Baughman

ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

DRAINAGE PLAN
HOOVER INDUSTRIAL PARK ADDITION

MARCH 2014

REPORT CONTENTS

EXISTING CONDITIONS

The property is approximately 73 acres located along the south side of K96 Highway and adjacent to Hoover Road in northwest Wichita. The property is currently farmland with farmland to the south and a C&D Landfill to the east.

The site appears to have standing water after rainfall events as well as the property to the south. The overall overflow of the site is to the north east and into the KDOT K96 ROW. The overall drainage patterns of this site as well as the rest of the basin is very flat with high infiltration rates.

The drainage patterns can be viewed on the Aerial and Lidar Exhibit (Exhibit 1).

PROPOSED CONDITIONS

The proposed property is being platted as an industrial park that will feature 36 large industrial lots with an internal street loop and a detention/retention facility. We expect the individual lots to have large buildings with paved and gravel parking. The lots are expected to drain primarily to the rear drainage easements and into proposed drainage ditches/channels. The grassed lined channels will provide some water quality and inherent detention for the site before being treated further and then discharged into the groundwater pit.

For a half-scale copy of the Plat, see Exhibit 2.

OFFSITE CONDITIONS

This basin, including this site, is very flat and appears to stand water during and after rainfall events. There is a small ditch section on the south side of K96 that appears to drain the ROW and cross road pipes under K96. This ditch flows to the east along K96 and then to the east. This ditch appears to lose conveyance approximately 1 mile to the east around the West Street off ramp(s).

There is approximately 23 acres of farmland and pasture that drains onto this site from the south and south west. A small portion of this site near the eastern half of the south line appears to drain onto the south property where it likely stands before infiltrating.

The Offsite Drainage Exhibit can be seen as Exhibit 6.

There does not appear to be any runoff encroaching this property from the north as the culverts under K96 drain into the KDOT ROW ditch section. This ditch is located north of the property and fence line and appears to be well defined along the north line of the property.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events
  - 2-yr Rainfall Intensity = 3.83 in
  - 10-yr Rainfall Intensity = 5.22 in
  - 100-yr Rainfall Intensity = 7.37 in

- FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - SCS Curve Number Method (CN = 71)
  - Time of Concentration: Lag Method (minimum 15 min)

SITE CHARACTERISTICS

The site is currently farmland and is very flat – as is the entire basin in this area. The site does drain a small portion to the south and onto the south adjacent property as well as to the north east and into the KDOT ROW ditch. The remainder of the site has ponding areas and appears to infiltrate into the sandy soils. The site accepts some offsite flow from the south where it appears to pond along the south property line – on this site as well as the south property.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

This property was analyzed based on existing conditions for peak runoff values for the entire storm series. Conditions on the site are farmed pasture in Type B soils (a composite of Types B, C, & D soils – underlying soils on the site are sandy, based on NRCS Soil Survey). A minimum Time of Concentration of 15 minutes was used, where applicable. The SCS Curve Number method was used for peak flow rates with a Curve Number of 71 (Undisturbed/ Pre-developed).

DOWNSTREAM DRAINAGE CAPACITY

The basin ultimately drains to the east and to the Arkansas River. There is currently a roadside ROW ditch on the south side of K96 that drains to the east. This ditch appears to be fade out approximately 1 mile to the east near the West Street ramps. There does not appear to be much additional capacity in the ROW ditch for anything other than the cross road pipes from the north and the KDOT ROW. A portion of this site drains and ponds to the south near the south east corner of the property. This area is intended to drain - eventually – to the south across this property and to 37th Street. There is major ponding and infiltration to the south as well as on the subject property.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Calculated
  - Rational Formula Method used for peak runoff
  - CN = 93 (Composite of Impervious and Disturbed Areas)
  - Time of Concentration; Lag Method, minimum Tc = 15min
  - Ditches sized for 100-year event.
  - Hydroguard Units sized for 1.2" rainfall

- GRADING CONSTRAINTS TO BE OBSERVED AT SITE PLAN
  - One foot freeboard between 100-yr WSE and adjacent lot corner
  - Match all existing perimeter grades

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

The site is being platted into 30 industrial lots with a loop street and associated utilities and detention/retention groundwater pit. The site was analyzed for runoff values based on approximately 72% impervious cover in Type B soils. The site was divided into sub-basins in order to size drainage channels and water quality structures.

Time of concentration for each sub-basin was computed using the proposed channel slope and cross section as well as proposed cover type. The Curve Number Method was used for total flows using a CN of a 93. This CN was based on industrial cover (72% impervious) in Type B soils. It should be noted that once this site is mass graded using the overburden from the detention facility that this soil type would lean more towards a Type A as this area is sandy.

The proposed channel sections were modeled as reaches in HydraFlow based on channel geometry with a slope of 0.2%. These ditches were not modeled for infiltration although we expect a high level of infiltration with the geometry and relatively flat slope of the channel bottom. The ditches do have some inherent detention, although not directly accounted for, whereas when modeled as a reach the peak flow is drawn down due to longer times of concentration.

DETENTION FACILITY

There is one proposed facility located in this subdivision located at the east end of the property. The detention pond will be located in groundwater and will be a pure retention facility with no true outfall. The pond is described in more detail below.

Reserve A

The pond in Reserve A will be in groundwater and will be approximately 5 acres in surface area at its static elevation of 1323.0. The pond will accept runoff from this entire developed site as well as the 23 acres of offsite flow from the south. The pond will not have a defined overflow or discharge

structure although the north east corner of the Reserve will be left at a 1330 elevation to allow for overtopping into the KDOT ROW.

Since the pond will be in groundwater, water quality will be required prior to any runoff entering. This will done by using the grass lined channel sections to get 50% removal and then using Hydroguard units to further clean the runoff before being discharged. We expect full retention of the storm series expect a small amount, approximately 6 cfs, to be discharged in the 100-year storm event at approximately 2 inches in flow depth. Since this is a groundwater pit, we would not expect the water surface to stay elevated at the peak elevation for more than 4 days. Also, since this is groundwater, these figures are conservative as runoff will likely infiltrate into the groundwater basin and not surcharge the pond as much as the model portrays.

DISCHARGE POINTS SUMMARY

The site currently drains a portion to the south east onto the south adjacent property as well as overflowing to the north east and into the KDOT ROW ditch. We do not expect to discharge any runoff to the south as this plat will utilize its own detention area for storage. The proposed pond is expected to discharge to the north and into the ROW only during the 100-year and larger storm events. This pond is a groundwater pit and would otherwise not have a discharge.

WATER QUALITY

Water quality will be obtained on this industrial plat prior to discharging into the groundwater pit. This will be achieved utilizing the grass lined drainage ditches/channels to achieve a portion of the treatment. Typically, the grassed lined channels can treat up to 50% of the TSS removal. In this case, the grassed lined channels will be relatively flat at 0.2% with a wide 5' bottom in a sandy soil. This channel, with these characteristics, will also have a high infiltration rate which would help us achieve more than the 50% removal rate – the channels would function more like an enhanced swale. For this project, however, we will assume only the 50% TSS removal from the ditch/channel sections and further treat the remainder of the flow with a water quality unit located at the very downstream end to the channel before entering the ground water pit. This unit will be sized to treat the remainder, approximately 30%, of each respective basins water quality flow.

DOWNSTREAM CHANNEL PROTECTION

Since this property will have a true non-discharging ground water lake, the downstream channel protection volume will be absorbed into the pit. We do not expect any discharge during the channel protection 1-year storm event.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

Due to the size of the retention facility with little to no discharge throughout the storm events, we do not expect any downstream impacts. This plat will accept all offsite runoff and we expect no upstream impacts. It appears that there is standing

water on the site as well as the surrounding properties. With the construction of this pit we expect this to help some of the basins flooding issues.

Since we are treating the runoff before entering the groundwater pit, we do not expect any impacts to the surrounding or downstream water table with this development.

SOURCE OF FLOODPLAIN INFORMATION

This site lies within a FEMA Zone X per FEMA FIRM Panel 195 of 700 for Wichita, Sedgwick County, Kansas; effective February 2, 2007.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time. The areas of discharge do not account for more than 640 acres.
Since this is a groundwater pit, a groundwater appropriations permit application will need to be filed and approved for the construction of the open water.

FEMA

No FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There is no KDOT ROW adjacent or near this property which would require a permit at this time since there is no additional discharge into the ROW with this plat.

SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

EXHIBIT 1: Aerial Photo Exhibit with Lidar Topography

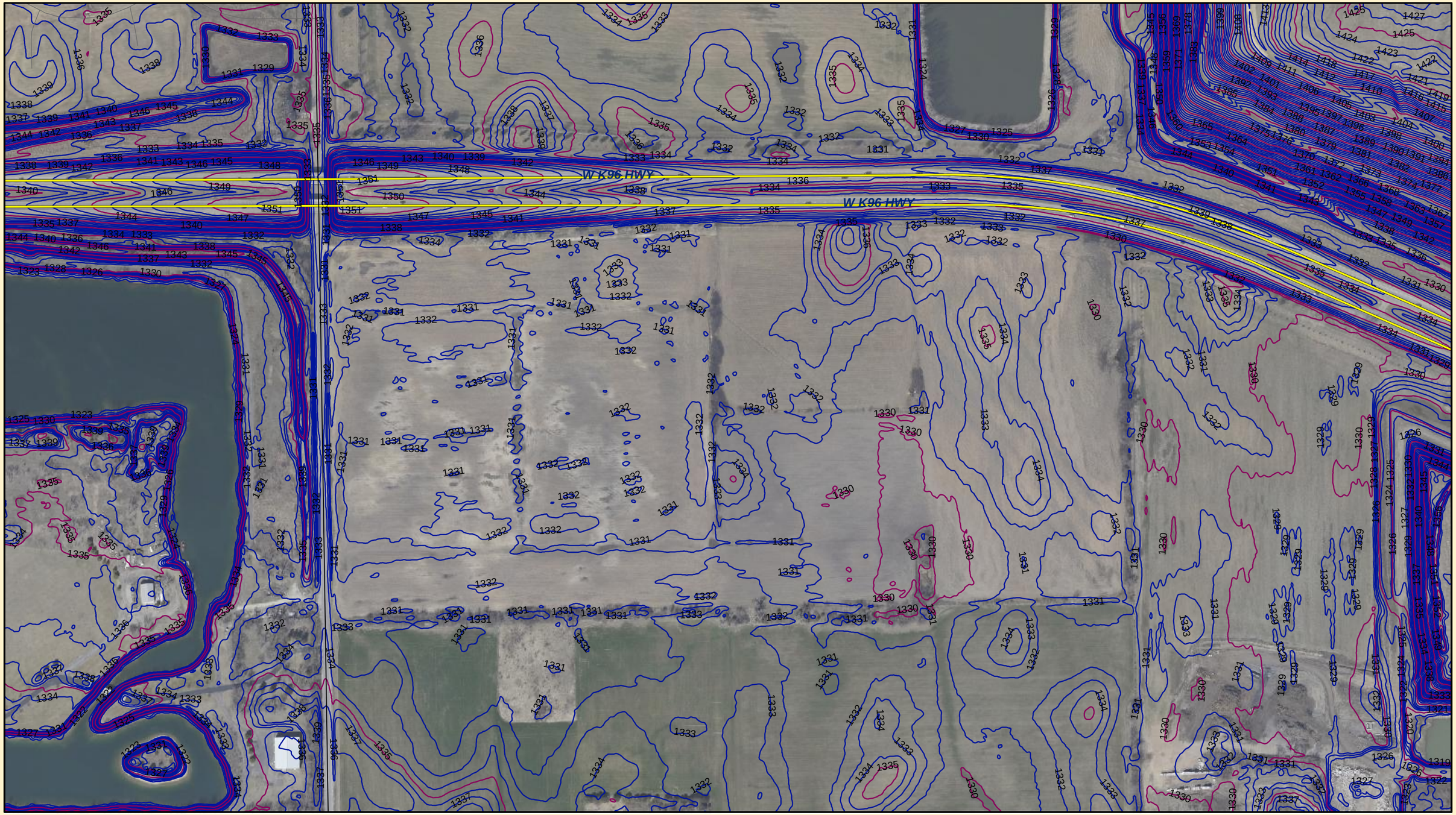
EXHIBIT 2: Plat – Half Scale

EXHIBIT 3: Site Location Map

EXHIBIT 4: Drainage Plan – Half Scale

EXHIBIT 5: Floodplain Location (FIRM)

EXHIBIT 6: Offsite Drainage Basin Map



AERIAL EXHIBIT

WITH LIDAR

0 150 300 600 Feet

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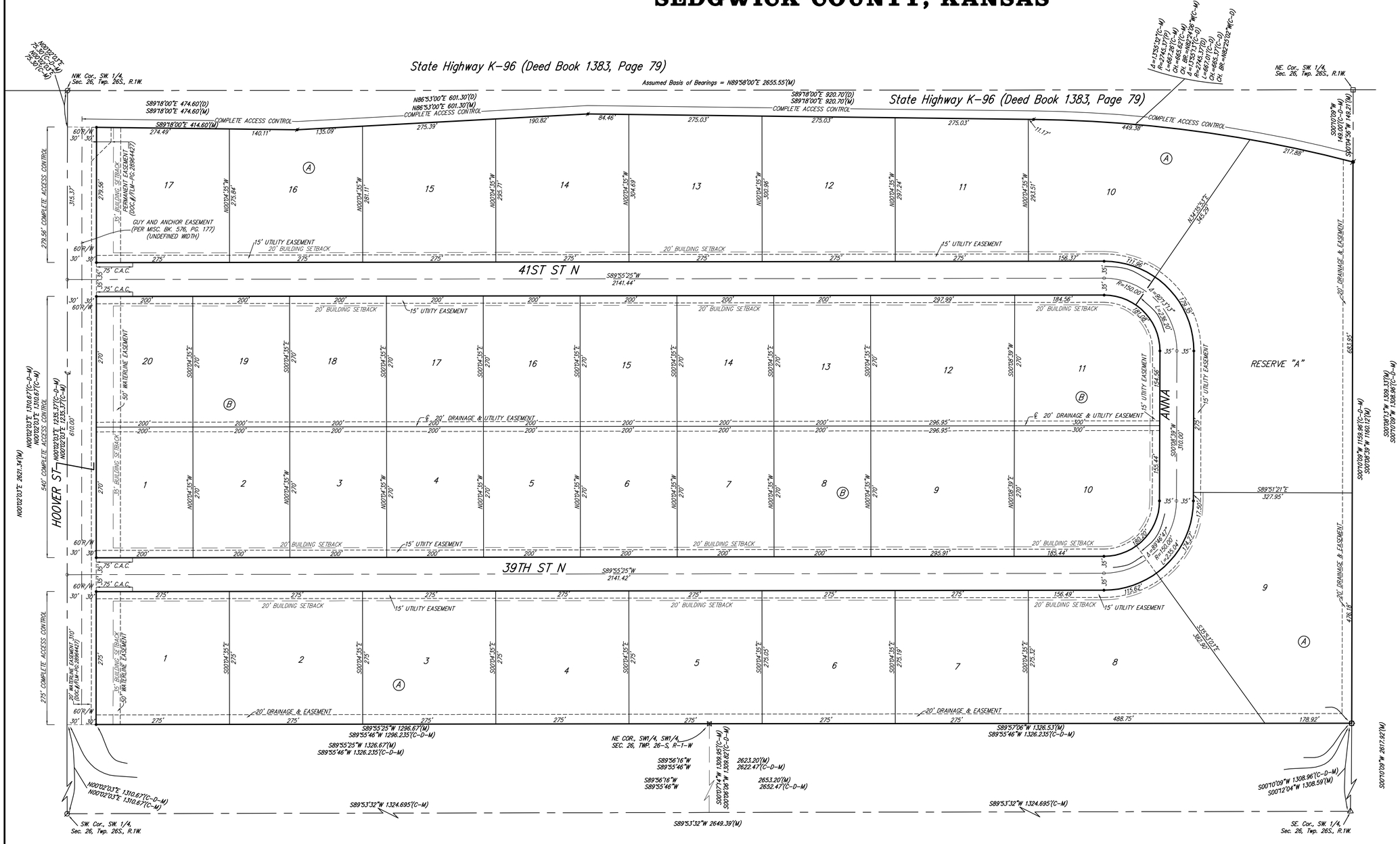

HOOVER INDUSTRIAL PARK ADDITION
SEDGWICK COUNTY, KANSAS

State of Kansas)
Sedgwick County) SS We, Baughman Company, P.A., Surveyors in aforesaid county and state do hereby certify that we have surveyed and platted "HOOVER INDUSTRIAL PARK ADDITION", Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as the north half of the Southwest Quarter of Section 26, Township 26 South, Range 1 West of the Sixth Principal Meridian, Sedgwick County, Kansas, EXCEPT that part deeded for highway in Deed Book 1383, Page 79.

Existing public easements and dedications being vacated by virtue of K.S.A. 12-512b, as amended.

Baughman Company, P.A.

______________________________, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, Blocks, Streets, and a Reserve, to be known as "HOOVER INDUSTRIAL PARK ADDITION", Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The drainage and utility easements are hereby granted as indicated for drainage purposes and for the construction and maintenance of all public utilities. The waterline easements are hereby granted as indicated for the construction and maintenance of water lines and related appurtenances. The streets are hereby dedicated to and for the use of the public. Reserve "A" is hereby reserved for open space, lakes, landscaping, drainage purposes, access, and utilities as confined to easements. Reserve "A" shall be owned and maintained by the current owner, and/or their successors, assigns, and/or a Lot Owner's Association. The Minimum Building Pad Elevations for the lowest opening to the structures shall be as indicated on the face of the plat. Access controls shall be as depicted on the face of the plat and are hereby granted to the appropriate governing body.

Russell Investment, LC

______________________________, President
Jay W. Russell

State of Kansas)
Sedgwick County) SS The foregoing instrument acknowledged before me, this______day of______________, 2014, by Jay W. Russell, President of Russell Investment, LC, on behalf of the limited liability company.

______________________________, Notary Public

My App't. Exp. __________

MINIMUM BUILDING PAD ELEVATIONS FOR LOWEST OPENING TO THE STRUCTURES		
LOT	BLOCK	ELEVATION
		NAVD88
9, 10	A	1334.0

BENCHMARK:
CITY OF WICHITA DISK ON THE NORTH RIGHT-OF-WAY OF K-96 HIGHWAY AND WEST RIGHT-OF-WAY OF HOOVER, 42.50' WEST OF THE CENTERLINE OF HOOVER AND 6.9' EAST SOUTHEAST OF POWER POLE.
ELEV.=1332.66 (NAVD88)

● = #4 REBAR W/ "BAUGHMAN" CAP (SET)
⊡ = 1/2" IRON PIPE (FOUND) (ORIGIN UNKNOWN)
△ = 3/4" IRON PIPE (FOUND) (ORIGIN UNKNOWN)
∅ = #5 REBAR (FOUND)(ORIGIN UNKNOWN)
ø = #5 REBAR W/ "GARBER" CAP (FOUND)
⊙ = 3/4" IRON PIPE W/ "MOEHRING" CAP (FOUND)
⊗ = #4 REBAR W/ "ARMSTRONG" CAP (FOUND)

(M) = MEASURED
(D) = DESCRIBED
(CM) = CALCULATED PER MEASURED INFO.
(CD) = CALCULATED PER DESCRIBED INFO.

This plat of "HOOVER INDUSTRIAL PARK ADDITION, Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this________day of________________, 2014.
Wichita-Sedgwick County Metropolitan Area Planning Commission

______________________________, Chair
Don Klausmeyer

______________________________, Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this________day of________________, 2014.

______________________________, Mayor
Carl Brewer

______________________________, City Clerk
Karen Sublett

This plat approved and all dedications shown hereon accepted by the Board of Commissioners of Sedgwick County, Kansas, this______day of________________, 2014.

______________________________, Chairman
Dave Unruh, 1st District

ATTEST:______________________________, County Clerk
Kelly B. Arnold

This plat approved and all dedications shown hereon accepted by the Board of Commissioners of Sedgwick County, Kansas, this________day of____________, 2014.

______________________________, Chairman
Dave Unruh, 1st District

ATTEST:______________________________, County Clerk
Kelly B. Arnold

Reviewed in accordance with K.S.A. 58-2005 on this________day of______________, 2014.

____
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

Entered on transfer record this________day of______________, 2014.

______________________________, County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County) SS This is to certify that this plat has been filed for record in the office of the Register of Deeds, this_______day of_____________, 2014 at______o'clock___M; and is duly recorded.

______________________________, Register of Deeds
Bill Meek

______________________________, Deputy
Tonya Buckingham

Baughman
Baughman Company , P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
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SITE LOCATION

0 250 500 1,000 Feet

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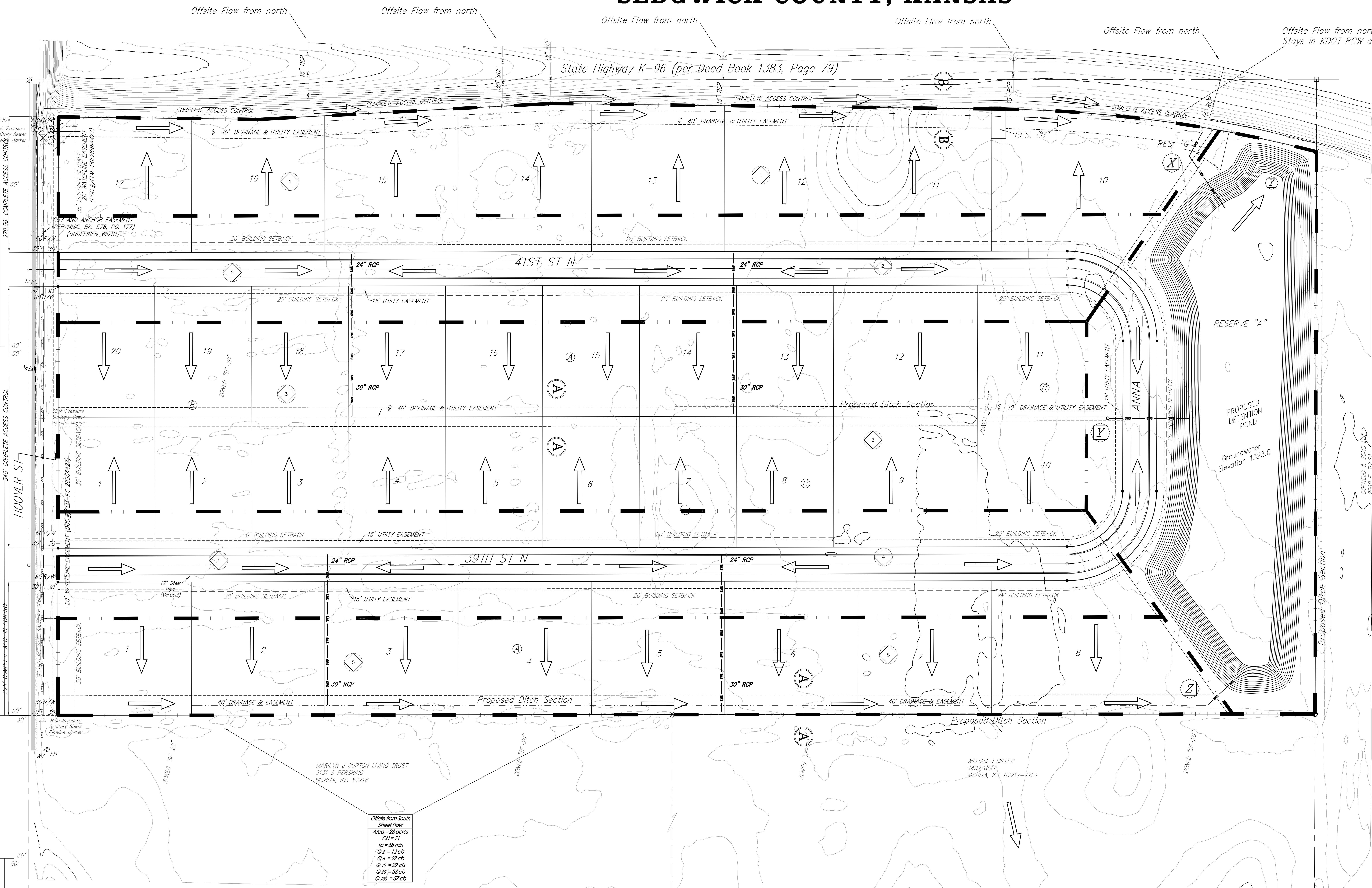
DRAINAGE PLAN

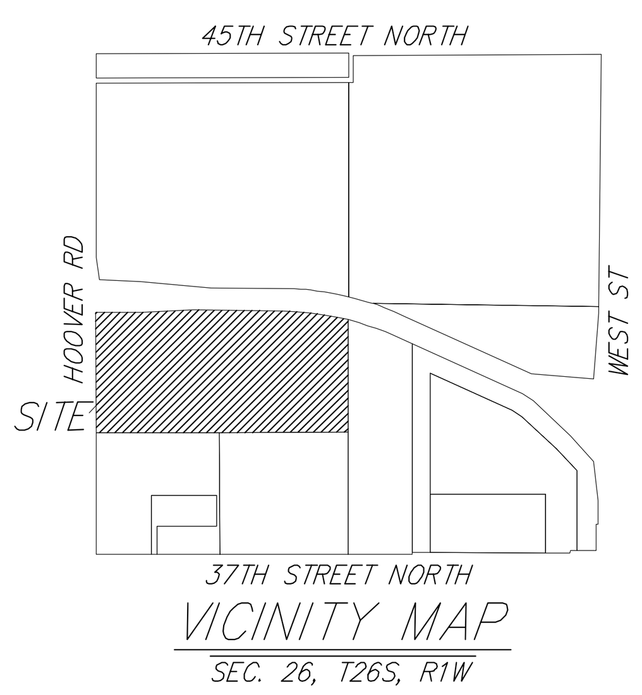
HOOVER INDUSTRIAL PARK ADDITION

SEDGWICK COUNTY, KANSAS



0' 100' 200'

DATE OF PREPARATION: 16 JANUARY 2014
DATE OF TOPOGRAPHY: 11 SEPTEMBER 2013
CONTOUR INTERVALS = 1 FOOT (CONTOURS PROVIDED BY SEDGWICK COUNTY)



VICINITY MAP

SEC. 26, T26S, R1W

- ● = #4 Baughman Rebar Set
- □ = 1/2" Iron Pipe Found (Origin Unknown)
- △ = 3/4" Iron Pipe Found (Origin Unknown)
- ⊘ = #5 Rebar Found
- ■ = #5 Garber Rebar Found
- ⊙ = 3/4" Moehring Capped Iron Pipe Found
- ⌘ = #4 Armstrong Capped Rebar Found

(C) = Calculated
CH. = Chord Length
CH. BR. = Chord Bearing
Δ = Delta Angle
D = Degree of Curve
(D) = Described
L = Arc Length
(M) = Measured
(P) = Platted
(Pro) = Prorated
R = Radius

GROUNDWATER PIT (Static = 1323.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	150 cfs	0.0 cfs	1326.0
10 yr	250 cfs	0.0 cfs	1327.8
100 yr	405 cfs	6.5 cfs	1330.2

GROUNDWATER PIT	
ELEVATION	TOTAL STORAGE (ac ft)
1323	0.0
1324	5.2
1325	10.6
1326	16.2
1327	22.1
1328	28.2
1329	34.5
1330	41.1

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group A	B	C	D	Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed	0.02	0.03	0.04	0.05	Undisturbed	55	71	80	84
Turf or Disturbed Soils	0.15	0.20	0.22	0.25	Turf or Disturbed Soils	71	80	84	88
Impervious Cover	0.95	0.95	0.95	0.95	Impervious Cover	98	98	98	98

Basin #	Undist. ft^2	Dist. ft^2	Red. Imp. ft^2	New Imp. ft^2	Total Area ft^2	U %	D %	Redev. I %	I %	R_v %	WQ_v ft^3 eq. 4-25*
1	0	140,340	0	360,600	500,940	0.000	0.056	0.000	0.654	0.7399	37,064
2	0	145,000	0	328,500	453,500	0.000	0.060	0.000	0.655	0.7251	35,058
3	0	246,000	0	580,000	826,000	0.000	0.060	0.000	0.655	0.7254	60,060
4	0	145,000	0	328,500	453,500	0.000	0.060	0.000	0.655	0.7251	35,058
5	0	132,000	0	308,000	440,000	0.000	0.060	0.000	0.655	0.7250	31,900

Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*)

Water Quality Peak Flow POINT X
eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	93	Table 4-9
Ia/P =	0.13	
Tc =	76	min
qu =	250	Figure 4-6
A =	500,940	ft^2
	11.5	acre
	0.01796875	mi^2
Rv =	0.7399	Eq. 4-24
P =	1.2	Sedg. Std.
Qwv =	0.88786202	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	1.34	cfs

Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

Water Quality Peak Flow POINT Y
eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	93	Table 4-9
Ia/P =	0.13	
Tc =	76	min
qu =	250	Figure 4-6
A =	1,311,500	ft^2
	30.1	acre
	0.0470436	mi^2
Rv =	0.7252	Eq. 4-24
P =	1.2	Sedg. Std.
Qwv =	0.8702639	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	3.44	cfs

Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

Water Quality Peak Flow POINT Z
eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	93	Table 4-9
Ia/P =	0.13	
Tc =	76	min
qu =	250	Figure 4-6
A =	923,500	ft^2
	21.2	acre
	0.033126	mi^2
Rv =	0.7250	Eq. 4-24
P =	1.2	Sedg. Std.
Qwv =	0.870047	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	2.42	cfs

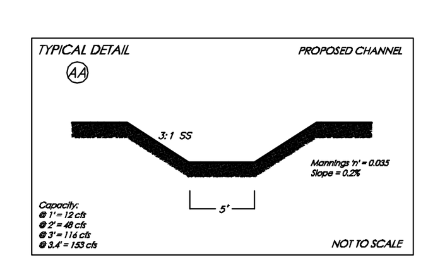
Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

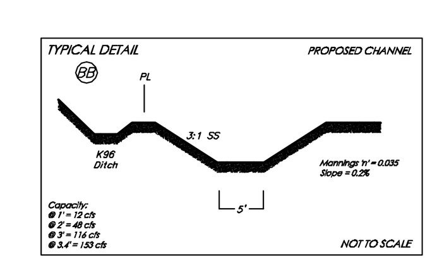
① NORTH DEVELOPED	② NORTH ROAD	③ MIDDLE DEVELOPED	④ SOUTH ROAD	⑤ SOUTH DEVELOPED
DA = 11.5 acres	DA = 11.1 acres	DA = 19 acres	DA = 11.1 acres	DA = 10.1 acres
CN = 93	CN = 93	CN = 93	CN = 93	CN = 93
Tc = 15 min	Tc = 15 min	Tc = 15 min	Tc = 15 min	Tc = 15 min
Q_2 = 38 cfs	Q_2 = 37 cfs	Q_2 = 63 cfs	Q_2 = 37 cfs	Q_2 = 33 cfs
Q_5 = 51 cfs	Q_5 = 49 cfs	Q_5 = 84 cfs	Q_5 = 49 cfs	Q_5 = 45 cfs
Q_{10} = 60 cfs	Q_{10} = 58 cfs	Q_{10} = 99 cfs	Q_{10} = 58 cfs	Q_{10} = 52 cfs
Q_{100} = 92 cfs	Q_{100} = 89 cfs	Q_{100} = 152 cfs	Q_{100} = 89 cfs	Q_{100} = 81 cfs

The above sub-basins are for sizing storm water sewer (where applicable) as well as the ditch/channel sections. Water quality and water quality treatment structures calculated and sized per total flows being conveyed to the 3 entrances to the groundwater pit.

X Proposed Flows at Point X	Y Proposed Flows at Point Y	Z Proposed Flows at Point Z
Q_2 = 25 cfs	Q_2 = 72 cfs	Q_2 = 53 cfs
Q_5 = 35 cfs	Q_5 = 98 cfs	Q_5 = 75 cfs
Q_{10} = 41 cfs	Q_{10} = 117 cfs	Q_{10} = 91 cfs
Q_{100} = 66 cfs	Q_{100} = 190 cfs	Q_{100} = 152 cfs

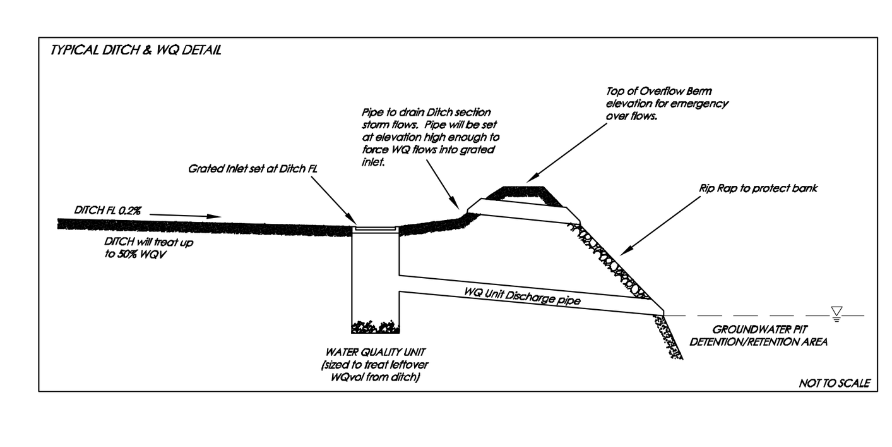
The above sub-basins and flows were modeled using the respective drainage basins and routed through a reach consisting of the proposed ditch section as shown per this plan. See HydraFlow model for additional details.





NOTE: Leave existing K96 ROW ditch intact for KDOT drainage from north. Onsite ditch will be utilized for this sites' flow to the detention facility.

Although the onsite soils will allow a large amount of infiltration, ditch sections were not modeled as having infiltration. This is a conservative approach as the infiltration will also allow some water quality treatment as well as reducing the peak flow to the qater quality unit and groundwater pit.



NOTES: There is no FEMA SFHA located on this property as of this date per FEMA FIRM Panel 195 of 700, for Wichita, Sedgwick County, Kansas; effective February 2, 2007.

DRAINAGE PLAN
HOOVER INDUSTRIAL PARK ADDITION

14 MAR 2014

Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

E:\PROJECTS\RUSSELL - TWEET PROPERTY\WATER RESOURCES\RUSSELL-TWEET_P_DRAIN.DWG

/

FIRM PANEL EXHIBIT

0 125 250 500 Feet

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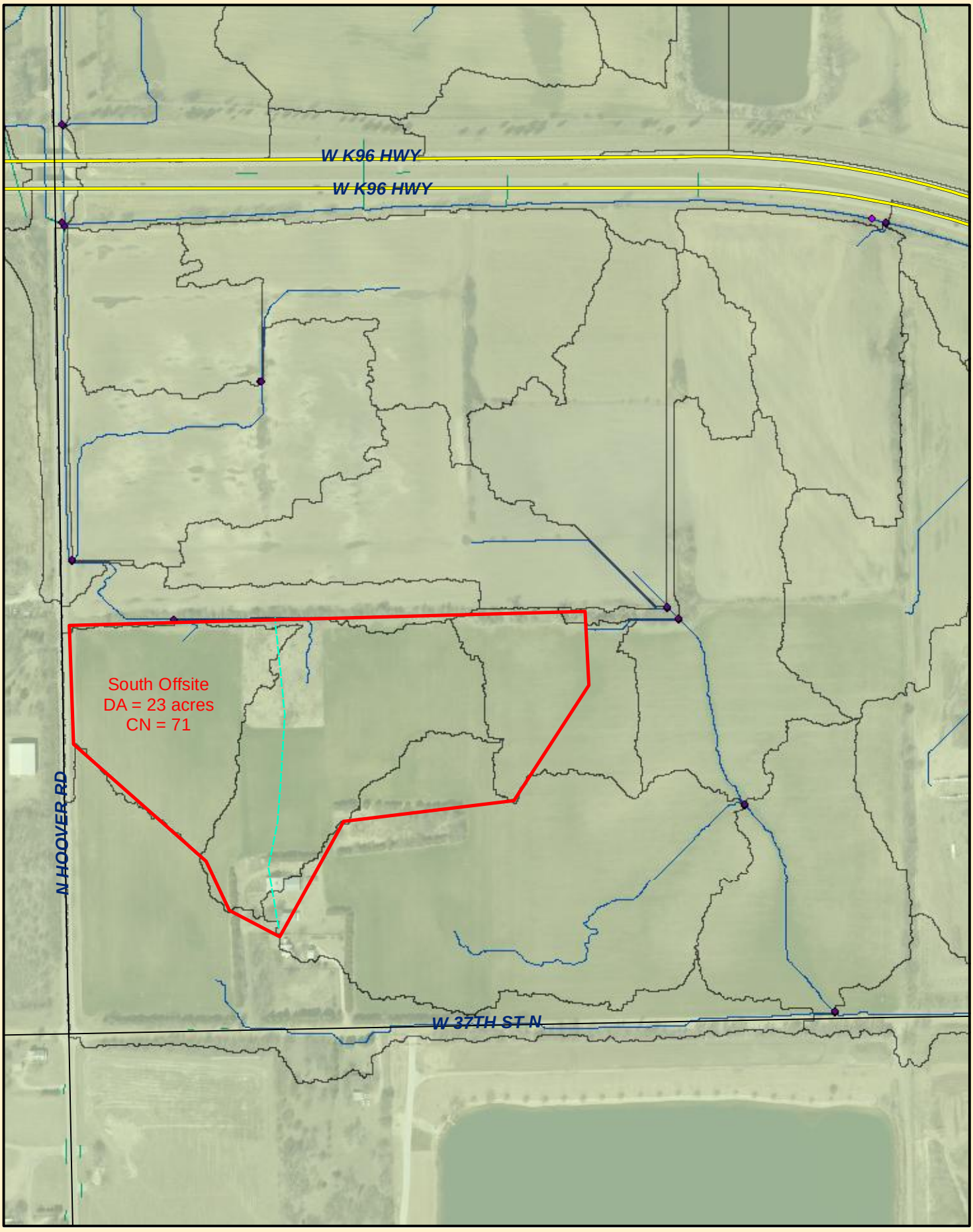

OFFSITE DRAINAGE EXHIBIT

0 100 200 400 Feet

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LANDSCAPE ARCHITECTURE

SUPPORTING CALCULATIONS

APPENDIX A: USGS Soils Survey

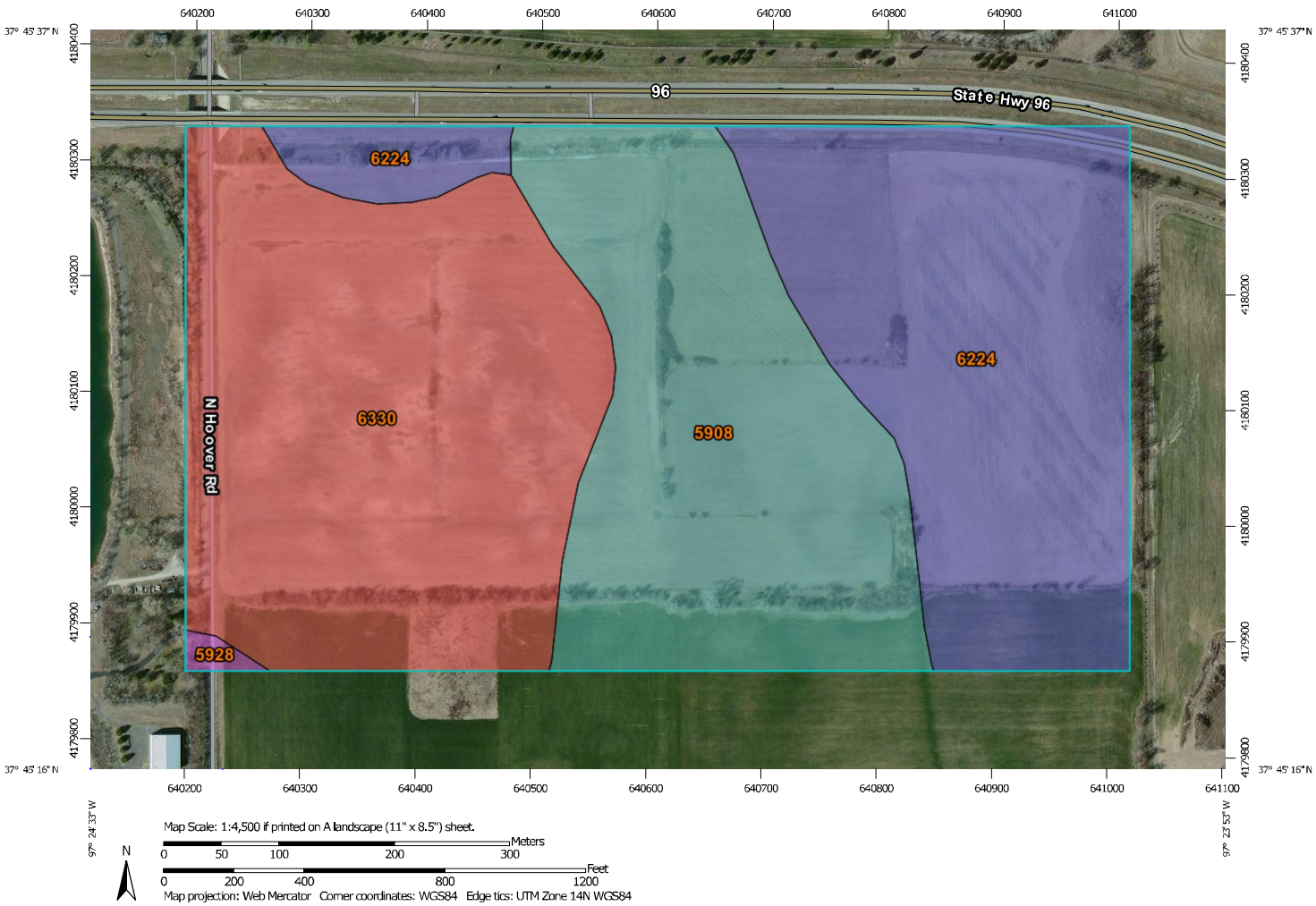
APPENDIX B: HydraFlow Hydrographs
Pond Routing and Site Flow

APPENDIX C: HydraFlow SWS
Proposed Onsite SWS – 5-year Event

APPENDIX D: Water Quality
Calculations and Hydroguard Unit Flows

USGS Soils Survey

Hydrologic Soil Group—Sedgwick County, Kansas
(Hoover Industrial)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 9, Dec 10, 2013

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

Date(s) aerial images were photographed: Jul 18, 2010—Sep 27, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sedgwick County, Kansas (KS173)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5908	Nalim loam, 0 to 1 percent slopes	C	27.9	29.2%
5928	Pratt loamy fine sand, 1 to 5 percent slopes	A	0.4	0.4%
6224	Canadian fine sandy loam, rarely flooded	B	31.7	33.1%
6330	Carwile fine sandy loam, 0 to 1 percent slopes	D	35.6	37.2%
Totals for Area of Interest			**95.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

