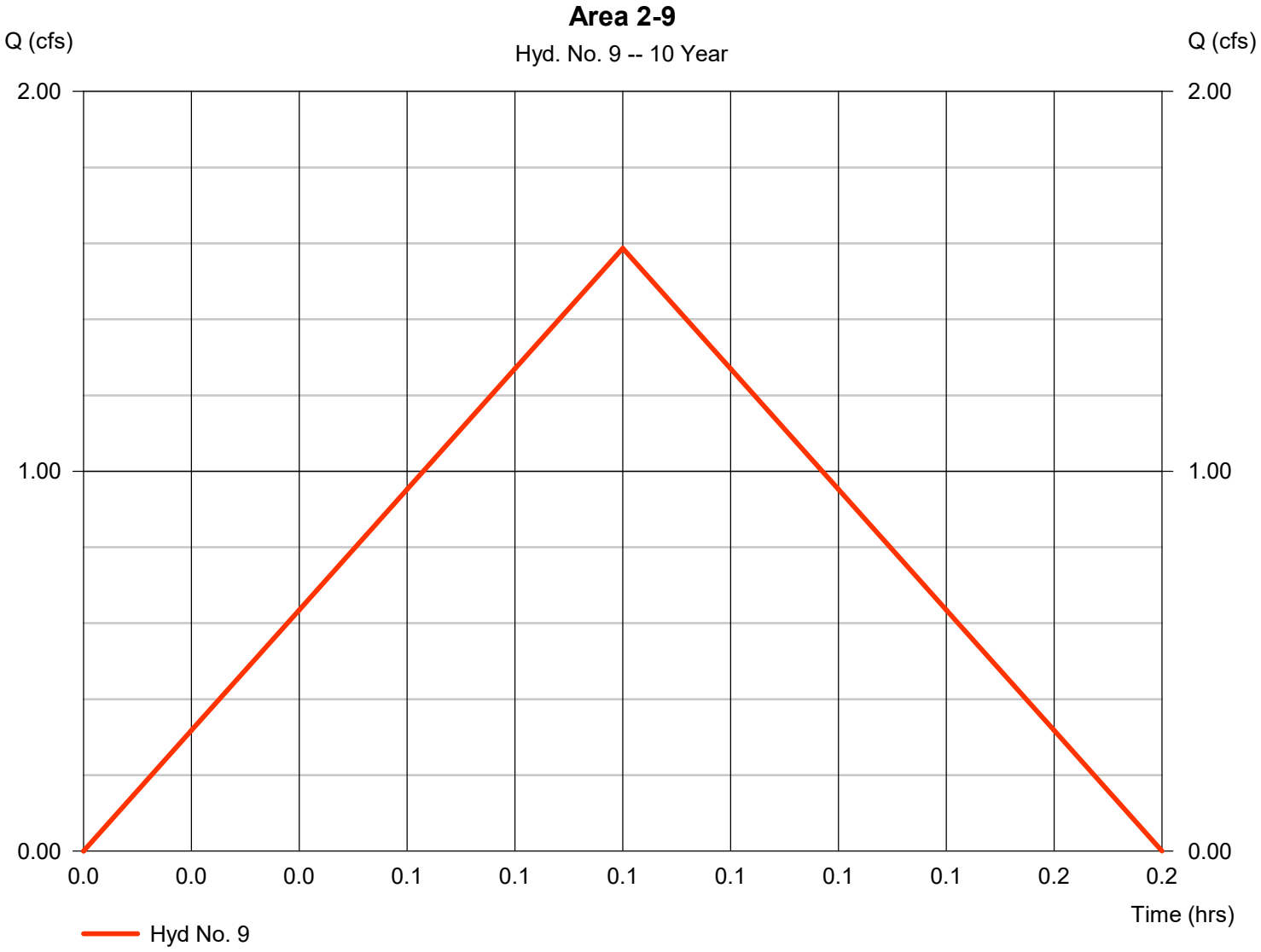


Hydrograph Report

Hyd. No. 9

Area 2-9

Hydrograph type	= Rational	Peak discharge	= 1.587 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 476 cuft
Drainage area	= 0.240 ac	Runoff coeff.	= 0.9
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

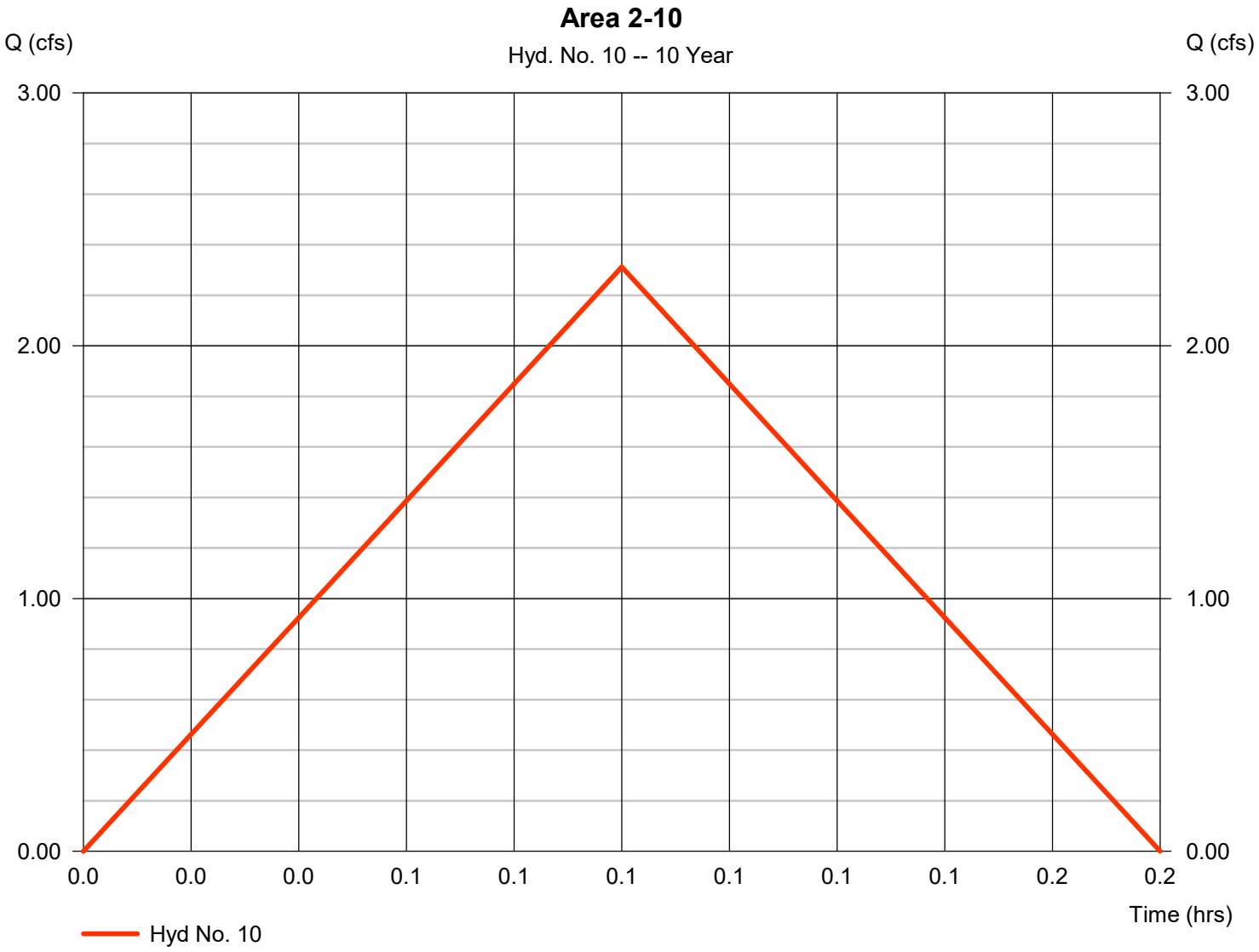


Hydrograph Report

Hyd. No. 10

Area 2-10

Hydrograph type	= Rational	Peak discharge	= 2.311 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 693 cuft
Drainage area	= 0.370 ac	Runoff coeff.	= 0.85
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

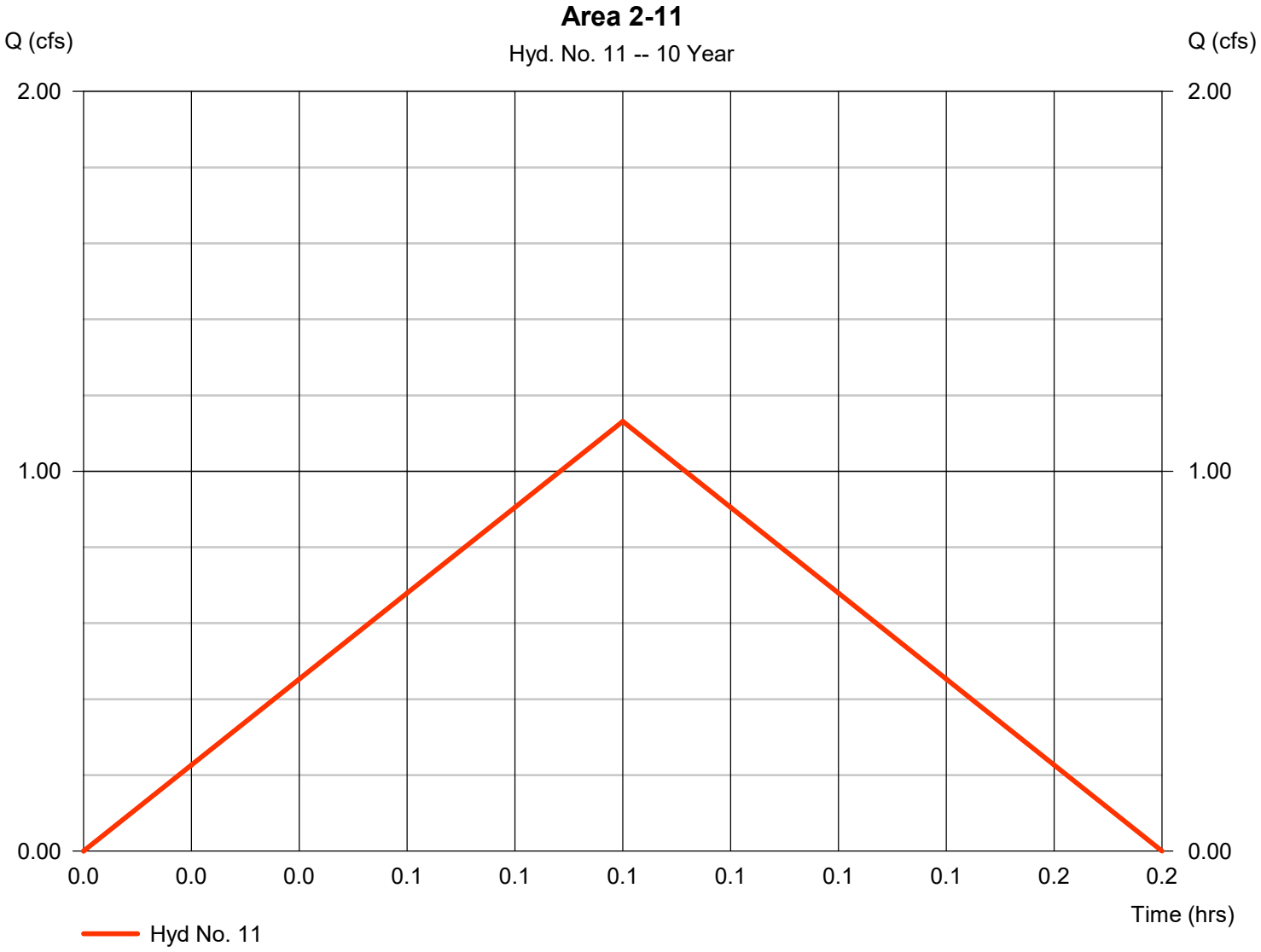


Hydrograph Report

Hyd. No. 11

Area 2-11

Hydrograph type	= Rational	Peak discharge	= 1.132 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 339 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.44
Intensity	= 7.348 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