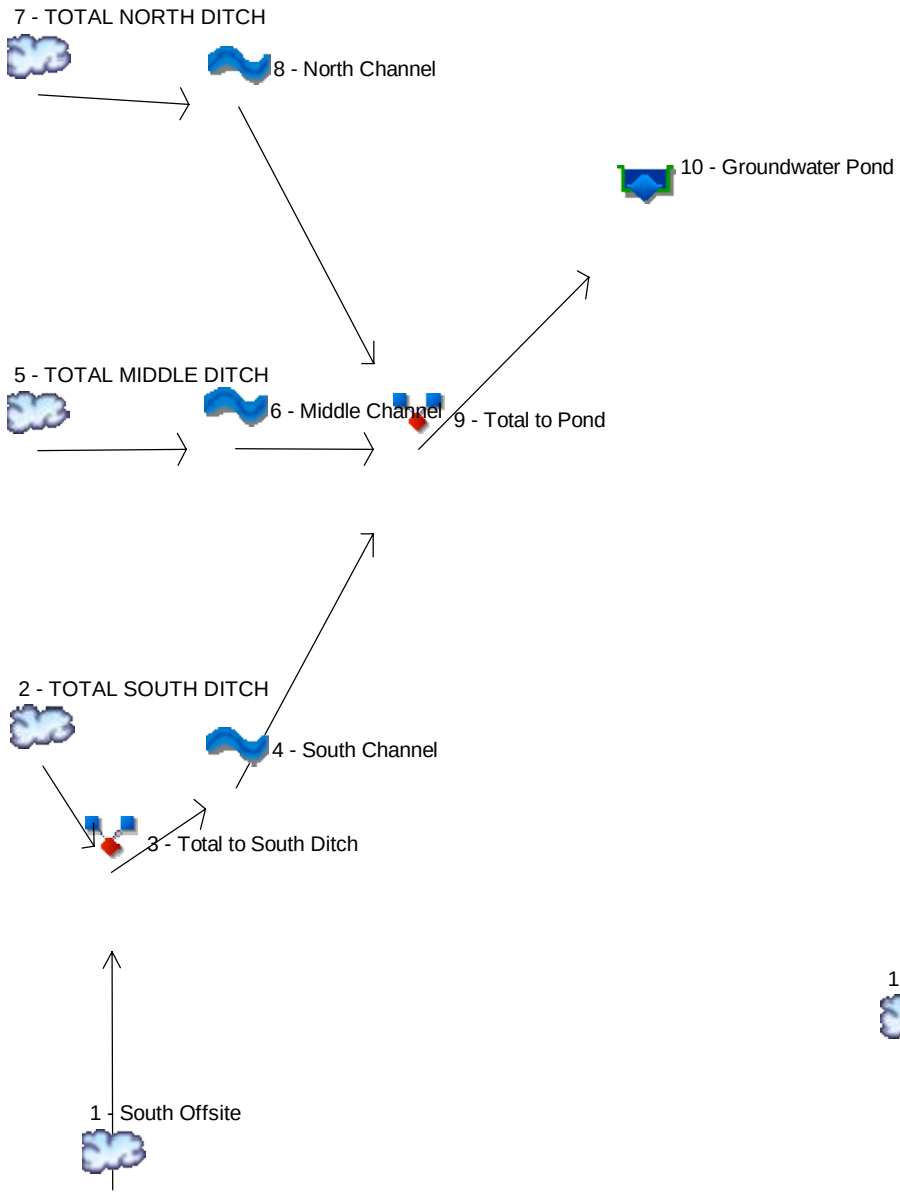
Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

HydraFlow Hydrographs

Pond Routing & Site Flow

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	South Offsite
2	SCS Runoff	TOTAL SOUTH DITCH
3	Combine	Total to South Ditch
4	Reach	South Channel
5	SCS Runoff	TOTAL MIDDLE DITCH
6	Reach	Middle Channel
7	SCS Runoff	TOTAL NORTH DITCH
8	Reach	North Channel
9	Combine	Total to Pond
10	Reservoir	Groundwater Pond
11	SCS Runoff	North Developed
12	SCS Runoff	North Road
13	SCS Runoff	MIddle Developed
14	SCS Runoff	South Road
15	SCS Runoff	South Developed
16	SCS Runoff	TC for Ditches for qu (general)

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	------	6.847	12.39	0.087	21.61	28.63	38.13	46.88	56.97	South Offsite
2	SCS Runoff	------	53.75	70.25	16.35	93.64	109.91	130.70	149.09	169.71	TOTAL SOUTH DITCH
3	Combine	1, 2	55.57	74.23	16.35	101.68	121.15	146.38	168.95	194.46	Total to South Ditch
4	Reach	3	38.18	52.72	9.652	74.77	90.72	111.64	130.56	152.13	South Channel
5	SCS Runoff	------	76.32	99.74	23.21	132.96	156.04	185.57	211.68	240.95	TOTAL MIDDLE DITCH
6	Reach	5	53.74	72.04	14.25	98.41	116.93	141.25	162.96	187.47	Middle Channel
7	SCS Runoff	------	29.16	38.11	8.868	50.80	59.62	70.90	80.87	92.06	TOTAL NORTH DITCH
8	Reach	7	18.70	25.23	4.862	34.70	41.39	50.04	57.76	66.48	North Channel
9	Combine	4, 6, 8	110.61	149.99	28.76	207.88	249.04	302.48	350.36	404.57	Total to Pond
10	Reservoir	9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.463	Groundwater Pond
11	SCS Runoff	------	29.16	38.11	8.868	50.80	59.62	70.90	80.87	92.06	North Developed
12	SCS Runoff	------	28.14	36.78	8.560	49.03	57.54	68.43	78.06	88.86	North Road
13	SCS Runoff	------	48.17	62.96	14.65	83.93	98.50	117.13	133.62	152.09	MIddle Developed
14	SCS Runoff	------	28.14	36.78	8.560	49.03	57.54	68.43	78.06	88.86	South Road
15	SCS Runoff	------	25.61	33.47	7.789	44.61	52.36	62.27	71.03	80.85	South Developed
16	SCS Runoff	------	14.45	18.99	4.267	25.46	29.96	35.72	40.81	46.52	TC for Ditches for qu (general)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

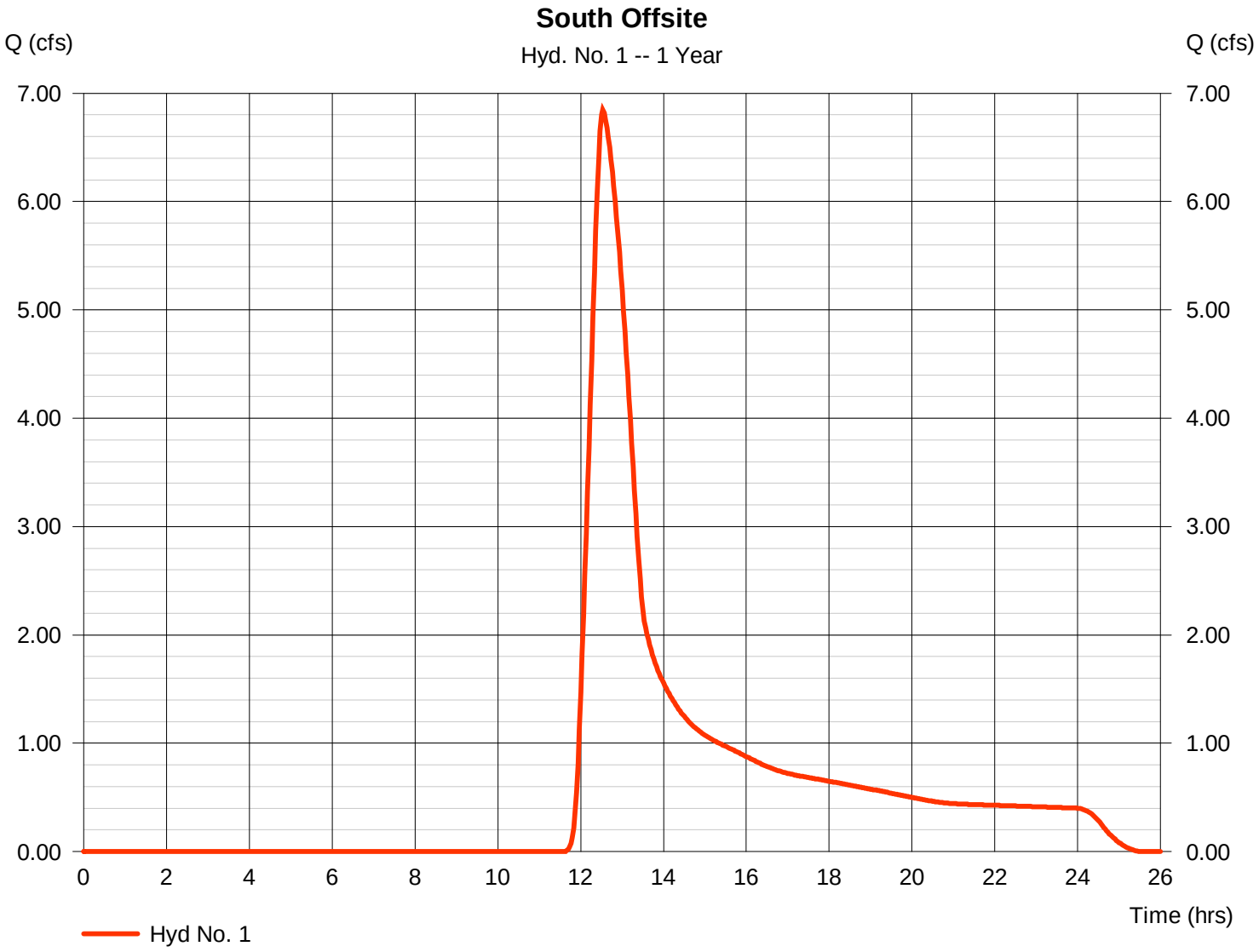
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	6.847	2	752	1.242	------	------	------	South Offsite
2	SCS Runoff	53.75	2	722	3.554	------	------	------	TOTAL SOUTH DITCH
3	Combine	55.57	2	722	4.796	1, 2	------	------	Total to South Ditch
4	Reach	38.18	2	730	4.796	3	------	------	South Channel
5	SCS Runoff	76.32	2	722	5.046	------	------	------	TOTAL MIDDLE DITCH
6	Reach	53.74	2	730	5.046	5	------	------	Middle Channel
7	SCS Runoff	29.16	2	722	1.928	------	------	------	TOTAL NORTH DITCH
8	Reach	18.70	2	730	1.928	7	------	------	North Channel
9	Combine	110.61	2	730	11.770	4, 6, 8	------	------	Total to Pond
10	Reservoir	0.000	2	n/a	0.000	9	1325.21	11.8	Groundwater Pond
11	SCS Runoff	29.16	2	722	1.928	------	------	------	North Developed
12	SCS Runoff	28.14	2	722	1.861	------	------	------	North Road
13	SCS Runoff	48.17	2	722	3.185	------	------	------	MIddle Developed
14	SCS Runoff	28.14	2	722	1.861	------	------	------	South Road
15	SCS Runoff	25.61	2	722	1.693	------	------	------	South Developed
16	SCS Runoff	14.45	2	758	2.565	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.847 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.53 hrs
Time interval	=	2 min	Hyd. volume	=	1.242 acft
Drainage area	=	23.000 ac	Curve number	=	71
Basin Slope	=	0.5 %	Hydraulic length	=	1000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	58.40 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

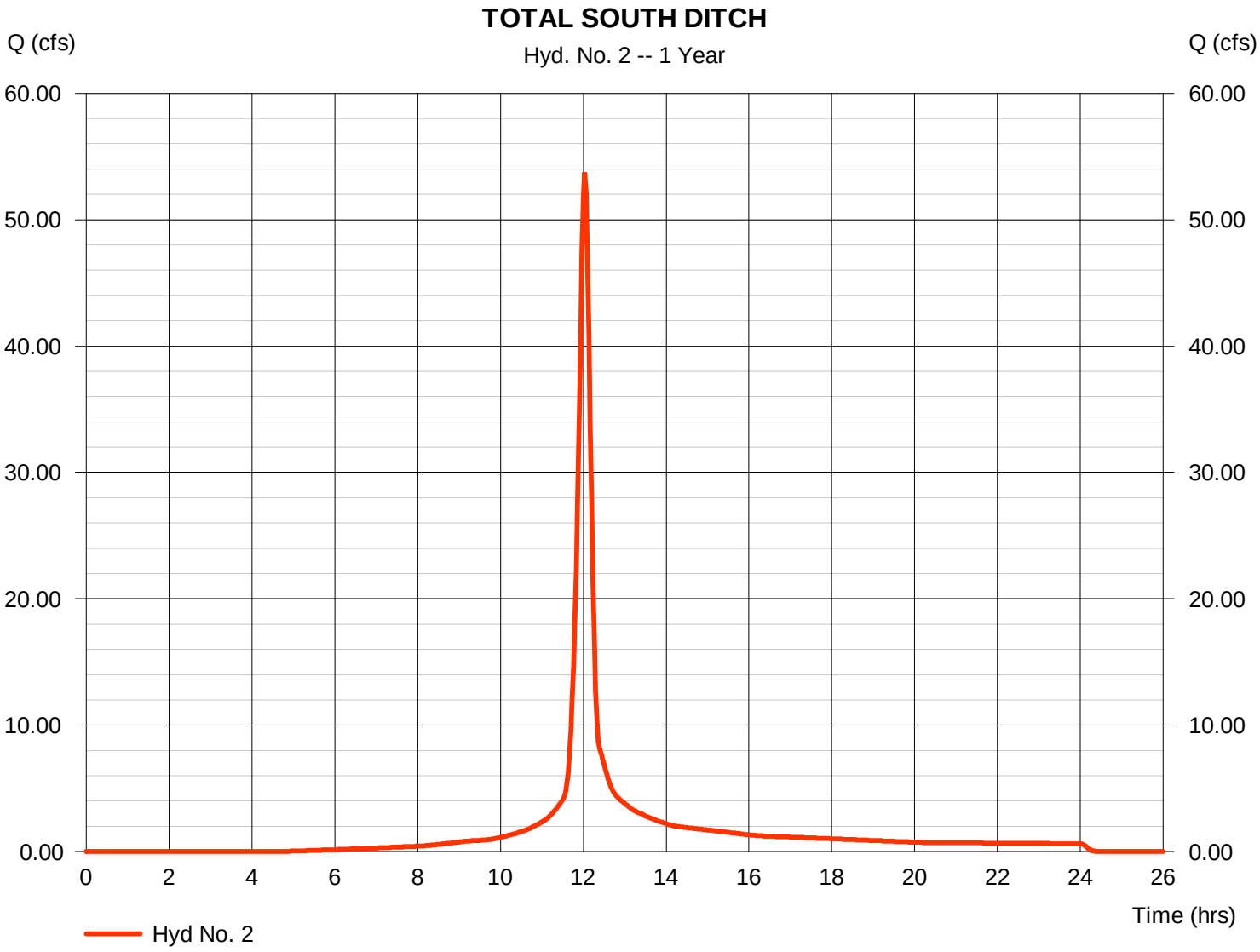


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 53.75 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 3.554 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

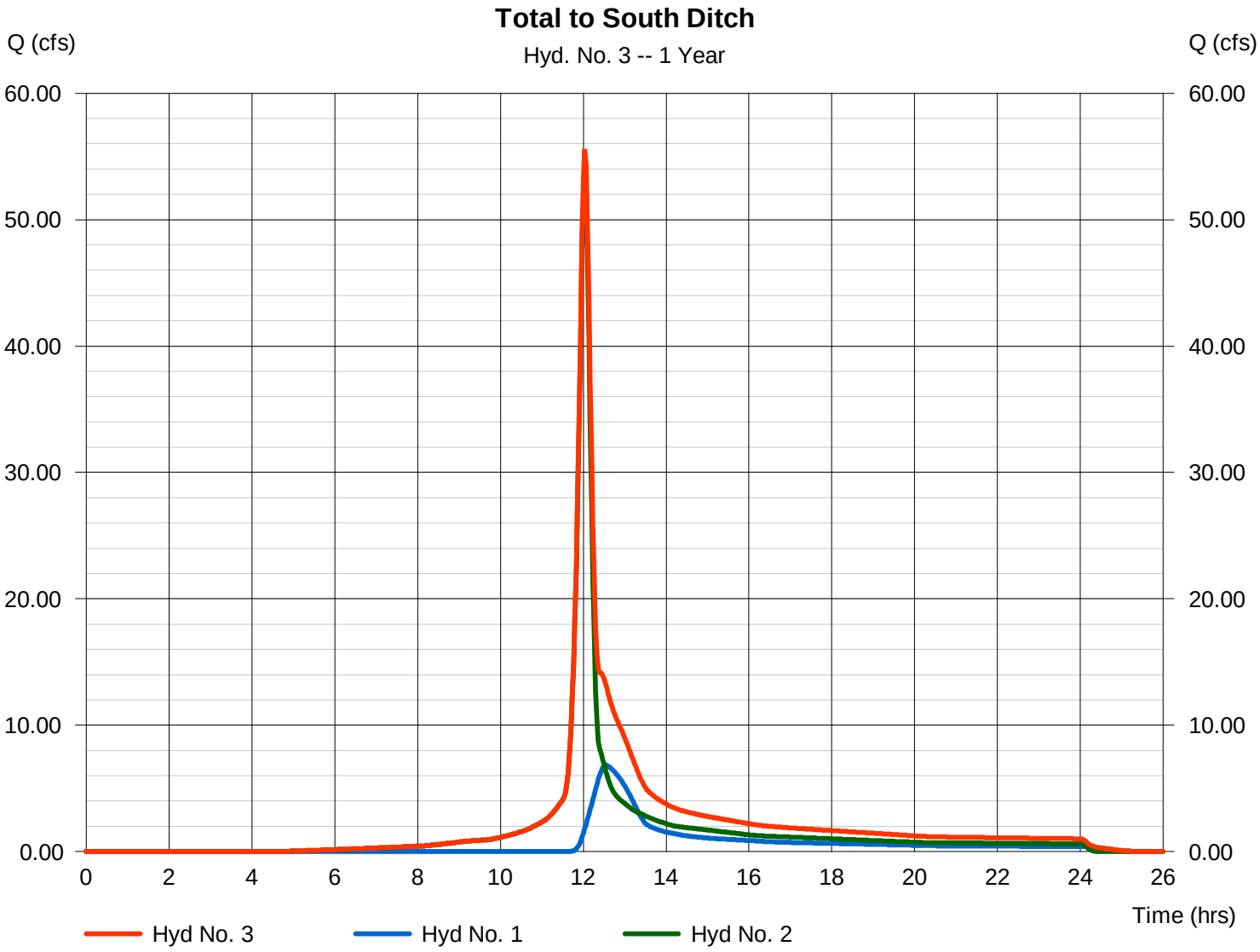


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 55.57 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.796 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



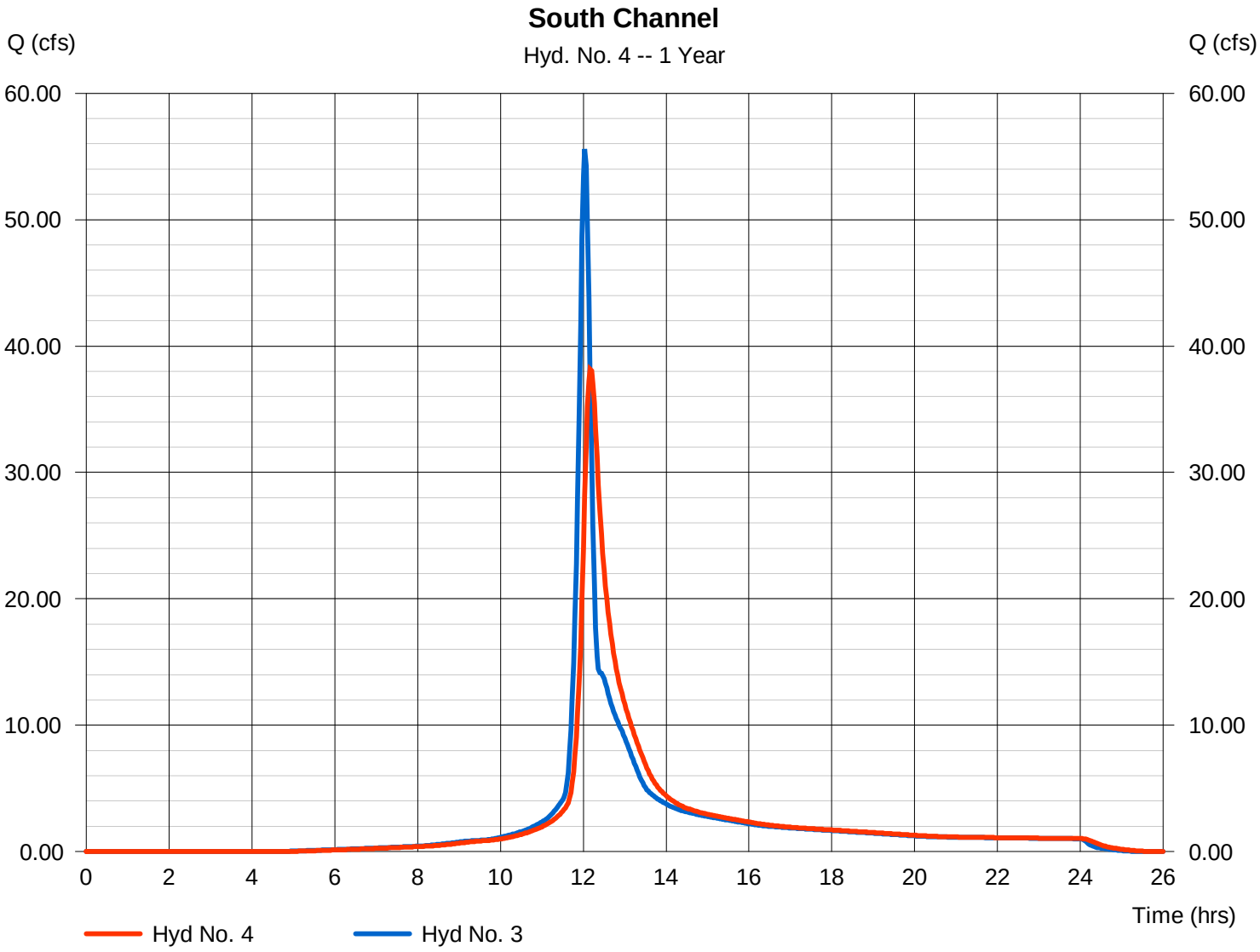
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	38.18 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	4.796 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	1.92 ft/s	Routing coeff.	=	0.1412

Modified Att-Kin routing method used.

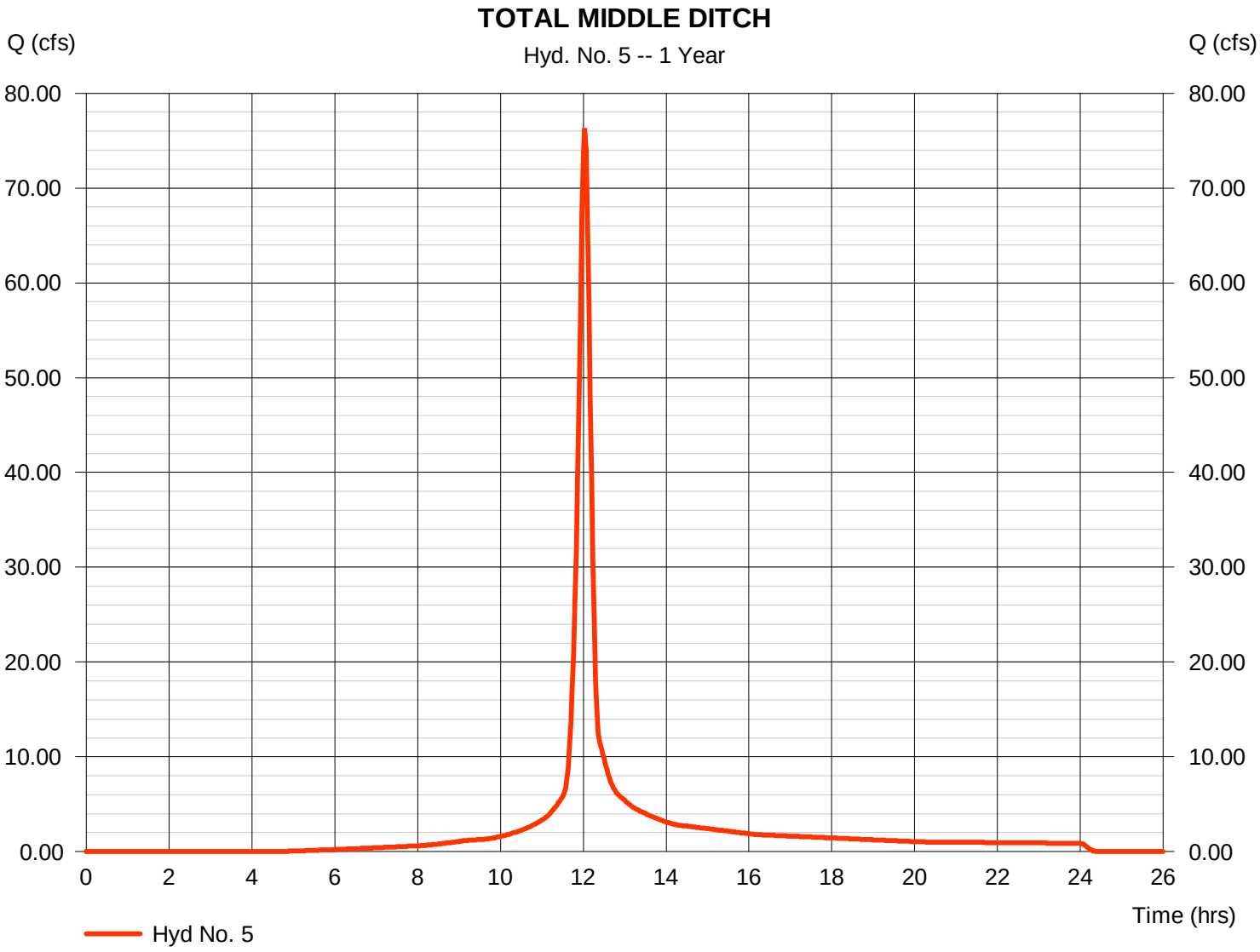


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 76.32 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 5.046 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



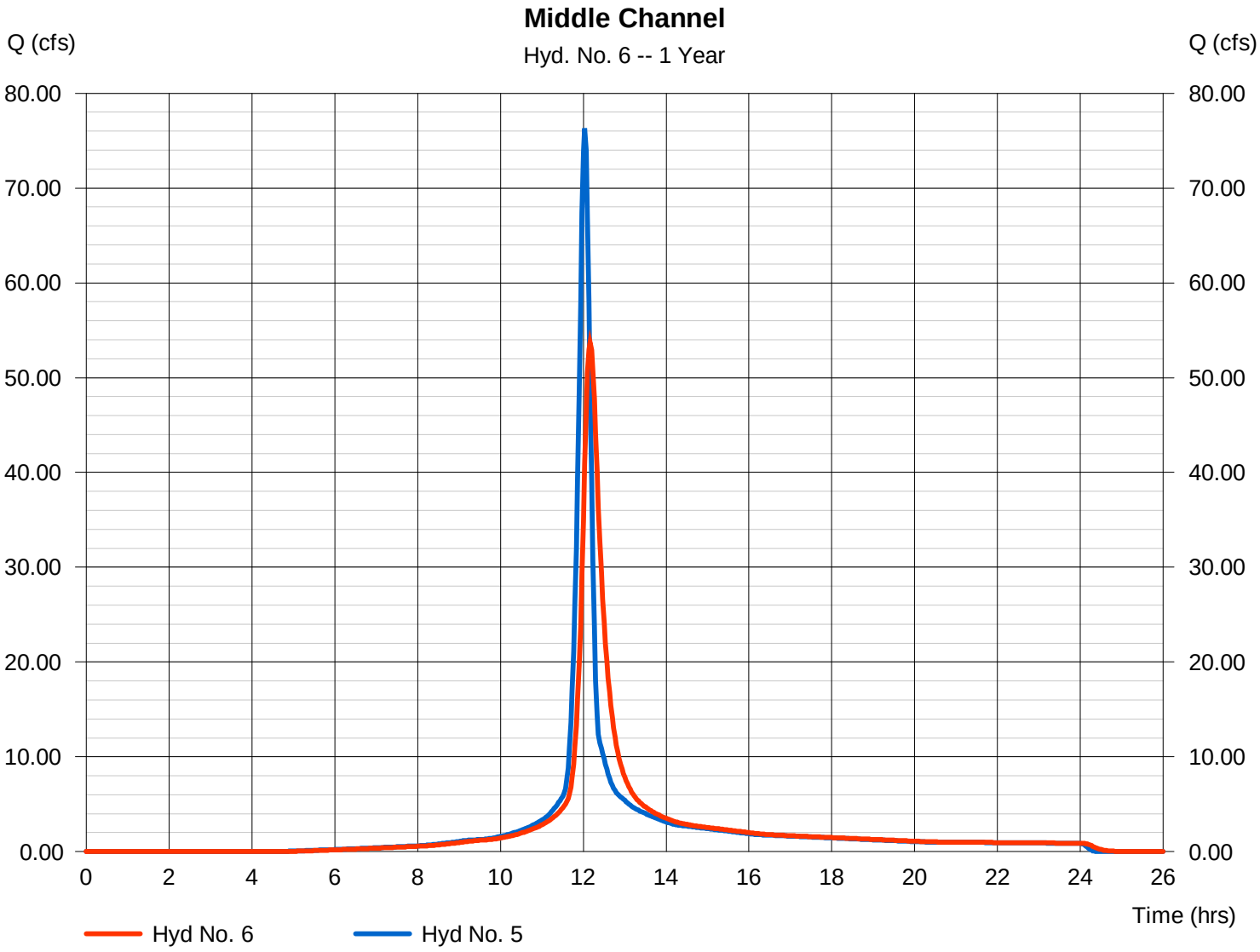
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	=	Reach	Peak discharge	=	53.74 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	5.046 acft
Inflow hyd. No.	=	5 - TOTAL MIDDLE DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.07 ft/s	Routing coeff.	=	0.1516

Modified Att-Kin routing method used.

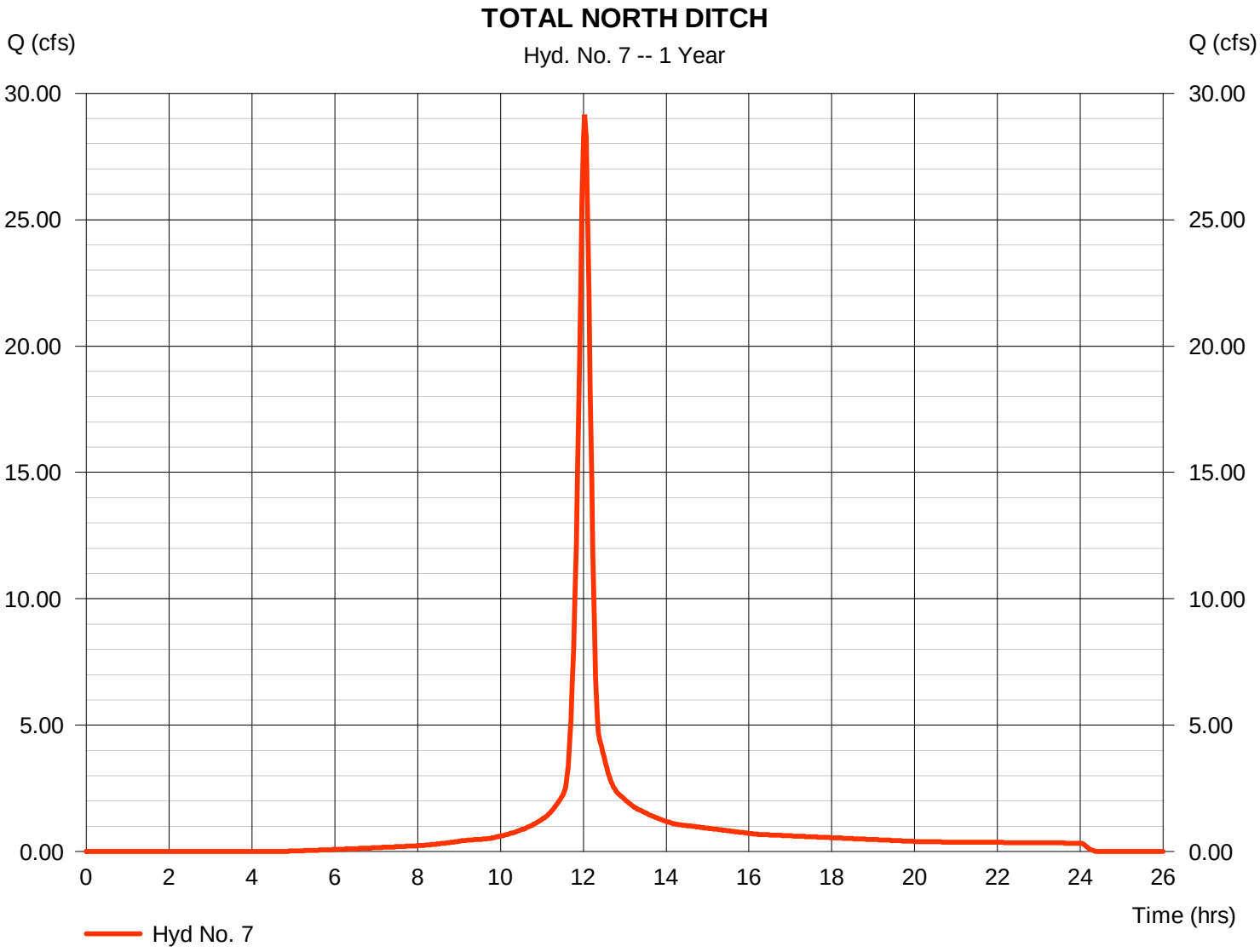


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 29.16 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1.928 acft
Drainage area	= 11.500 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



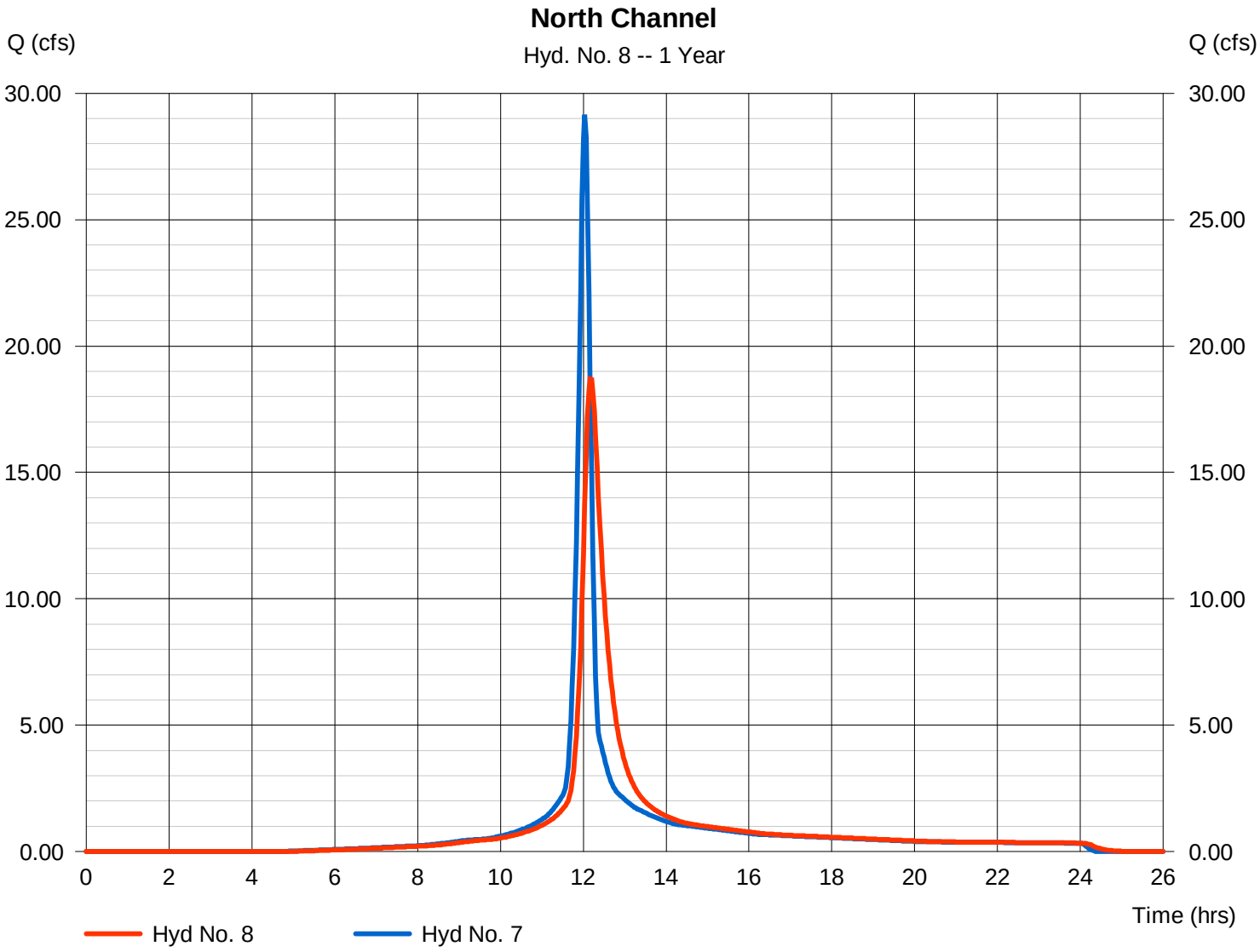
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	18.70 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	1.928 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	1.64 ft/s	Routing coeff.	=	0.1220

Modified Att-Kin routing method used.

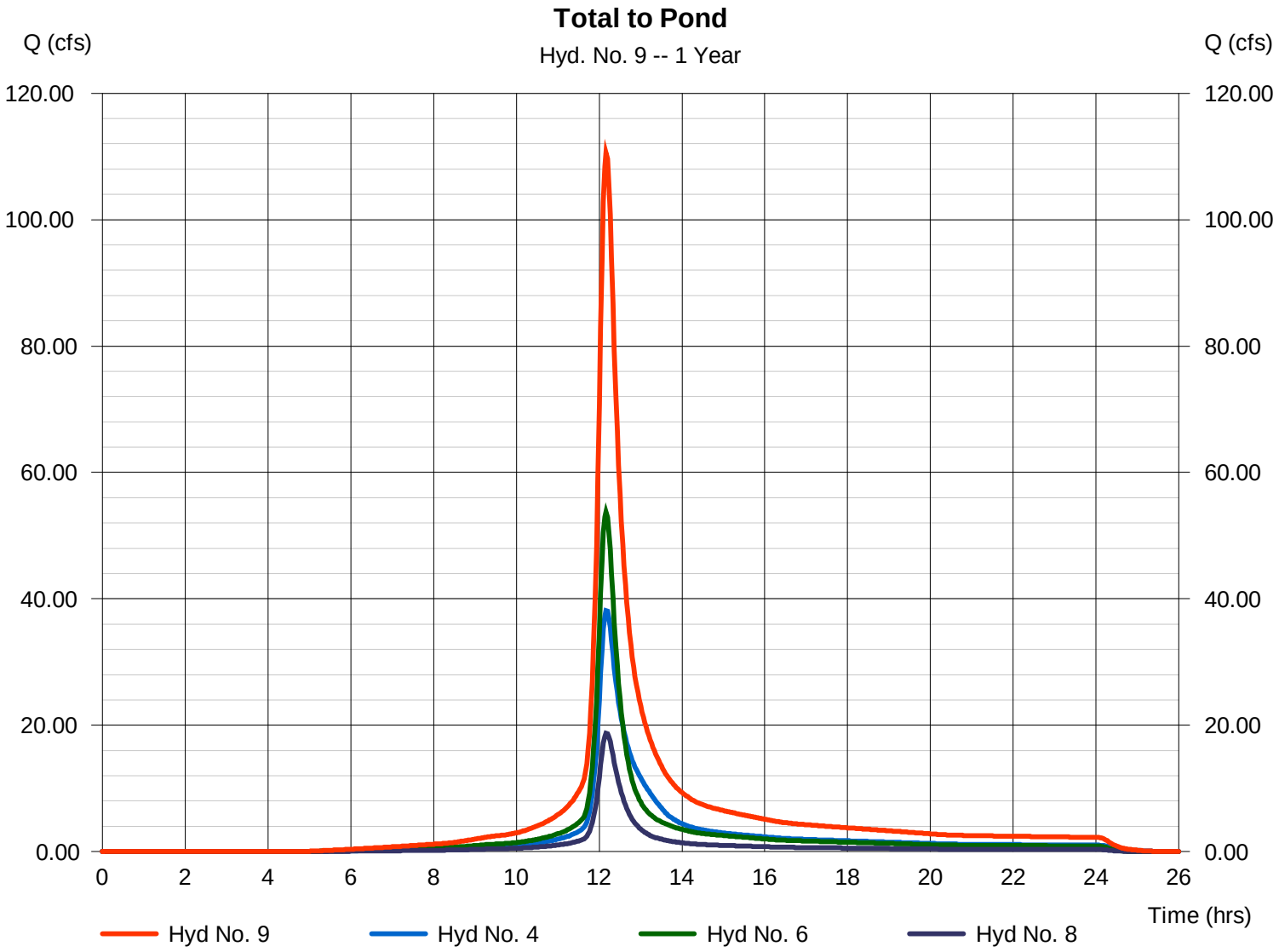


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 110.61 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 11.770 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



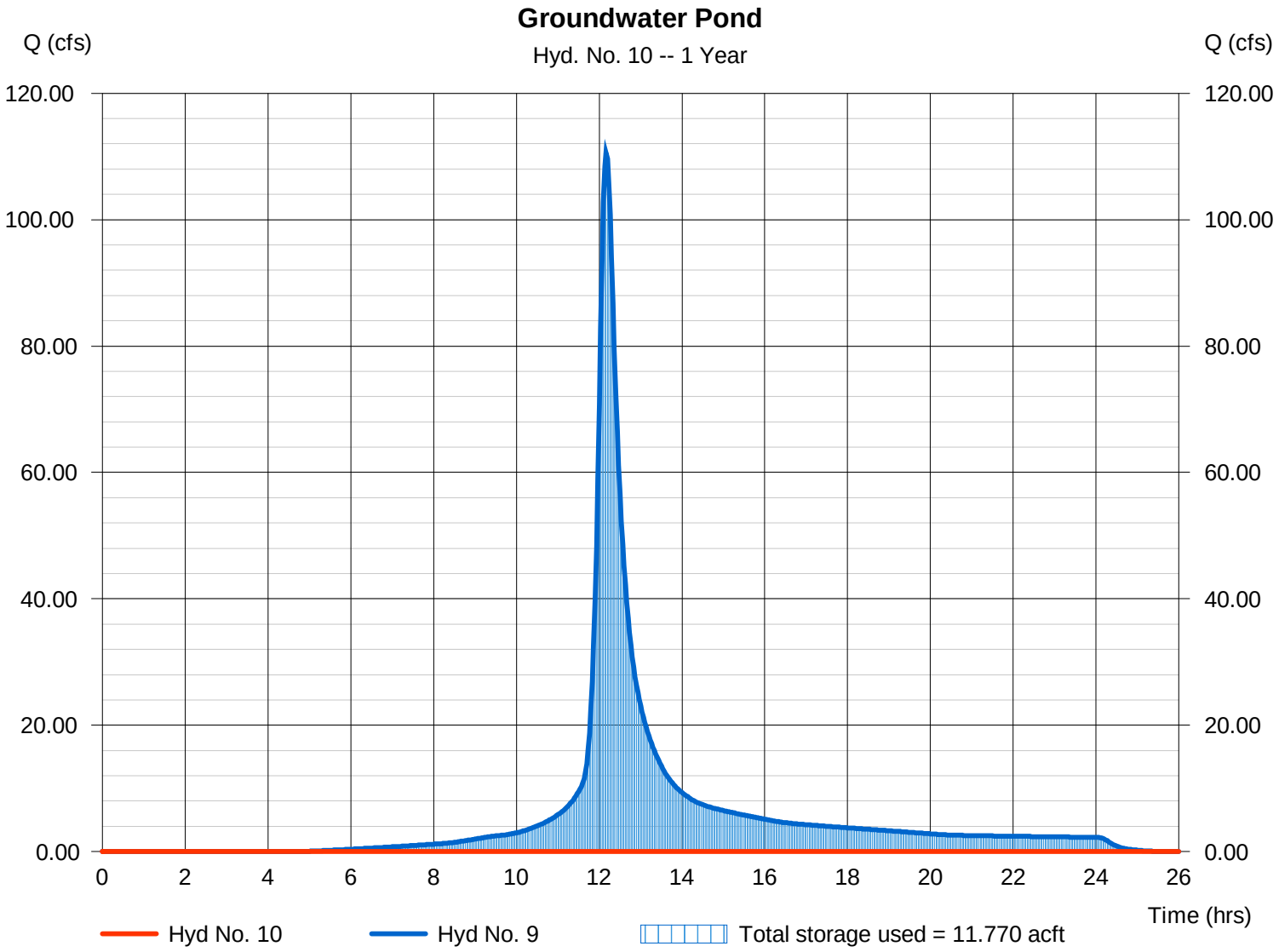
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1325.21 ft
Reservoir name	= <New Pond>	Max. Storage	= 11.770 acft

Storage Indication method used.



Pond Report

Pond No. 1 - <New Pond>

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1323.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1323.00	221,000	0.000	0.000
1.00	1324.00	230,500	5.182	5.182
2.00	1325.00	240,500	5.405	10.587
3.00	1326.00	250,500	5.635	16.222
4.00	1327.00	260,500	5.865	22.086
5.00	1328.00	270,500	6.094	28.181
6.00	1329.00	281,000	6.329	34.510
7.00	1330.00	292,000	6.576	41.086
8.00	1331.00	302,500	6.823	47.909

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

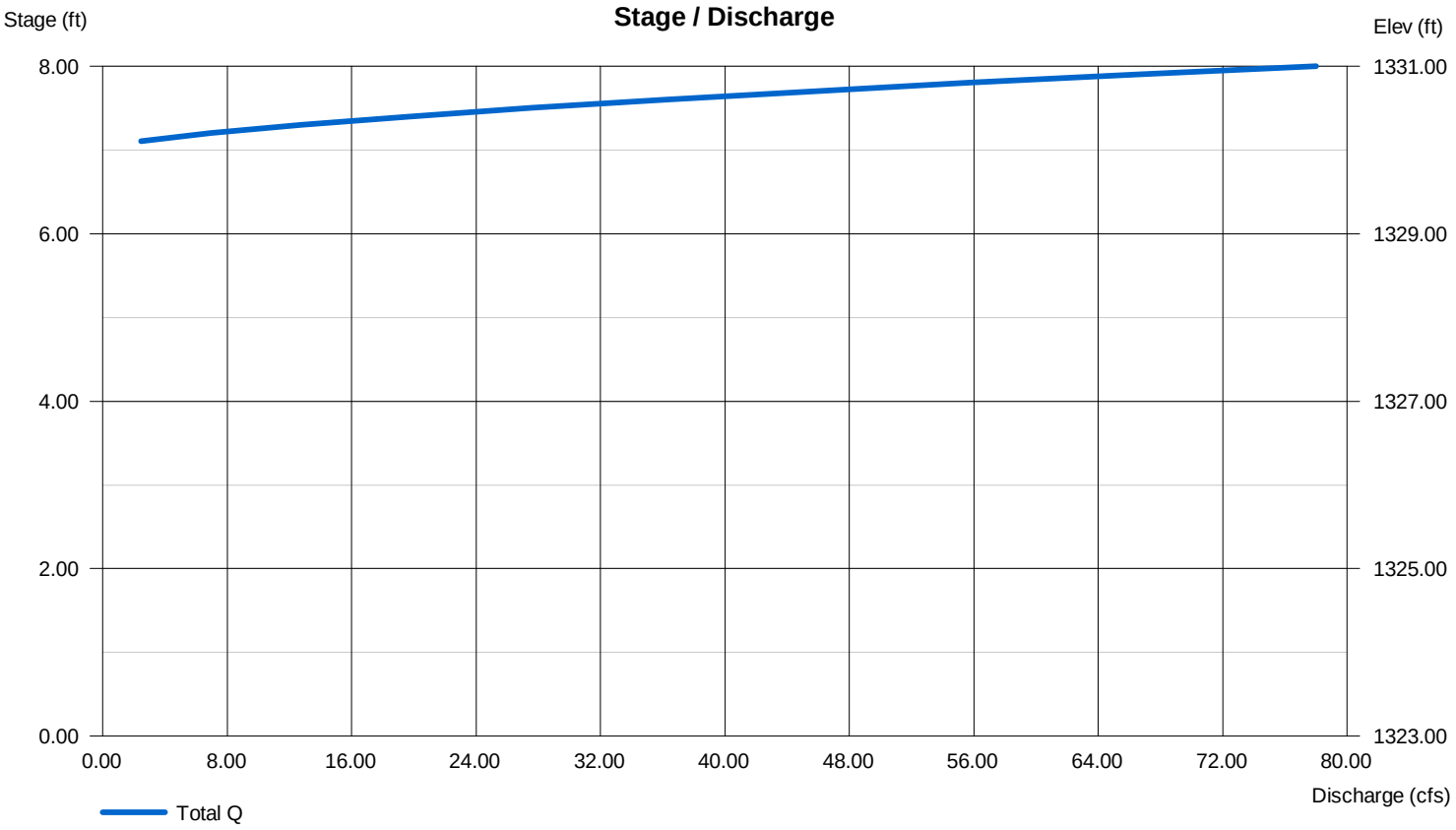
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 30.00	0.00	0.00	0.00
Crest El. (ft)	= 1330.00	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) = 0.000 (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).

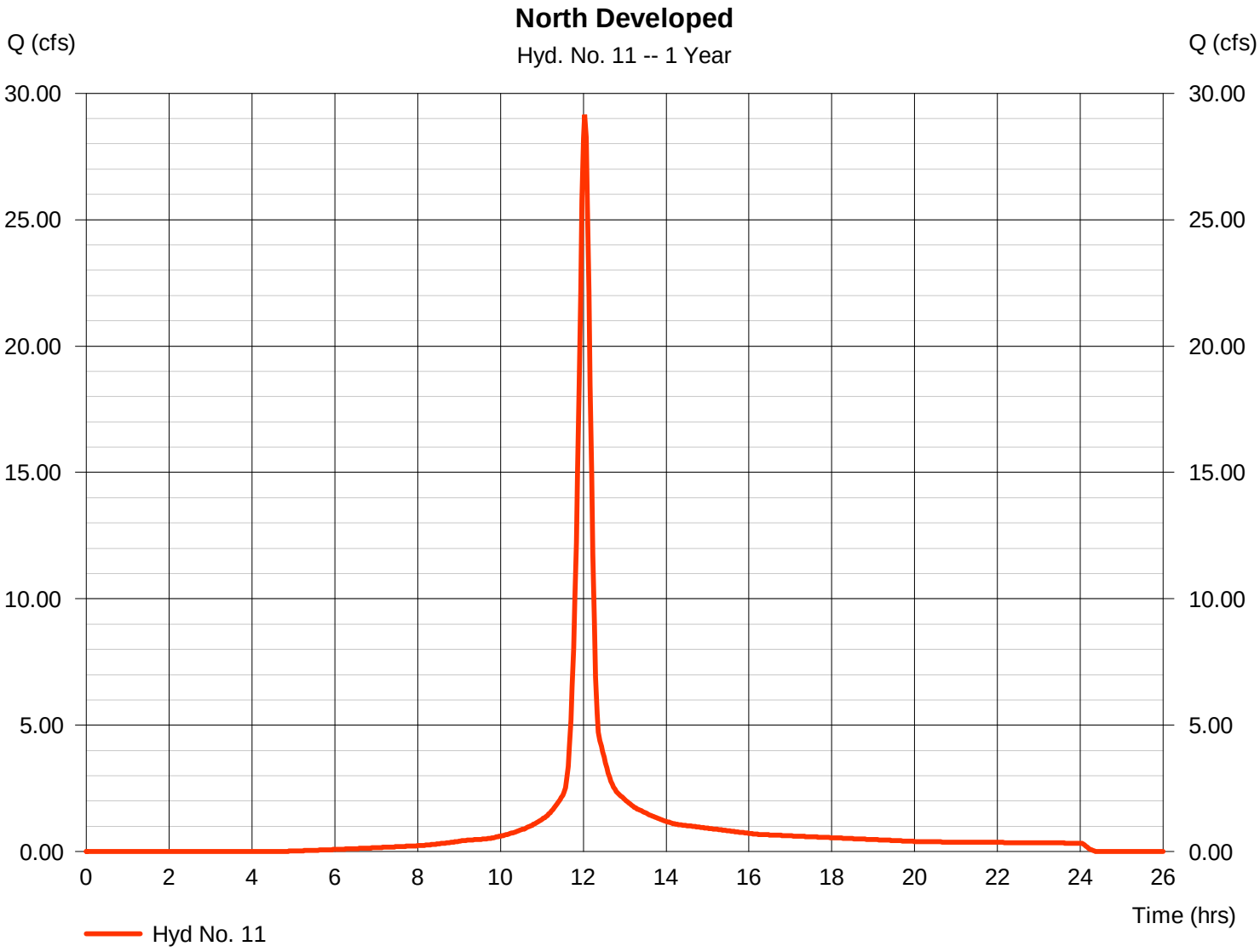


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	29.16 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.928 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

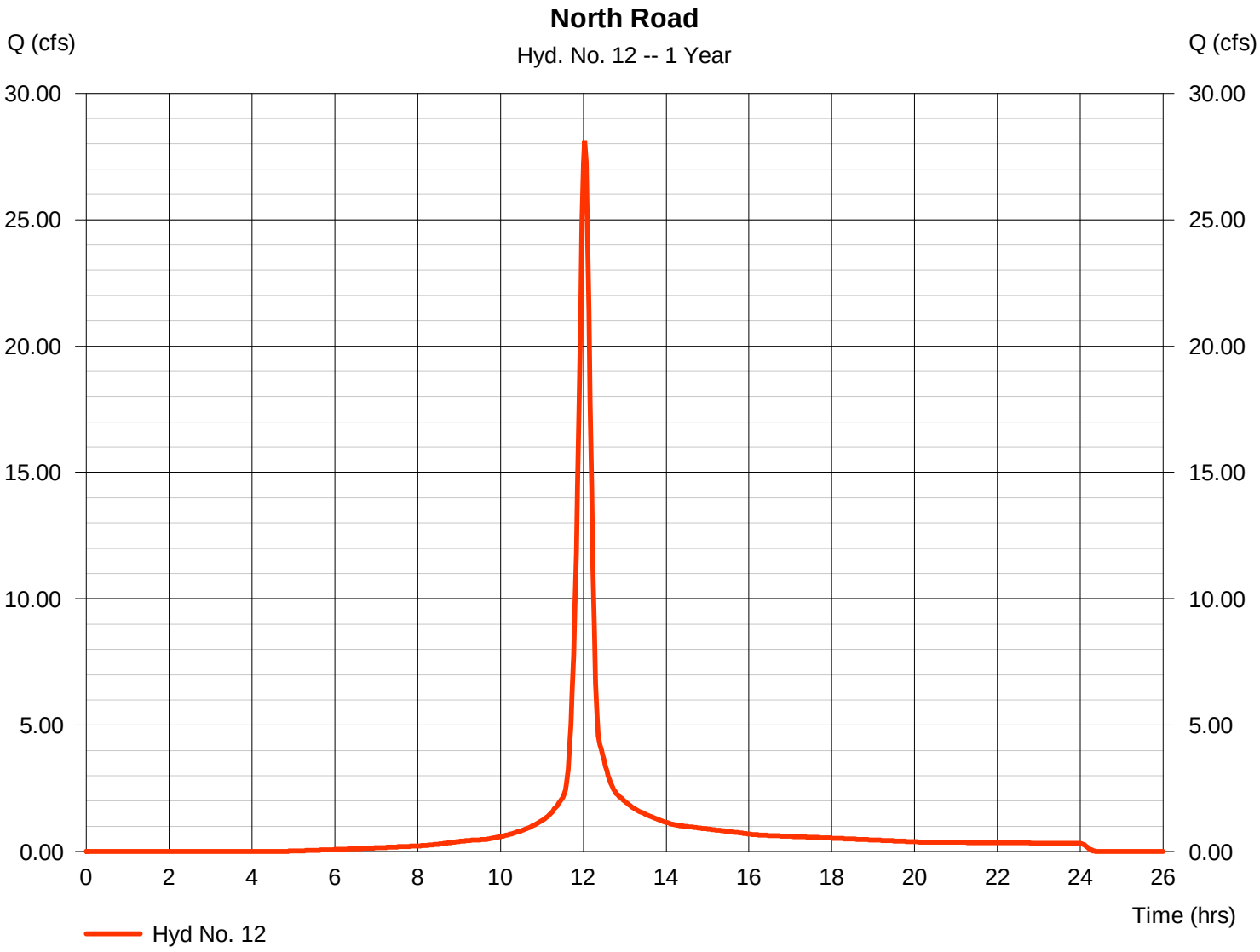


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.14 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.861 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

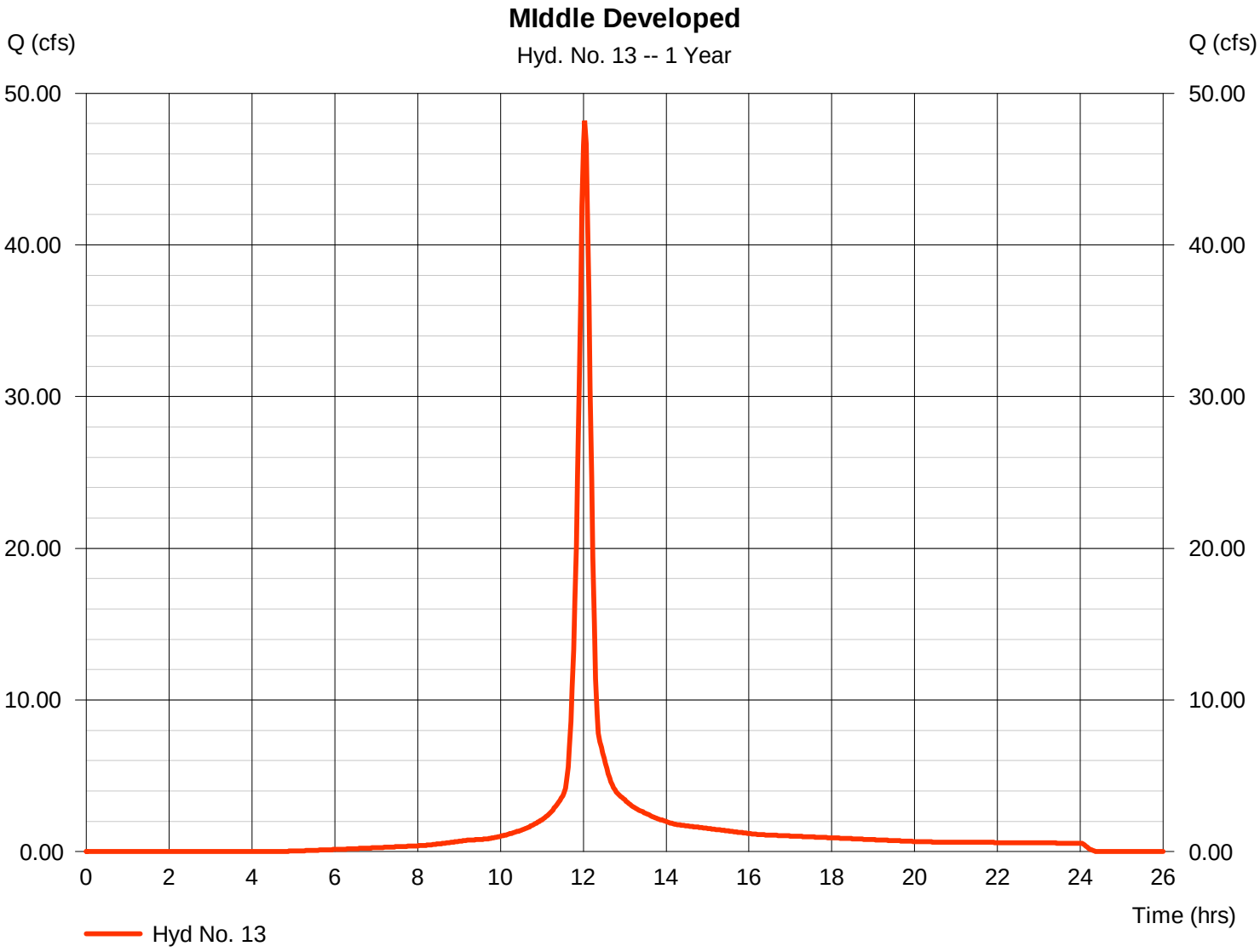


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	48.17 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.185 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

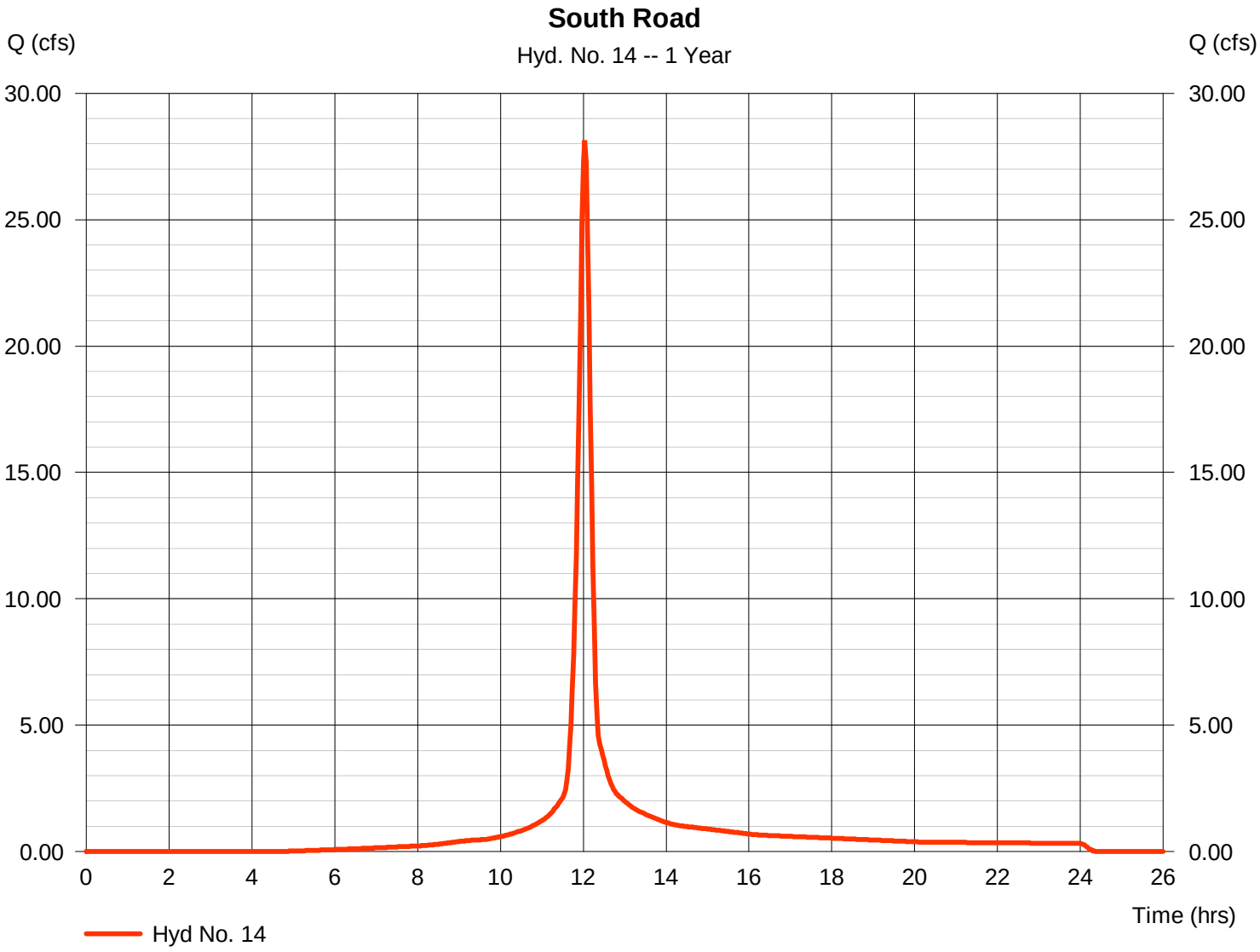


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.14 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.861 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

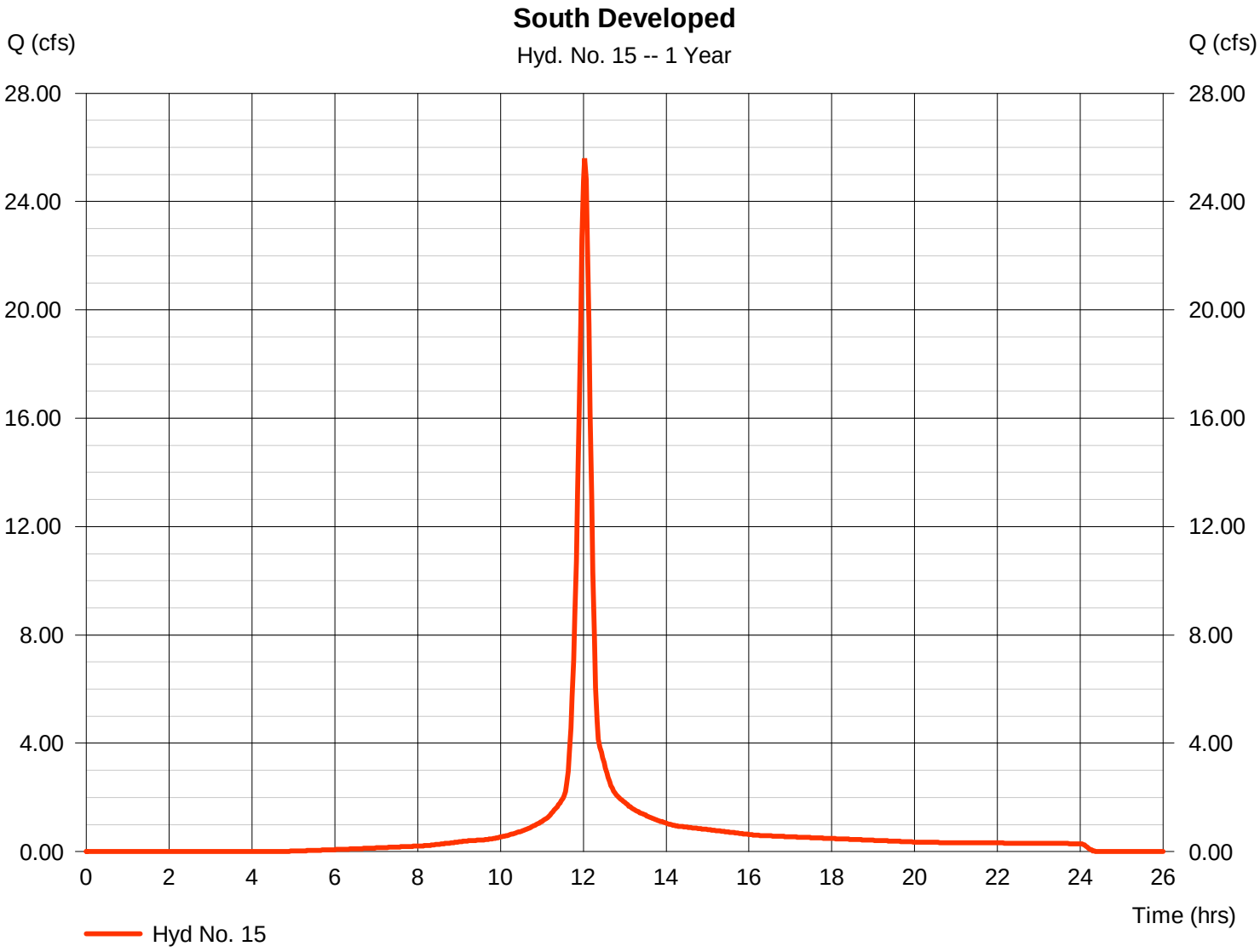


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.61 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	1.693 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

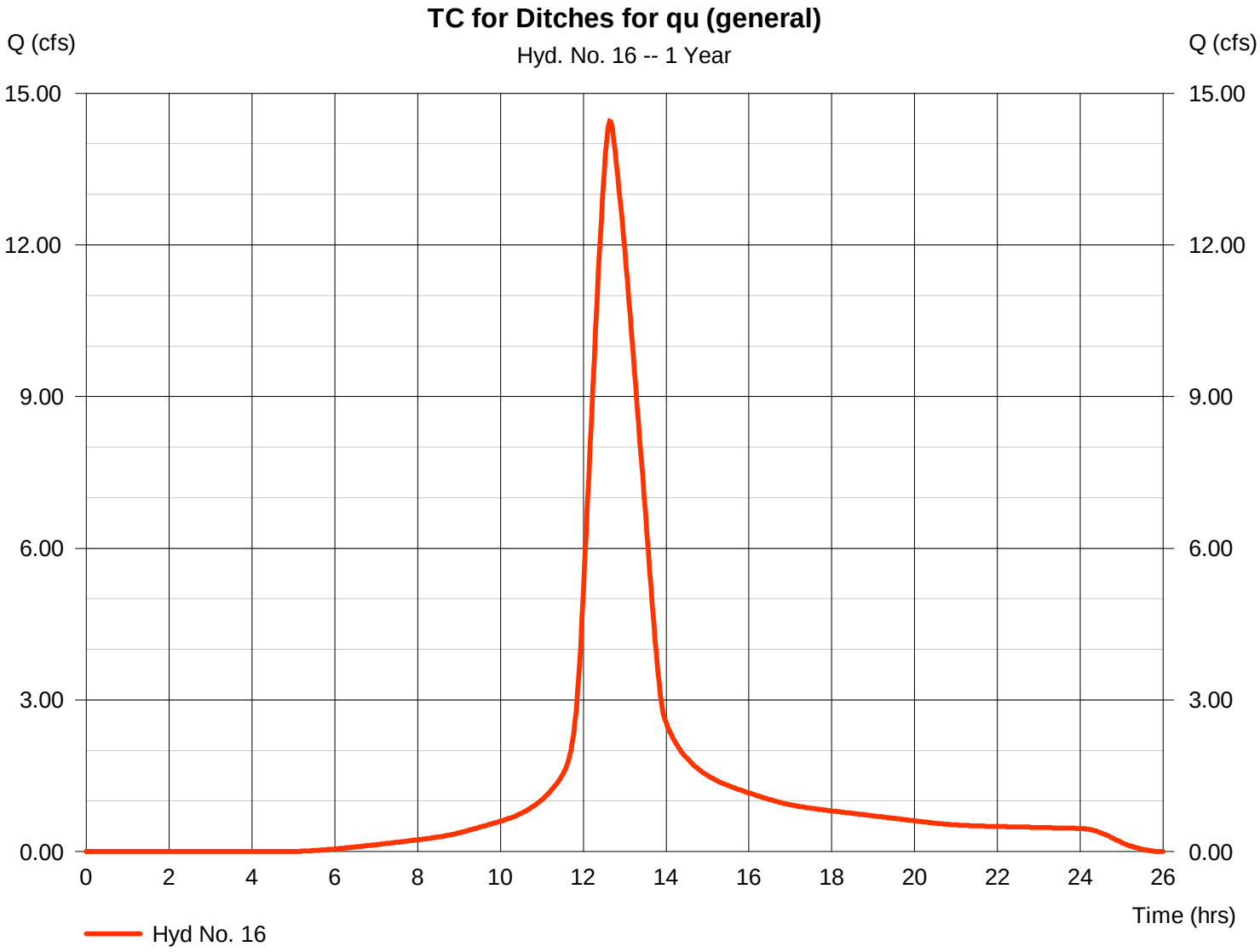


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	= SCS Runoff	Peak discharge	= 14.45 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 2.565 acft
Drainage area	= 15.000 ac	Curve number	= 93
Basin Slope	= 0.2 %	Hydraulic length	= 2000 ft
Tc method	= LAG	Time of conc. (Tc)	= 76.30 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

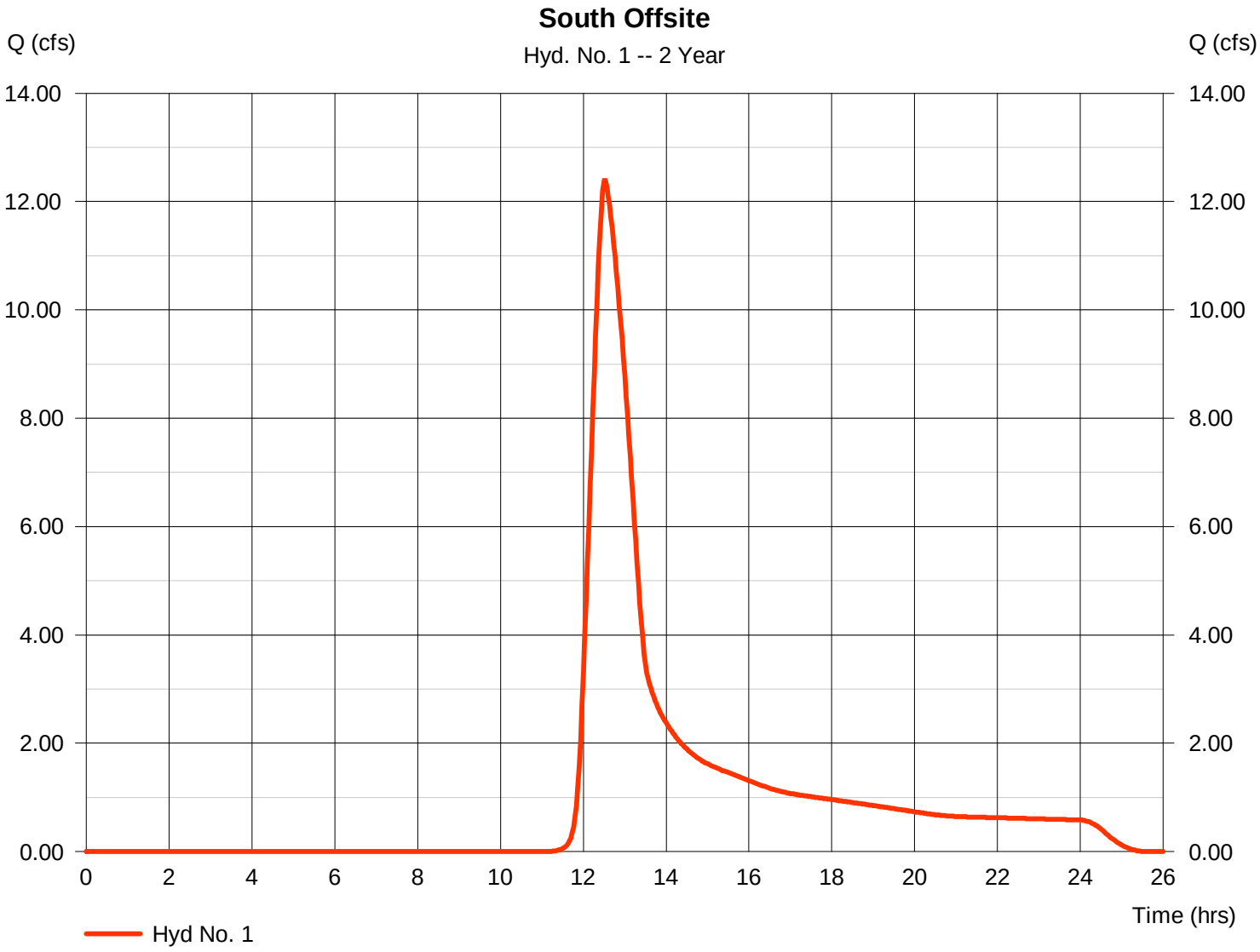
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	12.39	2	752	2.039	------	------	------	South Offsite
2	SCS Runoff	70.25	2	722	4.711	------	------	------	TOTAL SOUTH DITCH
3	Combine	74.23	2	722	6.750	1, 2	------	------	Total to South Ditch
4	Reach	52.72	2	730	6.750	3	------	------	South Channel
5	SCS Runoff	99.74	2	722	6.688	------	------	------	TOTAL MIDDLE DITCH
6	Reach	72.04	2	730	6.688	5	------	------	Middle Channel
7	SCS Runoff	38.11	2	722	2.555	------	------	------	TOTAL NORTH DITCH
8	Reach	25.23	2	730	2.555	7	------	------	North Channel
9	Combine	149.99	2	730	15.993	4, 6, 8	------	------	Total to Pond
10	Reservoir	0.000	2	n/a	0.000	9	1325.96	16.0	Groundwater Pond
11	SCS Runoff	38.11	2	722	2.555	------	------	------	North Developed
12	SCS Runoff	36.78	2	722	2.467	------	------	------	North Road
13	SCS Runoff	62.96	2	722	4.222	------	------	------	MIddle Developed
14	SCS Runoff	36.78	2	722	2.467	------	------	------	South Road
15	SCS Runoff	33.47	2	722	2.244	------	------	------	South Developed
16	SCS Runoff	18.99	2	758	3.400	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 12.39 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 2.039 acft
Drainage area	= 23.000 ac	Curve number	= 71
Basin Slope	= 0.5 %	Hydraulic length	= 1000 ft
Tc method	= LAG	Time of conc. (Tc)	= 58.40 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

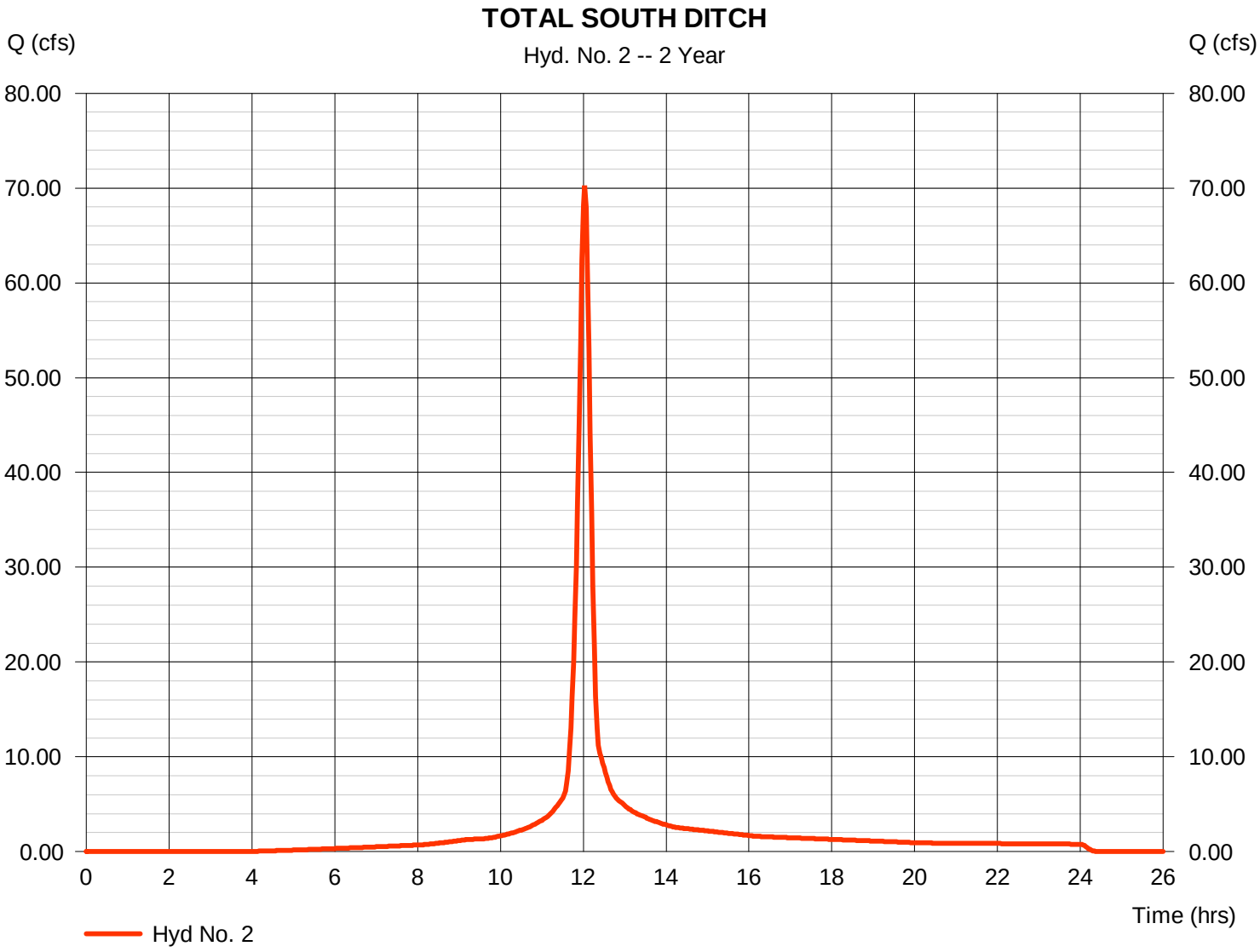


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 70.25 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.711 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

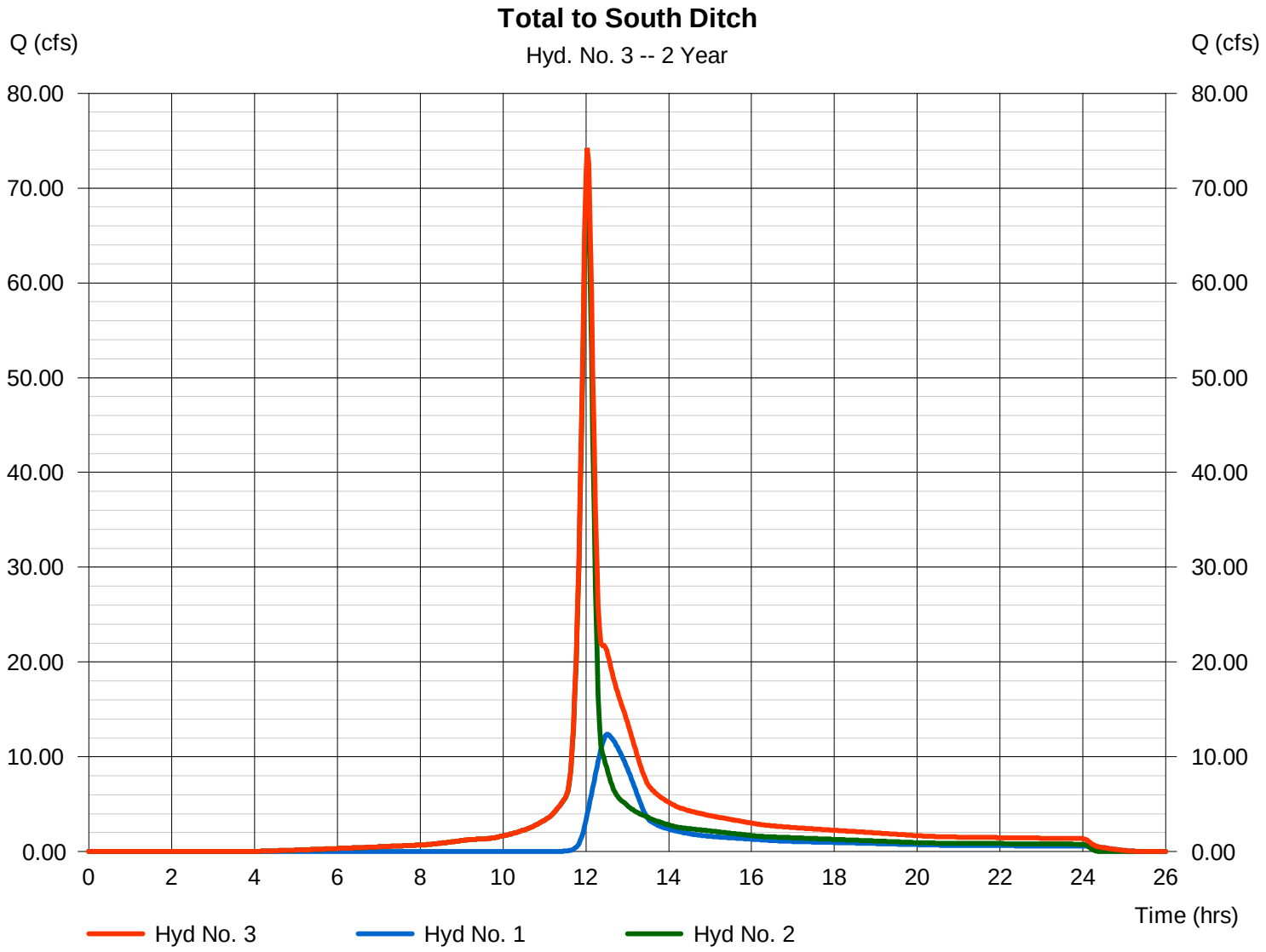


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 74.23 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6.750 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



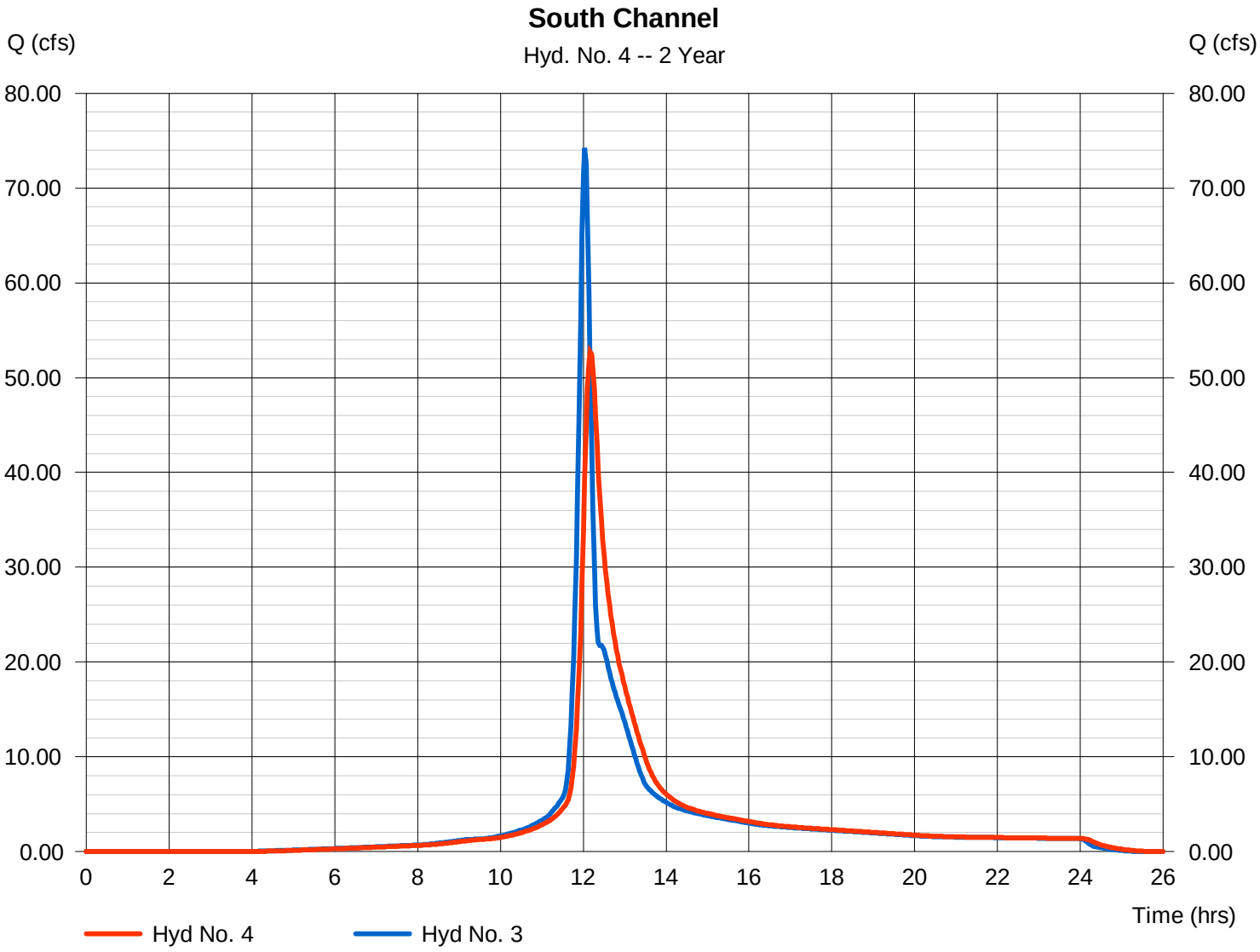
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	52.72 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	6.750 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.06 ft/s	Routing coeff.	=	0.1507

Modified Att-Kin routing method used.