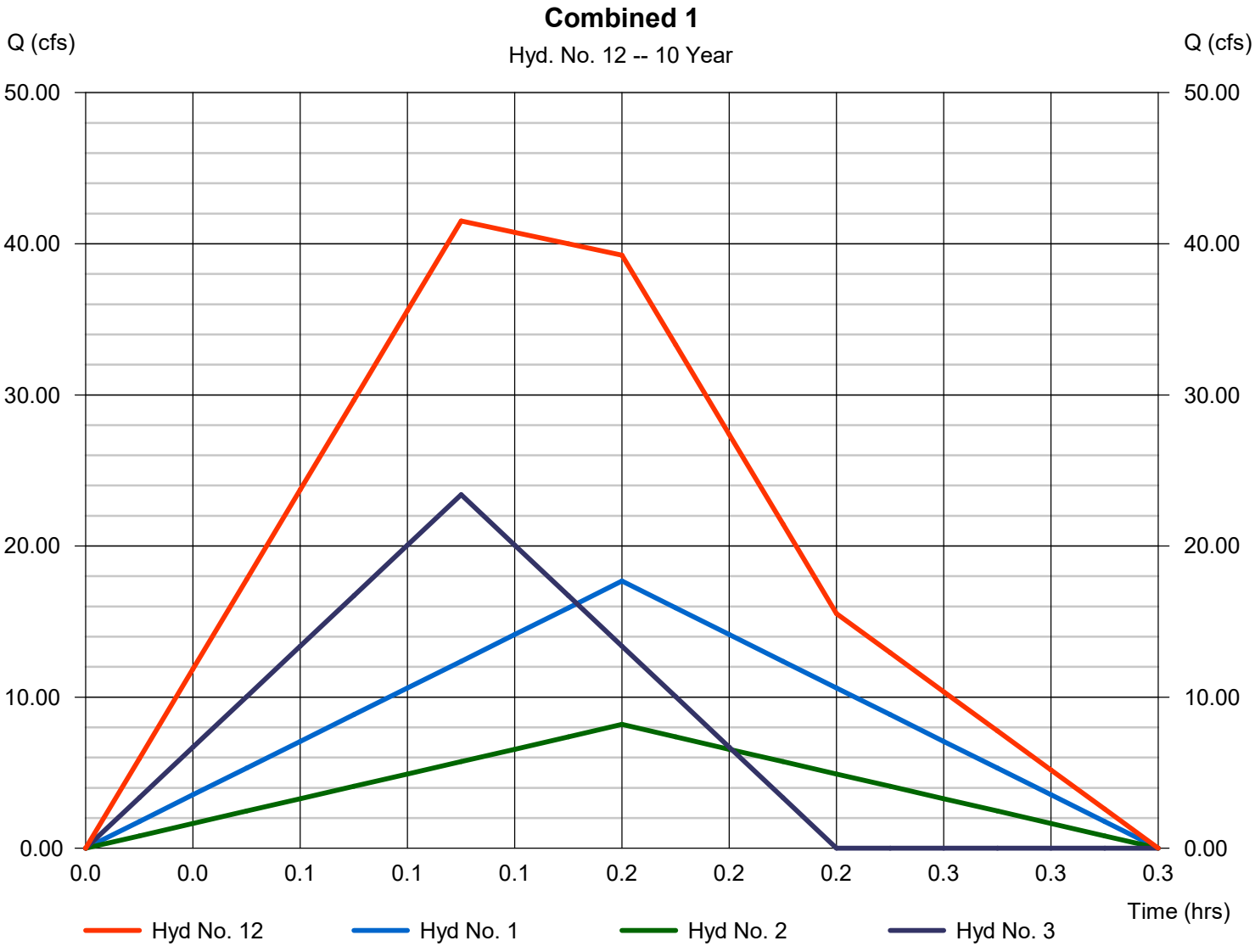


Hydrograph Report

Hyd. No. 12

Combined 1

Hydrograph type	= Combine	Peak discharge	= 41.51 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 25,347 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 25.370 ac

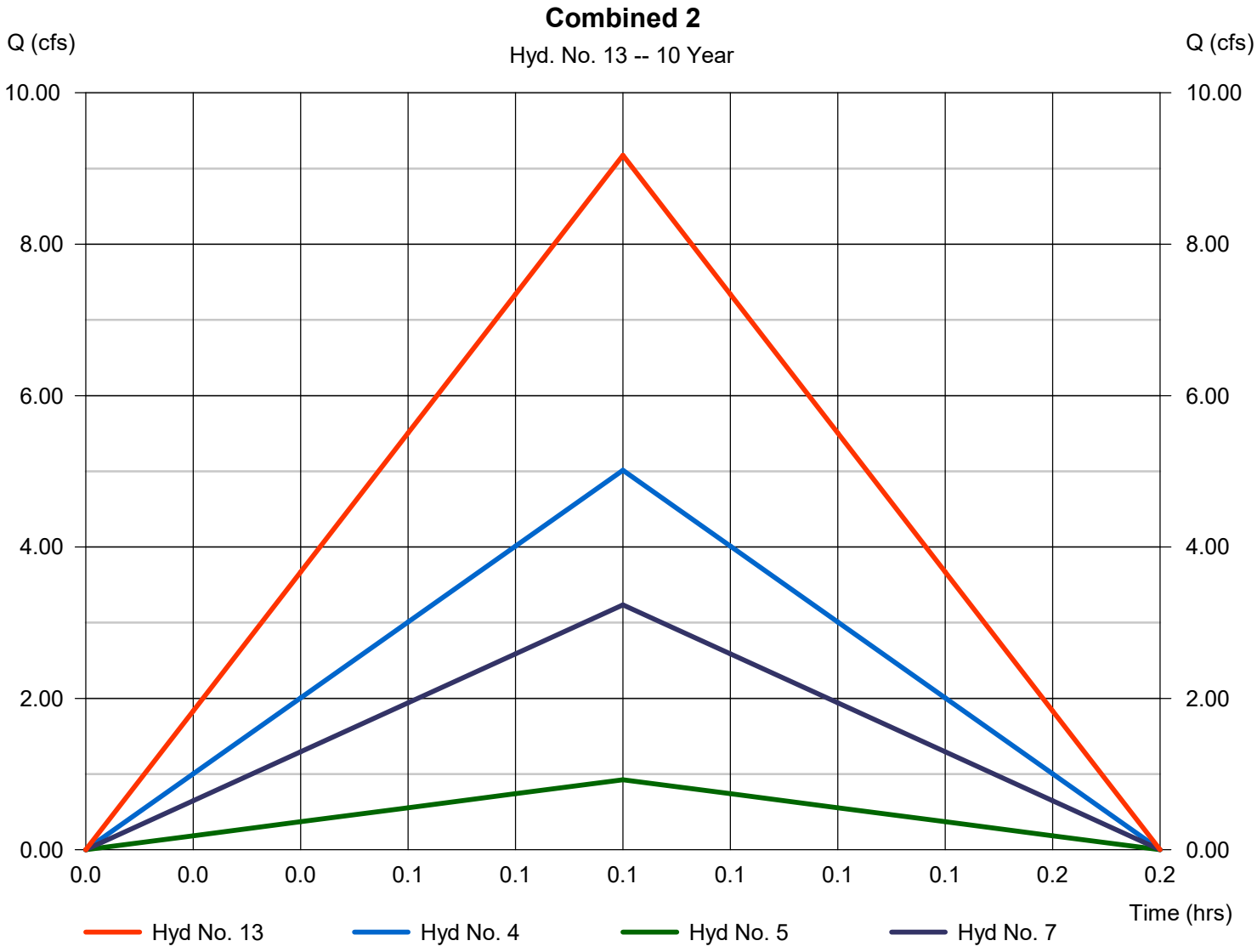


Hydrograph Report

Hyd. No. 13

Combined 2

Hydrograph type	= Combine	Peak discharge	= 9.175 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 2,752 cuft
Inflow hyds.	= 4, 5, 7	Contrib. drain. area	= 1.750 ac

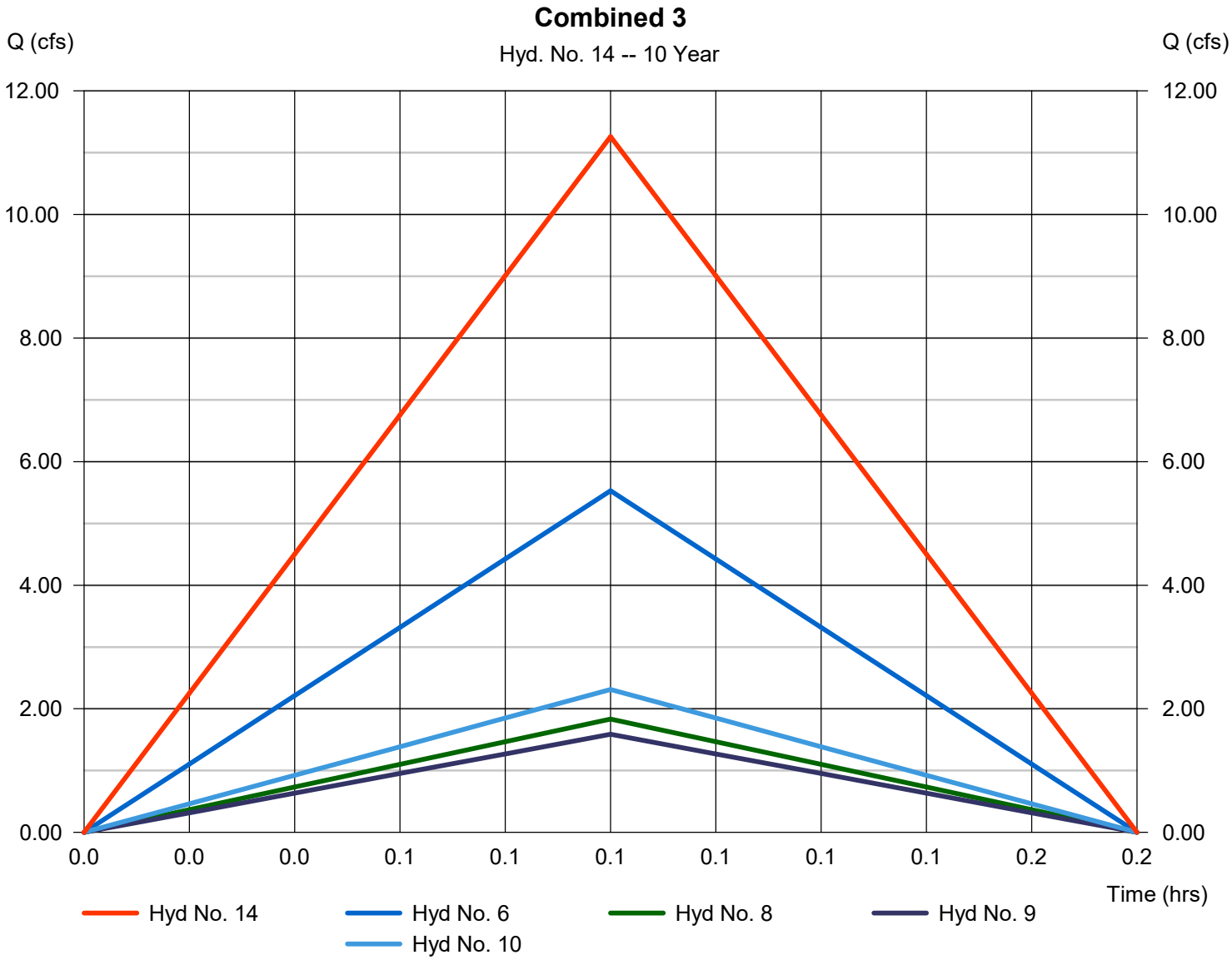


Hydrograph Report

Hyd. No. 14

Combined 3

Hydrograph type	=	Combine	Peak discharge	=	11.26 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	3,378 cuft
Inflow hyds.	=	6, 8, 9, 10	Contrib. drain. area	=	1.890 ac

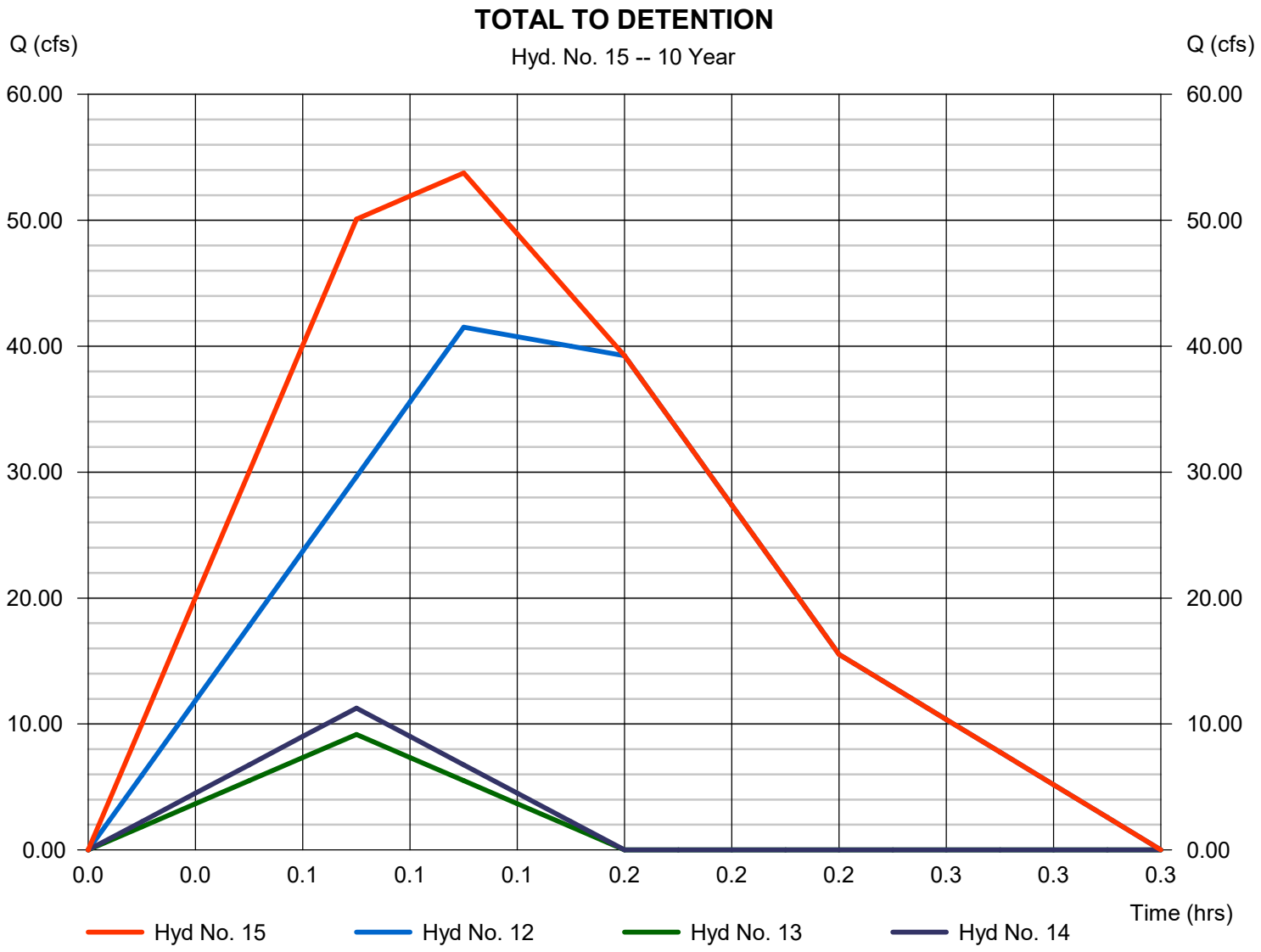


Hydrograph Report

Hyd. No. 15

TOTAL TO DETENTION

Hydrograph type	=	Combine	Peak discharge	=	53.77 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.12 hrs
Time interval	=	1 min	Hyd. volume	=	31,478 cuft
Inflow hyds.	=	12, 13, 14	Contrib. drain. area	=	0.000 ac



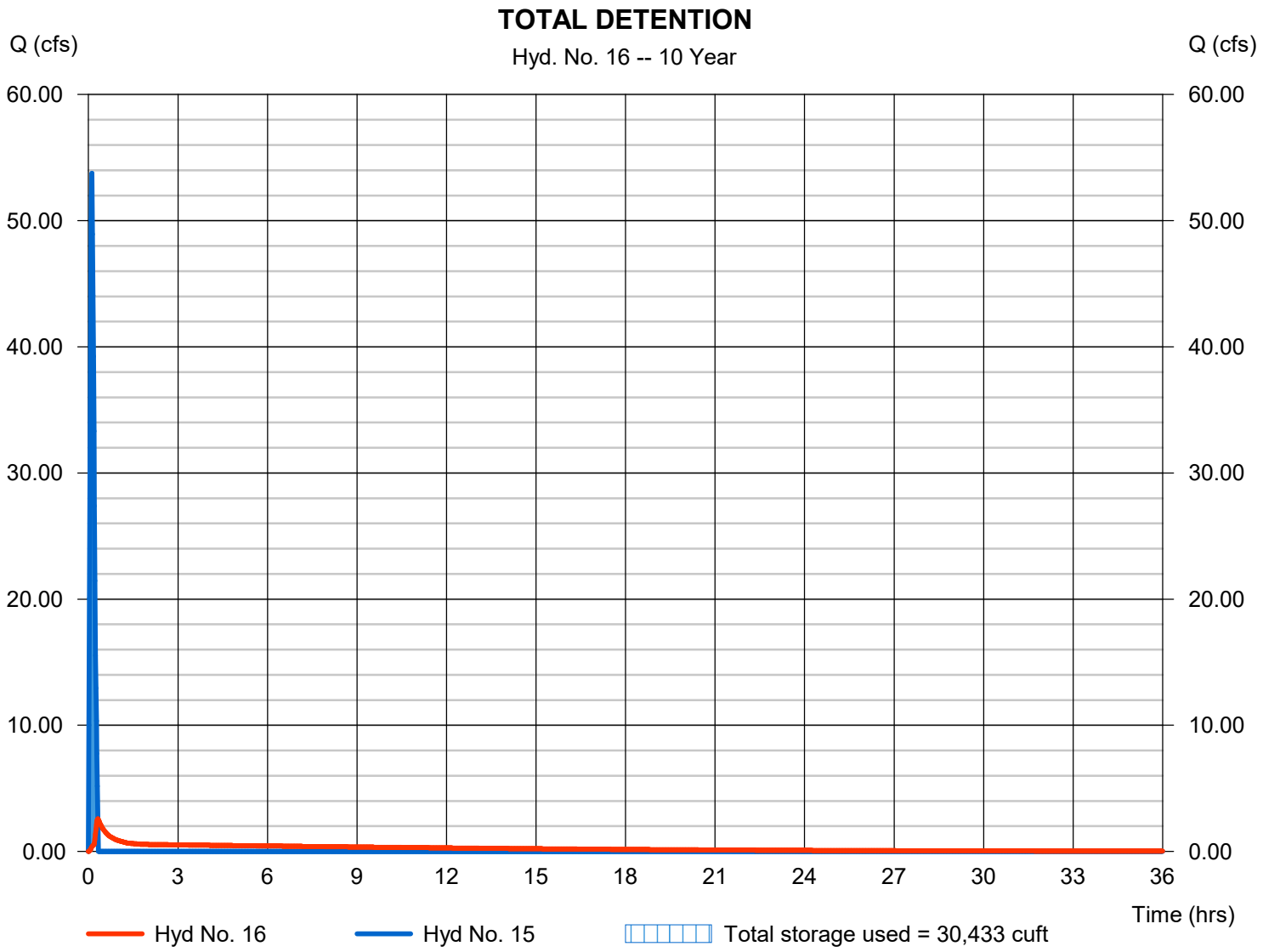
Hydrograph Report

Hyd. No. 16

TOTAL DETENTION

Hydrograph type	=	Reservoir	Peak discharge	=	2.589 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.32 hrs
Time interval	=	1 min	Hyd. volume	=	31,144 cuft
Inflow hyd. No.	=	15 - TOTAL TO DETENTION	Max. Elevation	=	983.51 ft
Reservoir name	=	Detention	Max. Storage	=	30,433 cuft

Storage Indication method used.

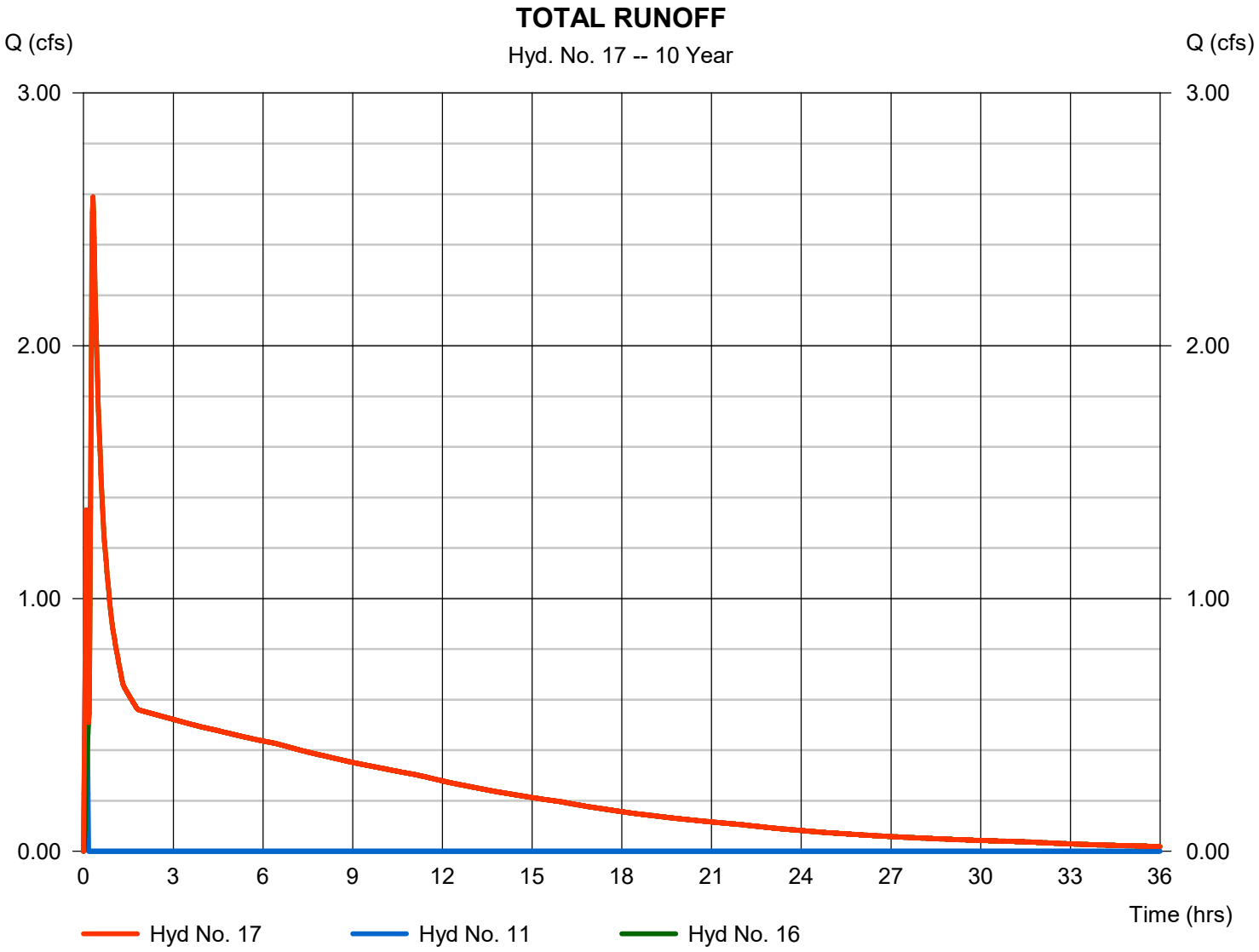


Hydrograph Report

Hyd. No. 17

TOTAL RUNOFF

Hydrograph type	=	Combine	Peak discharge	=	2.589 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.32 hrs
Time interval	=	1 min	Hyd. volume	=	31,484 cuft
Inflow hyds.	=	11, 16	Contrib. drain. area	=	0.350 ac



Hydrograph Summary Report

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

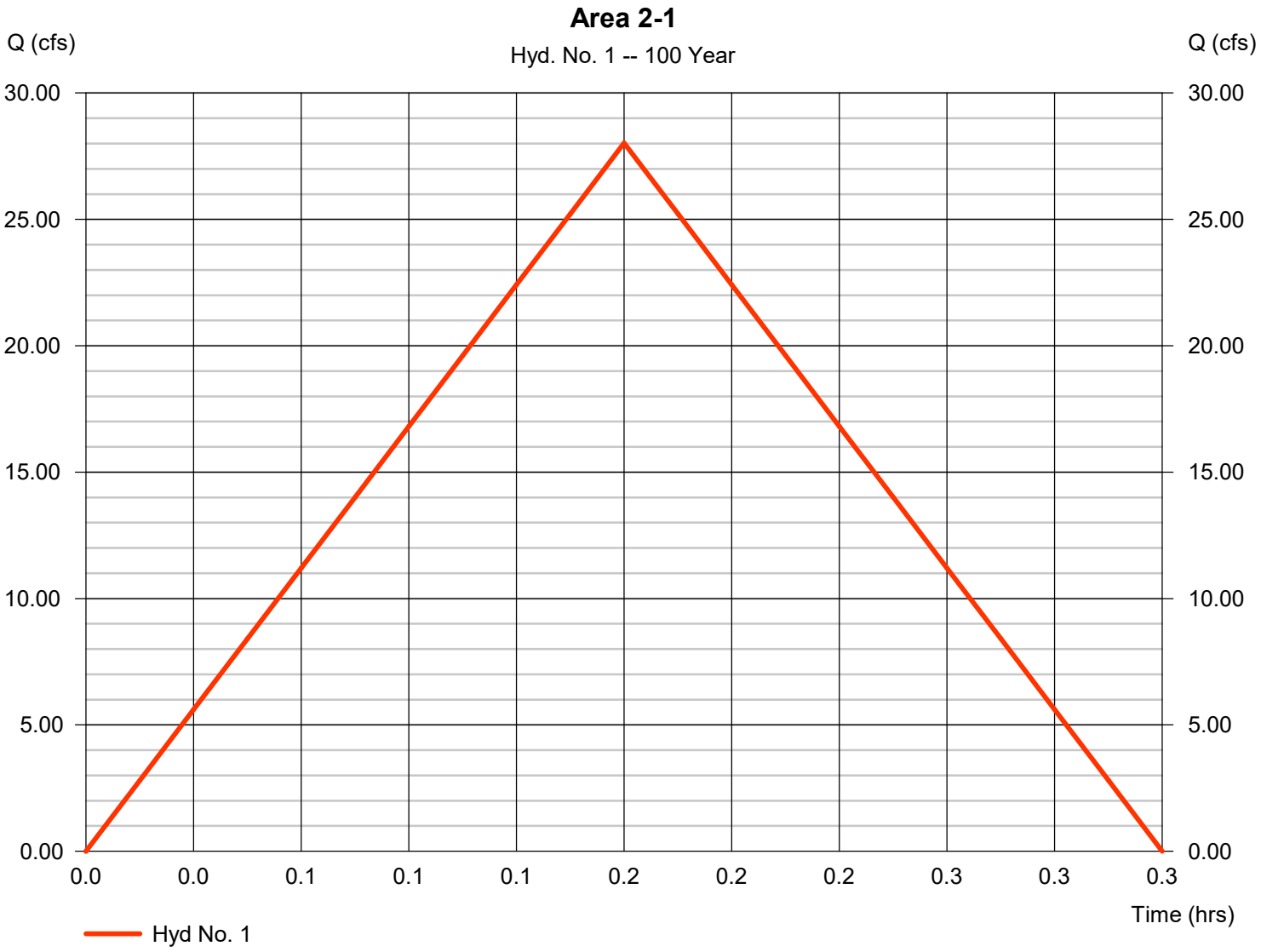
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	28.02	1	10	16,812	------	------	------	Area 2-1
2	Rational	12.98	1	10	7,788	------	------	------	Area 2-2
3	Rational	39.03	1	7	16,394	------	------	------	Area 2-3
4	Rational	8.784	1	5	2,635	------	------	------	Area 2-4
5	Rational	1.622	1	5	487	------	------	------	Area 2-5
6	Rational	9.684	1	5	2,905	------	------	------	Area 2-6
7	Rational	5.663	1	5	1,699	------	------	------	Area 2-7
8	Rational	3.210	1	5	963	------	------	------	Area 2-8
9	Rational	2.780	1	5	834	------	------	------	Area 2-9
10	Rational	4.048	1	5	1,214	------	------	------	Area 2-10
11	Rational	1.982	1	5	595	------	------	------	Area 2-11
12	Combine	67.73	1	7	40,993	1, 2, 3,	------	------	Combined 1
13	Combine	16.07	1	5	4,821	4, 5, 7,	------	------	Combined 2
14	Combine	19.72	1	5	5,917	6, 8, 9,	------	------	Combined 3
15	Combine	89.21	1	7	51,731	10, 12, 13, 14	------	------	TOTAL TO DETENTION
16	Reservoir	17.38	1	16	51,388	15	984.60	43,829	TOTAL DETENTION
17	Combine	17.38	1	16	51,983	11, 16	------	------	TOTAL RUNOFF