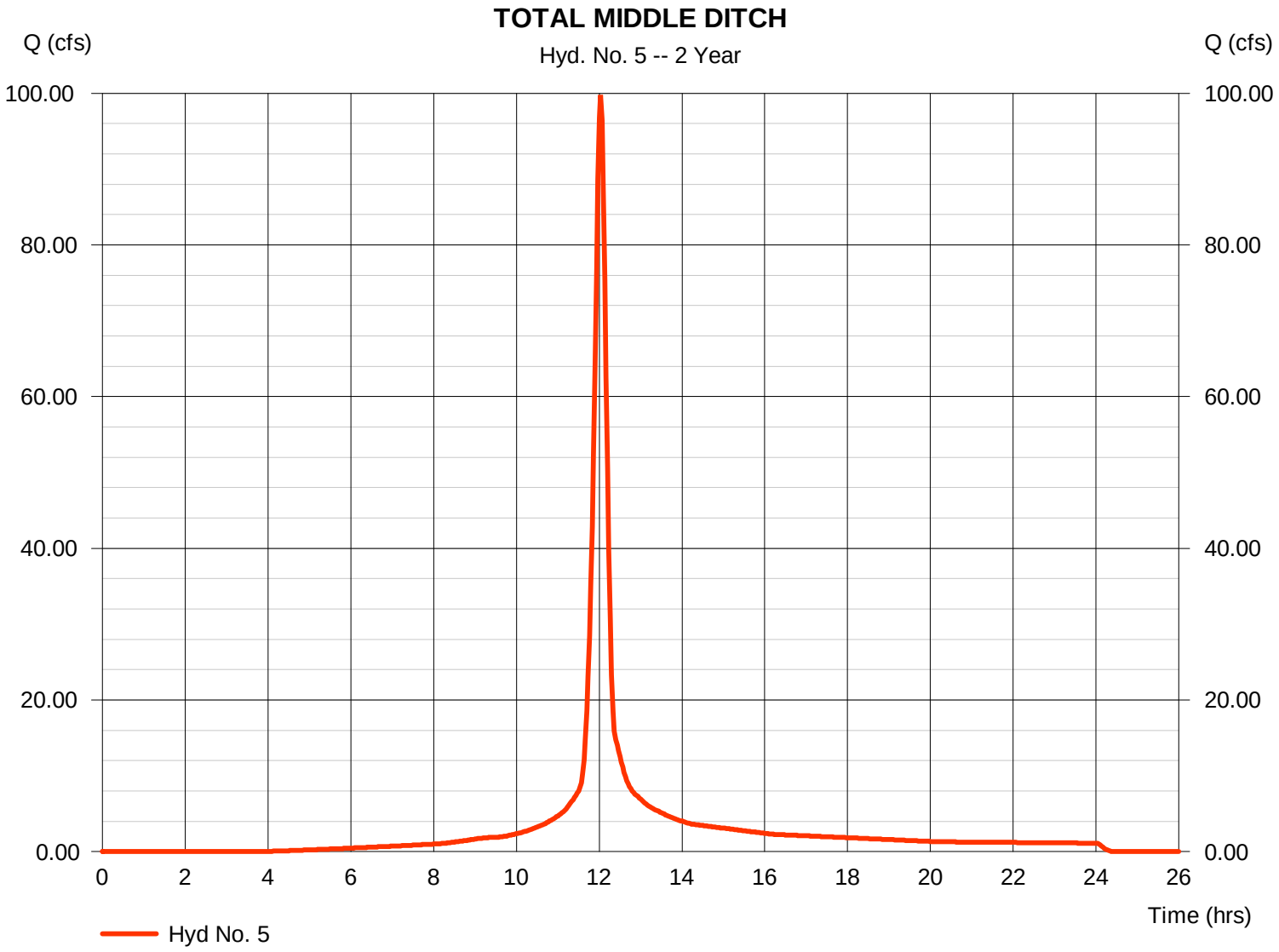


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 99.74 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6.688 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



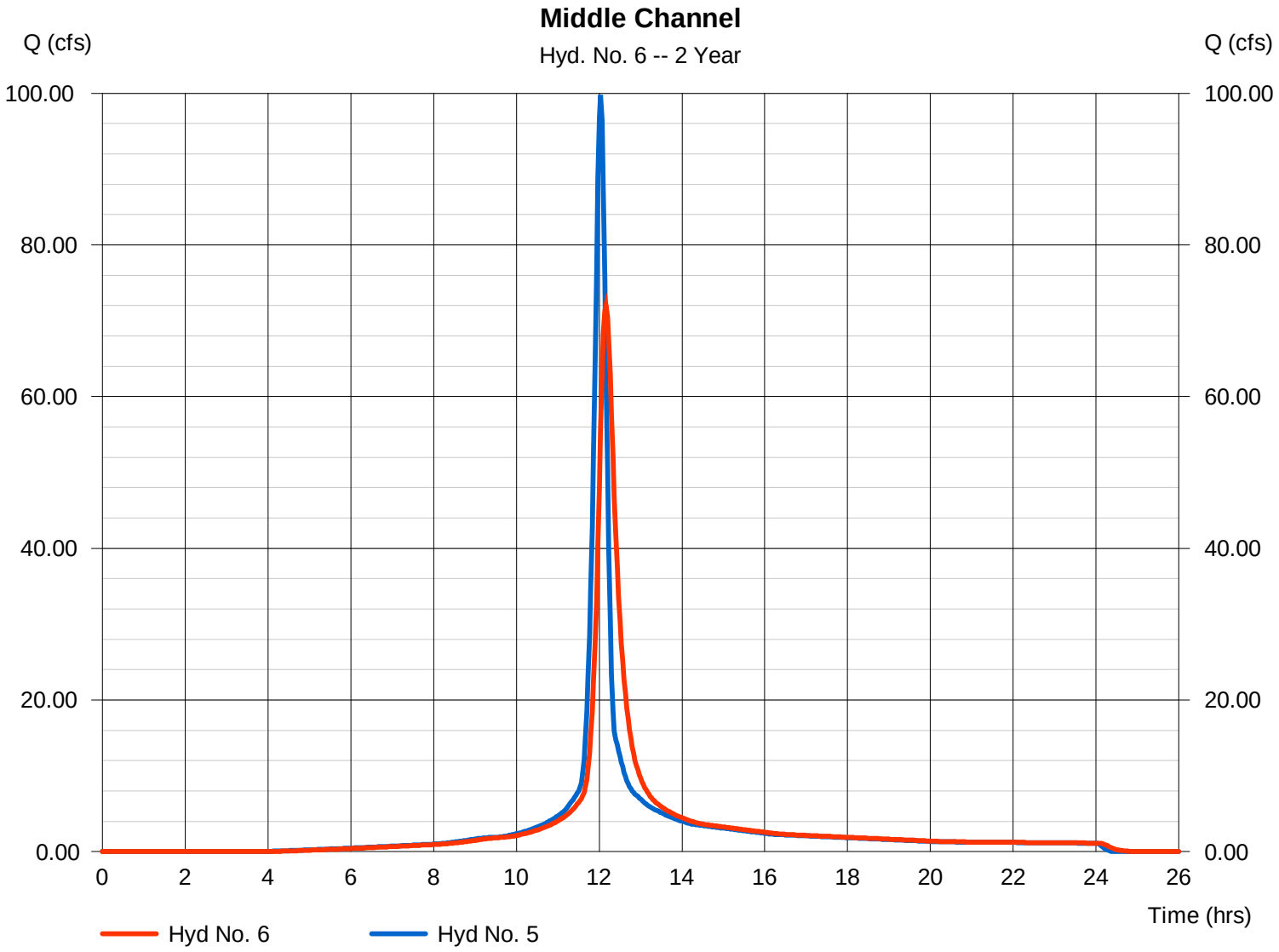
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	= Reach	Peak discharge	= 72.04 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 6.688 acft
Inflow hyd. No.	= 5 - TOTAL MIDDLE DITCH	Section type	= Trapezoidal
Reach length	= 2000.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.035	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.651	Rating curve m	= 1.321
Ave. velocity	= 2.21 ft/s	Routing coeff.	= 0.1610

Modified Att-Kin routing method used.

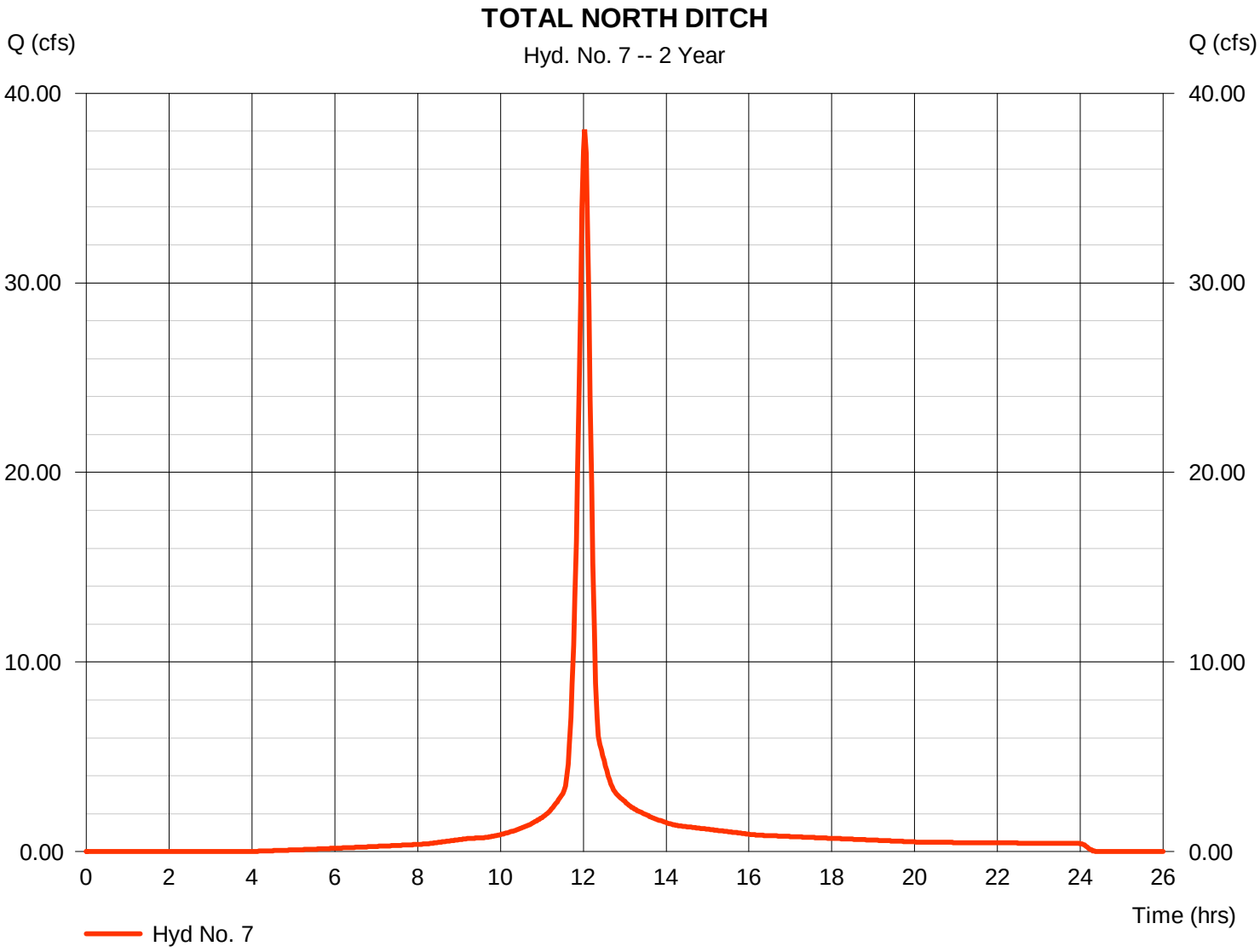


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 38.11 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 2.555 acft
Drainage area	= 11.500 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



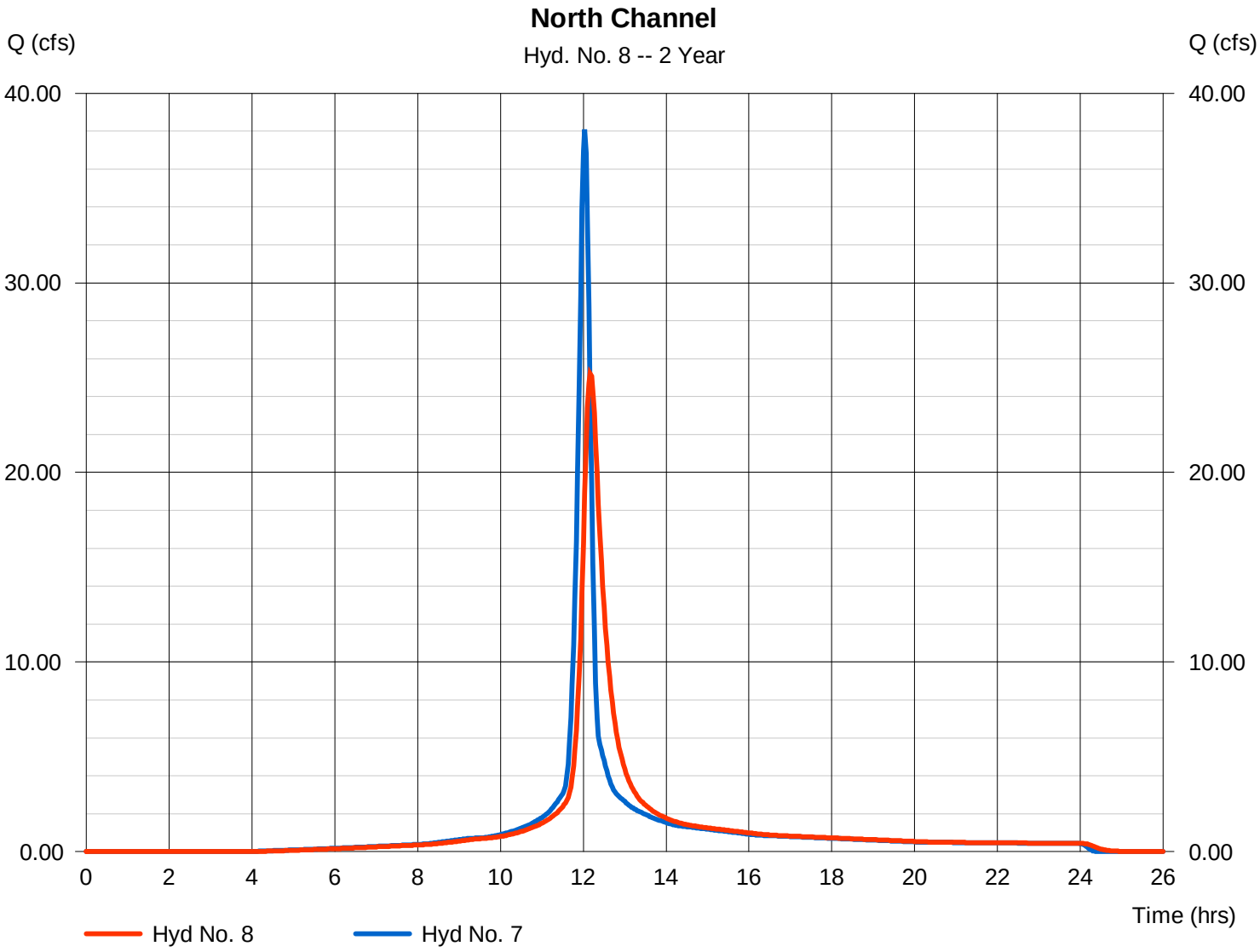
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	25.23 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	2.555 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	1.75 ft/s	Routing coeff.	=	0.1296

Modified Att-Kin routing method used.

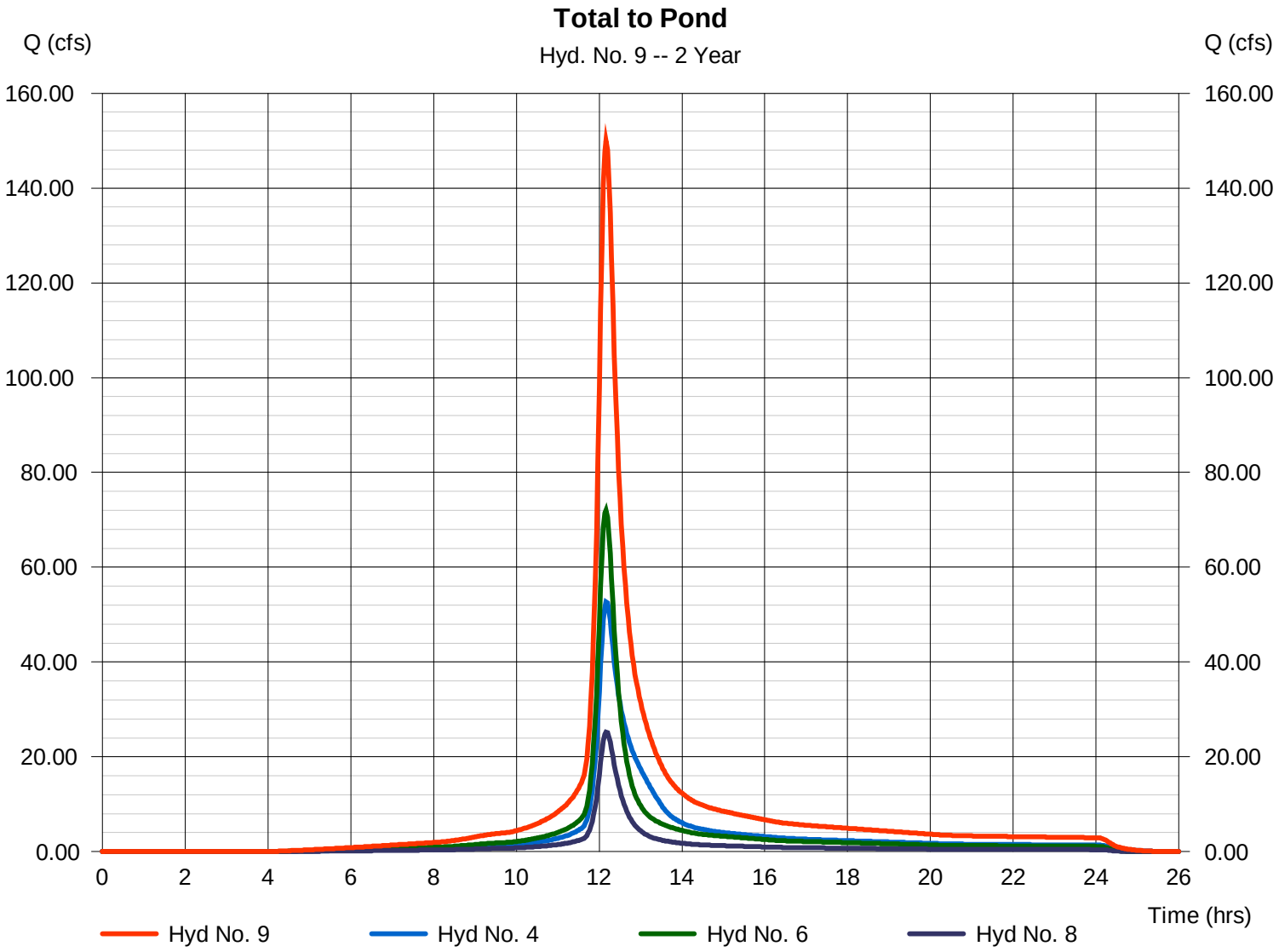


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 149.99 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 15.993 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



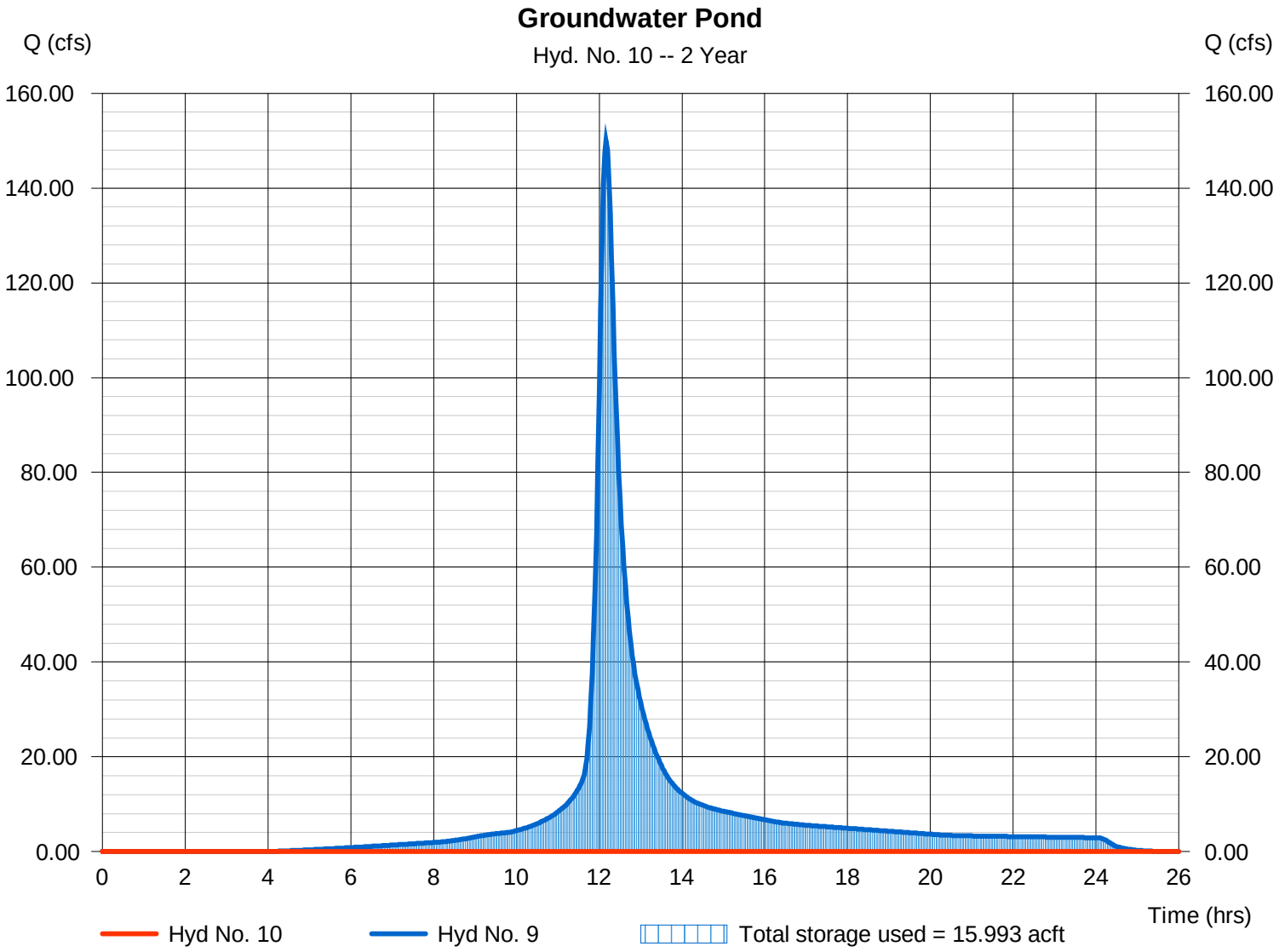
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1325.96 ft
Reservoir name	= <New Pond>	Max. Storage	= 15.993 acft

Storage Indication method used.

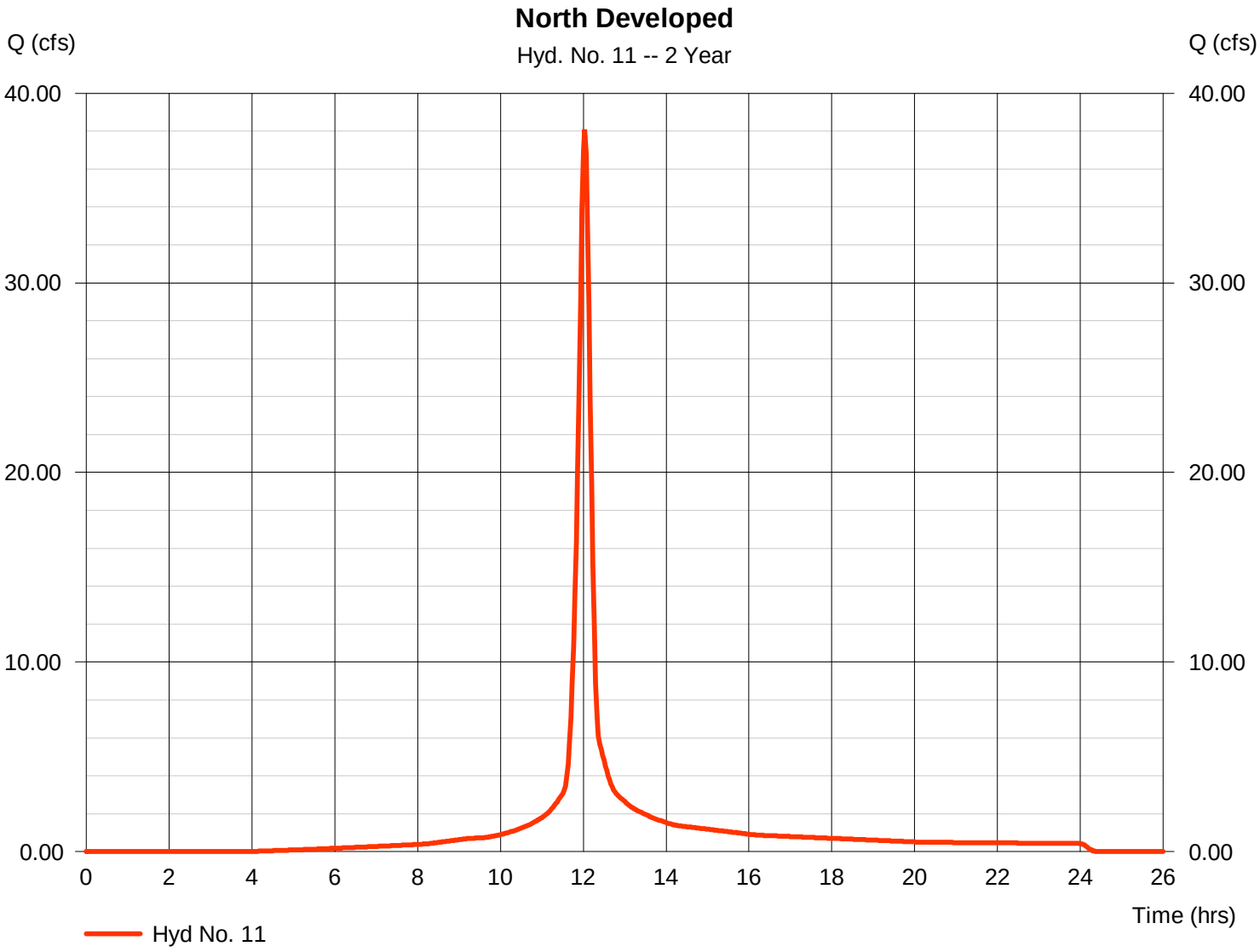


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	38.11 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	2.555 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

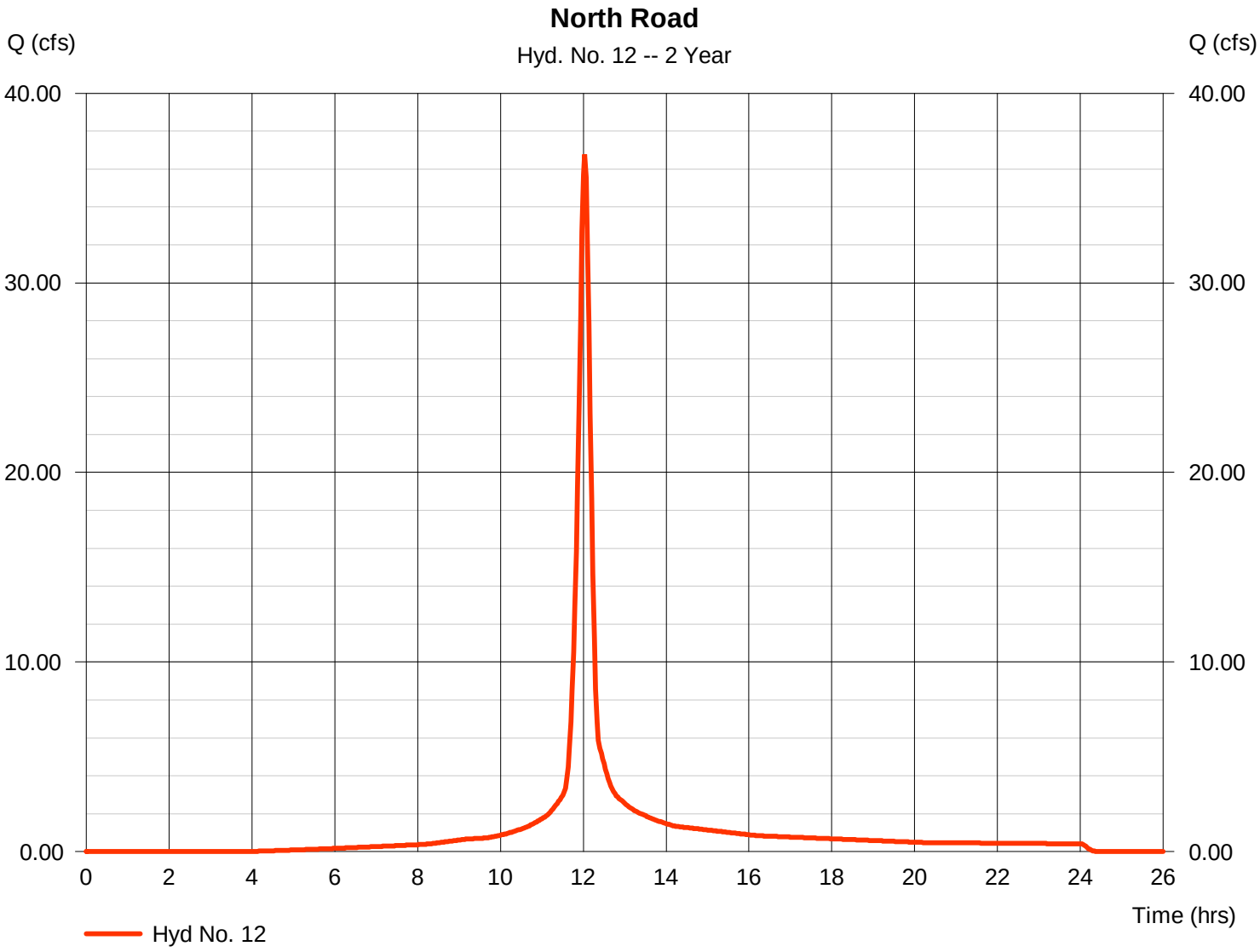


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	36.78 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	2.467 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

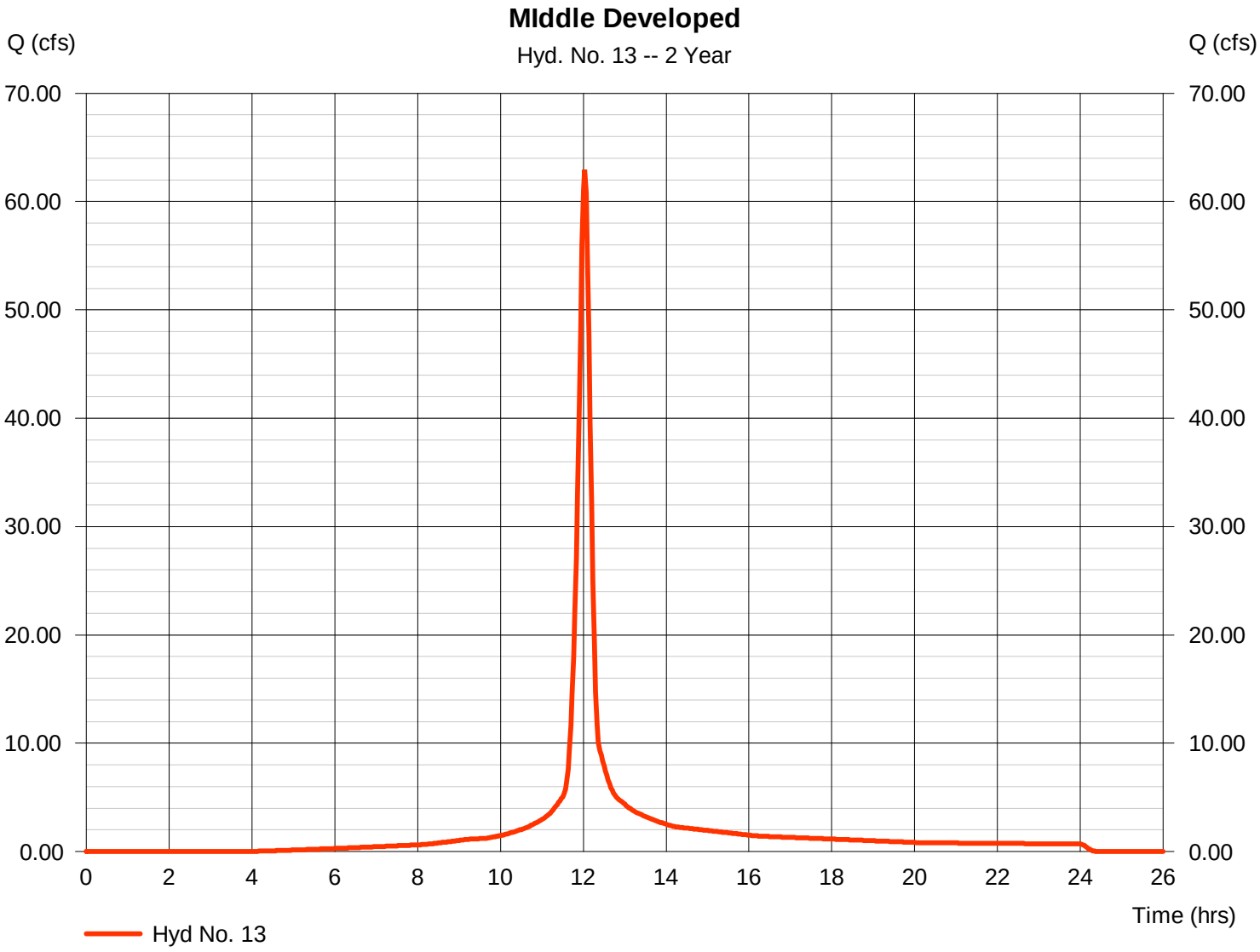


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	62.96 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.222 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

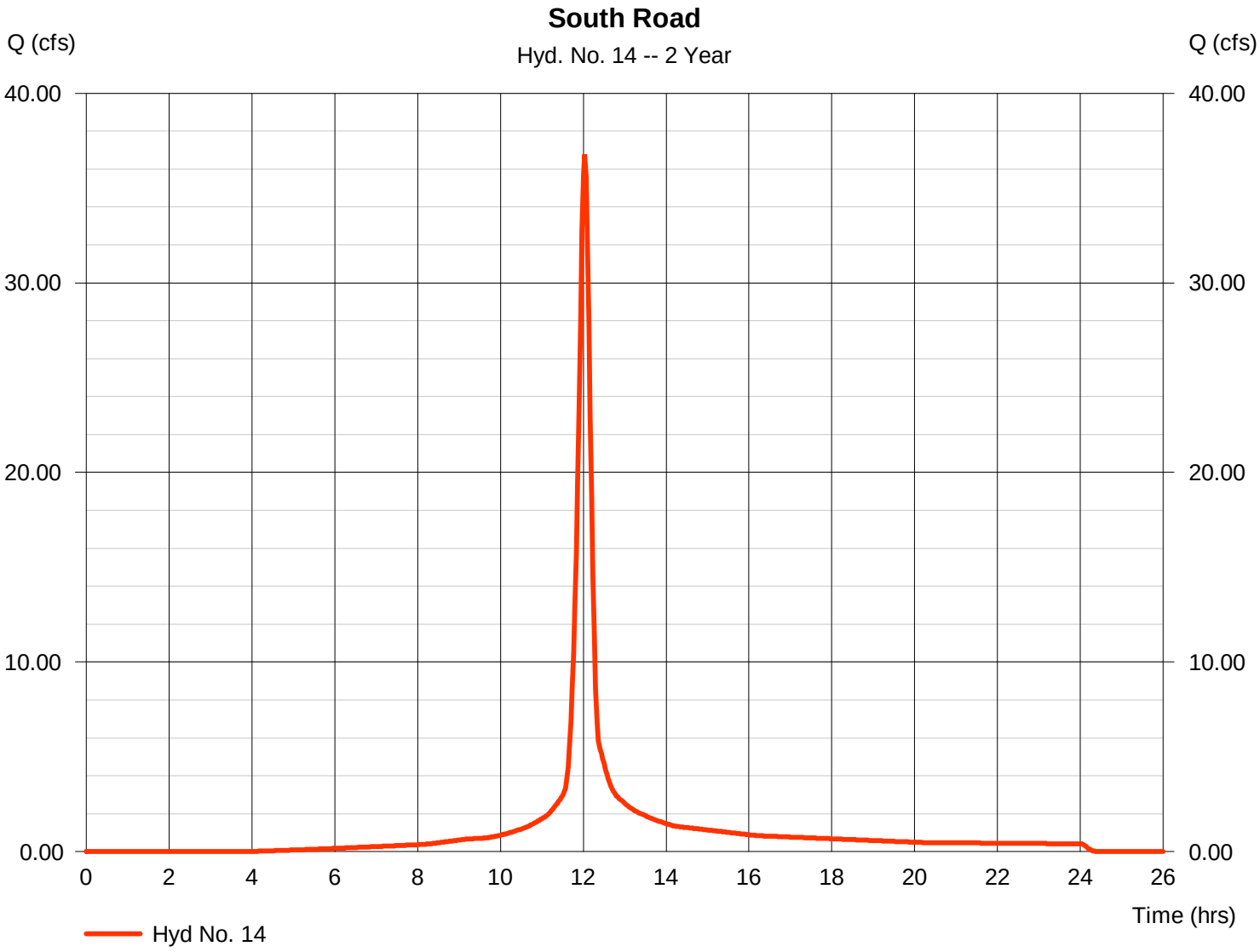


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	36.78 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	2.467 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

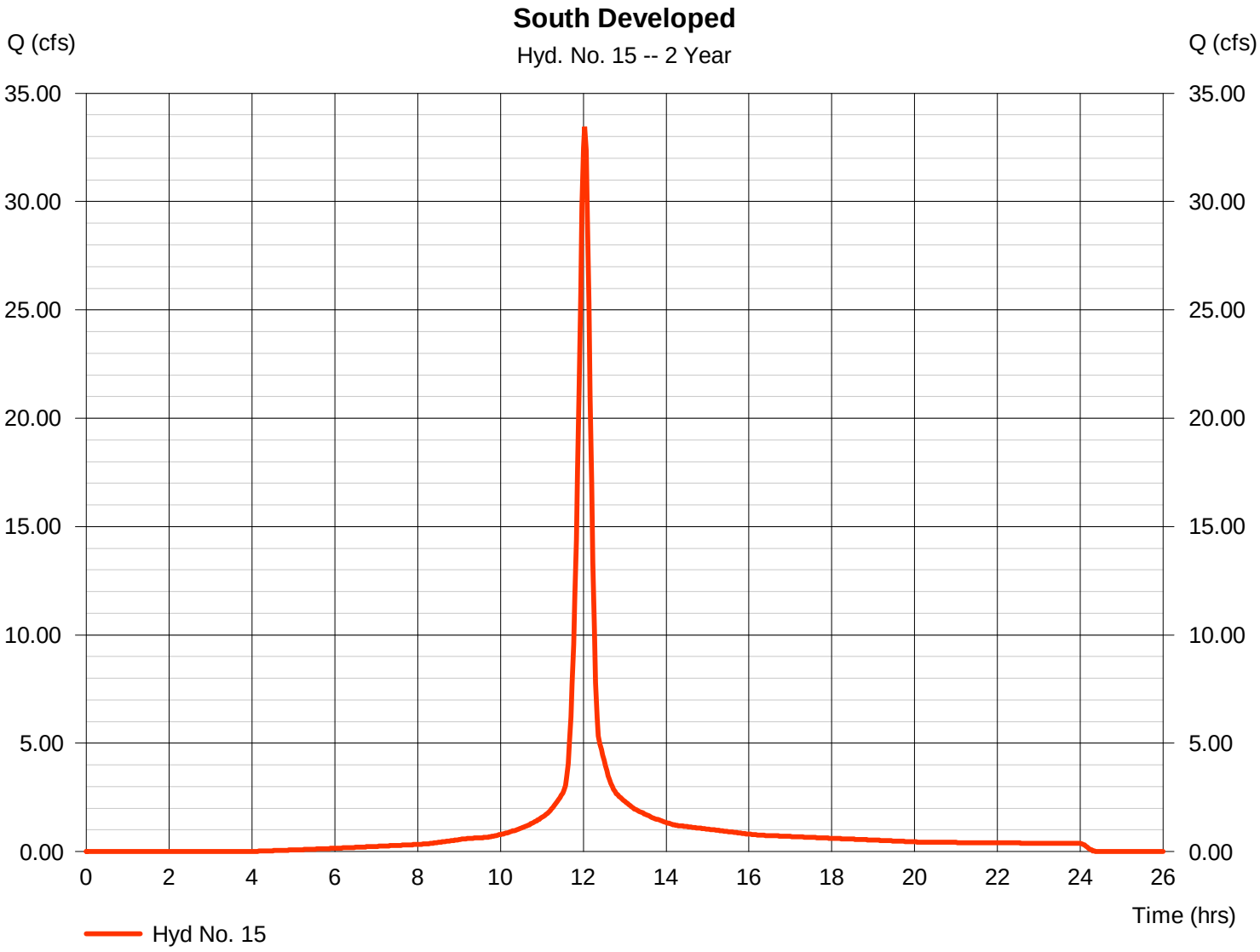


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.47 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	2.244 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