Hydrograph Report

Hyd. No. 1

Area 2-1

Hydrograph type	= Rational	Peak discharge	= 28.02 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 16,812 cuft
Drainage area	= 9.380 ac	Runoff coeff.	= 0.31
Intensity	= 9.636 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

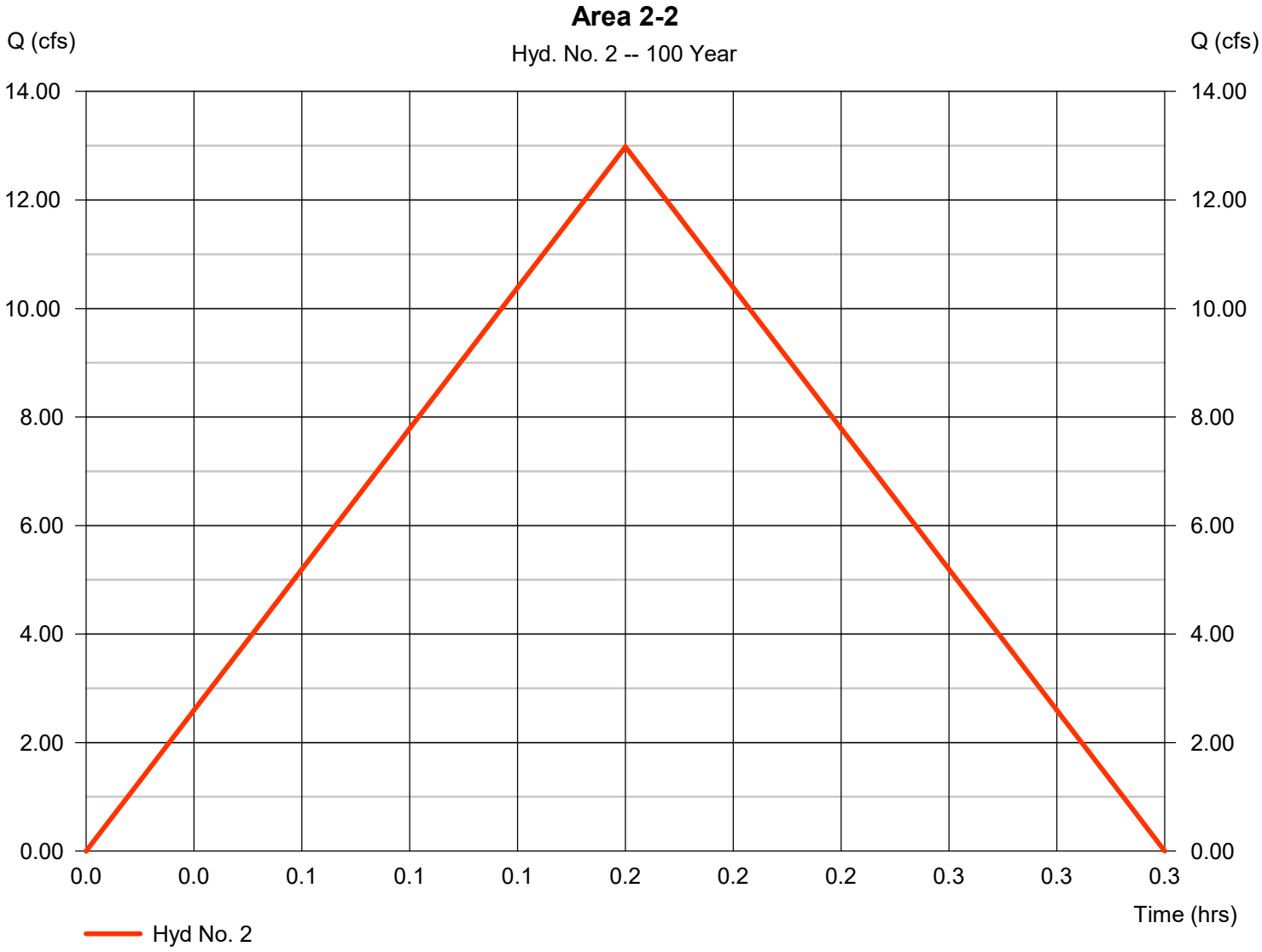


Hydrograph Report

Hyd. No. 2

Area 2-2

Hydrograph type	=	Rational	Peak discharge	=	12.98 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.17 hrs
Time interval	=	1 min	Hyd. volume	=	7,788 cuft
Drainage area	=	4.490 ac	Runoff coeff.	=	0.3
Intensity	=	9.636 in/hr	Tc by User	=	10.00 min
IDF Curve	=	KCAPWA.IDF	Asc/Rec limb fact	=	1/1

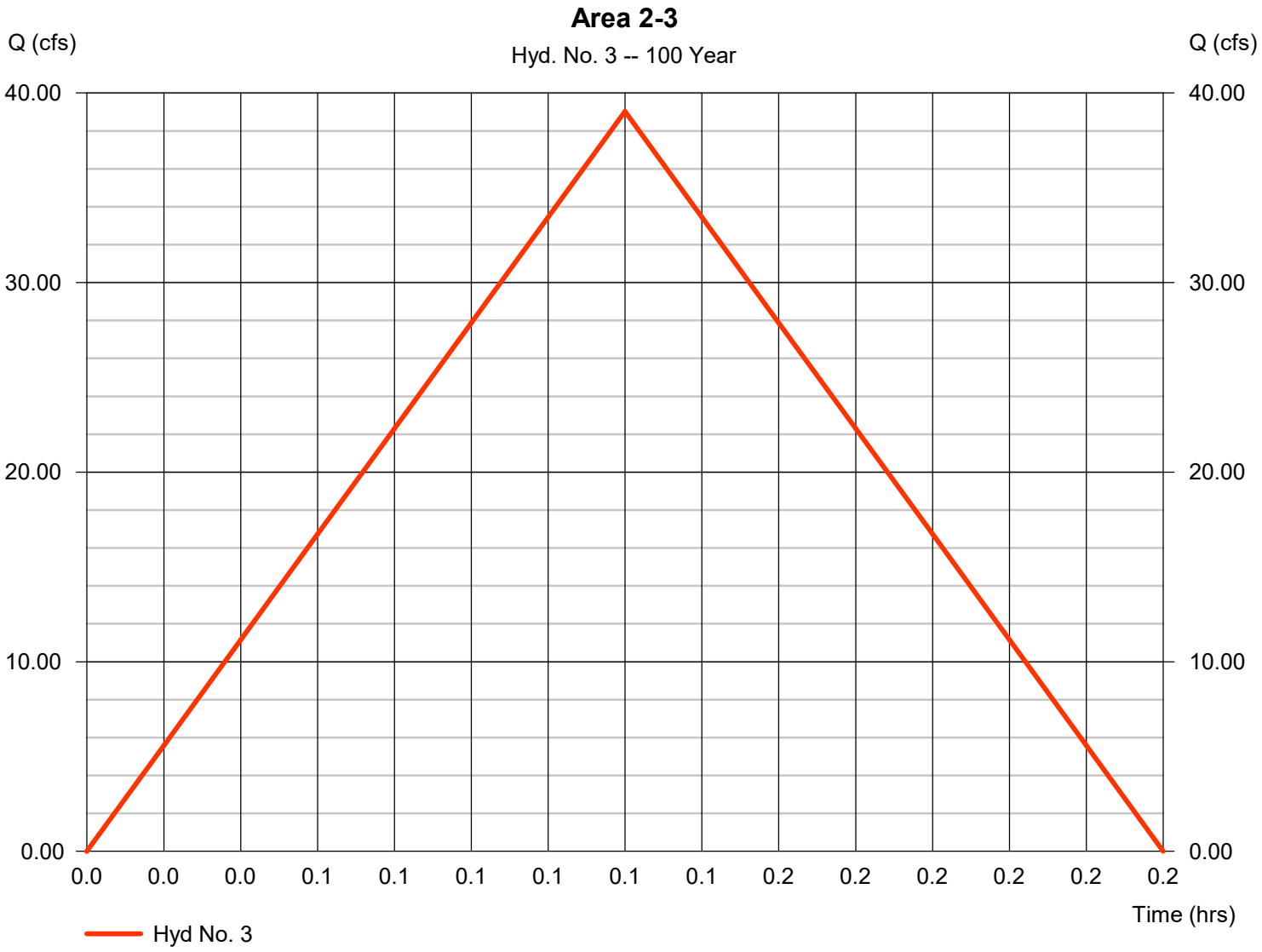


Hydrograph Report

Hyd. No. 3

Area 2-3

Hydrograph type	=	Rational	Peak discharge	=	39.03 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.12 hrs
Time interval	=	1 min	Hyd. volume	=	16,394 cuft
Drainage area	=	11.500 ac	Runoff coeff.	=	0.3
Intensity	=	11.314 in/hr	Tc by User	=	7.00 min
IDF Curve	=	KCAPWA.IDF	Asc/Rec limb fact	=	1/1

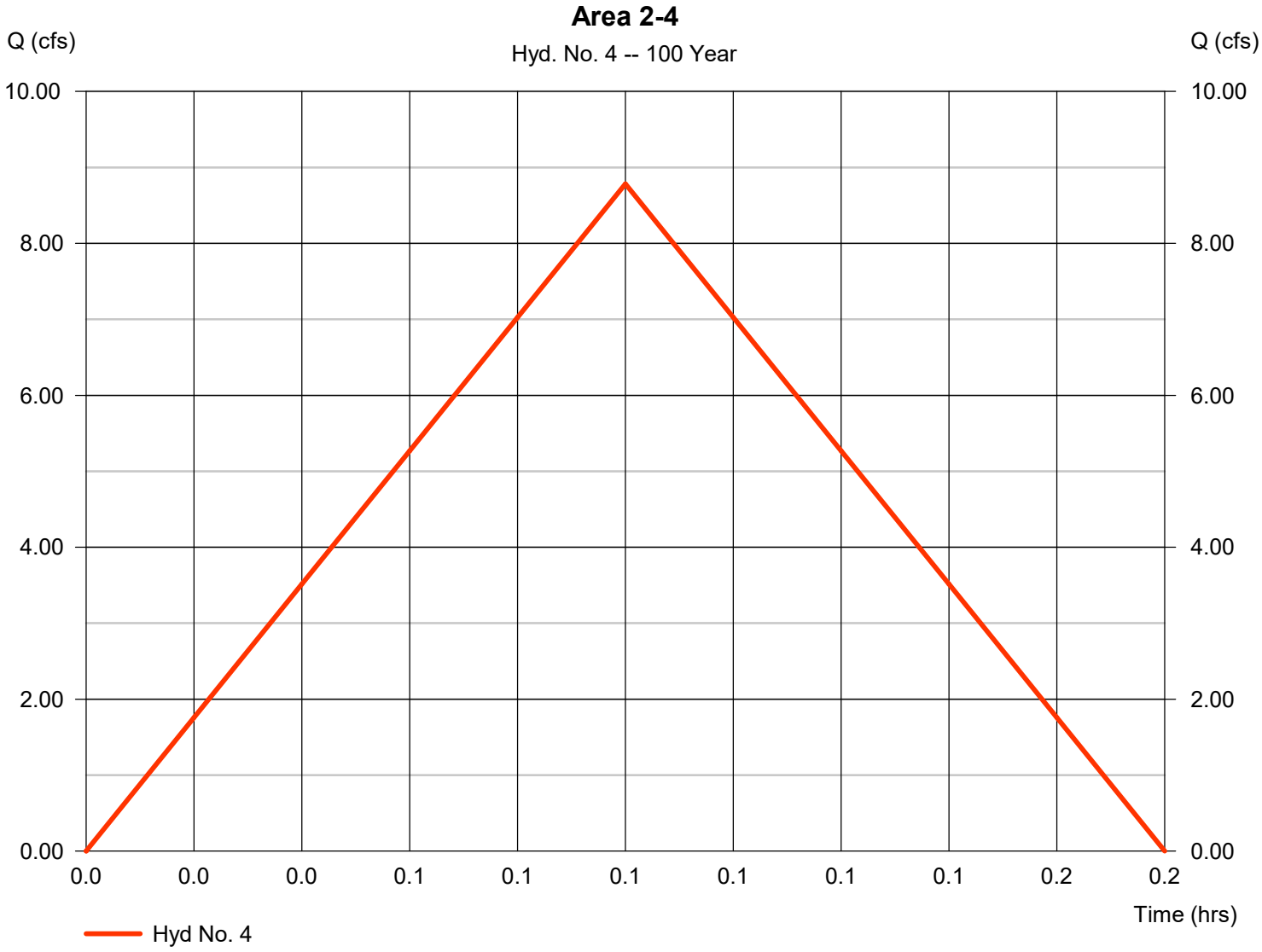


Hydrograph Report

Hyd. No. 4

Area 2-4

Hydrograph type	= Rational	Peak discharge	= 8.784 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 2,635 cuft
Drainage area	= 1.050 ac	Runoff coeff.	= 0.65
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