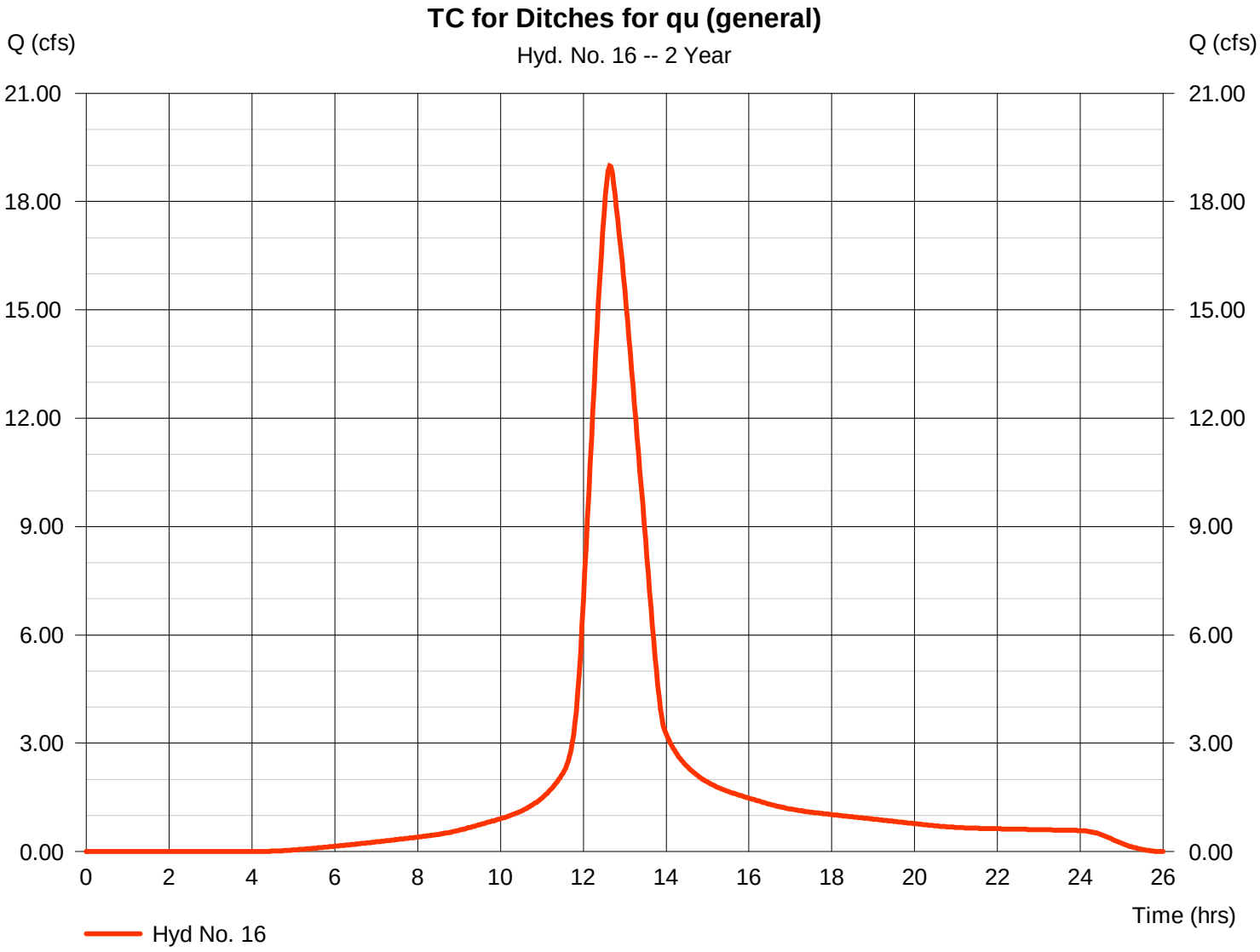


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	= SCS Runoff	Peak discharge	= 18.99 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 3.400 acft
Drainage area	= 15.000 ac	Curve number	= 93
Basin Slope	= 0.2 %	Hydraulic length	= 2000 ft
Tc method	= LAG	Time of conc. (Tc)	= 76.30 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

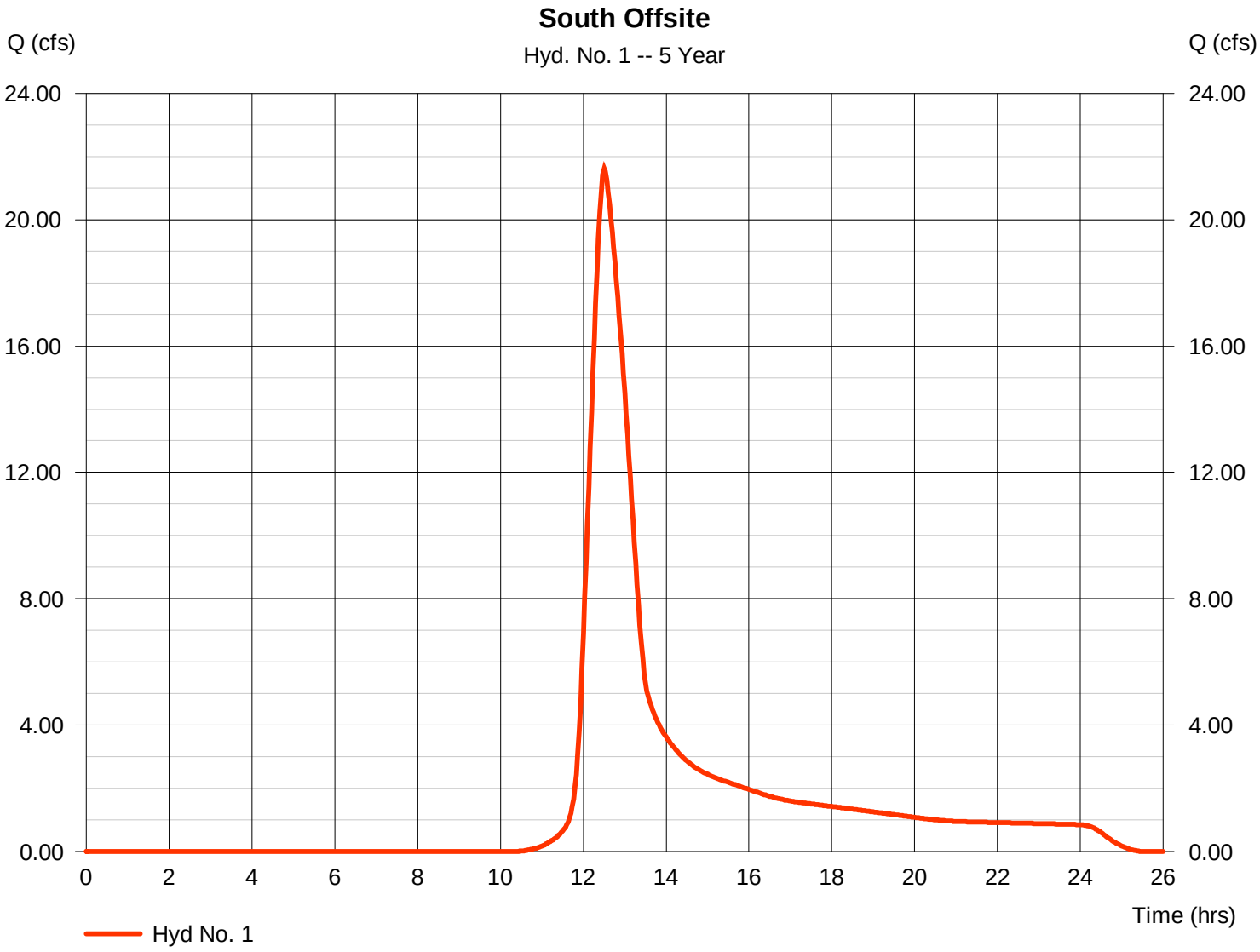
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	21.61	2	750	3.347	------	------	------	South Offsite
2	SCS Runoff	93.64	2	722	6.387	------	------	------	TOTAL SOUTH DITCH
3	Combine	101.68	2	722	9.734	1, 2	------	------	Total to South Ditch
4	Reach	74.77	2	730	9.734	3	------	------	South Channel
5	SCS Runoff	132.96	2	722	9.068	------	------	------	TOTAL MIDDLE DITCH
6	Reach	98.41	2	730	9.068	5	------	------	Middle Channel
7	SCS Runoff	50.80	2	722	3.464	------	------	------	TOTAL NORTH DITCH
8	Reach	34.70	2	730	3.464	7	------	------	North Channel
9	Combine	207.88	2	730	22.266	4, 6, 8	------	------	Total to Pond
10	Reservoir	0.000	2	n/a	0.000	9	1327.03	22.3	Groundwater Pond
11	SCS Runoff	50.80	2	722	3.464	------	------	------	North Developed
12	SCS Runoff	49.03	2	722	3.344	------	------	------	North Road
13	SCS Runoff	83.93	2	722	5.724	------	------	------	MIddle Developed
14	SCS Runoff	49.03	2	722	3.344	------	------	------	South Road
15	SCS Runoff	44.61	2	722	3.043	------	------	------	South Developed
16	SCS Runoff	25.46	2	758	4.610	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.61 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	3.347 acft
Drainage area	=	23.000 ac	Curve number	=	71
Basin Slope	=	0.5 %	Hydraulic length	=	1000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	58.40 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

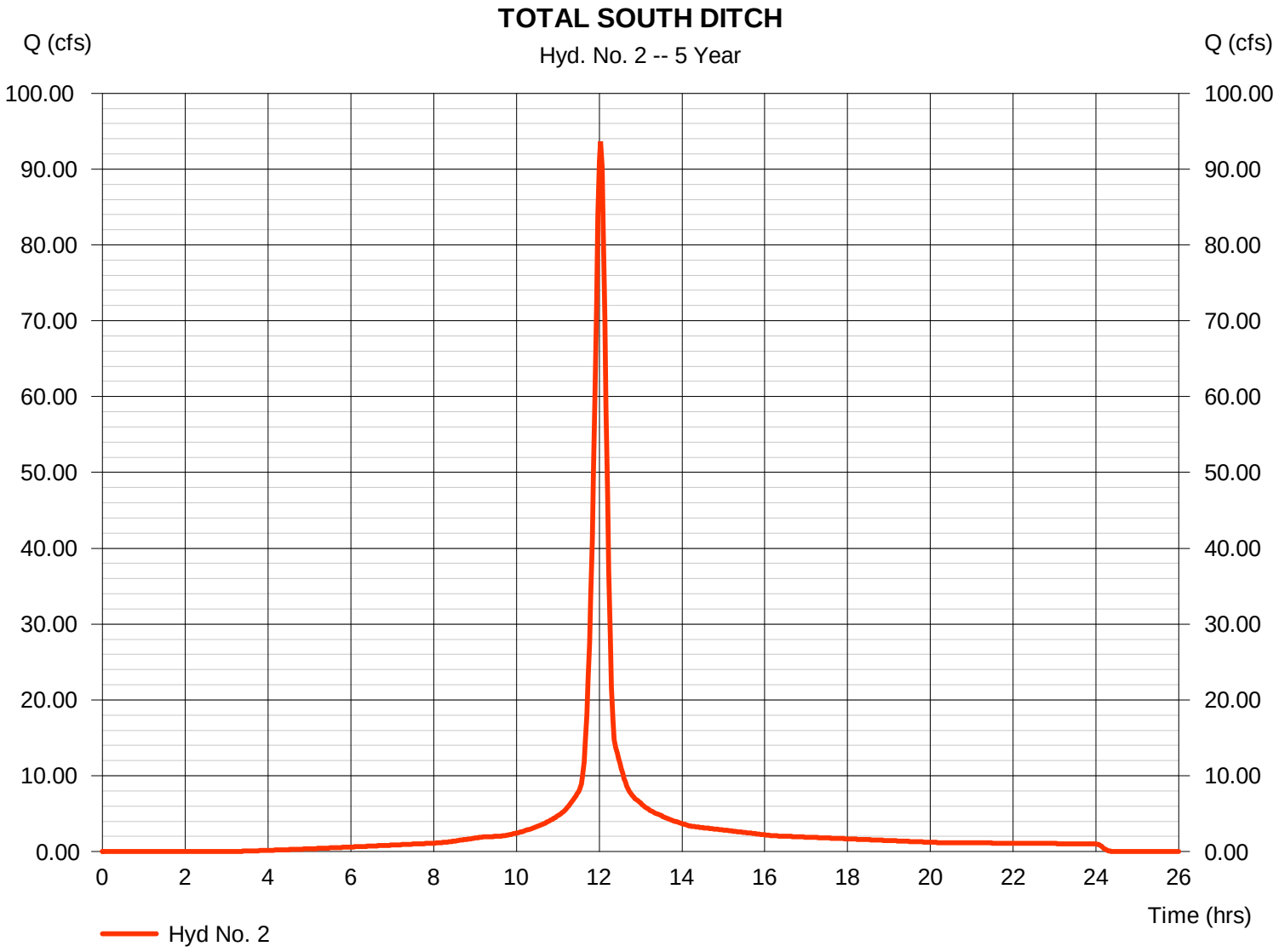


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 93.64 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6.387 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

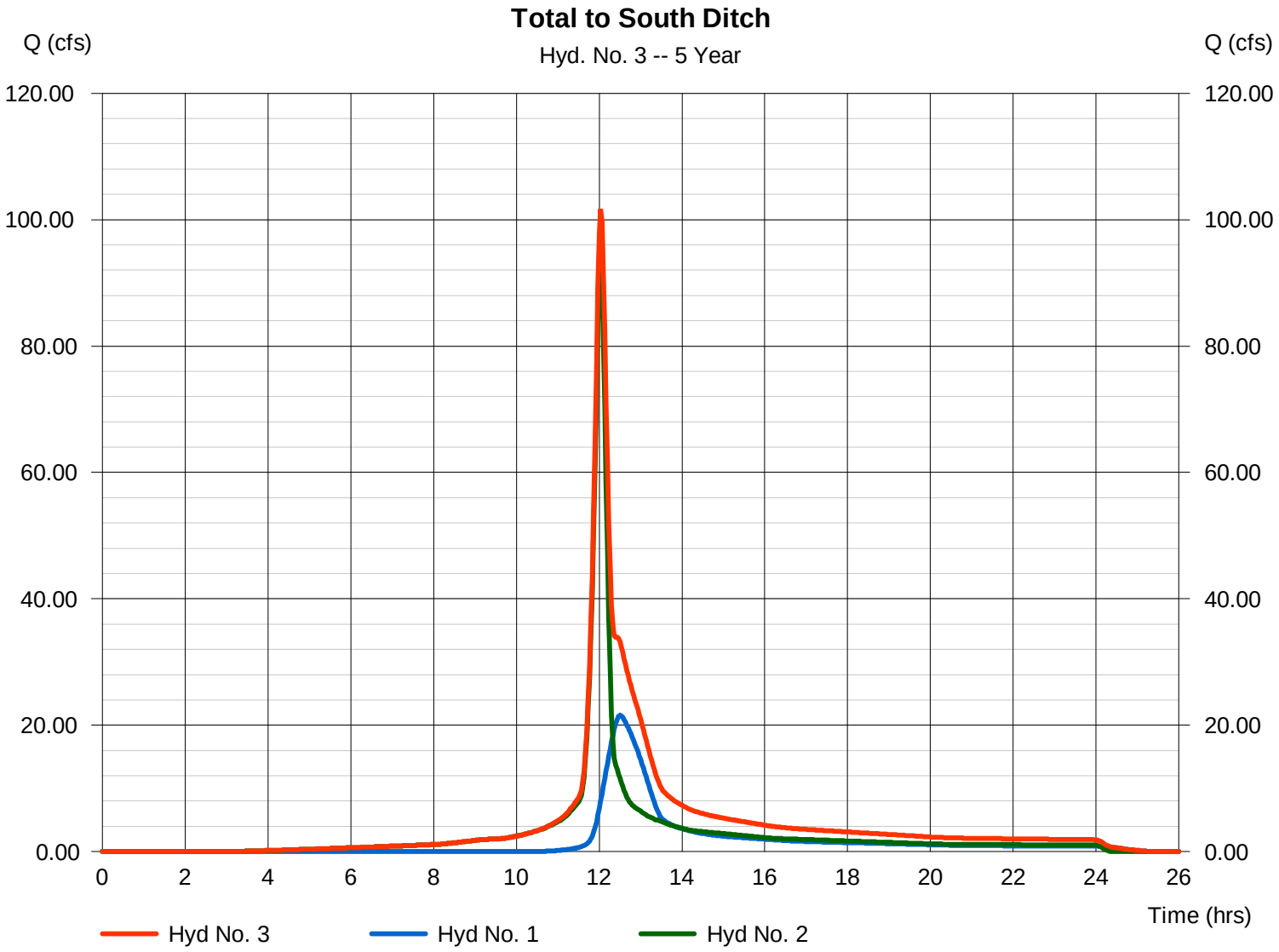


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 101.68 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 9.734 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



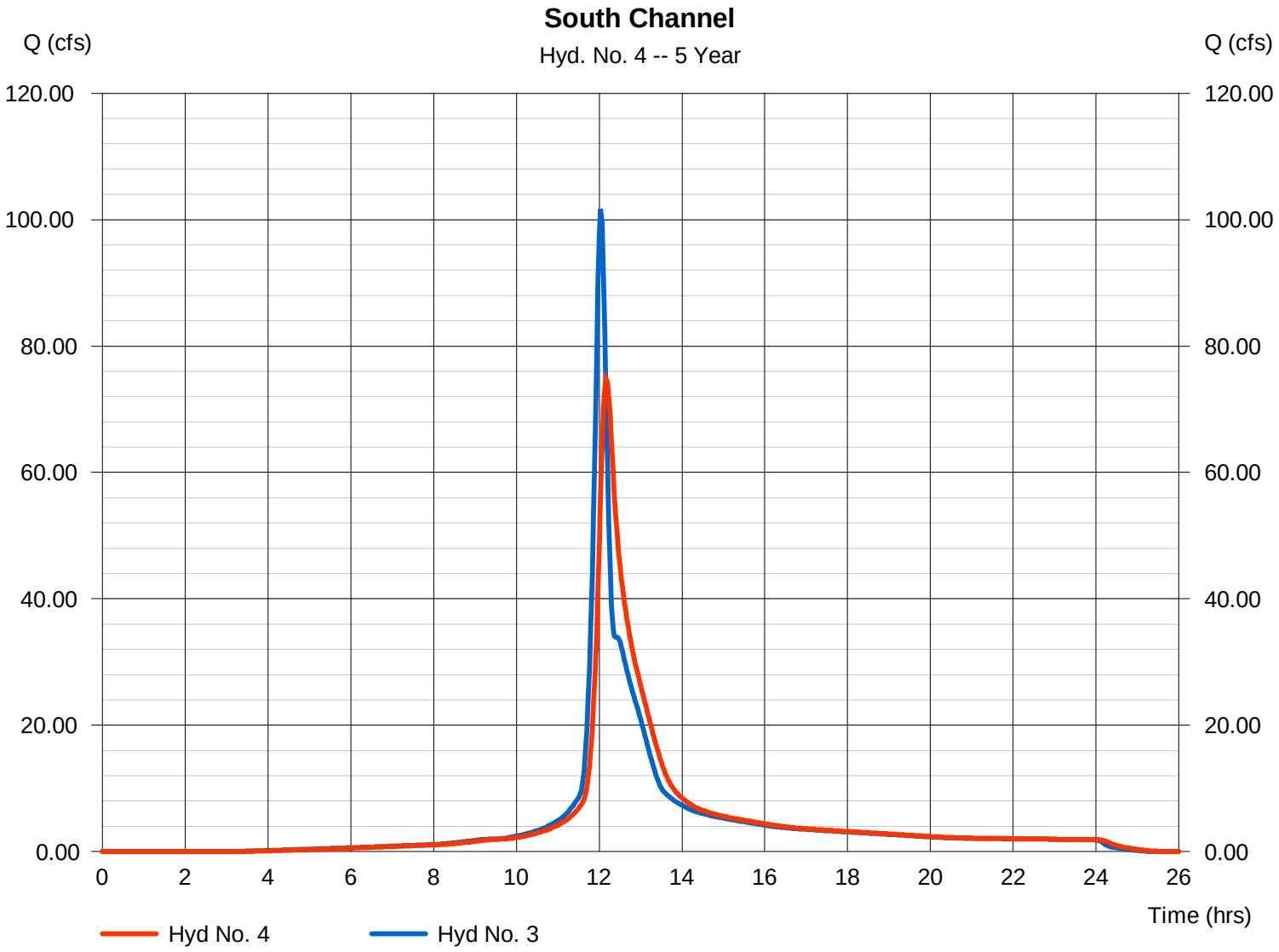
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	74.77 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	9.734 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.22 ft/s	Routing coeff.	=	0.1617

Modified Att-Kin routing method used.

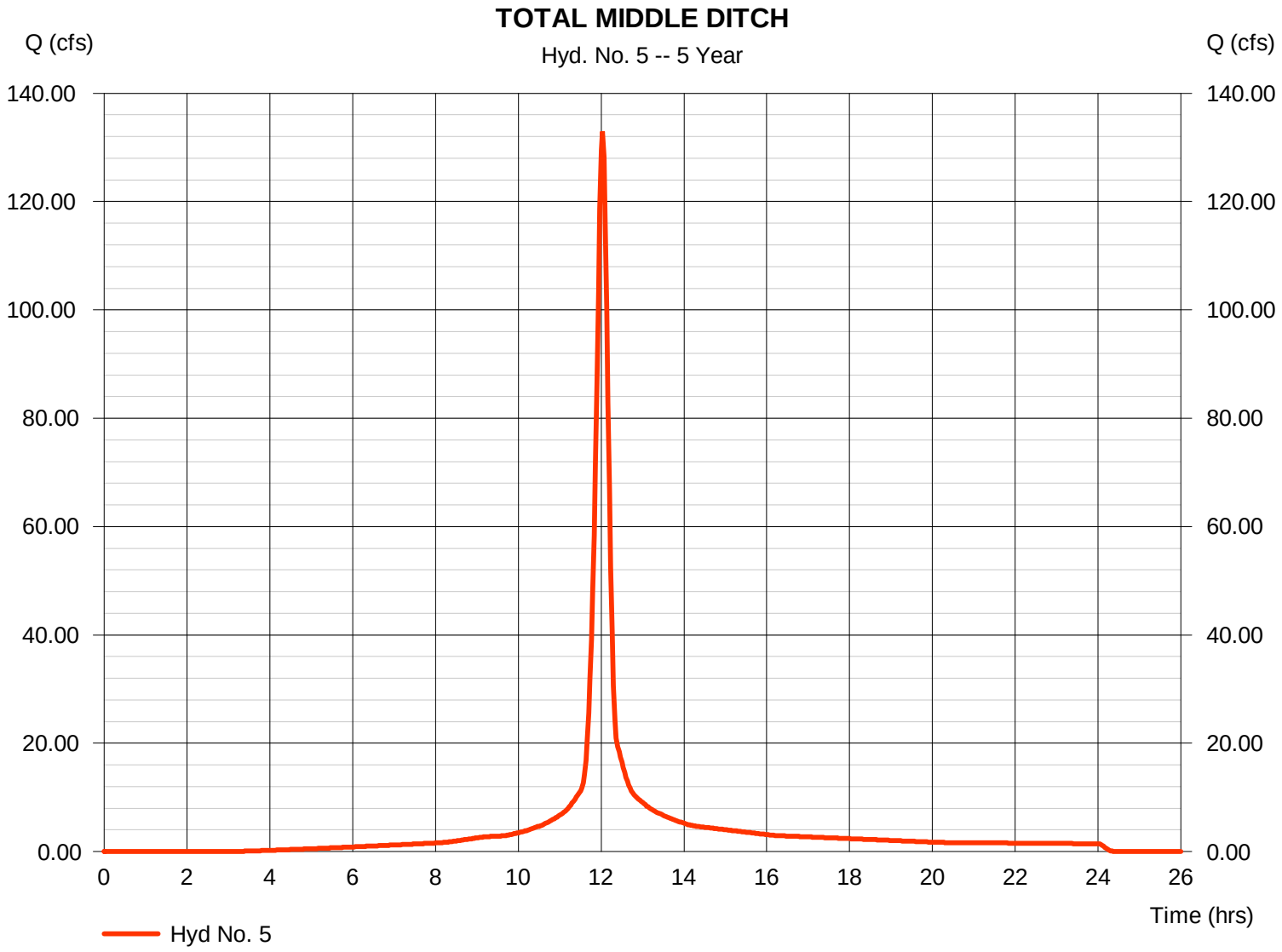


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 132.96 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 9.068 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



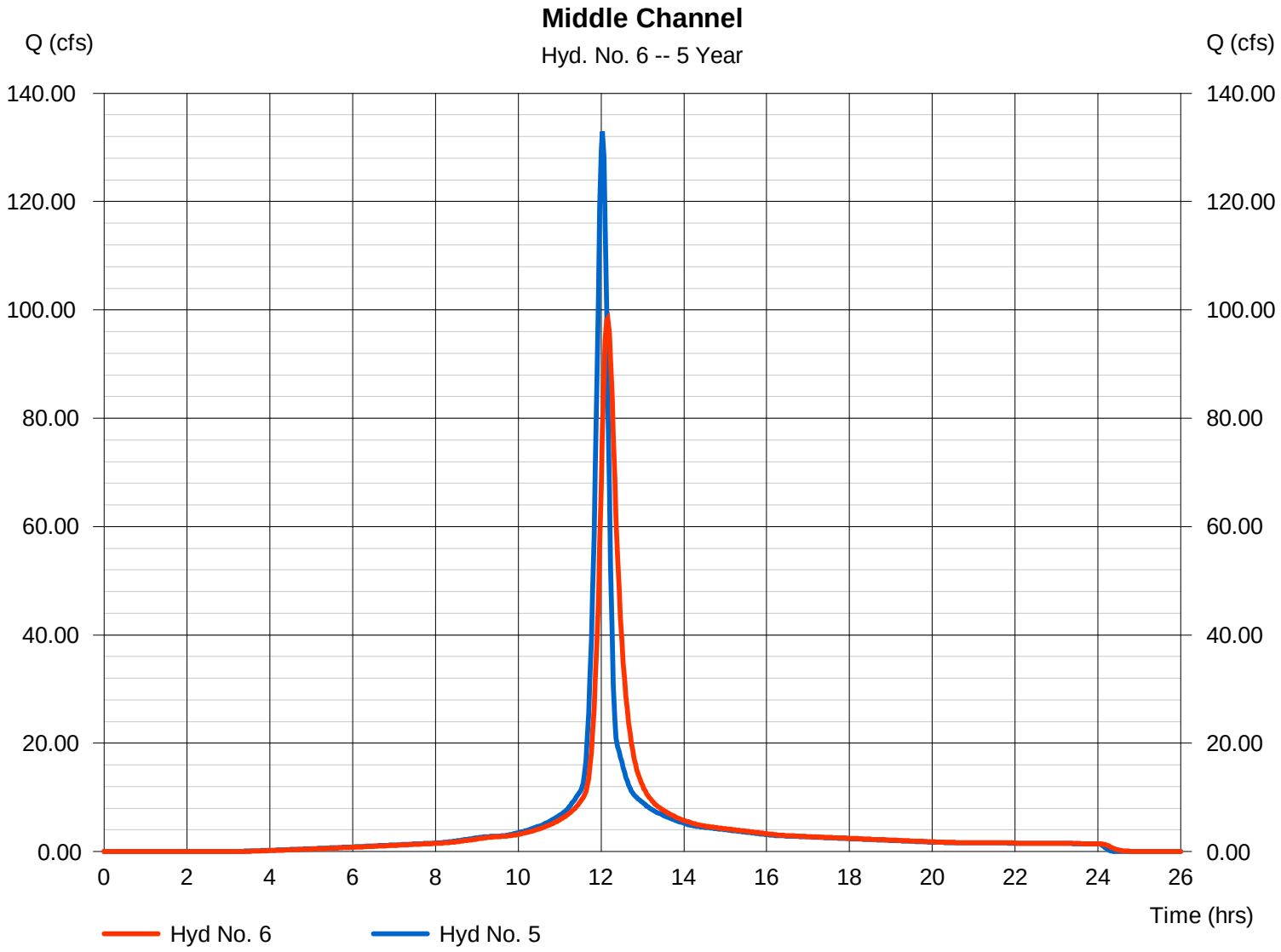
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	=	Reach	Peak discharge	=	98.41 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	9.068 acft
Inflow hyd. No.	=	5 - TOTAL MIDDLE DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.37 ft/s	Routing coeff.	=	0.1716

Modified Att-Kin routing method used.

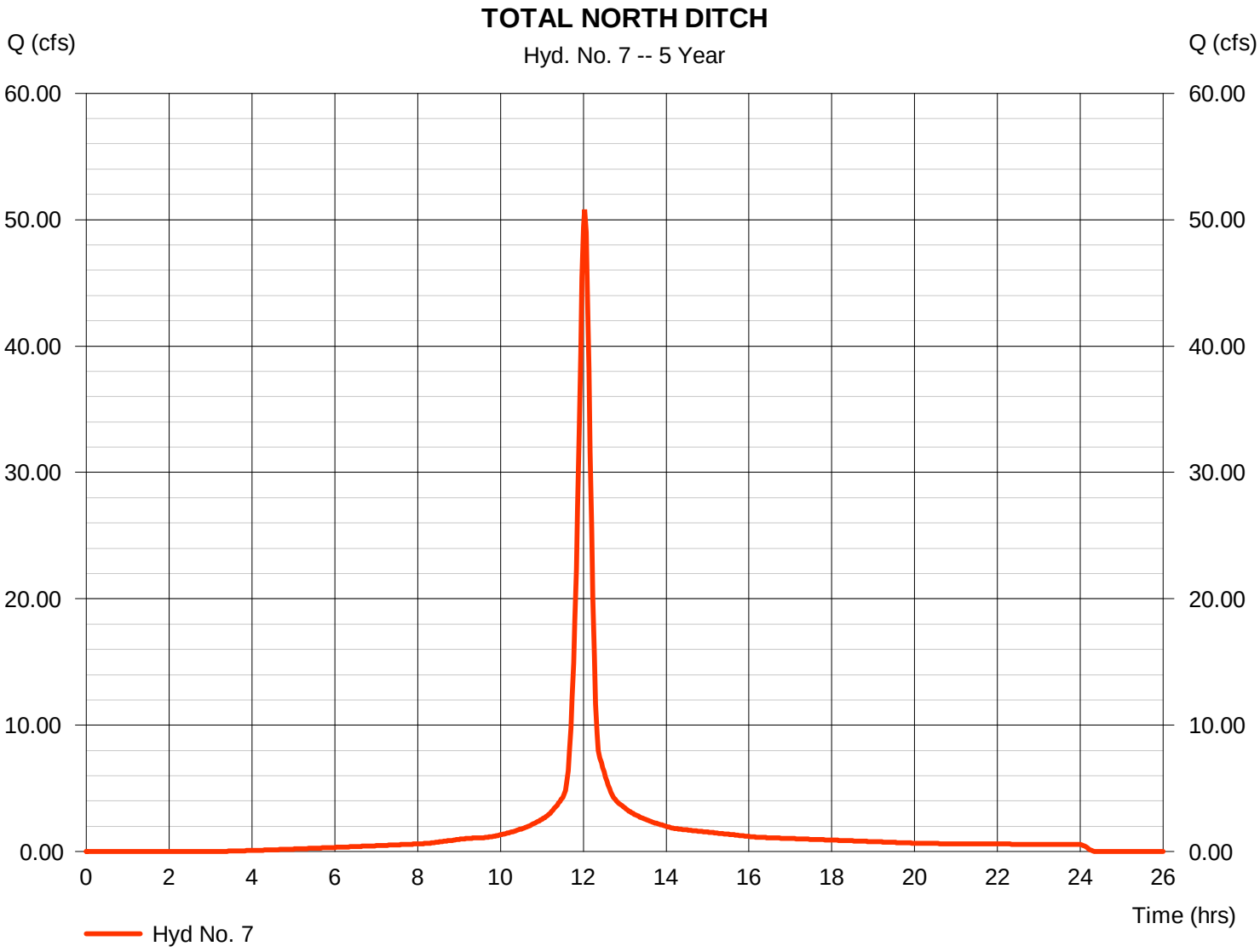


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 50.80 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 3.464 acft
Drainage area	= 11.500 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



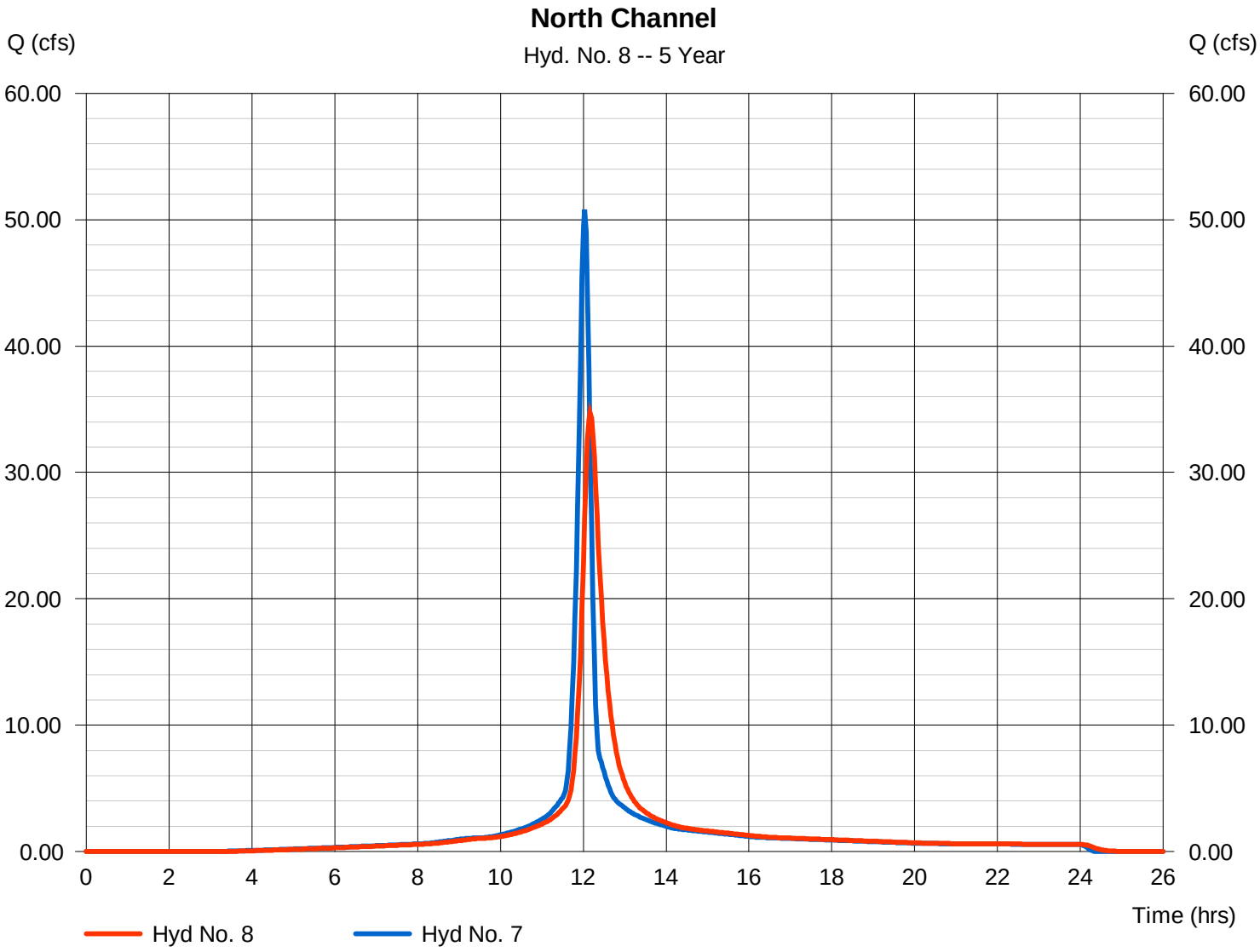
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	34.70 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	3.464 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	1.88 ft/s	Routing coeff.	=	0.1383

Modified Att-Kin routing method used.

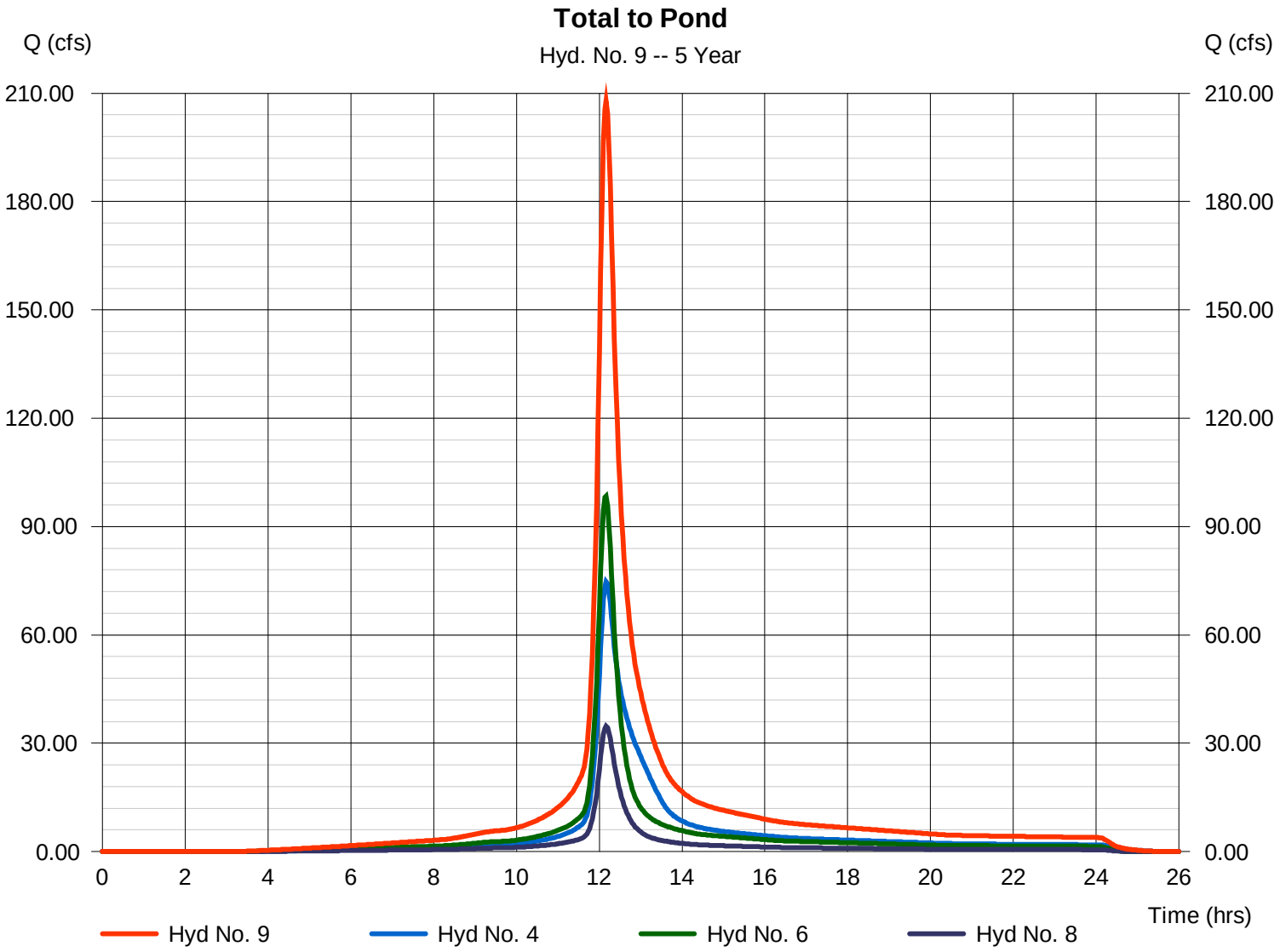


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 207.88 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 22.266 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



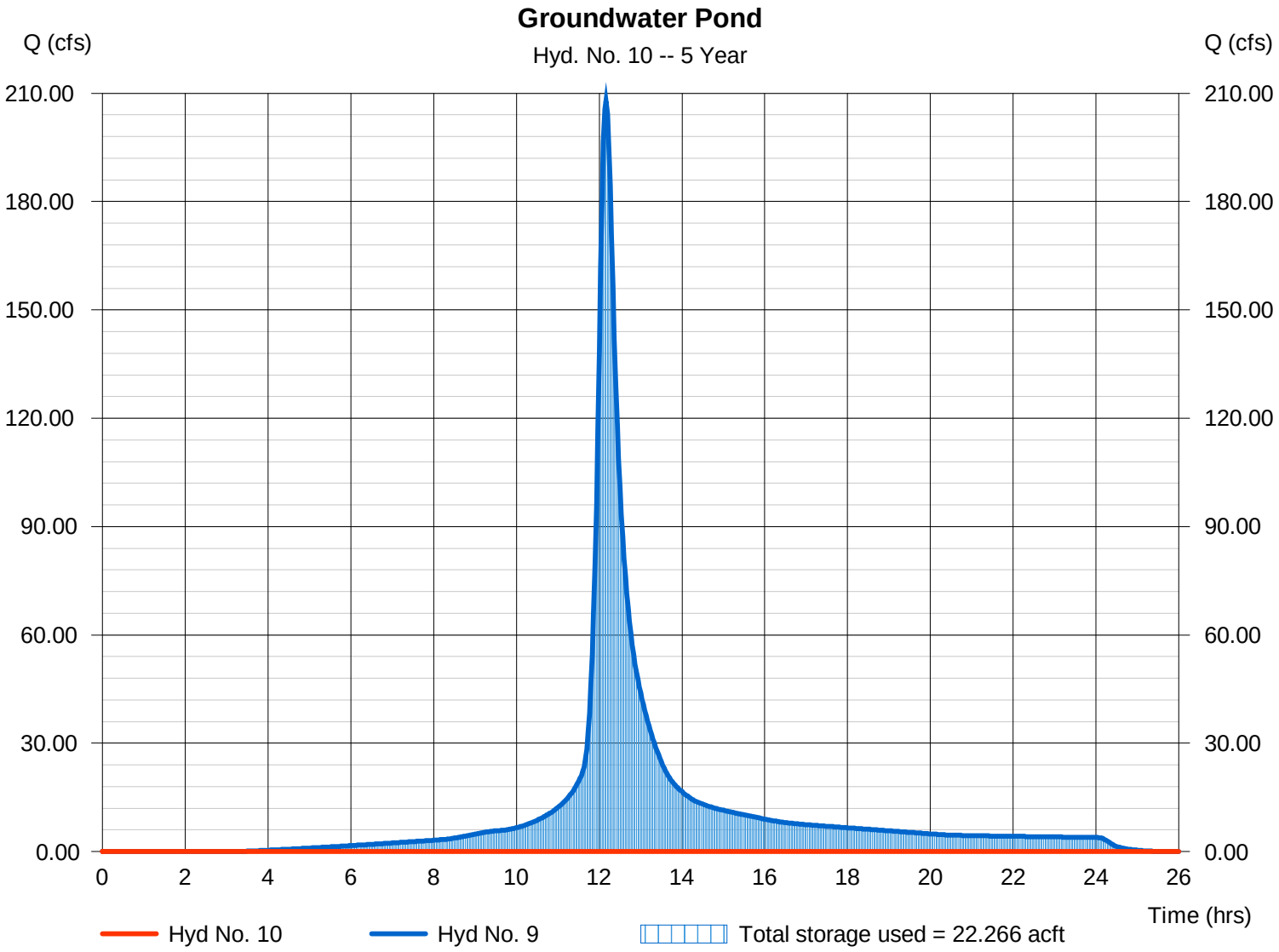
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1327.03 ft
Reservoir name	= <New Pond>	Max. Storage	= 22.266 acft

Storage Indication method used.