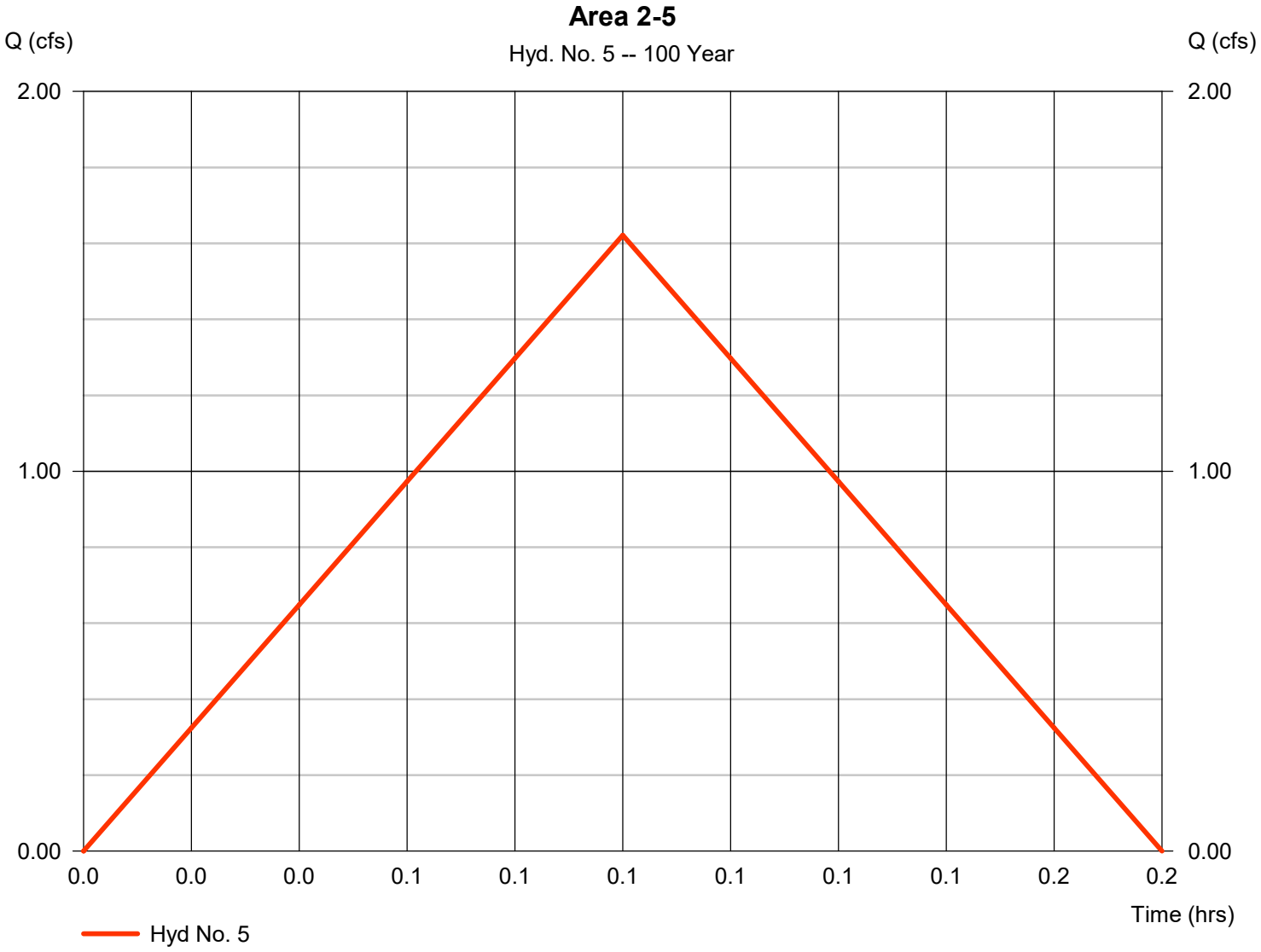


Hydrograph Report

Hyd. No. 5

Area 2-5

Hydrograph type	= Rational	Peak discharge	= 1.622 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 487 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.63
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

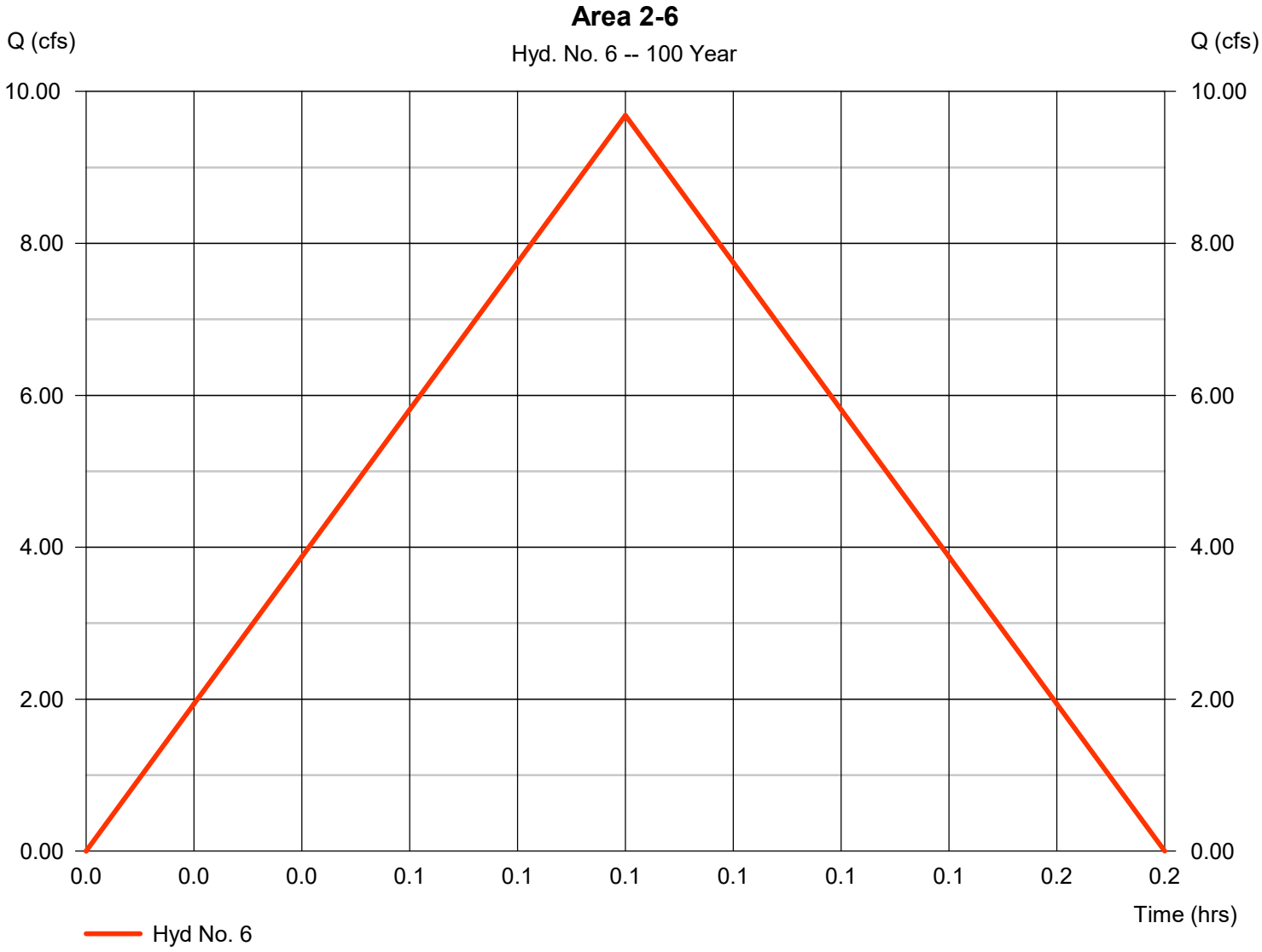


Hydrograph Report

Hyd. No. 6

Area 2-6

Hydrograph type	=	Rational	Peak discharge	=	9.684 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	2,905 cuft
Drainage area	=	0.990 ac	Runoff coeff.	=	0.76
Intensity	=	12.871 in/hr	Tc by User	=	5.00 min
IDF Curve	=	KCAPWA.IDF	Asc/Rec limb fact	=	1/1

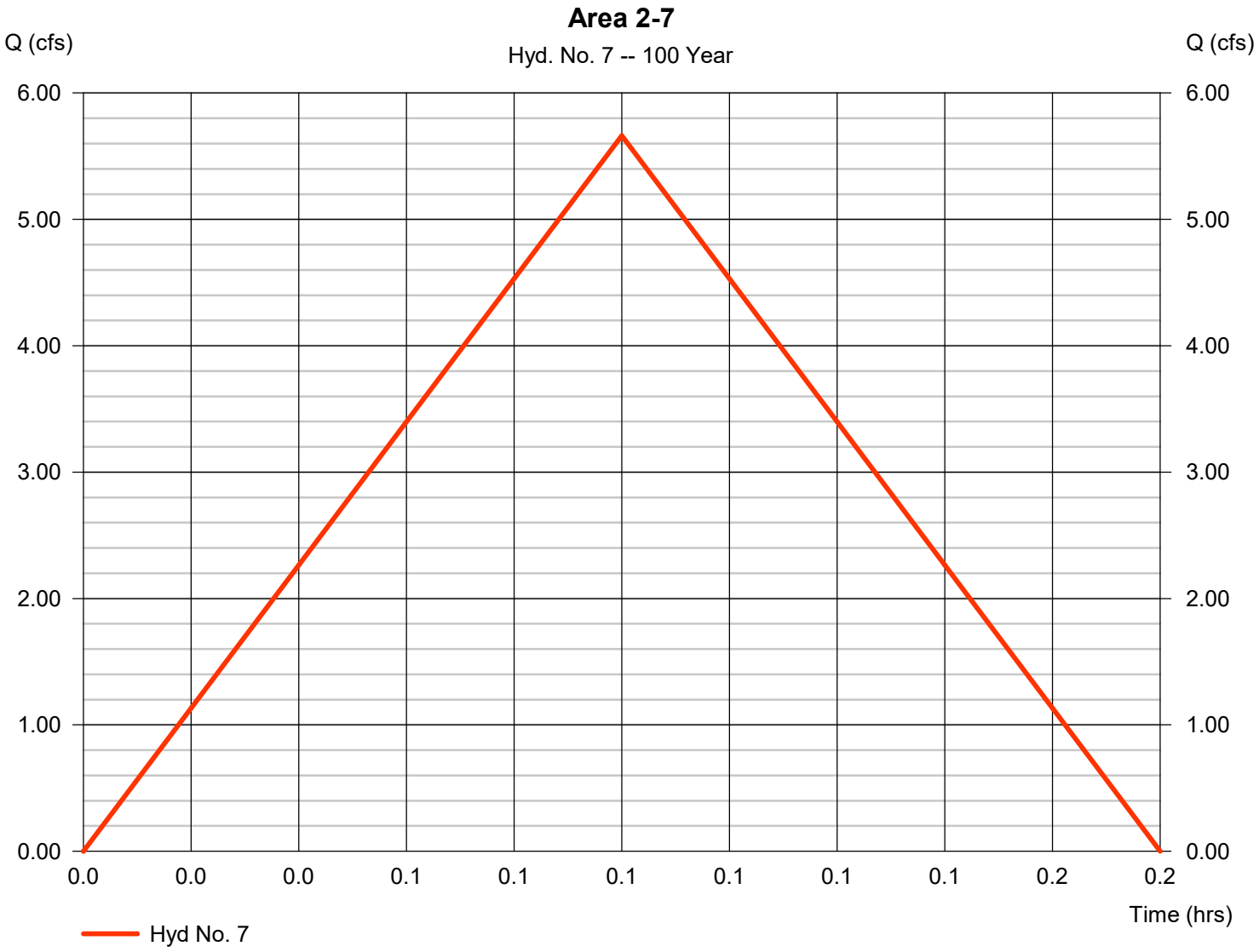


Hydrograph Report

Hyd. No. 7

Area 2-7

Hydrograph type	= Rational	Peak discharge	= 5.663 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,699 cuft
Drainage area	= 0.500 ac	Runoff coeff.	= 0.88
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

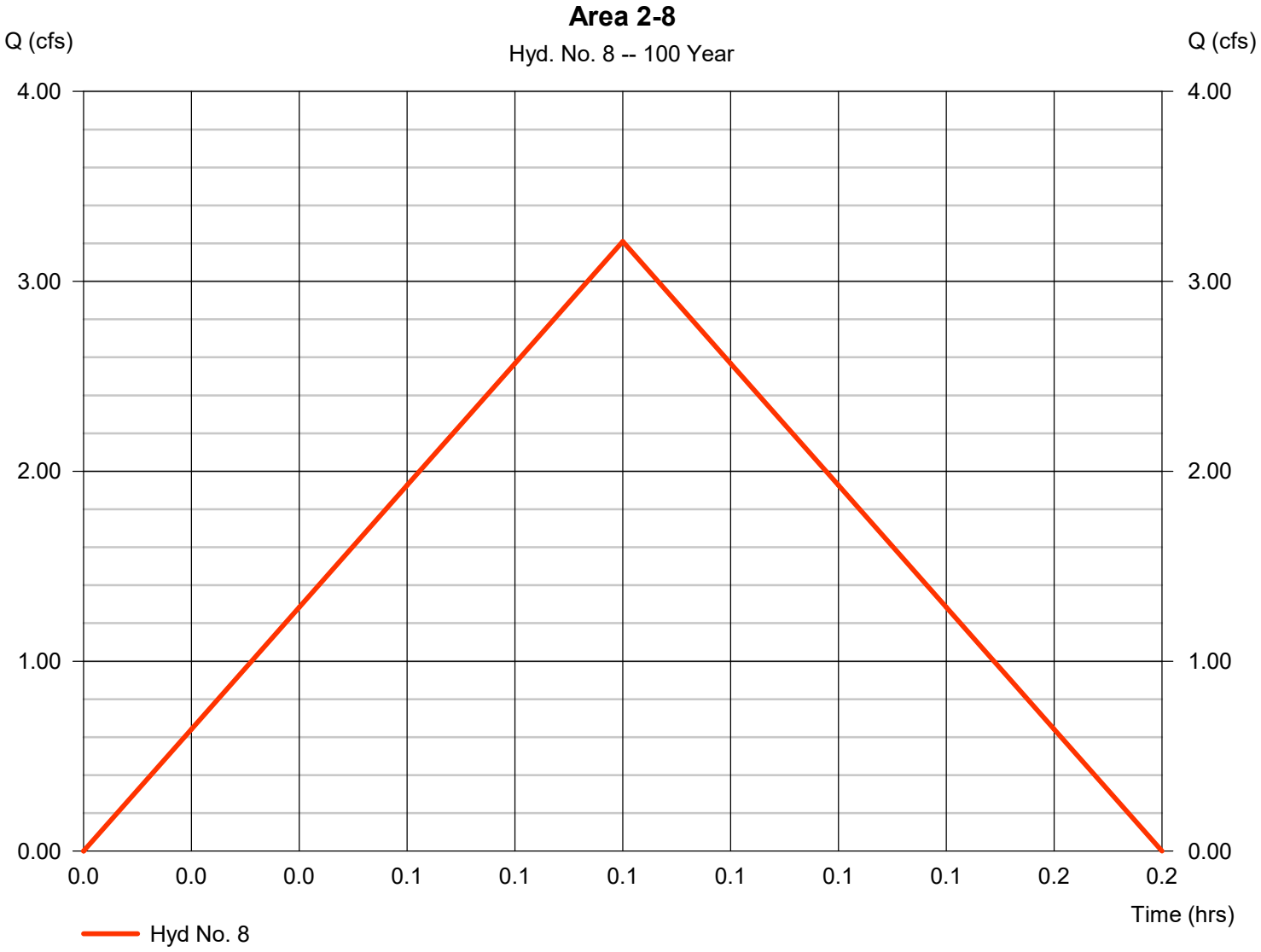


Hydrograph Report

Hyd. No. 8

Area 2-8

Hydrograph type	= Rational	Peak discharge	= 3.210 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 963 cuft
Drainage area	= 0.290 ac	Runoff coeff.	= 0.86
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

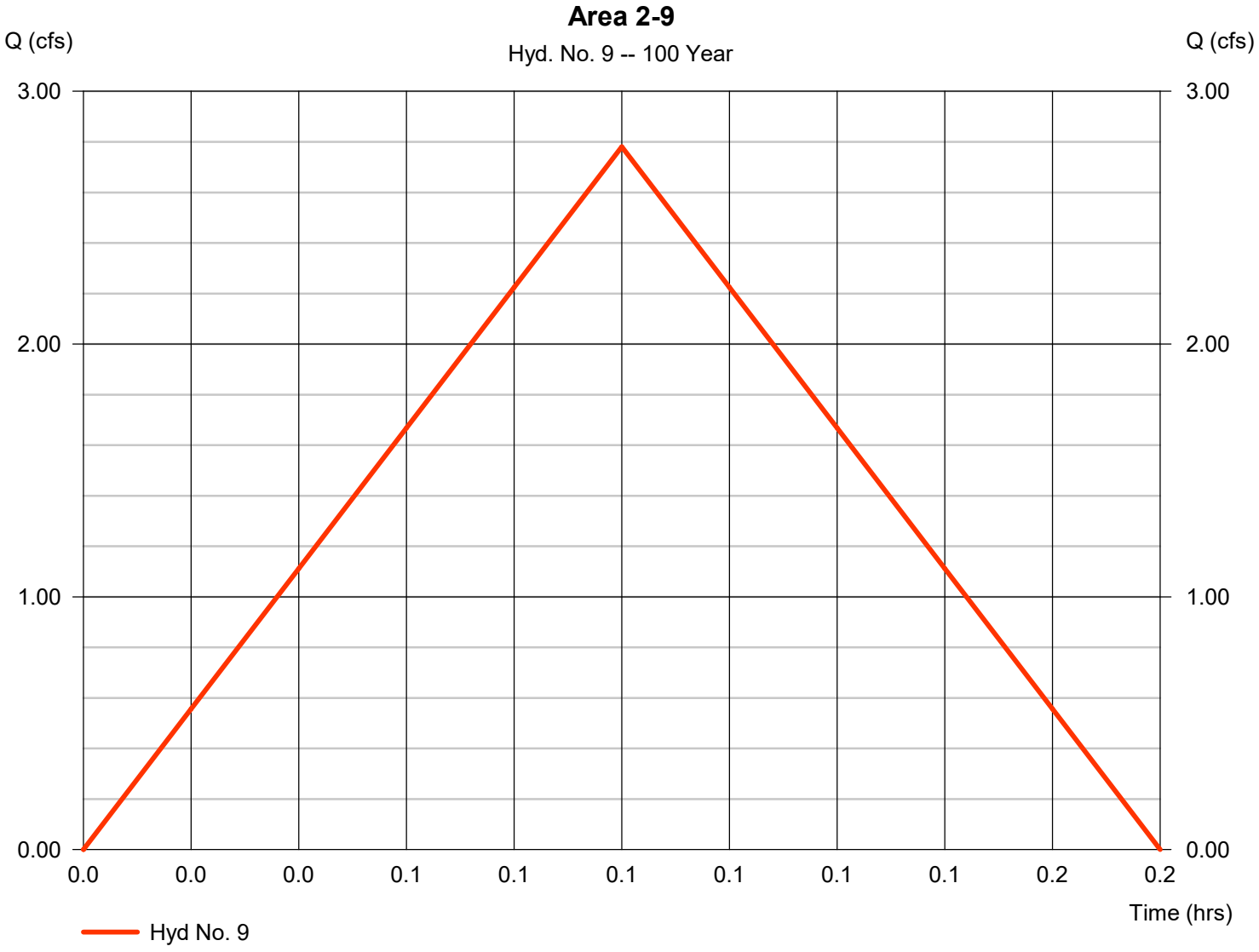


Hydrograph Report

Hyd. No. 9

Area 2-9

Hydrograph type	= Rational	Peak discharge	= 2.780 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 834 cuft
Drainage area	= 0.240 ac	Runoff coeff.	= 0.9
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

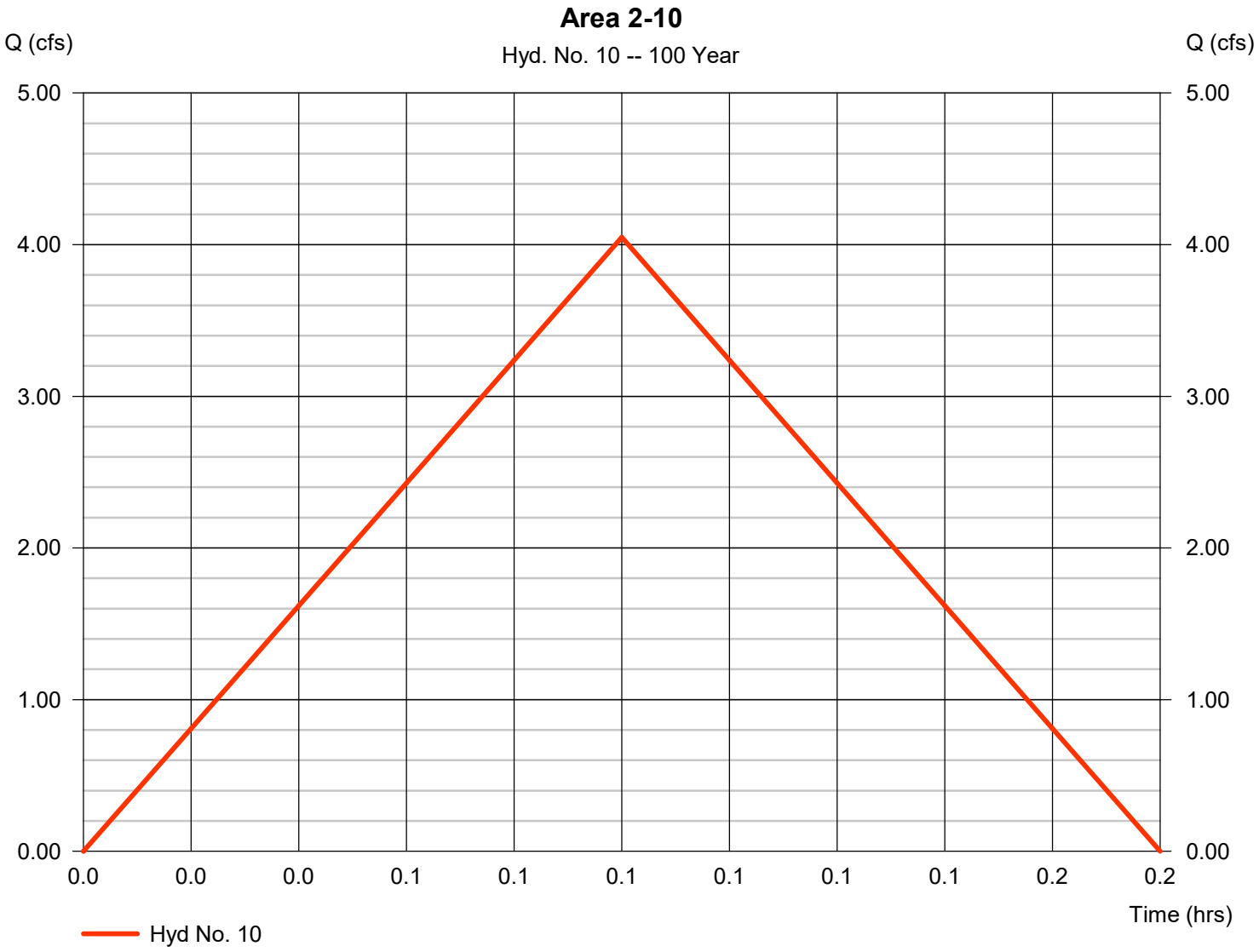


Hydrograph Report

Hyd. No. 10

Area 2-10

Hydrograph type	= Rational	Peak discharge	= 4.048 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 1,214 cuft
Drainage area	= 0.370 ac	Runoff coeff.	= 0.85
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

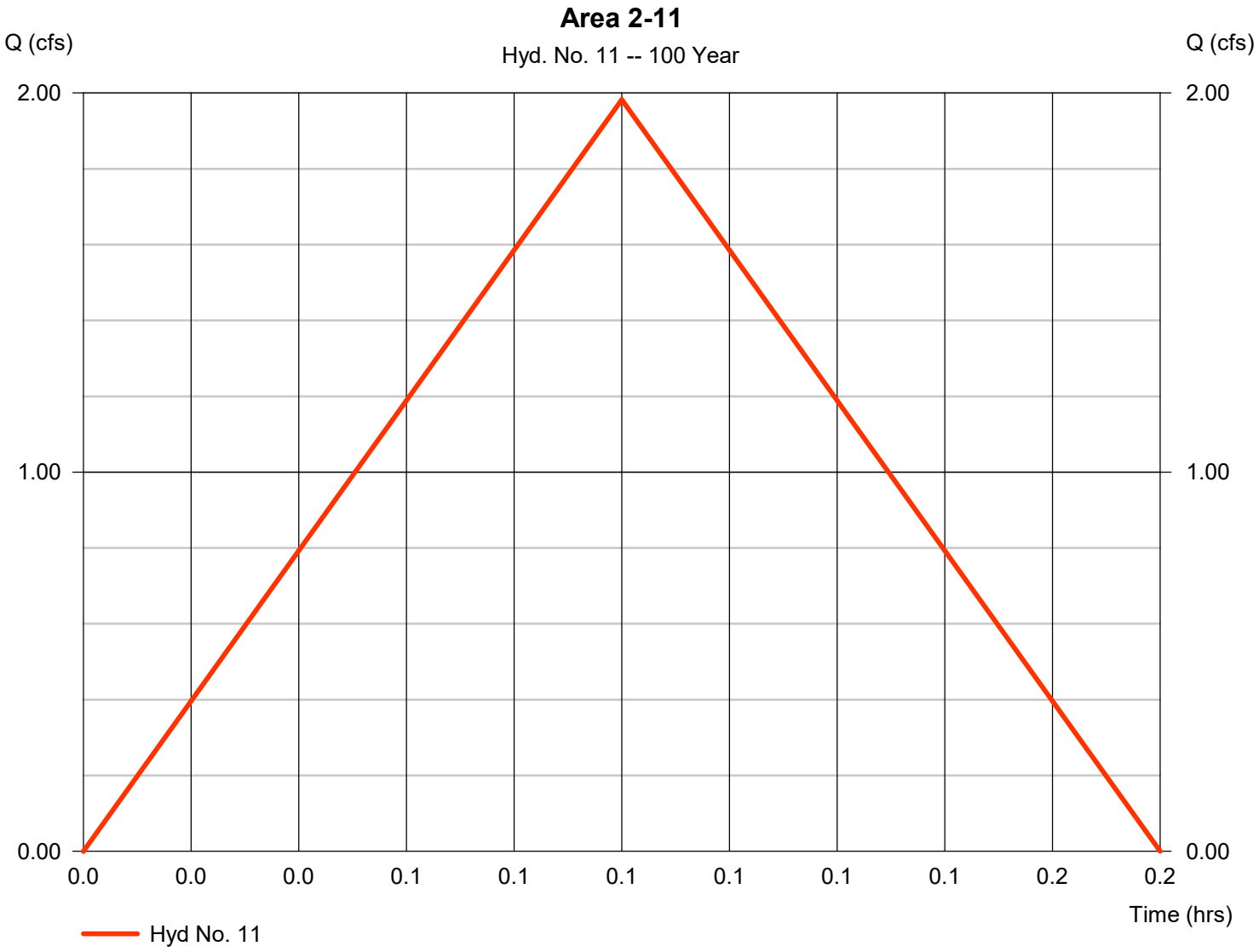


Hydrograph Report

Hyd. No. 11

Area 2-11

Hydrograph type	= Rational	Peak discharge	= 1.982 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 595 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.44
Intensity	= 12.871 in/hr	Tc by User	= 5.00 min
IDF Curve	= KCAPWA.IDF	Asc/Rec limb fact	= 1/1