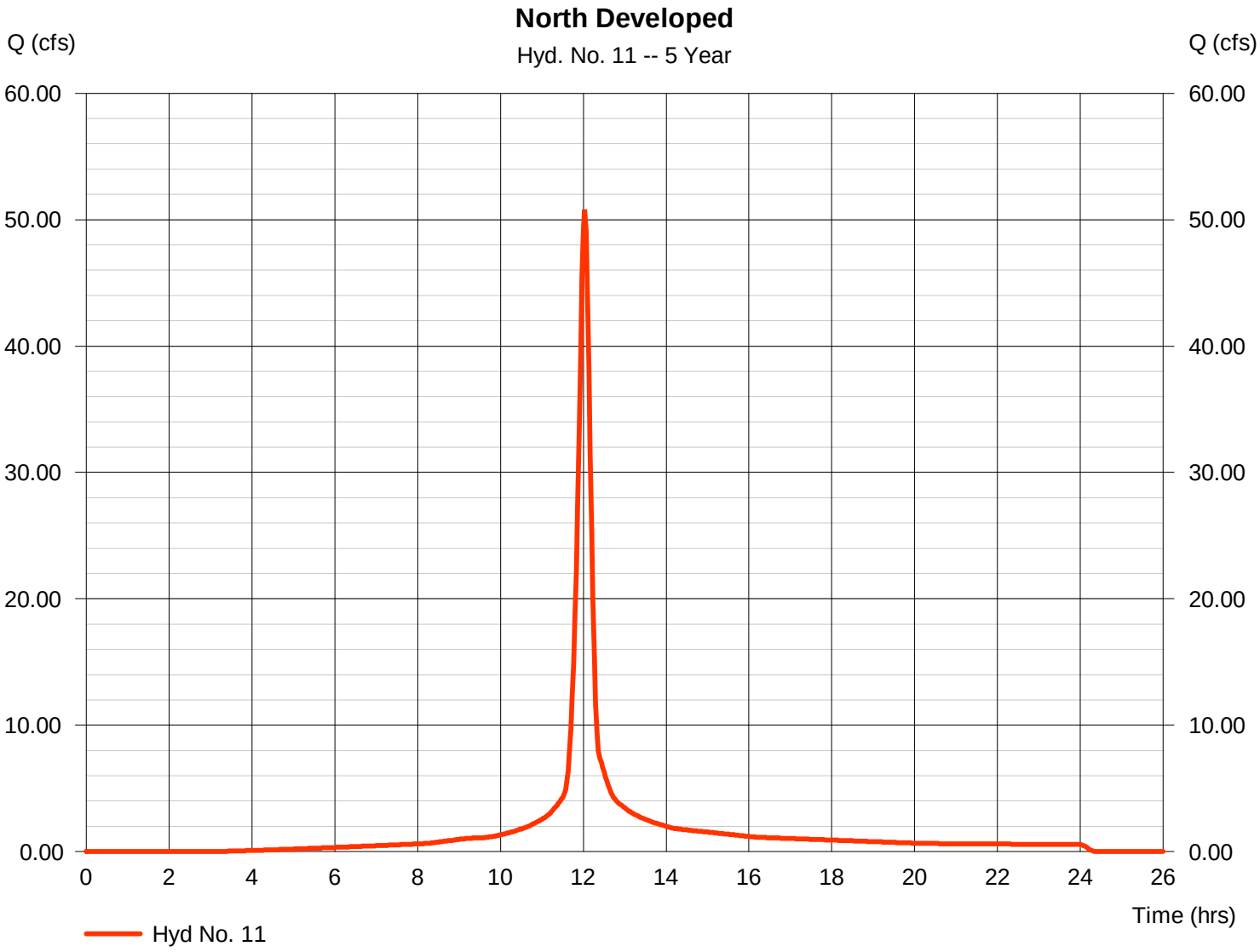


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	50.80 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.464 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

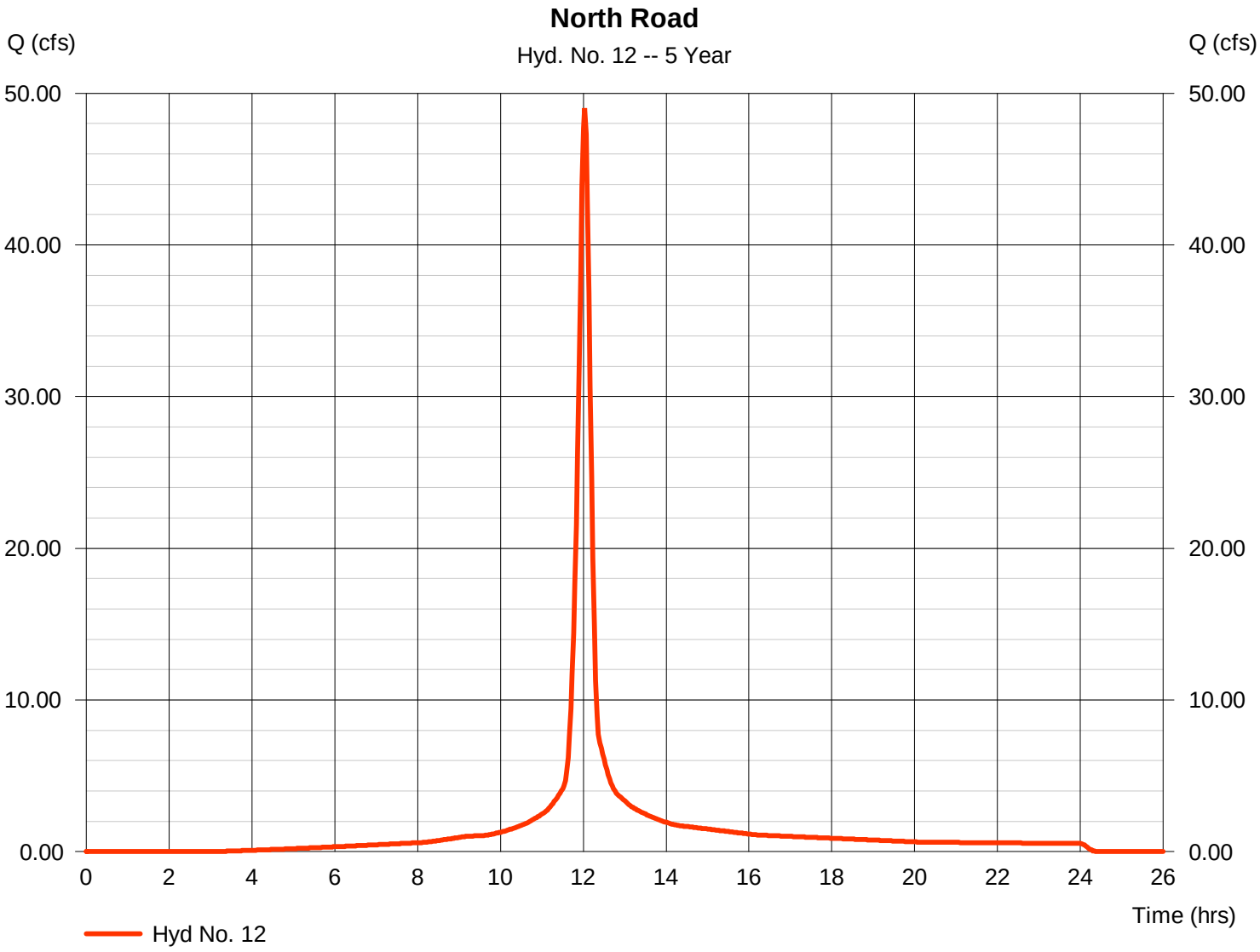


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	= SCS Runoff	Peak discharge	= 49.03 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 3.344 acft
Drainage area	= 11.100 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

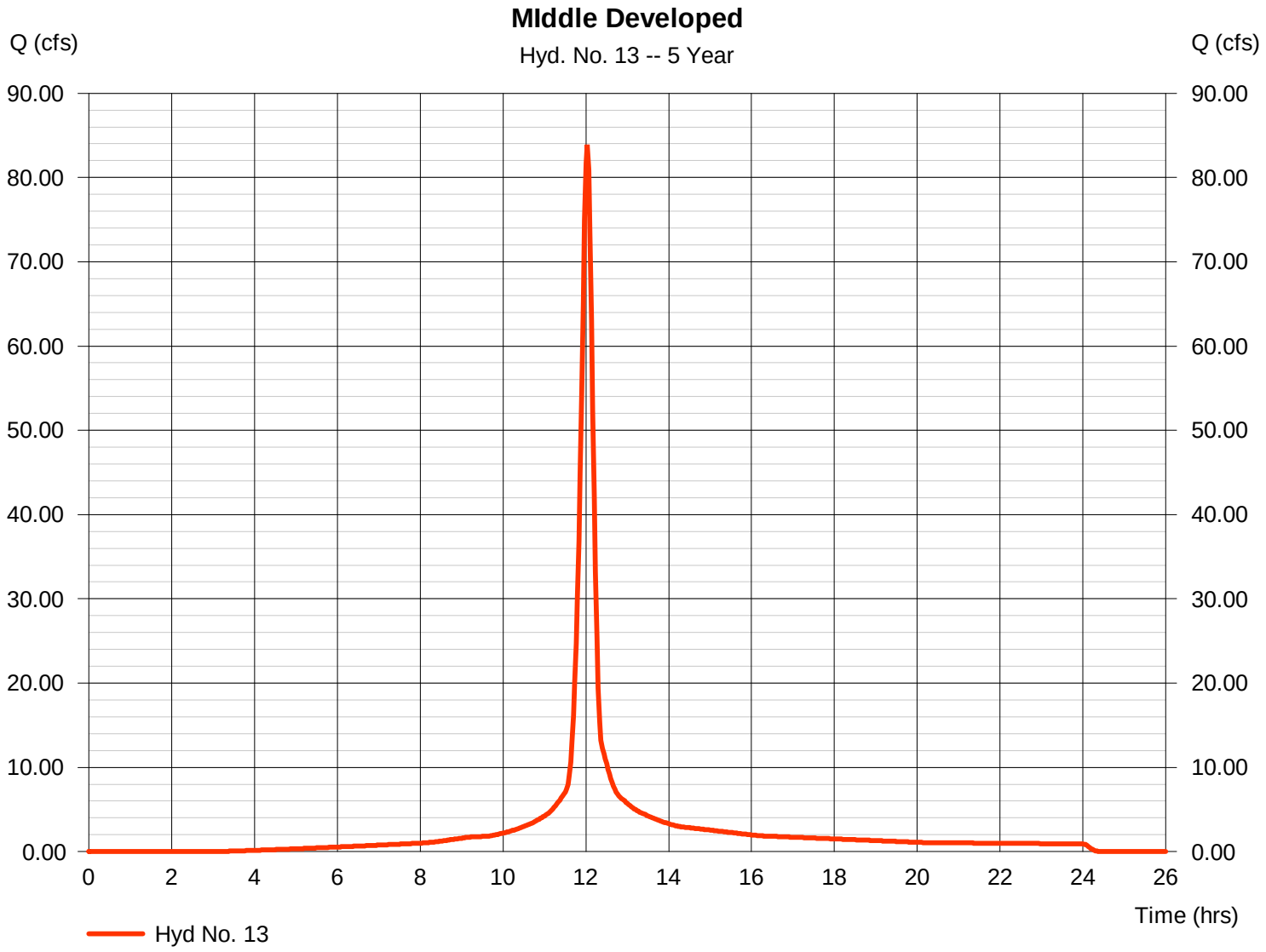


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	83.93 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	5.724 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

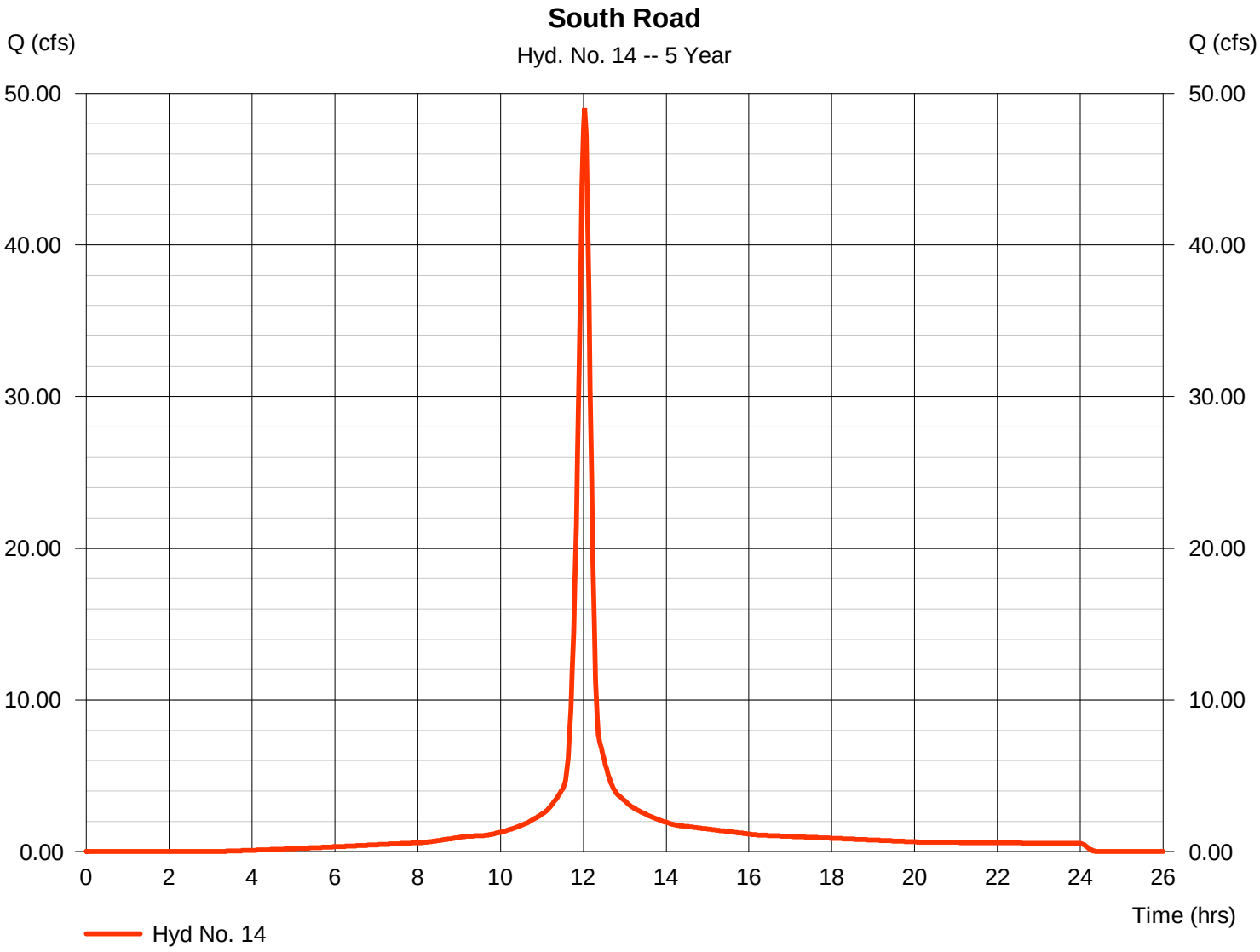


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	= SCS Runoff	Peak discharge	= 49.03 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 3.344 acft
Drainage area	= 11.100 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

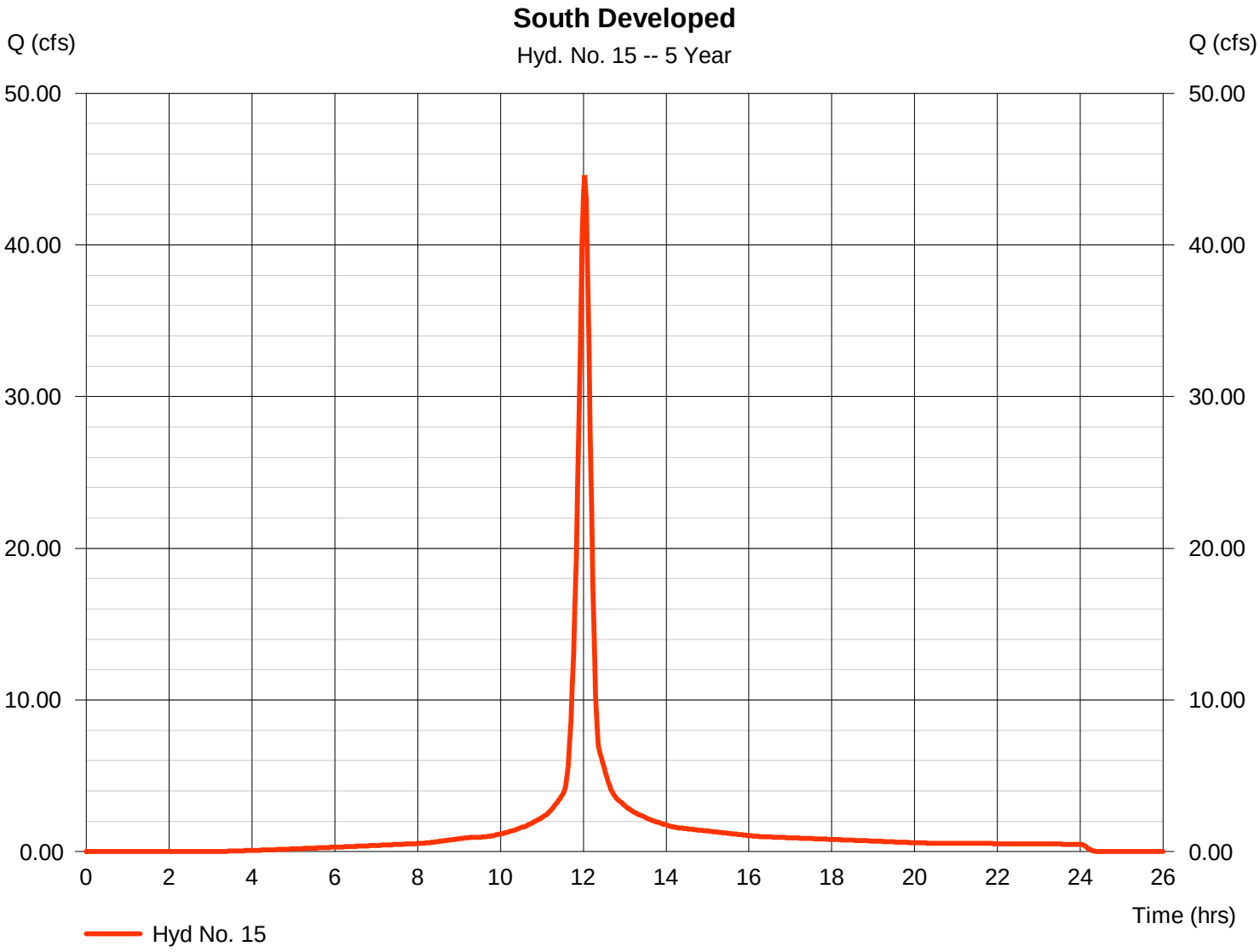


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	44.61 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.043 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

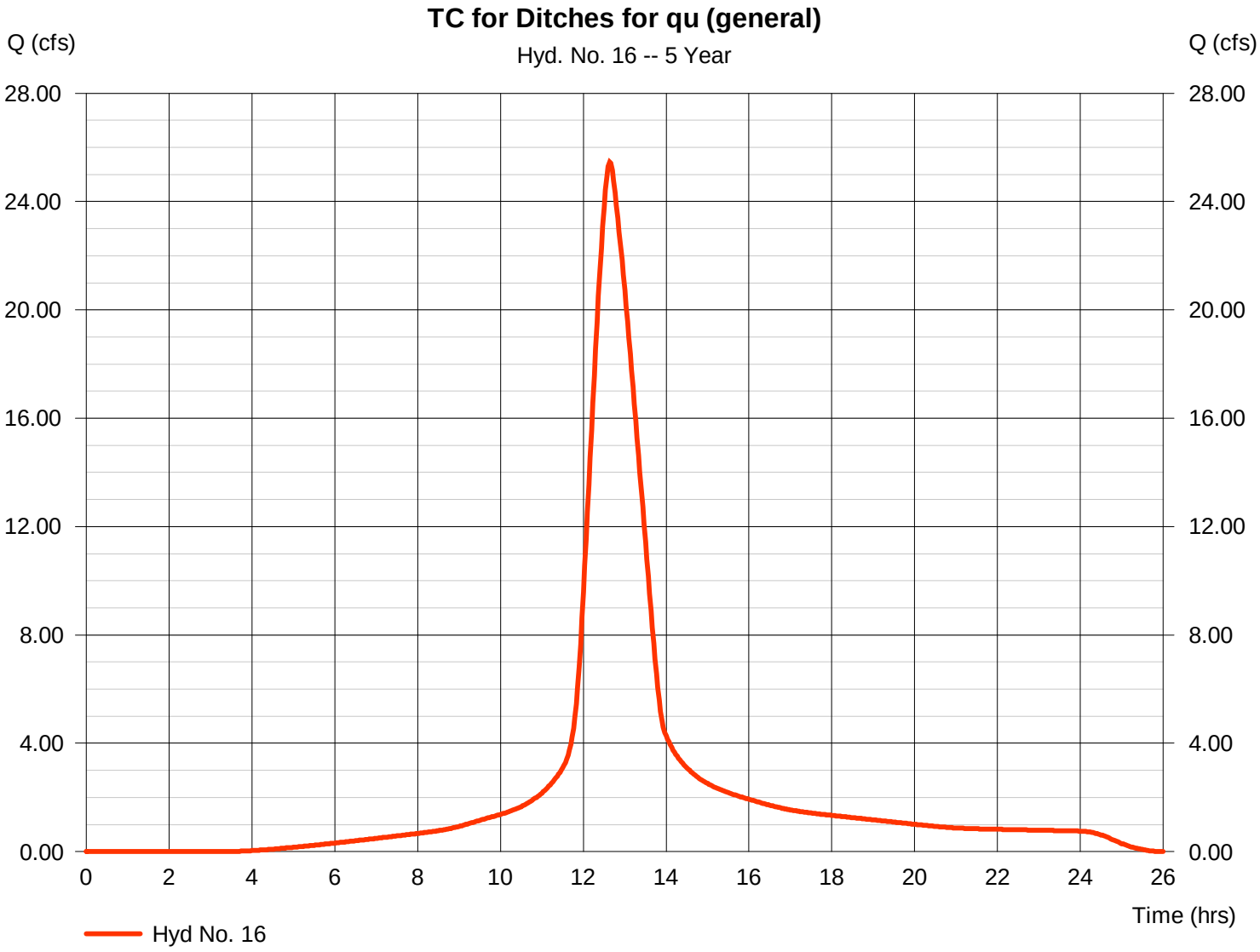


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	= SCS Runoff	Peak discharge	= 25.46 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 4.610 acft
Drainage area	= 15.000 ac	Curve number	= 93
Basin Slope	= 0.2 %	Hydraulic length	= 2000 ft
Tc method	= LAG	Time of conc. (Tc)	= 76.30 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

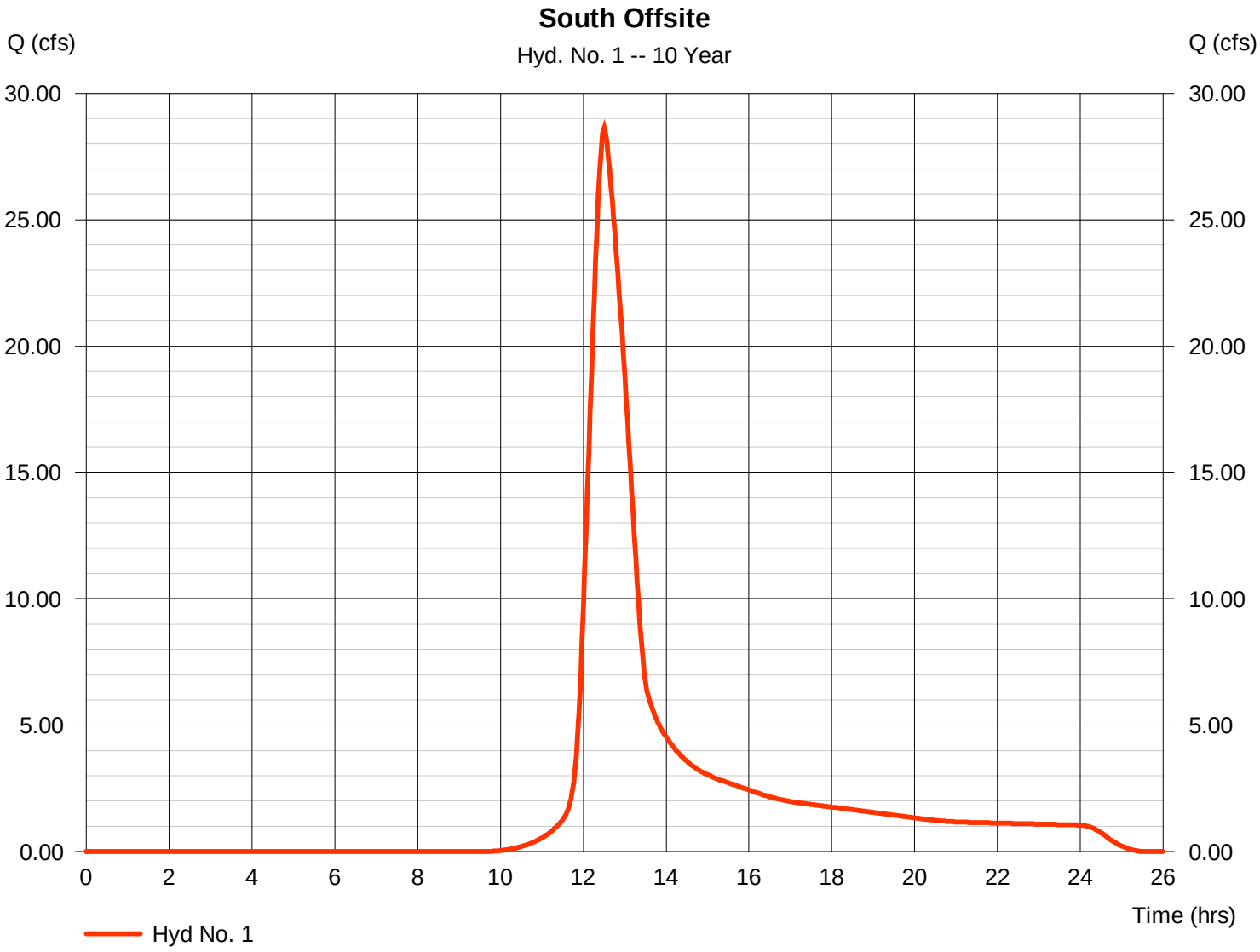
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	28.63	2	750	4.349	------	------	------	South Offsite
2	SCS Runoff	109.91	2	722	7.569	------	------	------	TOTAL SOUTH DITCH
3	Combine	121.15	2	722	11.918	1, 2	------	------	Total to South Ditch
4	Reach	90.72	2	730	11.918	3	------	------	South Channel
5	SCS Runoff	156.04	2	722	10.747	------	------	------	TOTAL MIDDLE DITCH
6	Reach	116.93	2	730	10.747	5	------	------	Middle Channel
7	SCS Runoff	59.62	2	722	4.106	------	------	------	TOTAL NORTH DITCH
8	Reach	41.39	2	730	4.106	7	------	------	North Channel
9	Combine	249.04	2	730	26.771	4, 6, 8	------	------	Total to Pond
10	Reservoir	0.000	2	n/a	0.000	9	1327.77	26.8	Groundwater Pond
11	SCS Runoff	59.62	2	722	4.106	------	------	------	North Developed
12	SCS Runoff	57.54	2	722	3.963	------	------	------	North Road
13	SCS Runoff	98.50	2	722	6.784	------	------	------	MIddle Developed
14	SCS Runoff	57.54	2	722	3.963	------	------	------	South Road
15	SCS Runoff	52.36	2	722	3.606	------	------	------	South Developed
16	SCS Runoff	29.96	2	758	5.463	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.63 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	4.349 acft
Drainage area	=	23.000 ac	Curve number	=	71
Basin Slope	=	0.5 %	Hydraulic length	=	1000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	58.40 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

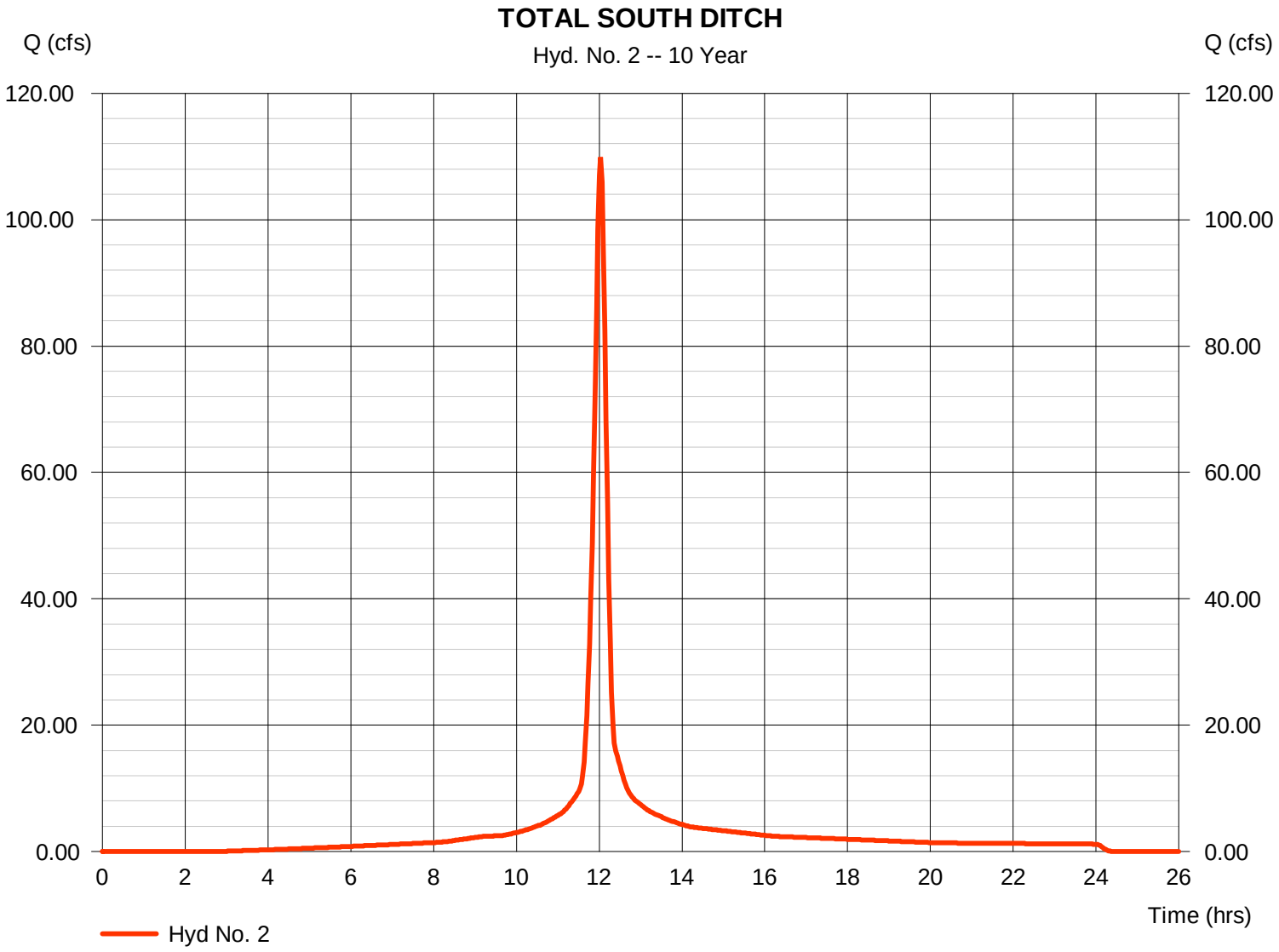


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 109.91 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 7.569 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

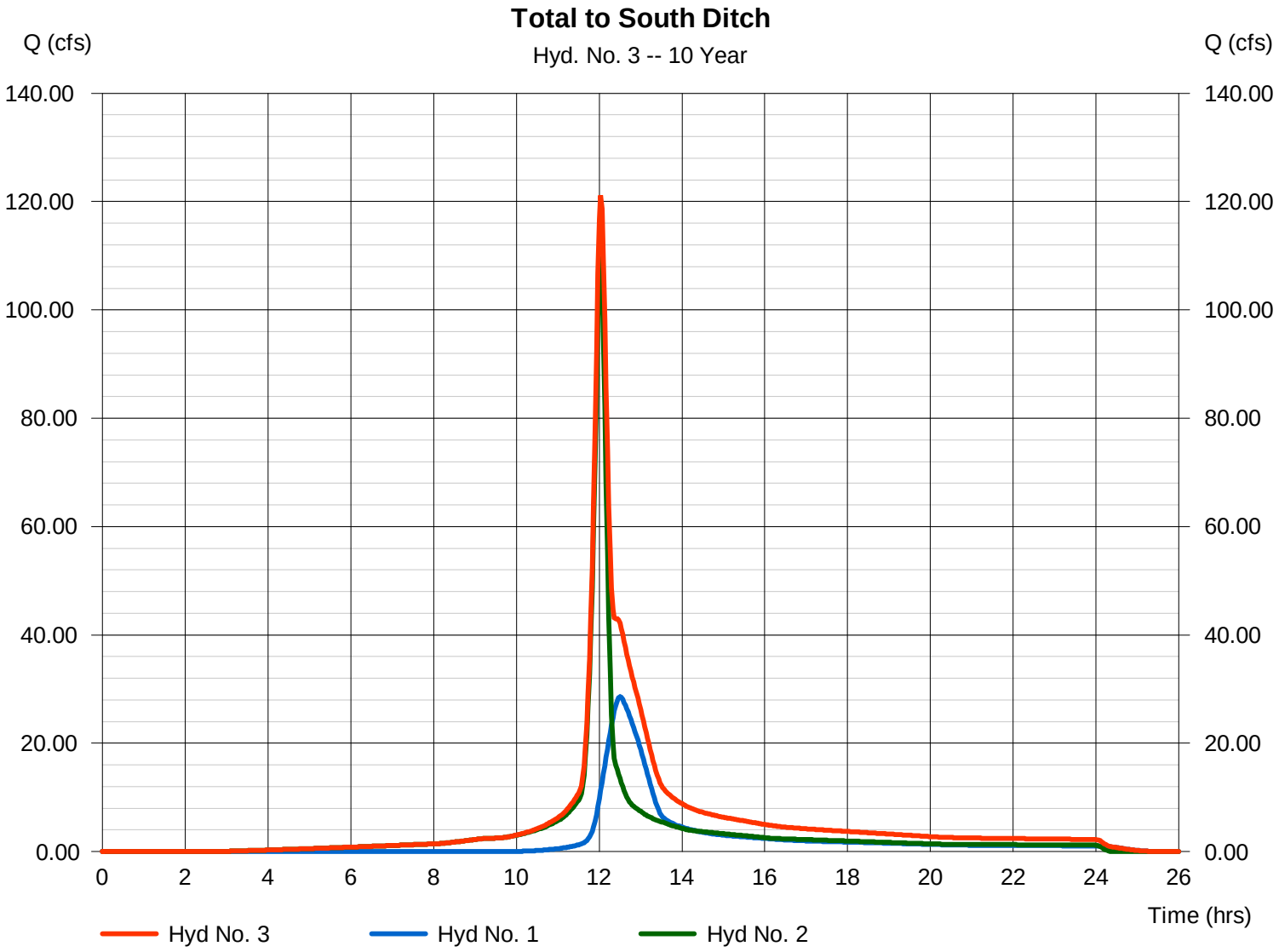


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 121.15 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 11.918 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



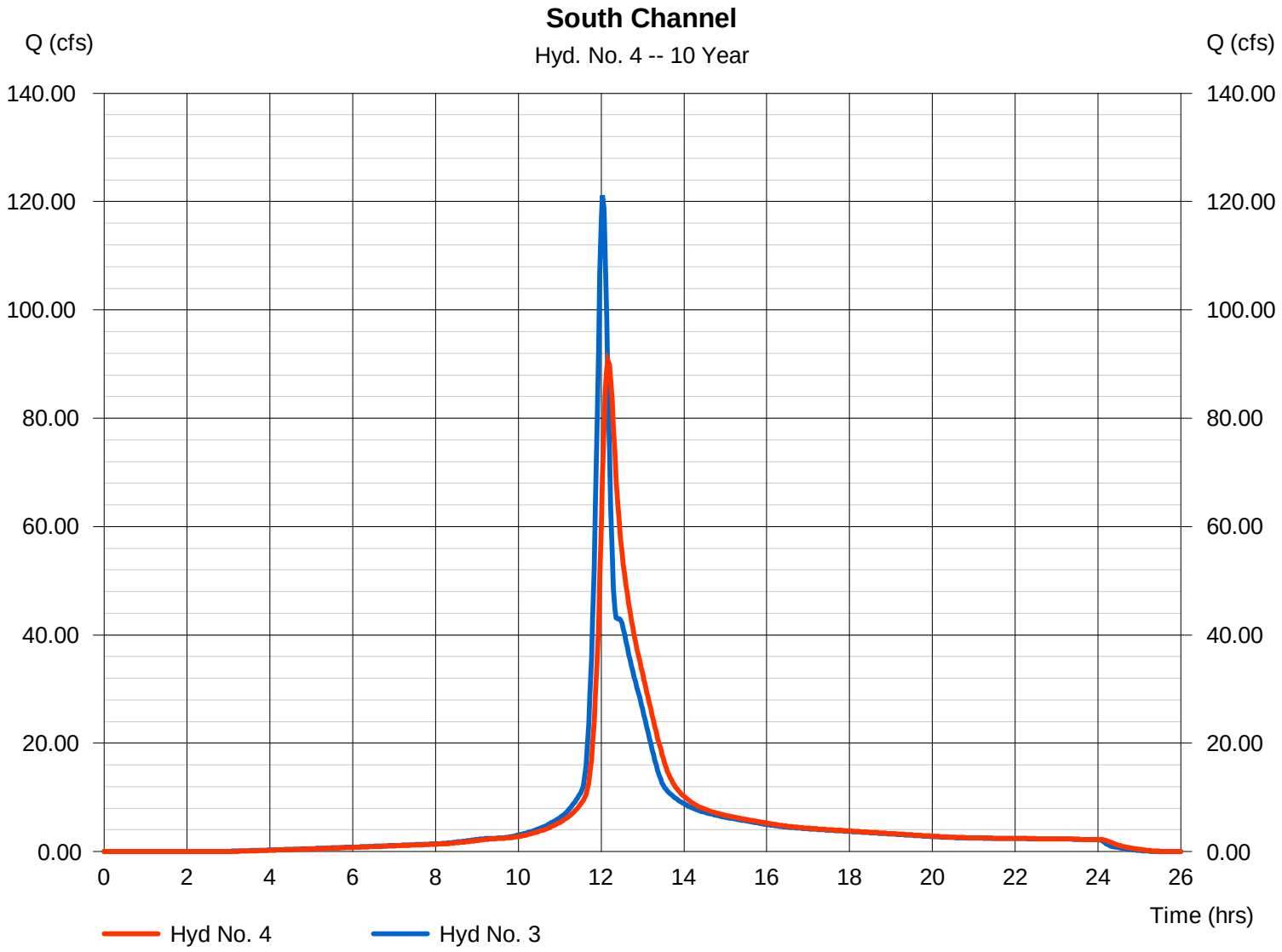
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	90.72 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	11.918 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.32 ft/s	Routing coeff.	=	0.1681

Modified Att-Kin routing method used.

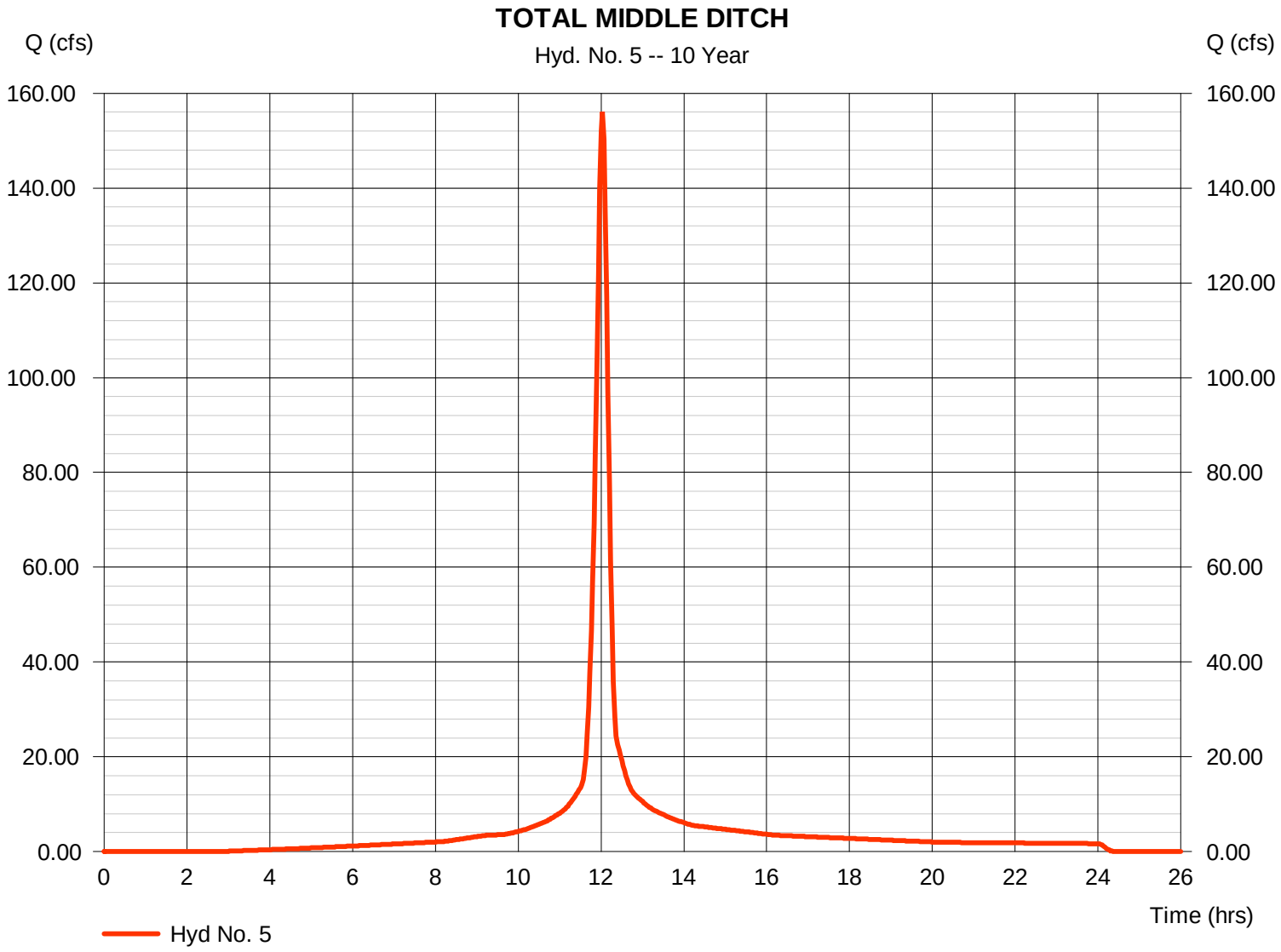


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 156.04 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 10.747 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



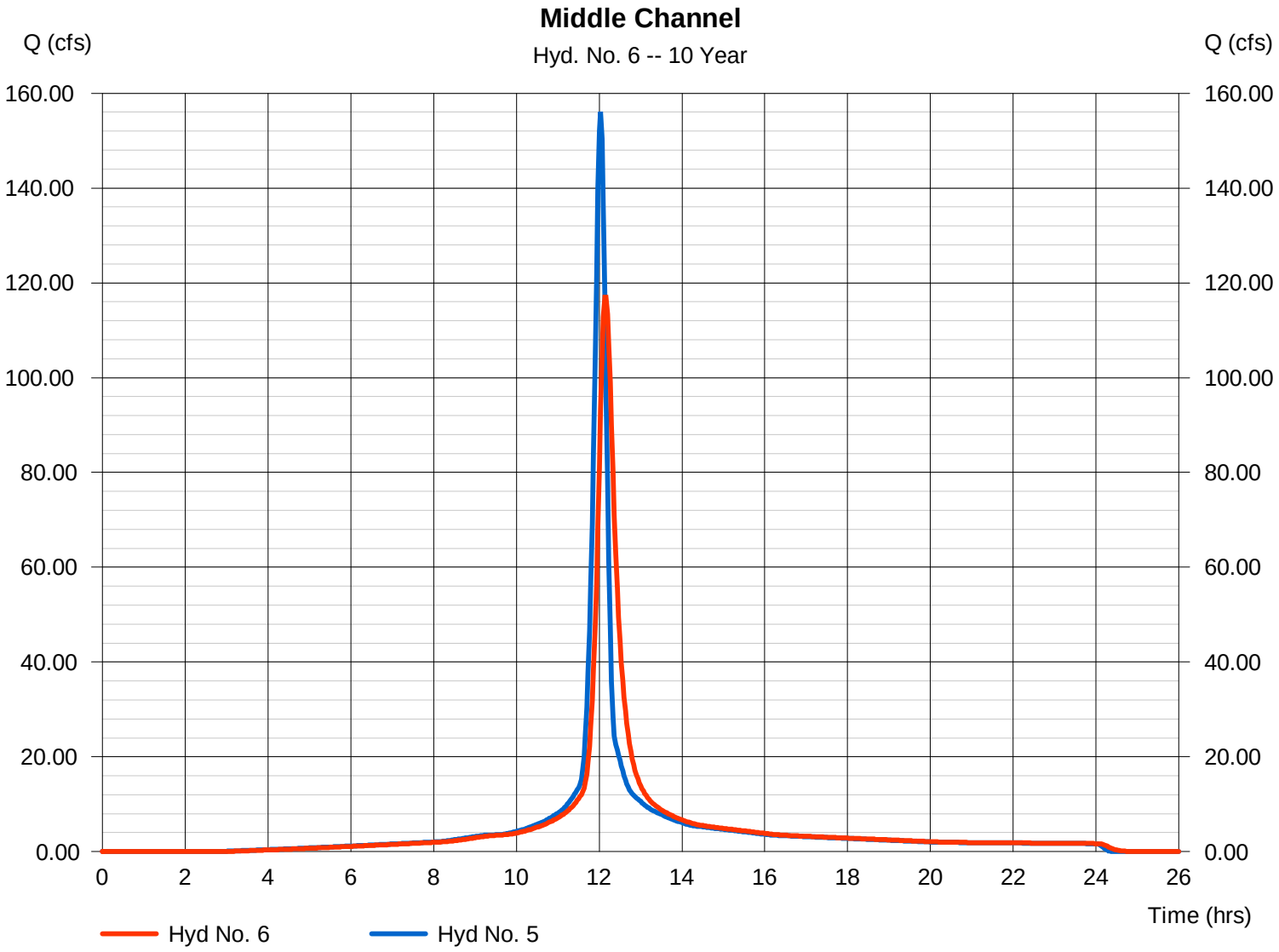
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	= Reach	Peak discharge	= 116.93 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 10.747 acft
Inflow hyd. No.	= 5 - TOTAL MIDDLE DITCH	Section type	= Trapezoidal
Reach length	= 2000.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.035	Bottom width	= 5.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.651	Rating curve m	= 1.321
Ave. velocity	= 2.46 ft/s	Routing coeff.	= 0.1779

Modified Att-Kin routing method used.

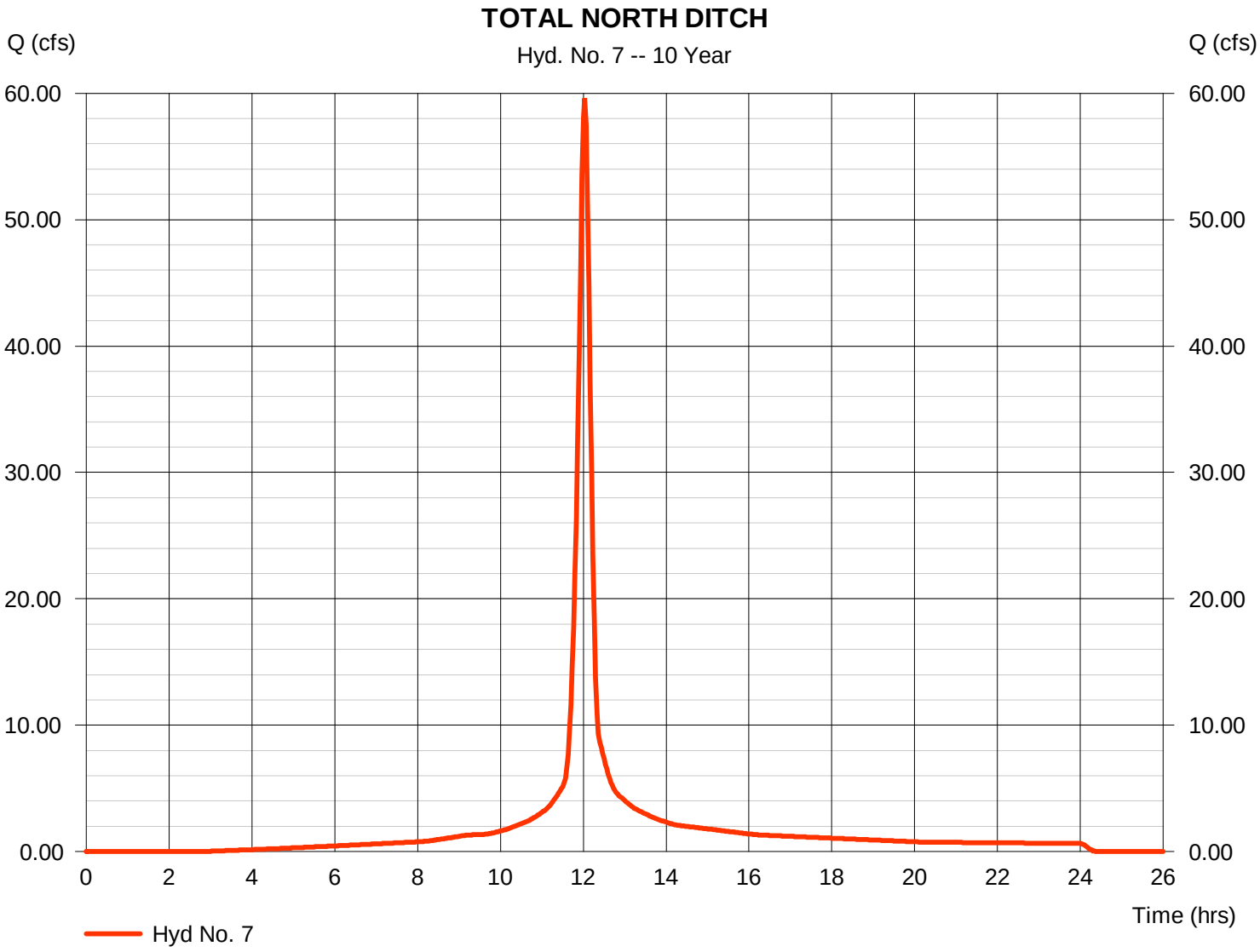


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 59.62 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.106 acft
Drainage area	= 11.500 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



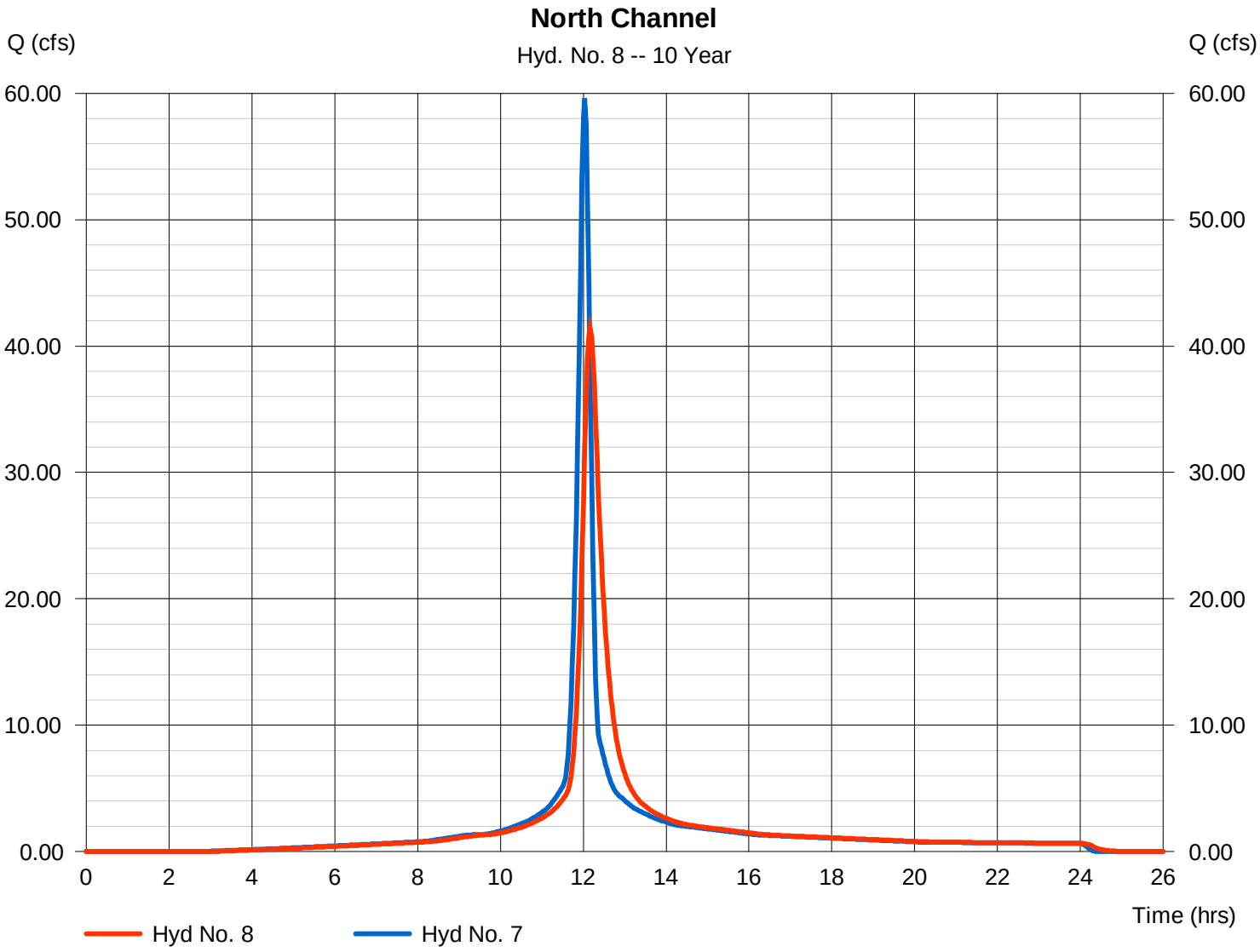
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	41.39 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	4.106 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	1.95 ft/s	Routing coeff.	=	0.1434

Modified Att-Kin routing method used.

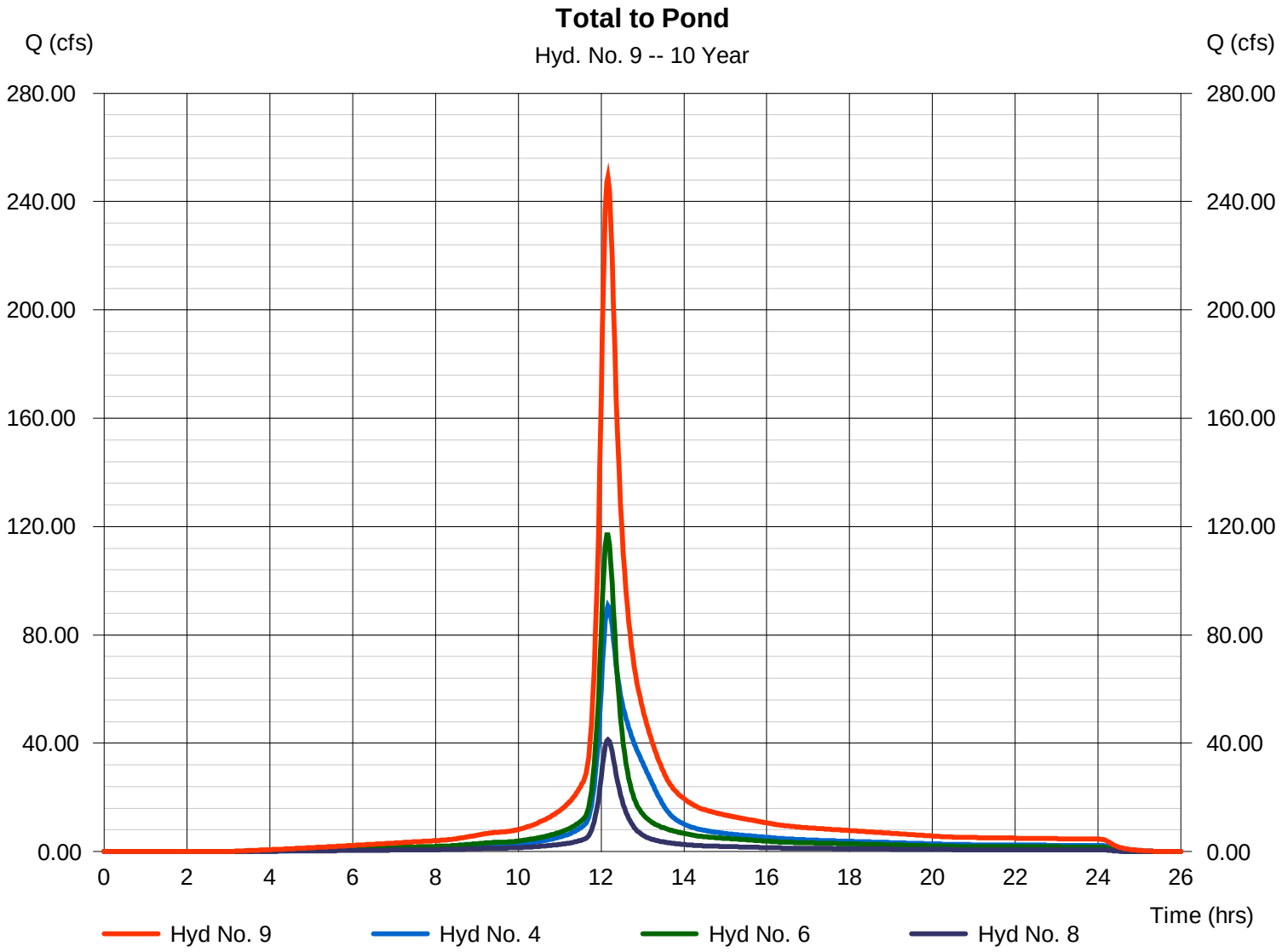


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 249.04 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 26.771 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



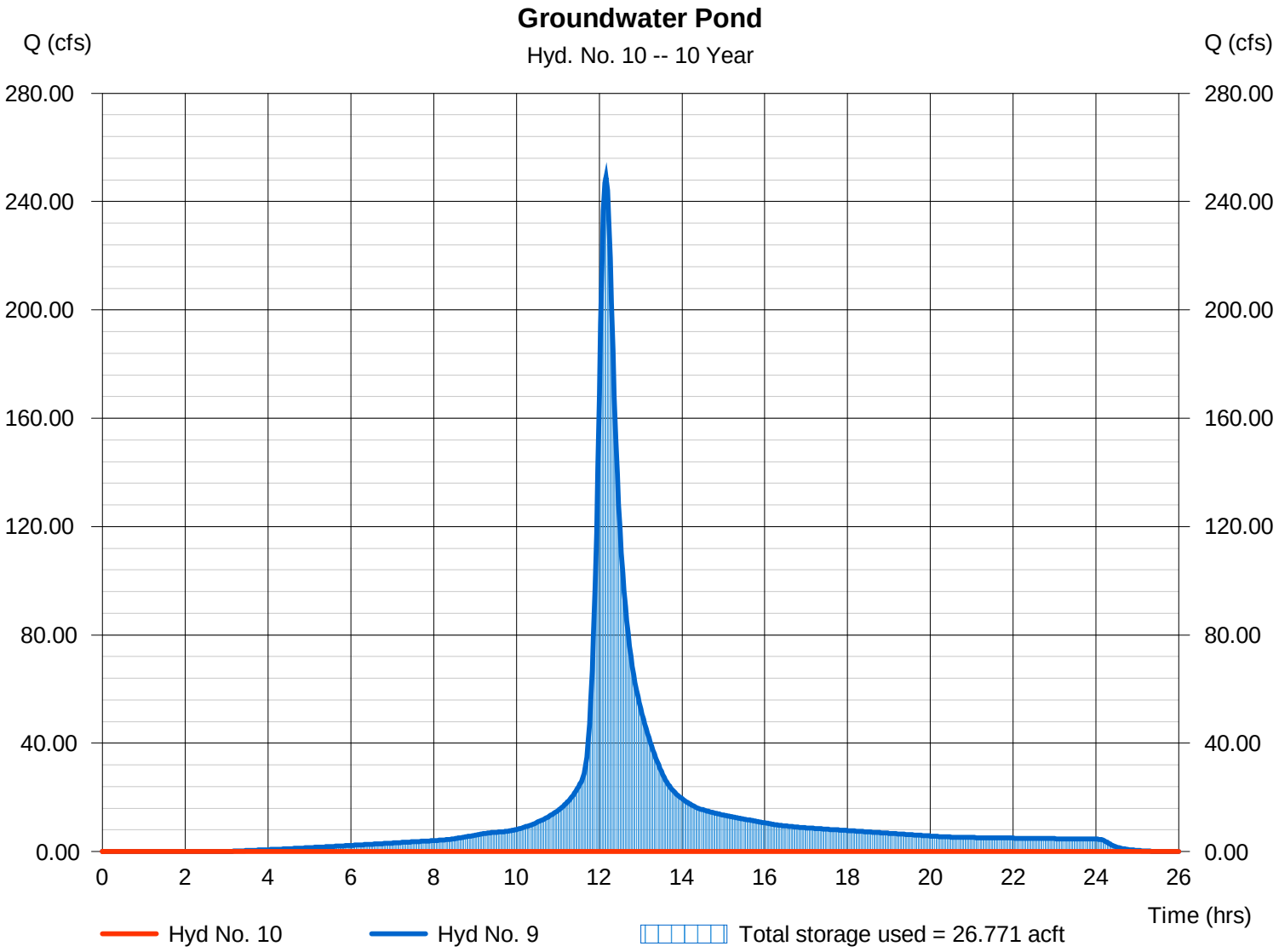
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1327.77 ft
Reservoir name	= <New Pond>	Max. Storage	= 26.771 acft

Storage Indication method used.

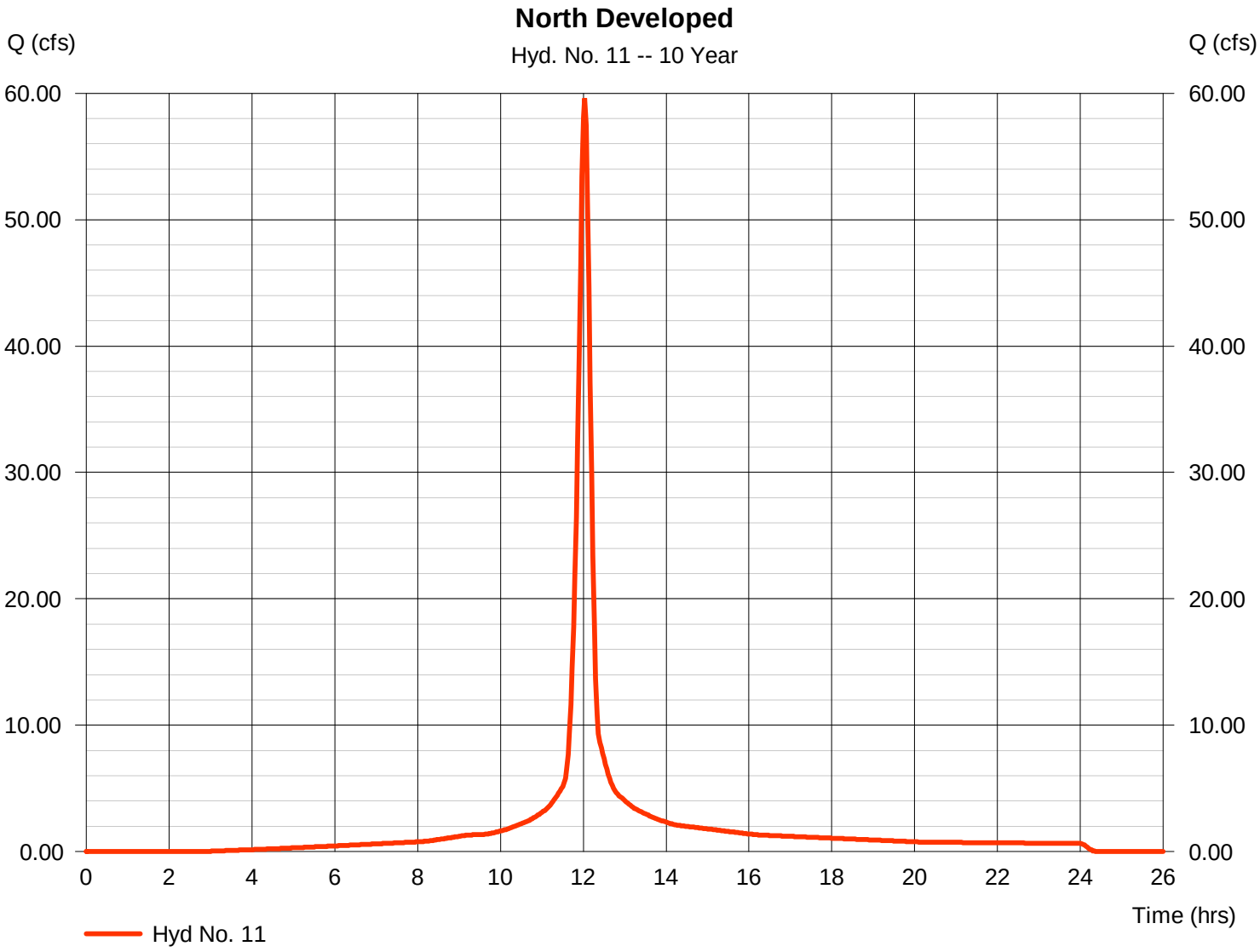


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	59.62 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.106 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

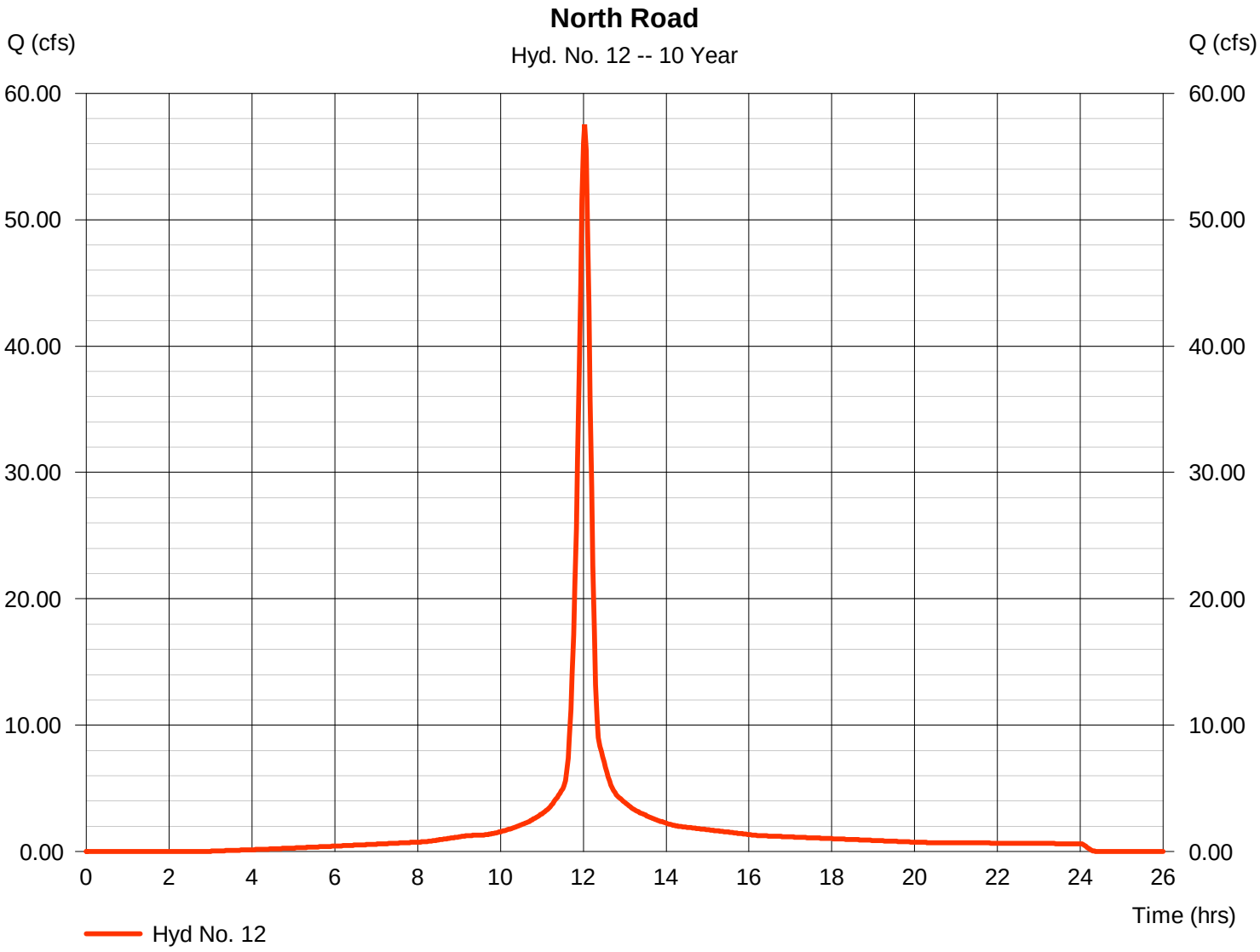


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.54 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.963 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

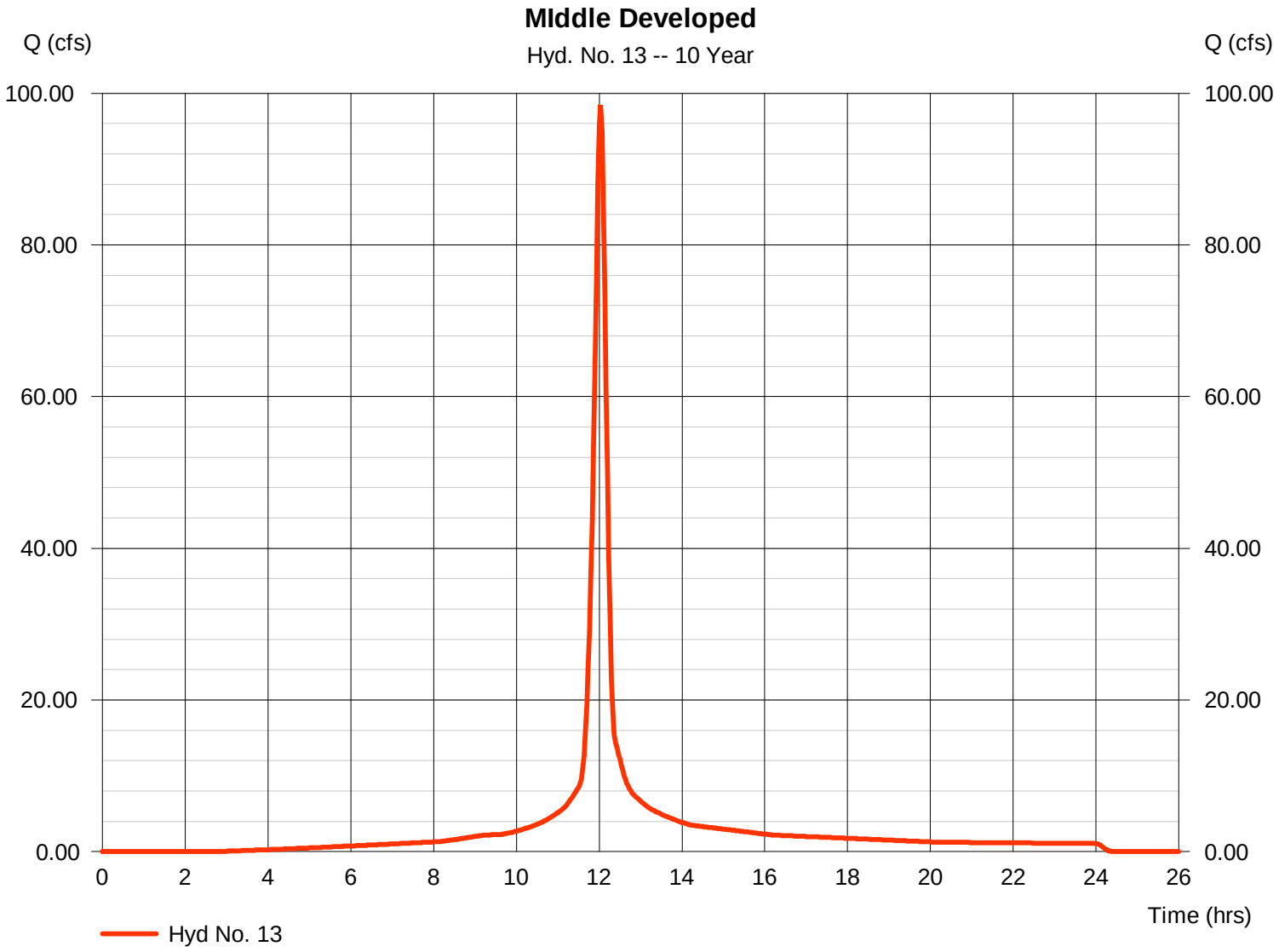


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	98.50 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.784 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

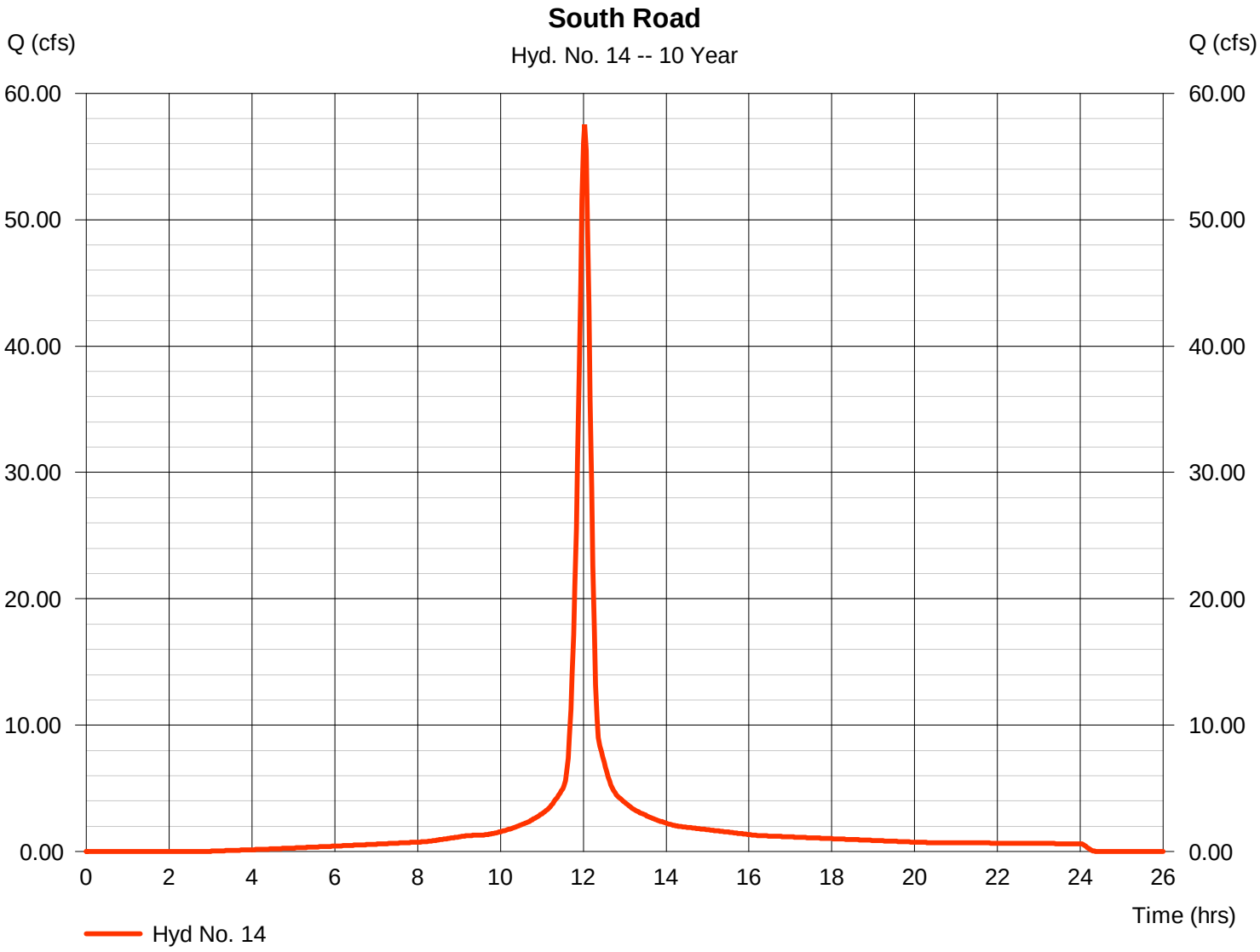


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	57.54 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.963 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

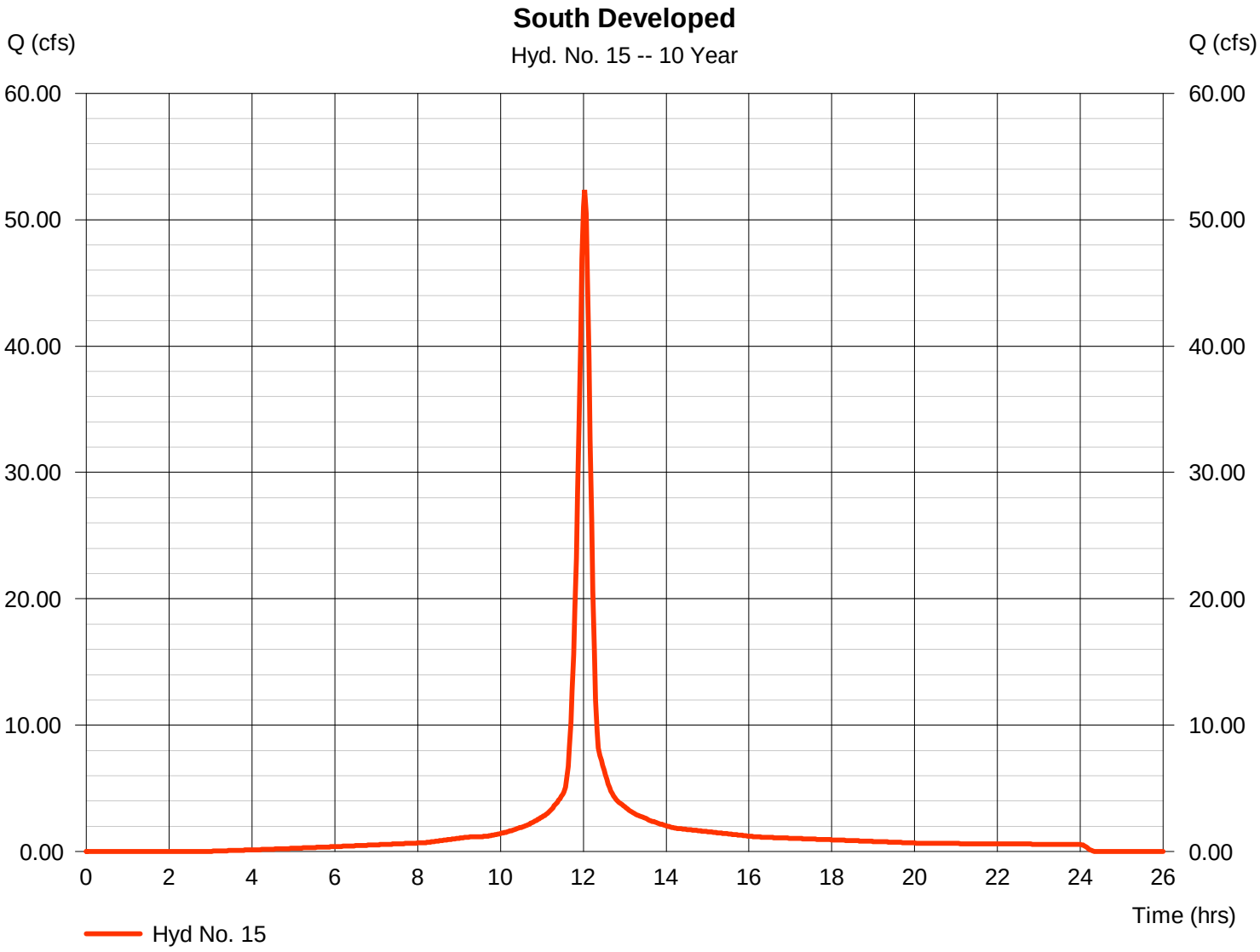


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	52.36 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	3.606 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

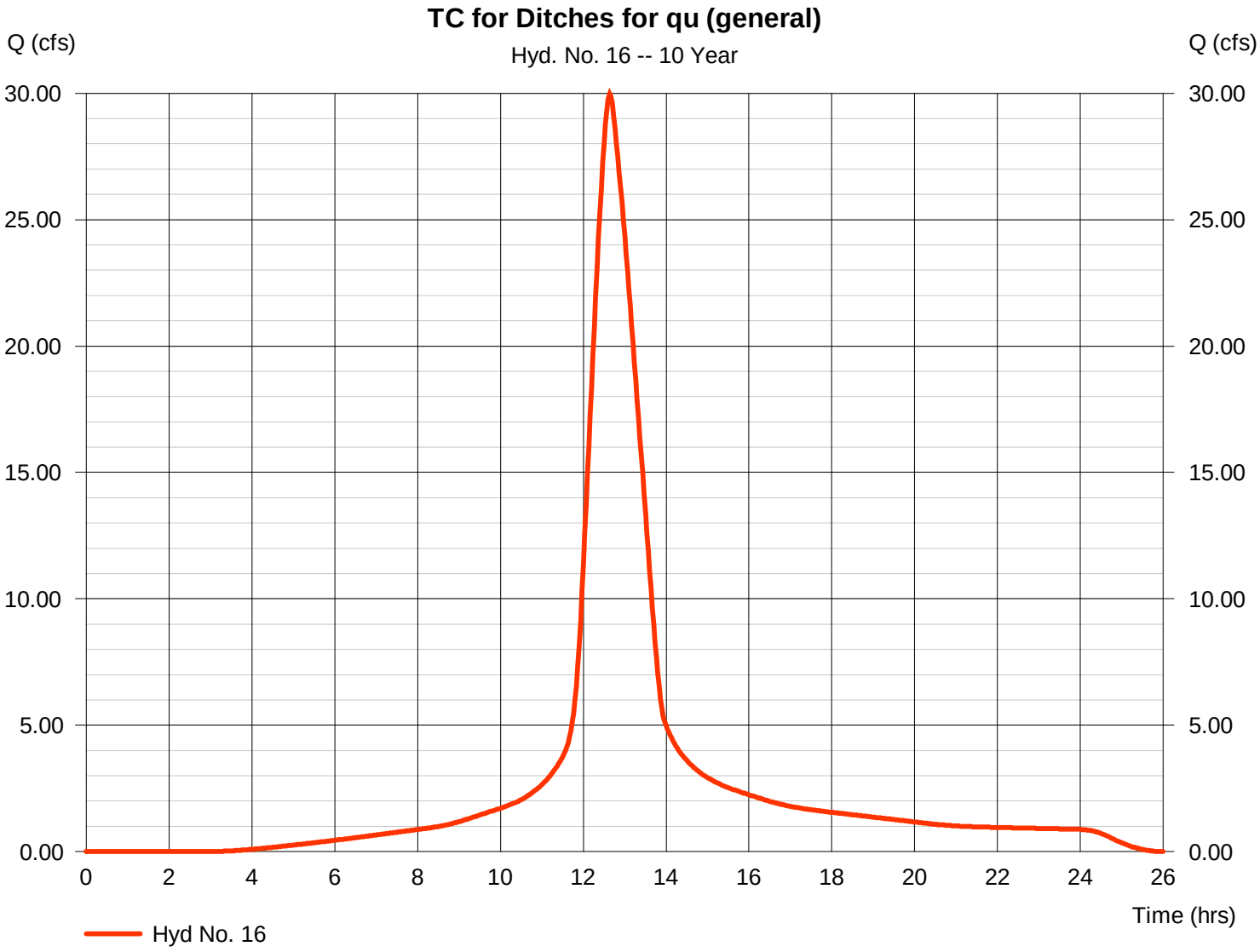


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	= SCS Runoff	Peak discharge	= 29.96 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 5.463 acft
Drainage area	= 15.000 ac	Curve number	= 93
Basin Slope	= 0.2 %	Hydraulic length	= 2000 ft
Tc method	= LAG	Time of conc. (Tc)	= 76.30 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