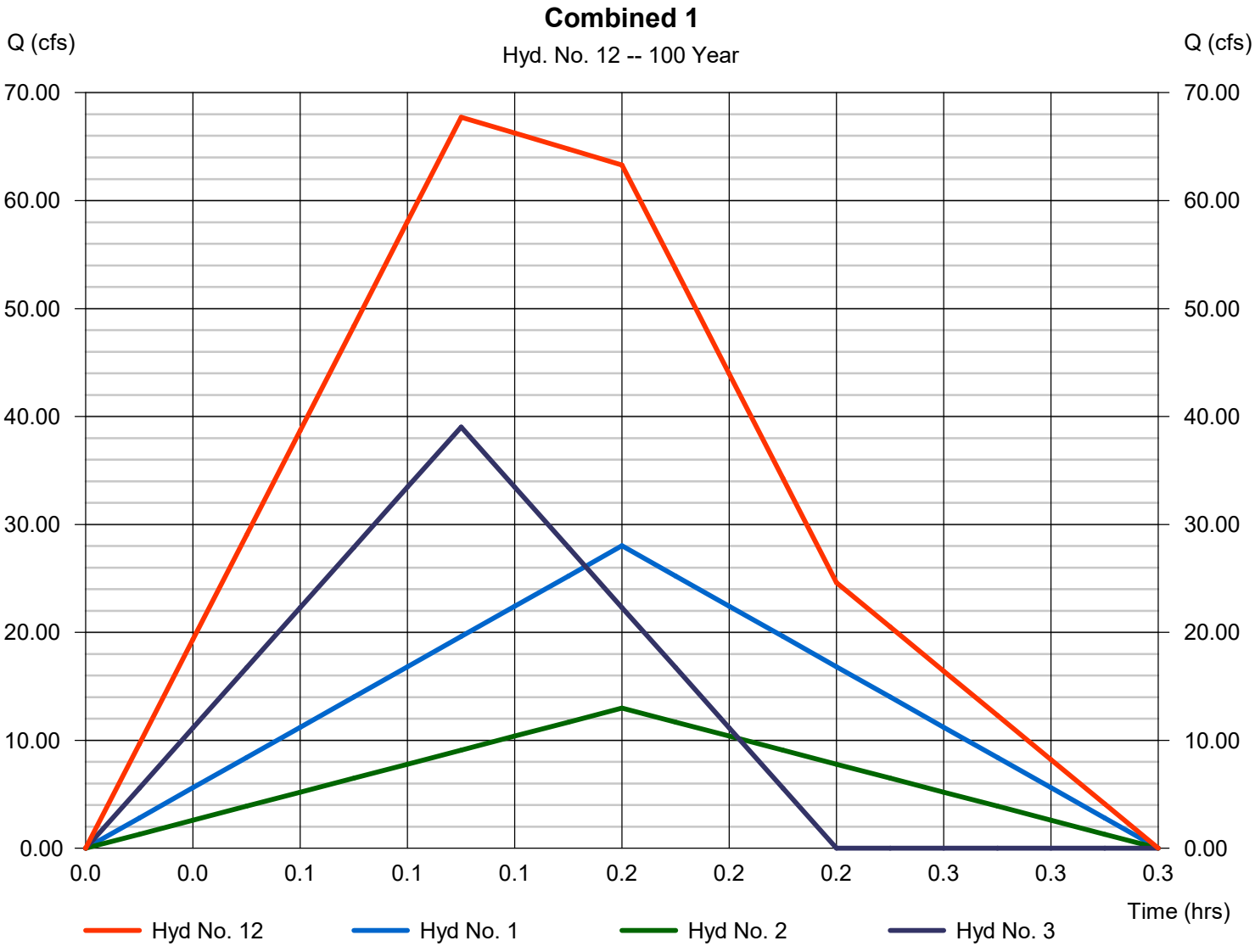


Hydrograph Report

Hyd. No. 12

Combined 1

Hydrograph type	= Combine	Peak discharge	= 67.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 40,993 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 25.370 ac

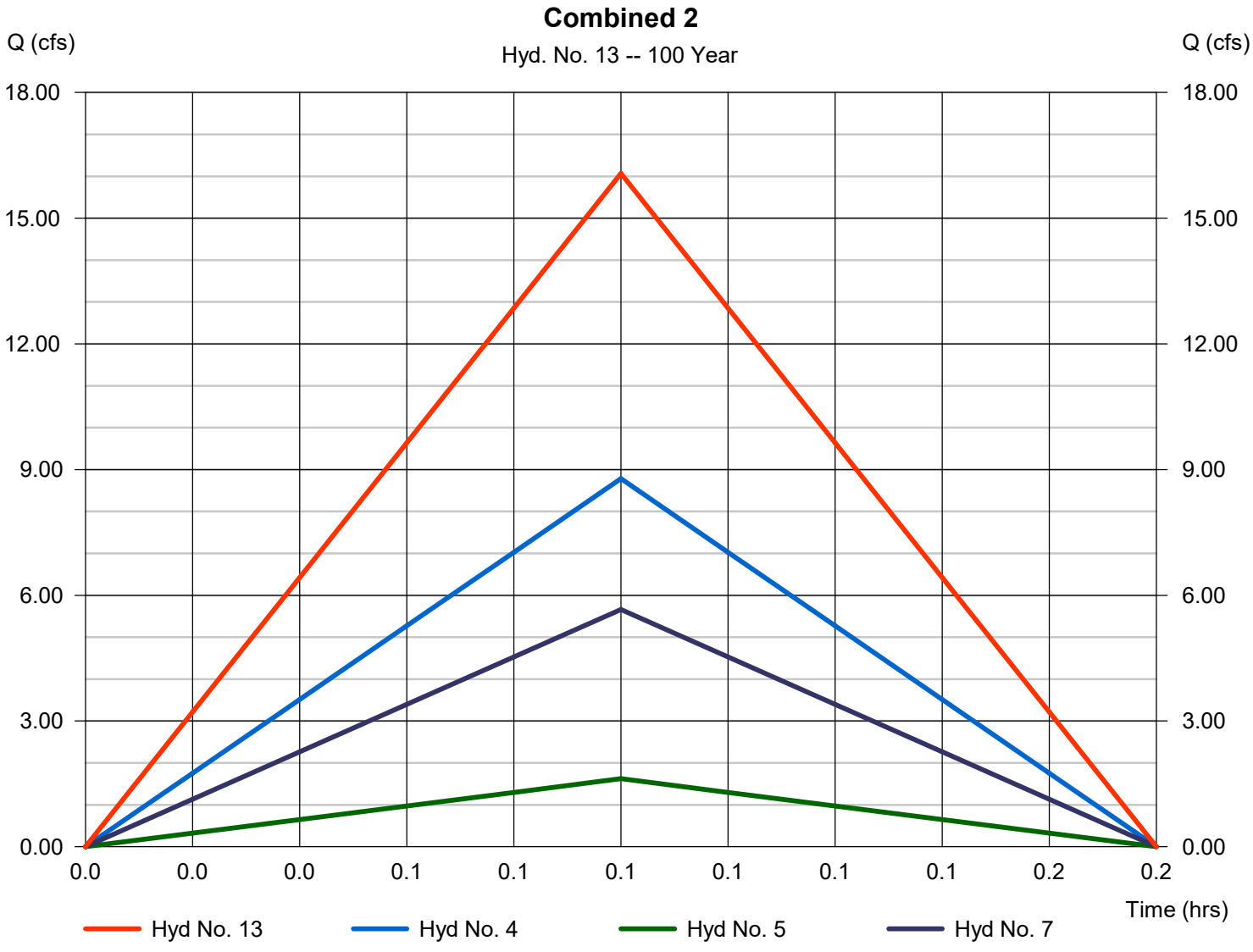


Hydrograph Report

Hyd. No. 13

Combined 2

Hydrograph type	= Combine	Peak discharge	= 16.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.08 hrs
Time interval	= 1 min	Hyd. volume	= 4,821 cuft
Inflow hyds.	= 4, 5, 7	Contrib. drain. area	= 1.750 ac

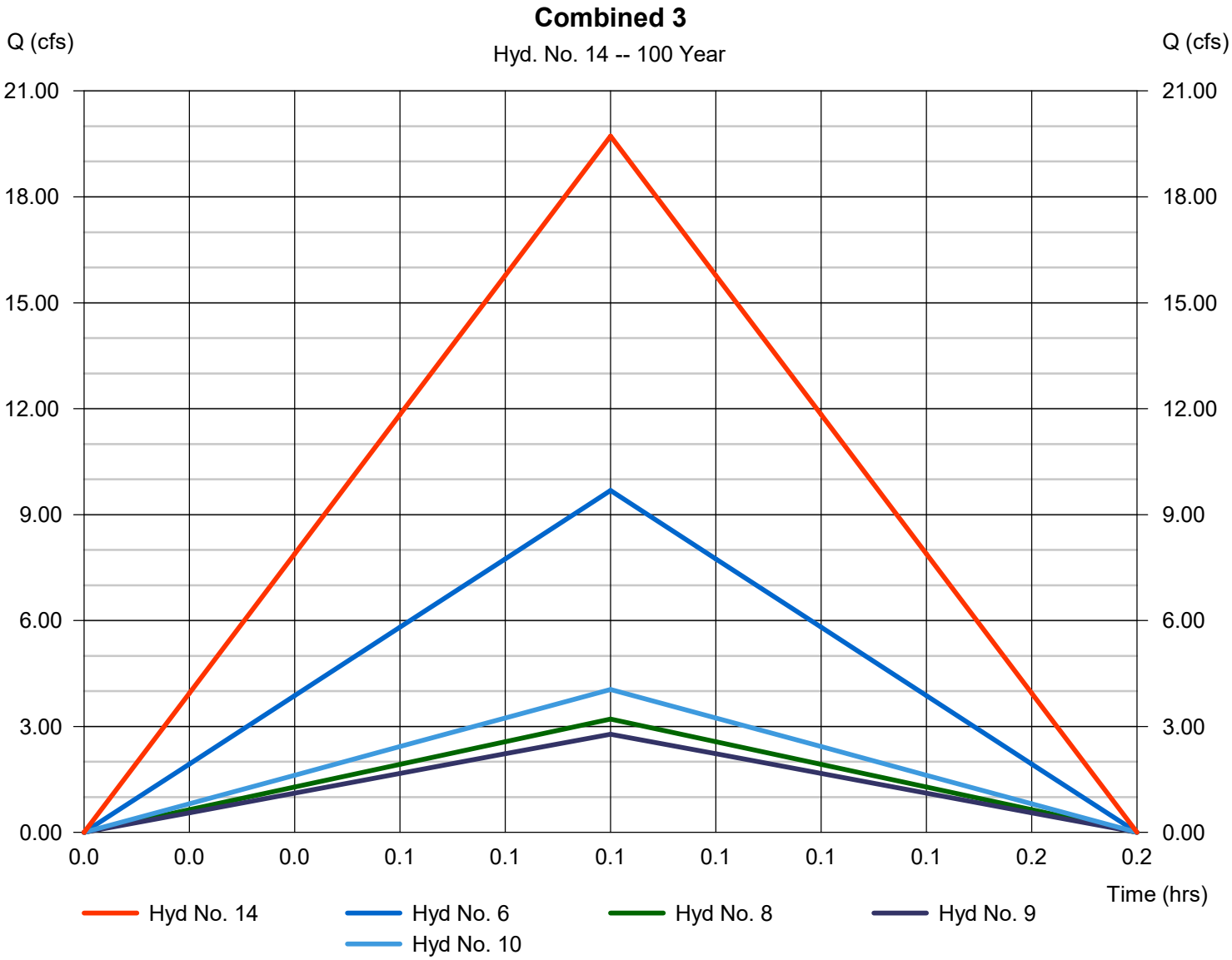


Hydrograph Report

Hyd. No. 14

Combined 3

Hydrograph type	=	Combine	Peak discharge	=	19.72 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.08 hrs
Time interval	=	1 min	Hyd. volume	=	5,917 cuft
Inflow hyds.	=	6, 8, 9, 10	Contrib. drain. area	=	1.890 ac

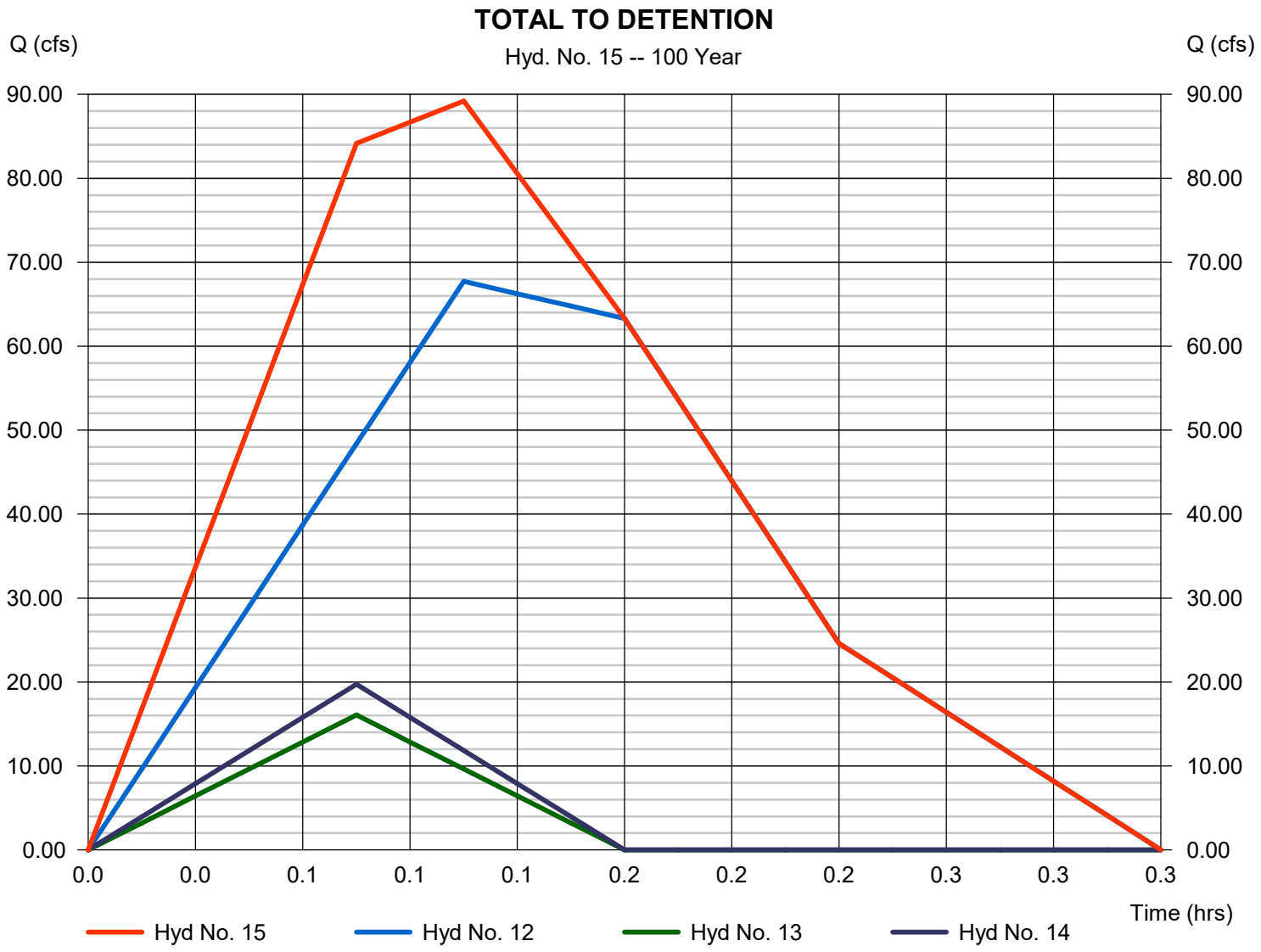


Hydrograph Report

Hyd. No. 15

TOTAL TO DETENTION

Hydrograph type	=	Combine	Peak discharge	=	89.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.12 hrs
Time interval	=	1 min	Hyd. volume	=	51,731 cuft
Inflow hyds.	=	12, 13, 14	Contrib. drain. area	=	0.000 ac



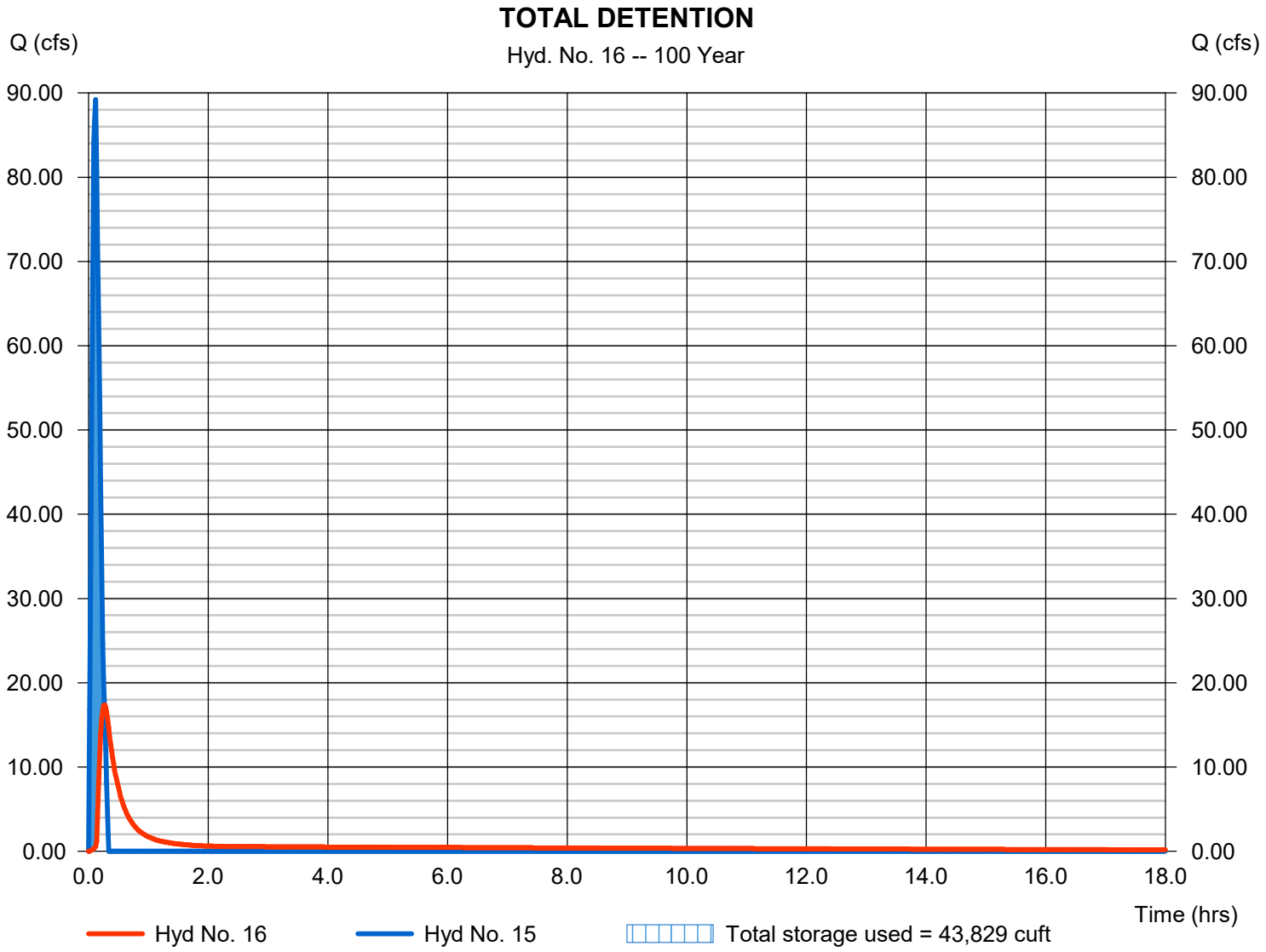
Hydrograph Report

Hyd. No. 16

TOTAL DETENTION

Hydrograph type	=	Reservoir	Peak discharge	=	17.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.27 hrs
Time interval	=	1 min	Hyd. volume	=	51,388 cuft
Inflow hyd. No.	=	15 - TOTAL TO DETENTION	Max. Elevation	=	984.60 ft
Reservoir name	=	Detention	Max. Storage	=	43,829 cuft

Storage Indication method used.

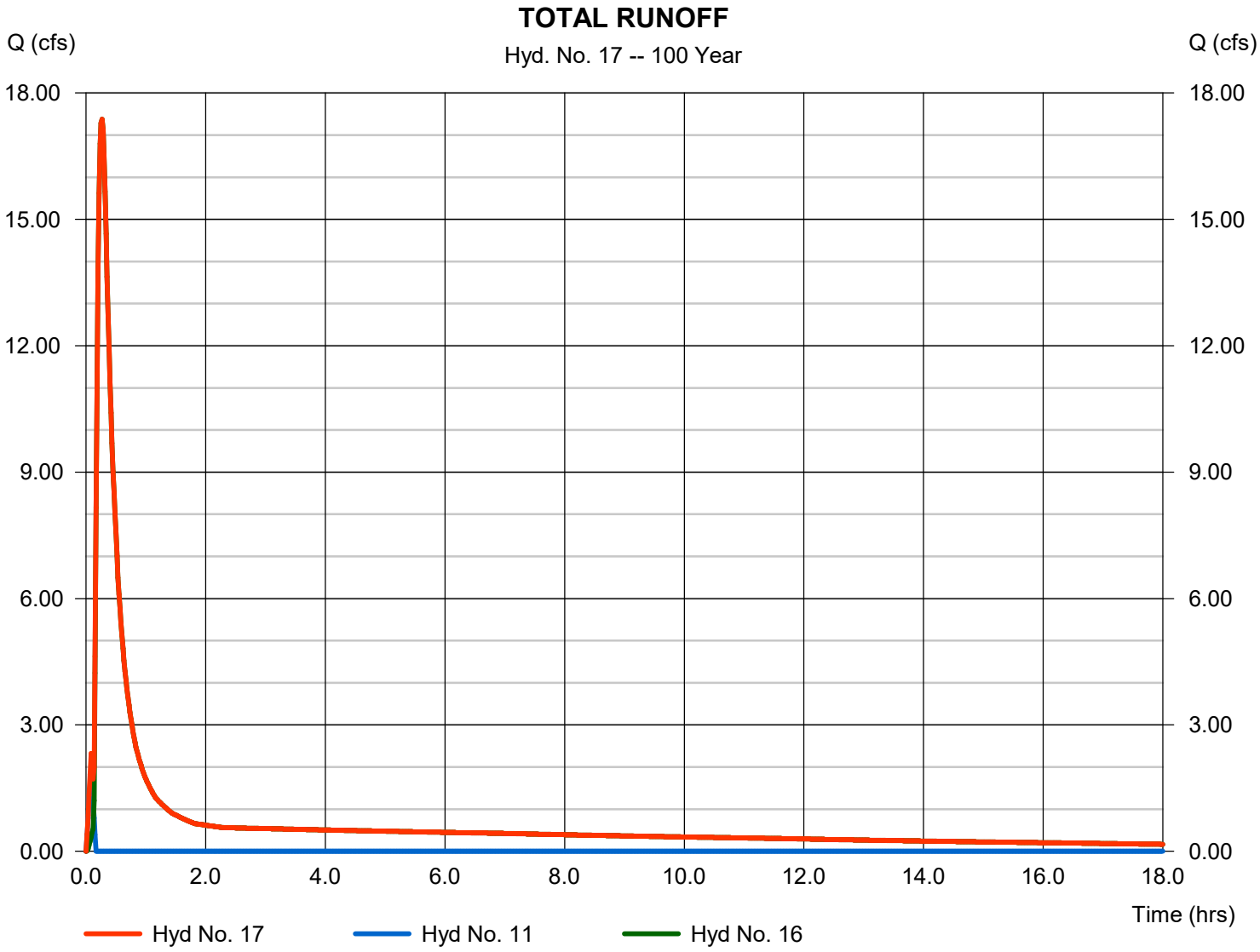


Hydrograph Report

Hyd. No. 17

TOTAL RUNOFF

Hydrograph type	=	Combine	Peak discharge	=	17.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.27 hrs
Time interval	=	1 min	Hyd. volume	=	51,983 cuft
Inflow hyds.	=	11, 16	Contrib. drain. area	=	0.350 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	2.9200	0.1000	0.0000	--------
2	110.7137	16.5000	0.9842	--------
3	0.0000	0.0000	0.0000	--------
5	168.3971	19.5000	1.0189	--------
10	183.3473	19.2000	1.0096	--------
25	12318.8496	51.4998	1.8037	--------
50	235.4014	19.9000	1.0020	--------
100	83.7894	6.1000	0.7783	--------

File name: KCAPWA.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	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92	2.92
2	5.41	4.40	3.71	3.21	2.83	2.53	2.29	2.09	1.92	1.78	1.66	1.55
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	6.47	5.35	4.56	3.98	3.52	3.16	2.86	2.62	2.41	2.24	2.08	1.95
10	7.35	6.08	5.18	4.52	4.00	3.59	3.26	2.98	2.74	2.54	2.37	2.22
25	8.52	7.31	6.35	5.57	4.93	4.40	3.95	3.57	3.24	2.96	2.72	2.50
50	9.39	7.82	6.70	5.86	5.20	4.68	4.25	3.90	3.60	3.34	3.12	2.92
100	12.87	9.64	7.81	6.62	5.77	5.14	4.65	4.25	3.92	3.65	3.41	3.21

Tc = time in minutes. Values may exceed 60.

Precip. file name: bluesprings.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.90	3.50	0.00	4.50	5.30	6.10	6.80	7.70
SCS 6-Hr	0.00	2.65	0.00	3.30	3.45	4.50	5.10	5.70
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
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	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10