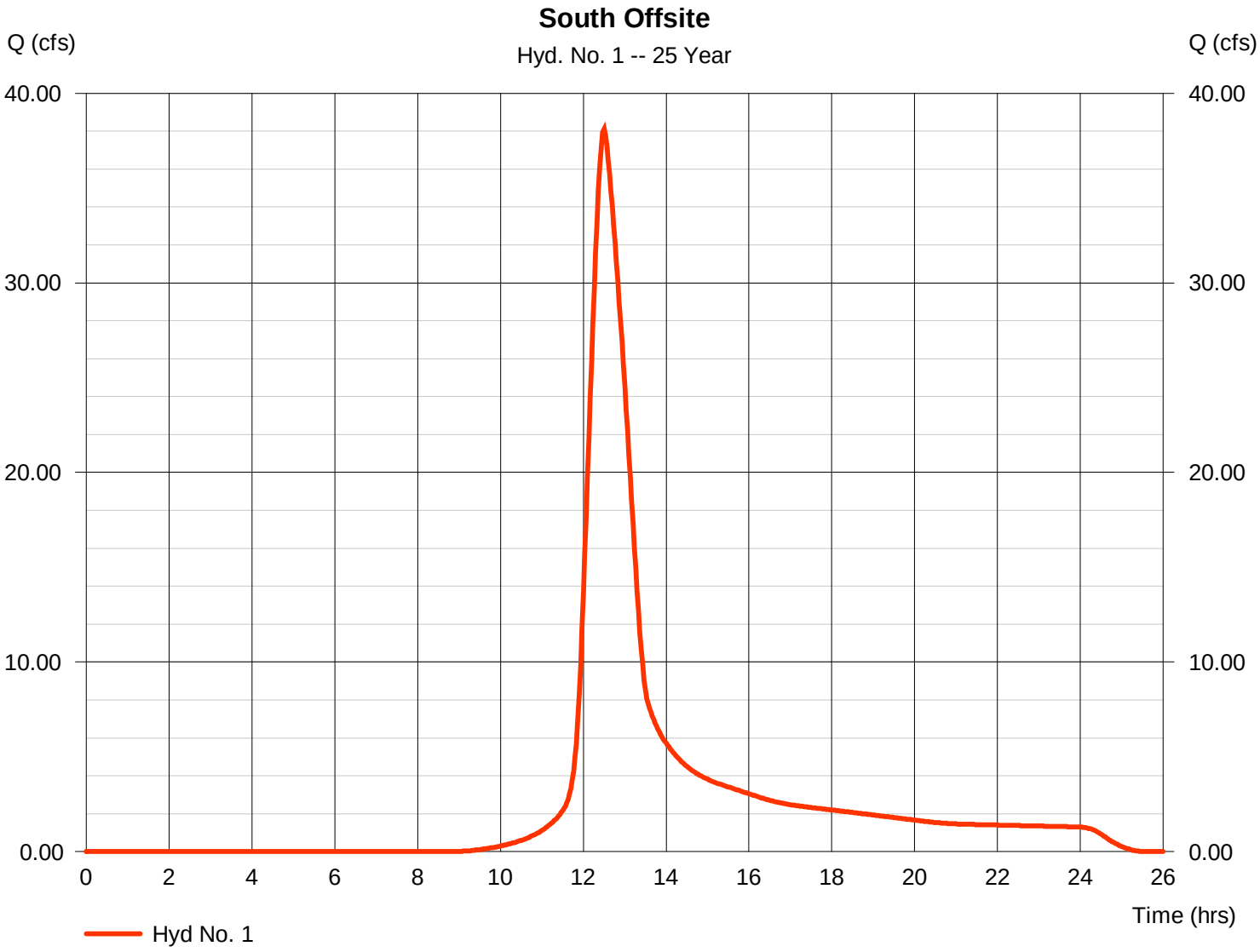
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	38.13	2	750	5.711	------	------	------	South Offsite
2	SCS Runoff	130.70	2	722	9.097	------	------	------	TOTAL SOUTH DITCH
3	Combine	146.38	2	722	14.808	1, 2	------	------	Total to South Ditch
4	Reach	111.64	2	730	14.808	3	------	------	South Channel
5	SCS Runoff	185.57	2	722	12.916	------	------	------	TOTAL MIDDLE DITCH
6	Reach	141.25	2	728	12.916	5	------	------	Middle Channel
7	SCS Runoff	70.90	2	722	4.935	------	------	------	TOTAL NORTH DITCH
8	Reach	50.04	2	730	4.935	7	------	------	North Channel
9	Combine	302.48	2	730	32.658	4, 6, 8	------	------	Total to Pond
10	Reservoir	0.000	2	n/a	0.000	9	1328.71	32.7	Groundwater Pond
11	SCS Runoff	70.90	2	722	4.935	------	------	------	North Developed
12	SCS Runoff	68.43	2	722	4.763	------	------	------	North Road
13	SCS Runoff	117.13	2	722	8.153	------	------	------	MIddle Developed
14	SCS Runoff	68.43	2	722	4.763	------	------	------	South Road
15	SCS Runoff	62.27	2	722	4.334	------	------	------	South Developed
16	SCS Runoff	35.72	2	758	6.566	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	38.13 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	5.711 acft
Drainage area	=	23.000 ac	Curve number	=	71
Basin Slope	=	0.5 %	Hydraulic length	=	1000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	58.40 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

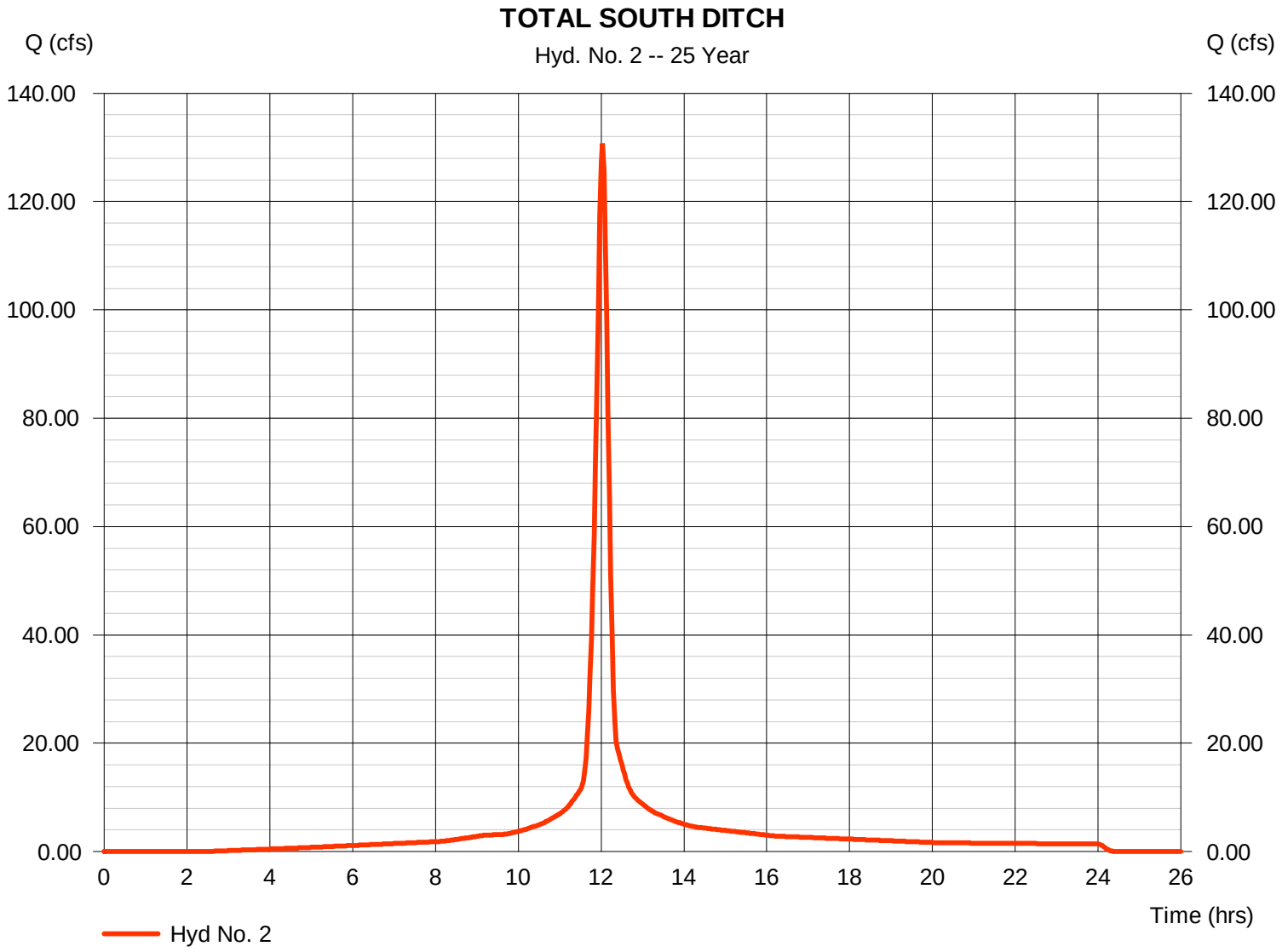


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 130.70 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 9.097 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

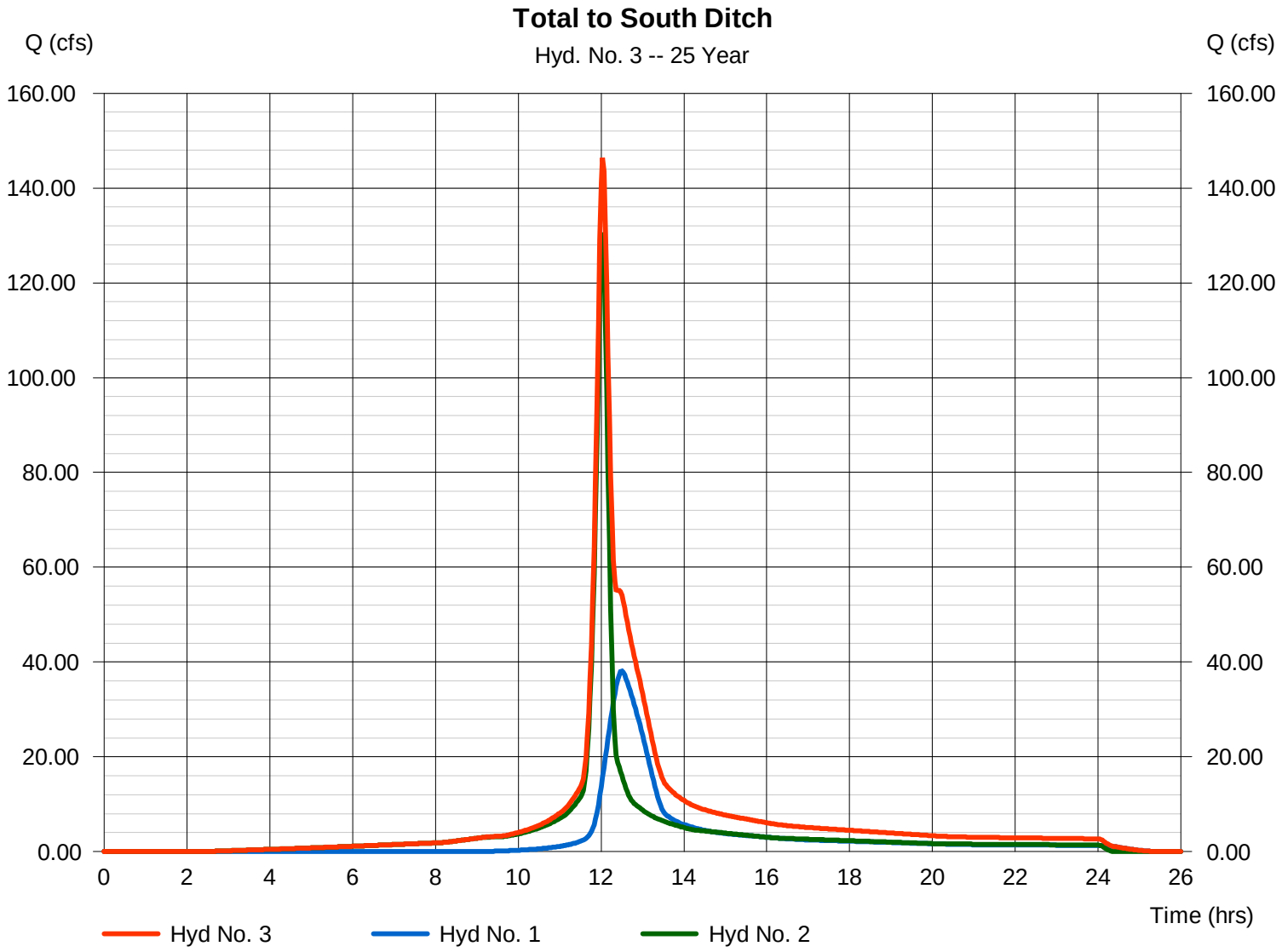


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 146.38 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 14.808 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



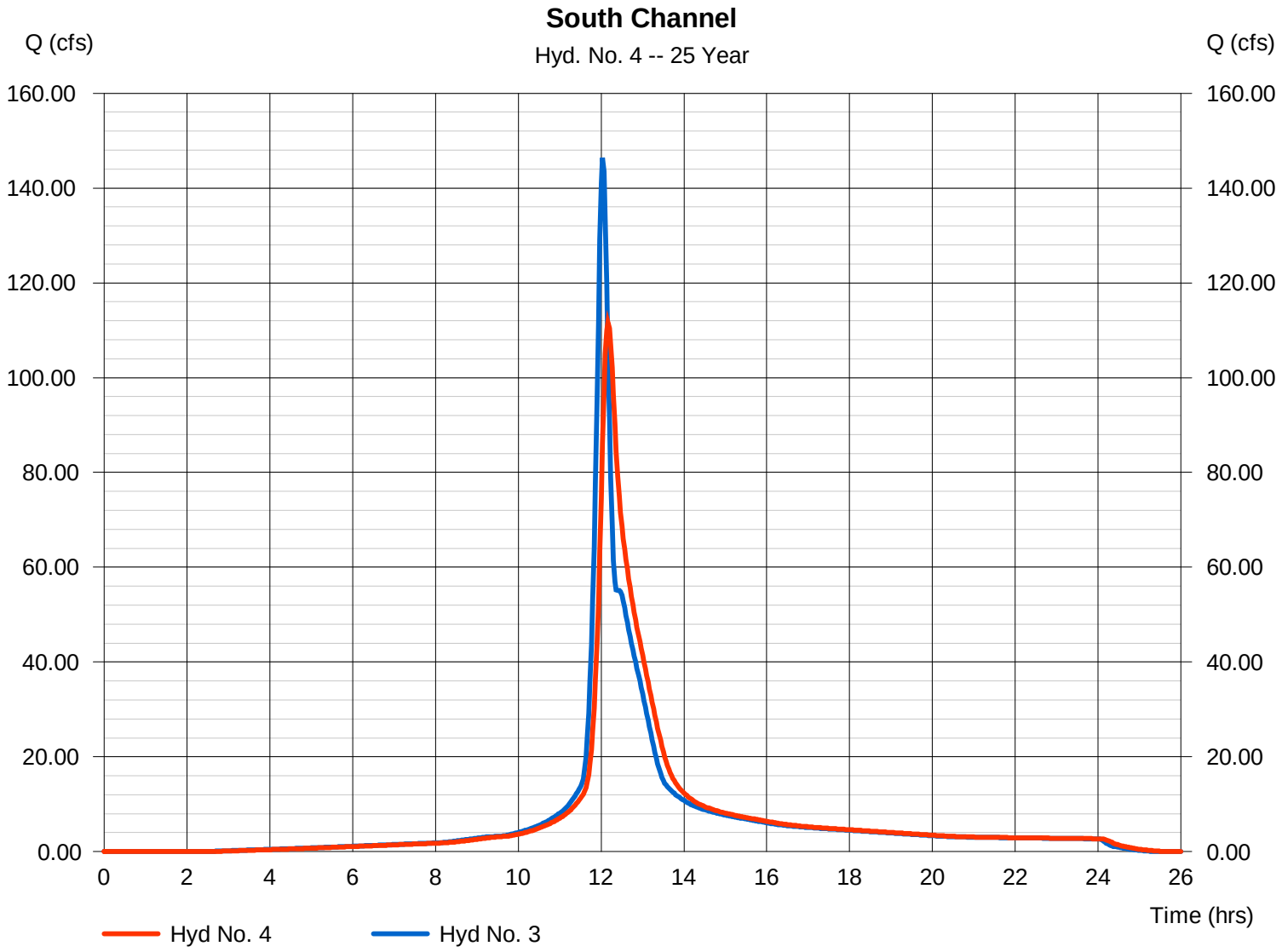
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	111.64 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	14.808 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.43 ft/s	Routing coeff.	=	0.1754

Modified Att-Kin routing method used.

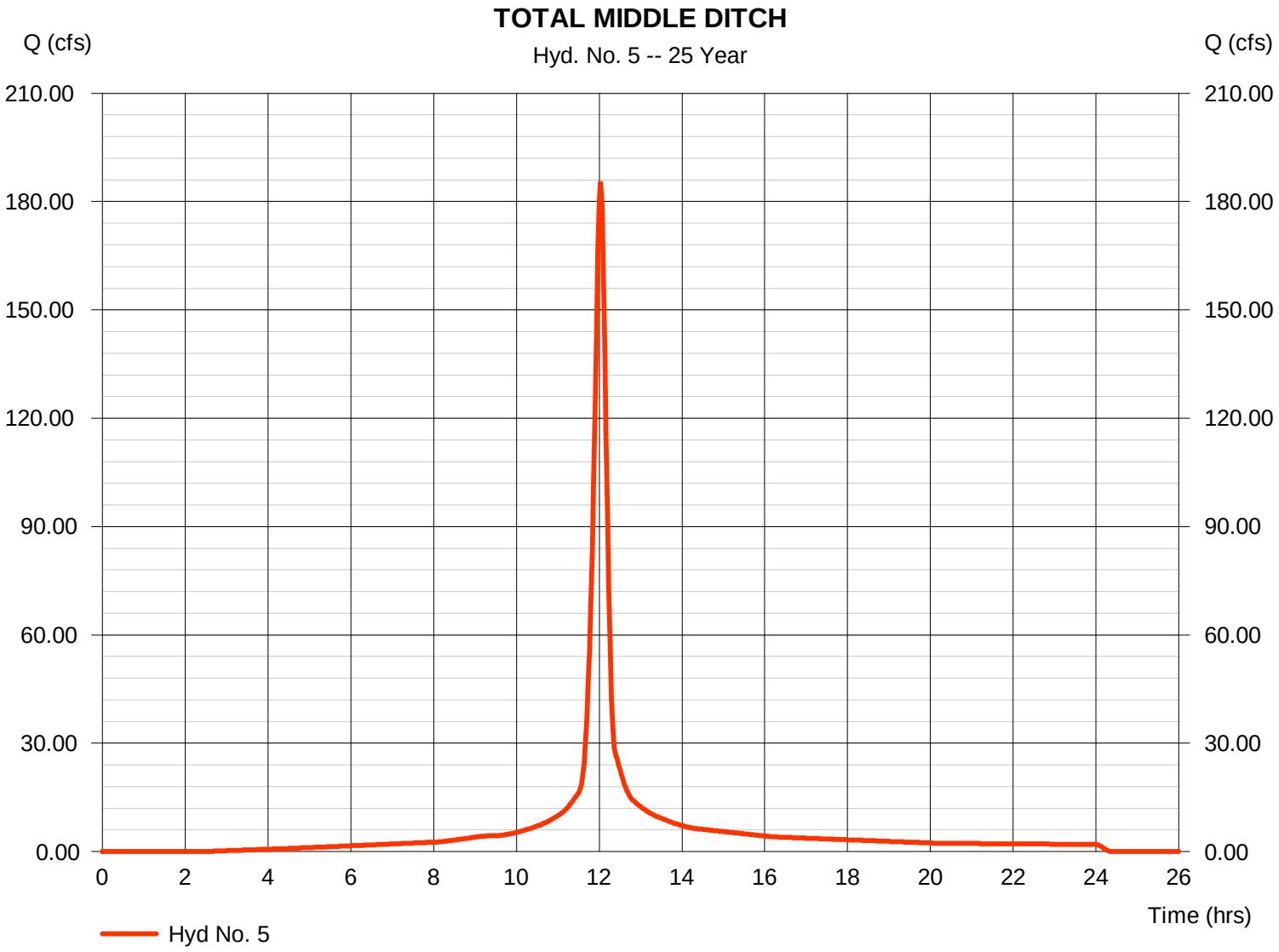


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 185.57 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 12.916 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



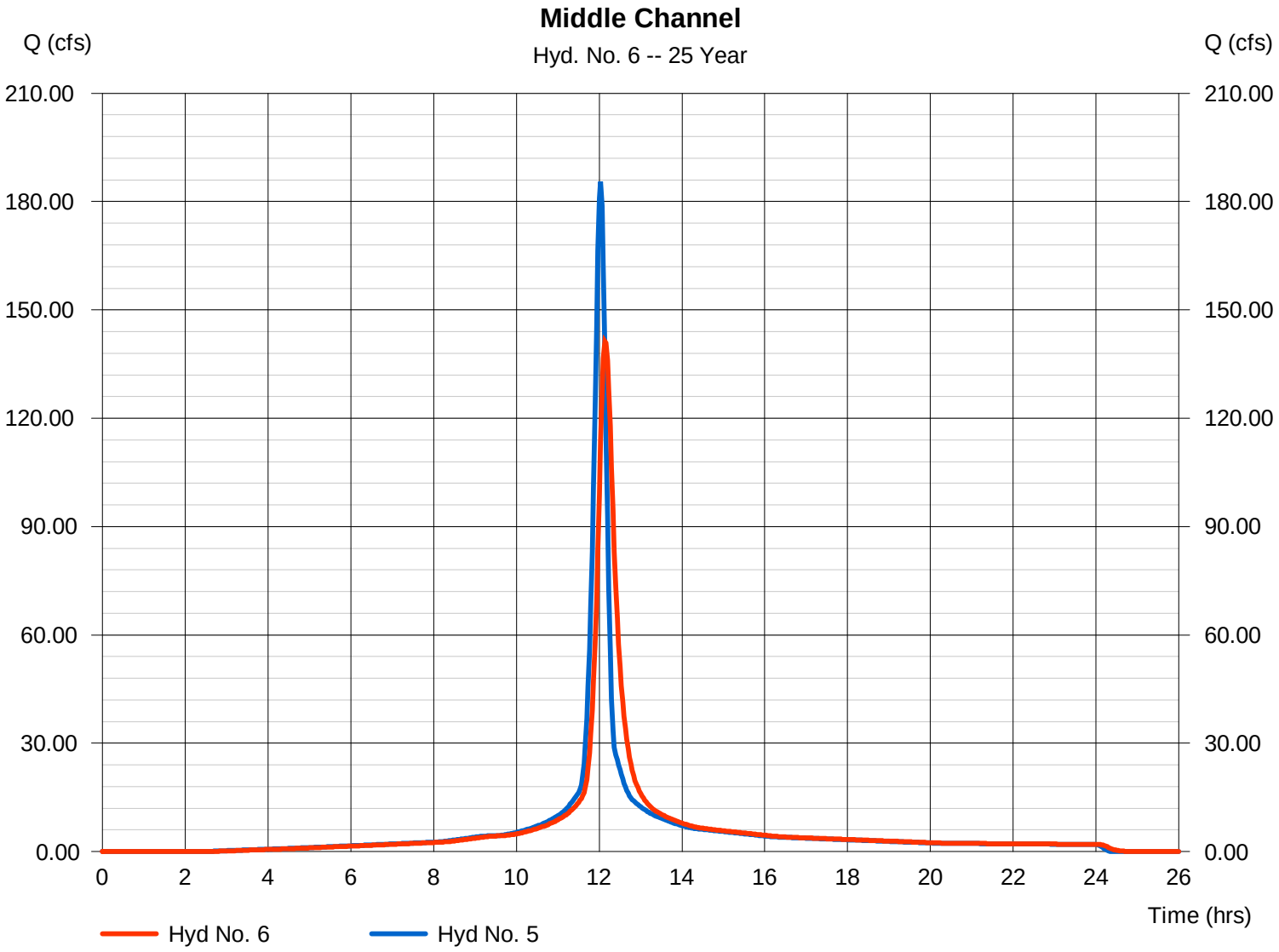
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	=	Reach	Peak discharge	=	141.25 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	12.916 acft
Inflow hyd. No.	=	5 - TOTAL MIDDLE DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.57 ft/s	Routing coeff.	=	0.1848

Modified Att-Kin routing method used.

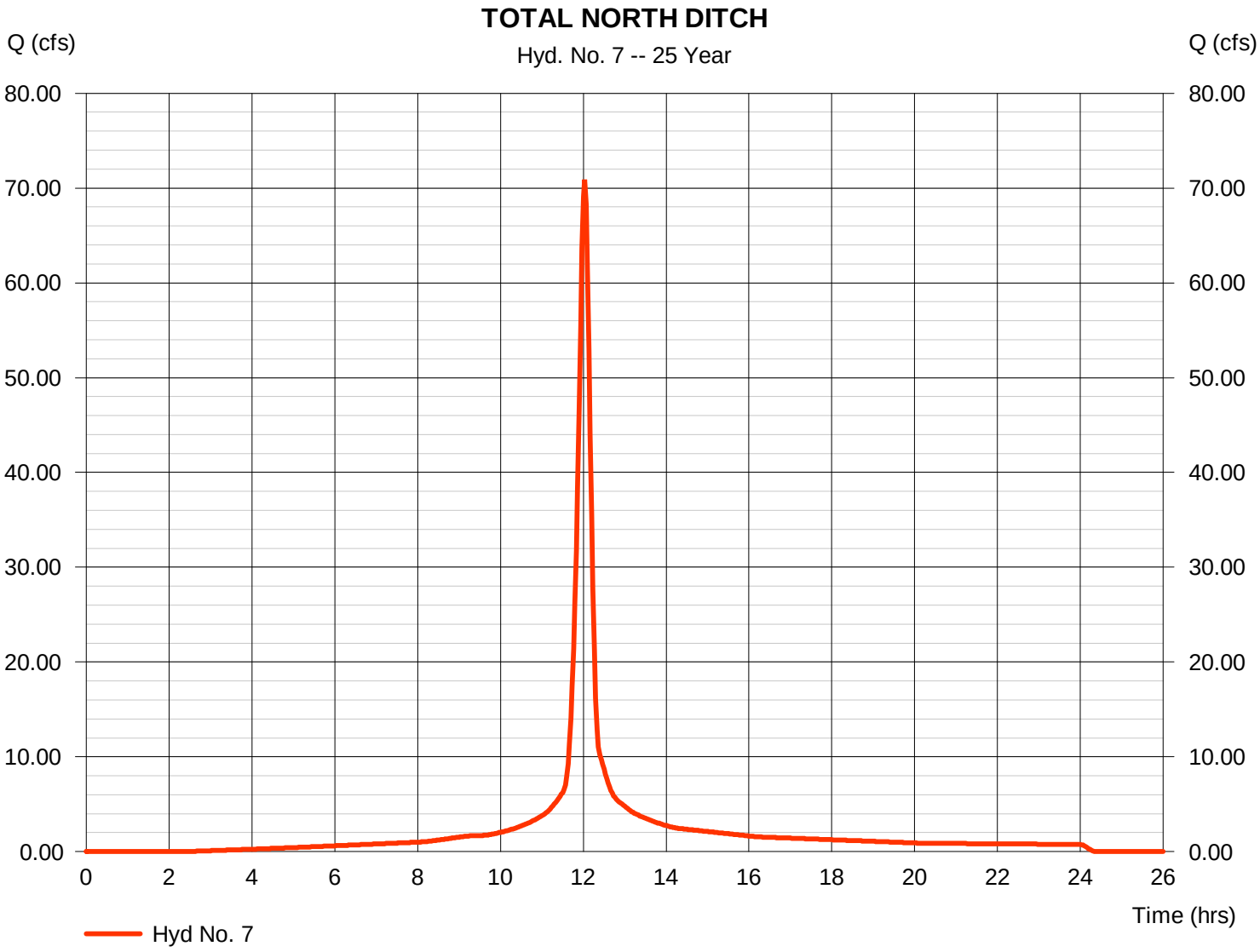


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 70.90 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 4.935 acft
Drainage area	= 11.500 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



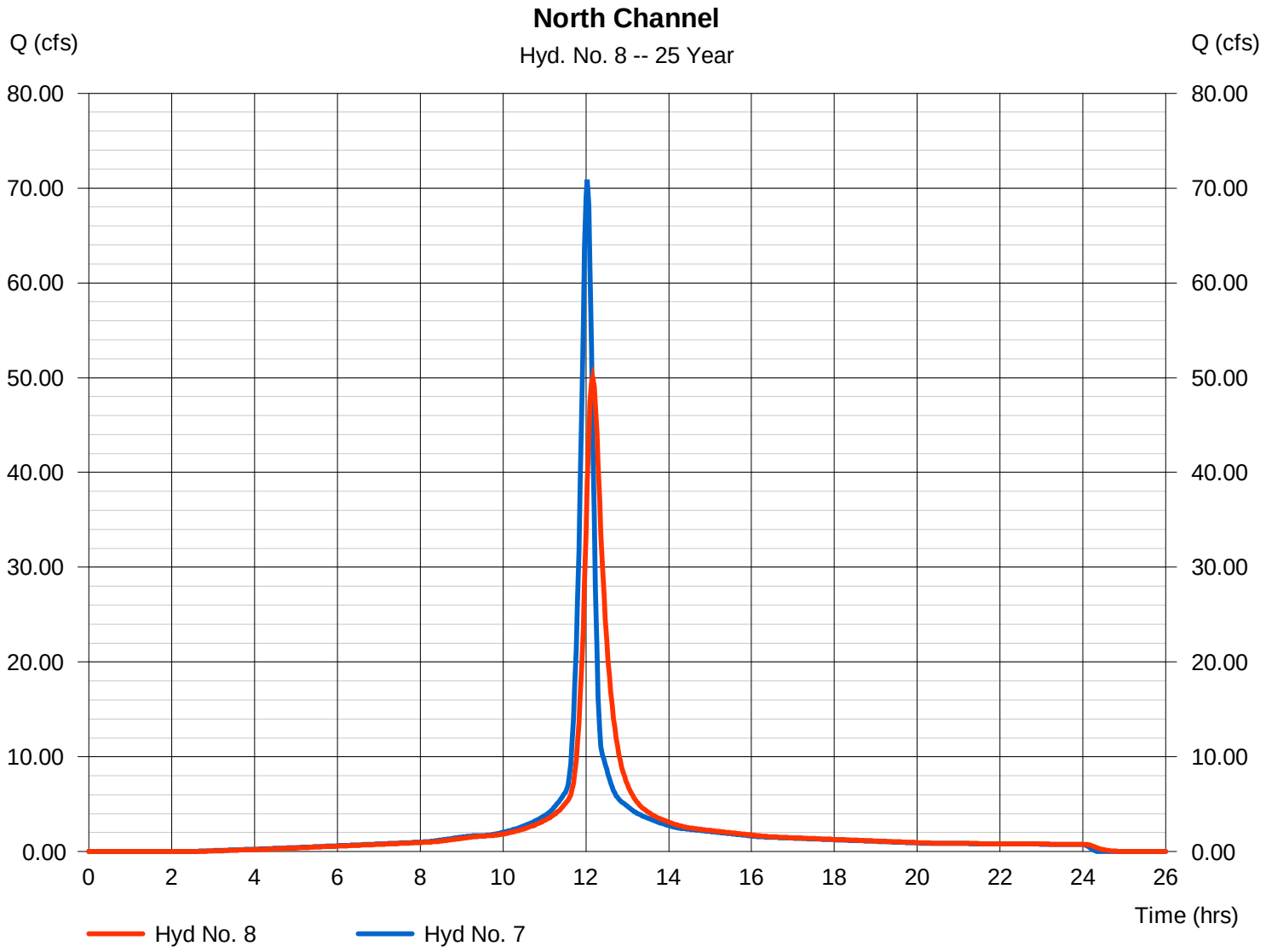
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	50.04 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	4.935 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.03 ft/s	Routing coeff.	=	0.1491

Modified Att-Kin routing method used.

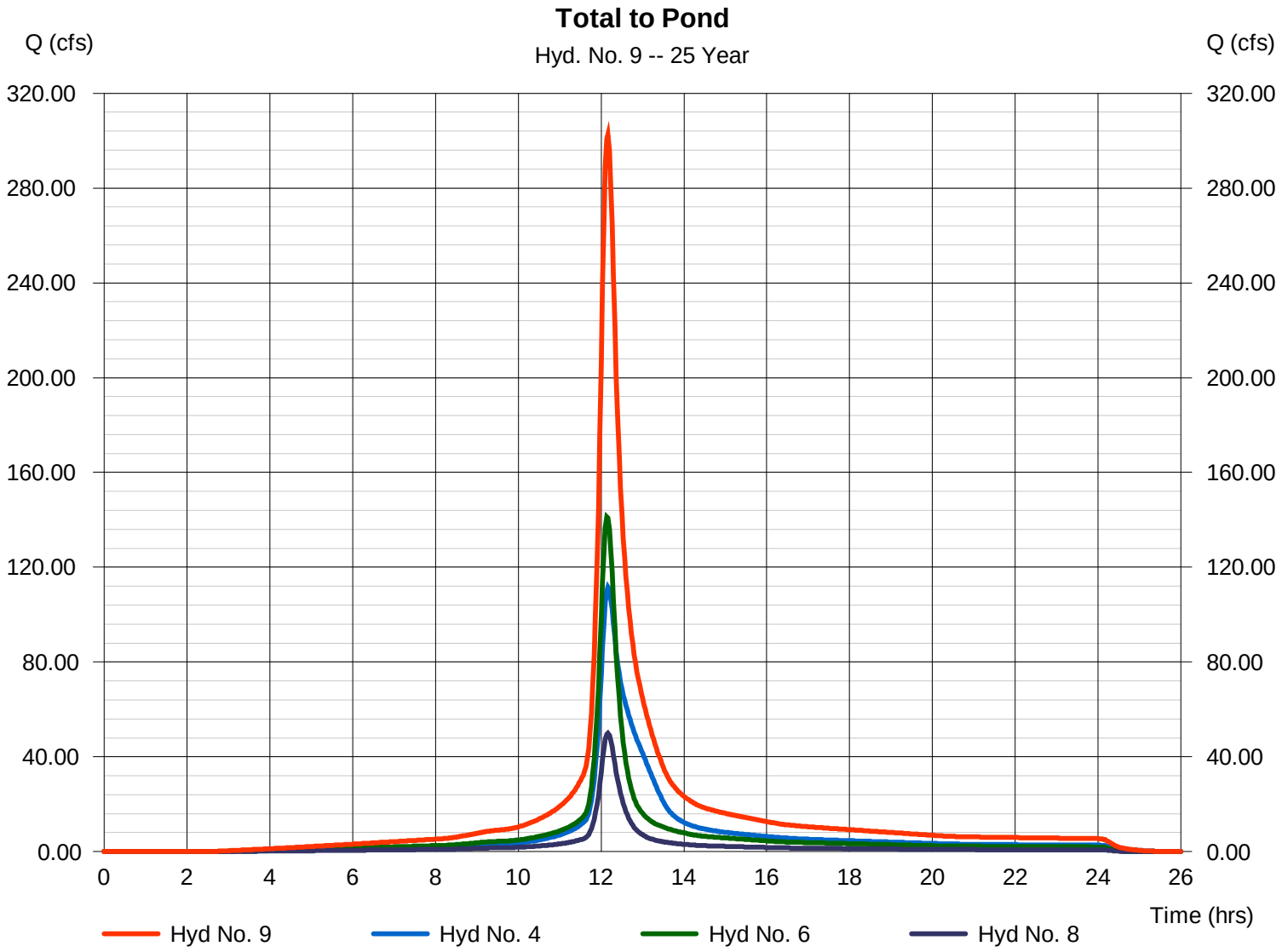


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 302.48 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 32.658 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



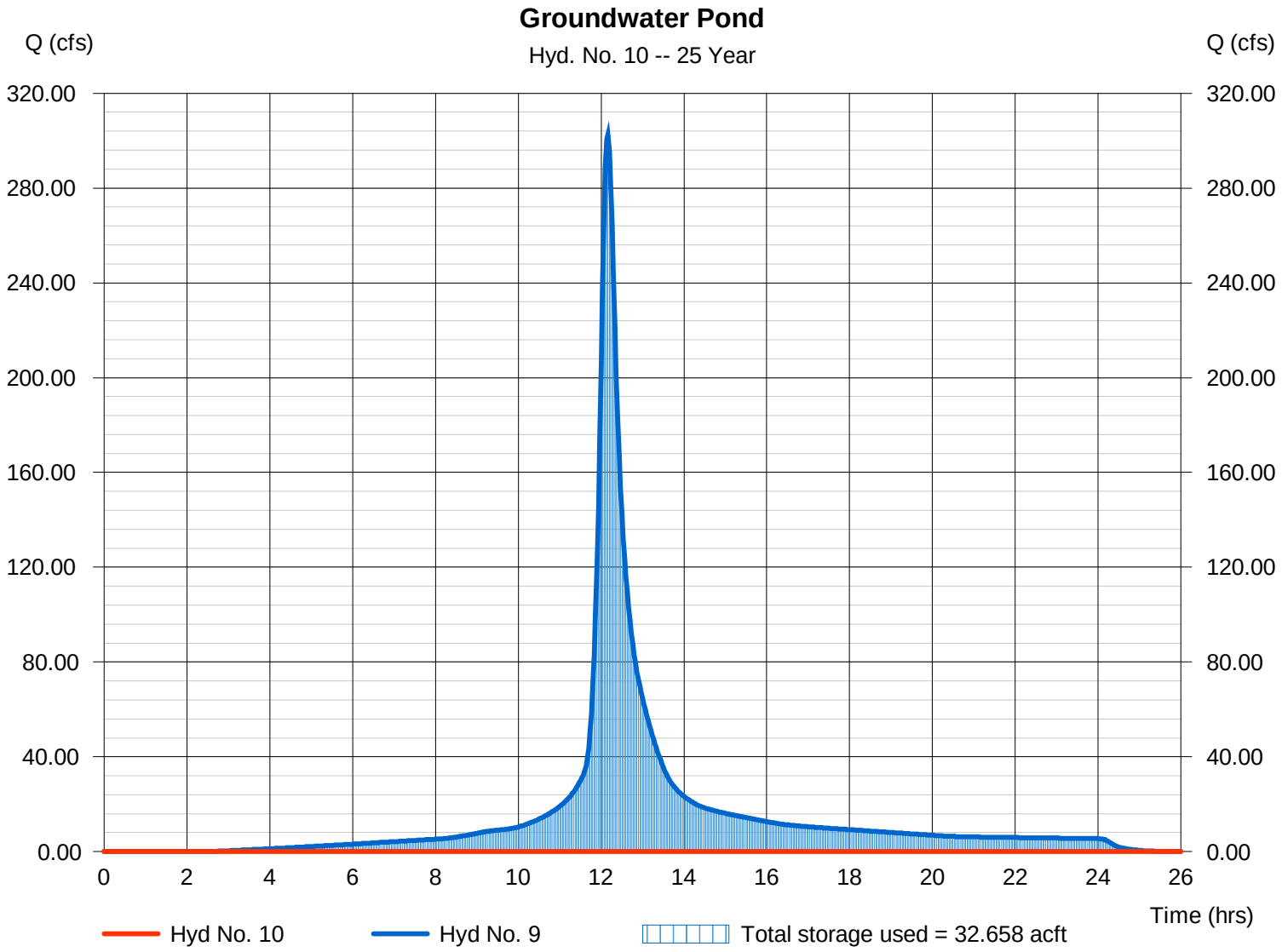
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1328.71 ft
Reservoir name	= <New Pond>	Max. Storage	= 32.658 acft

Storage Indication method used.

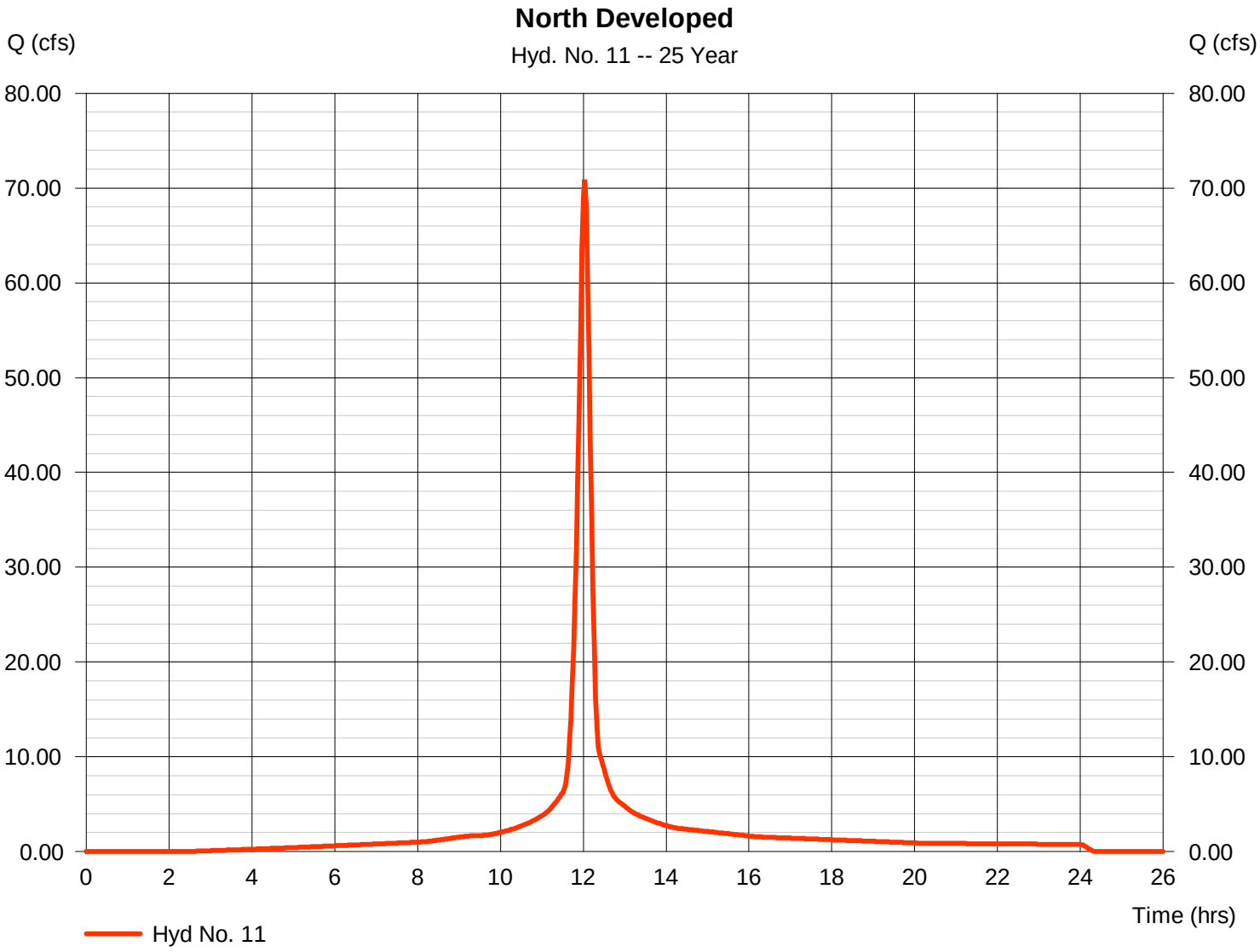


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	70.90 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.935 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

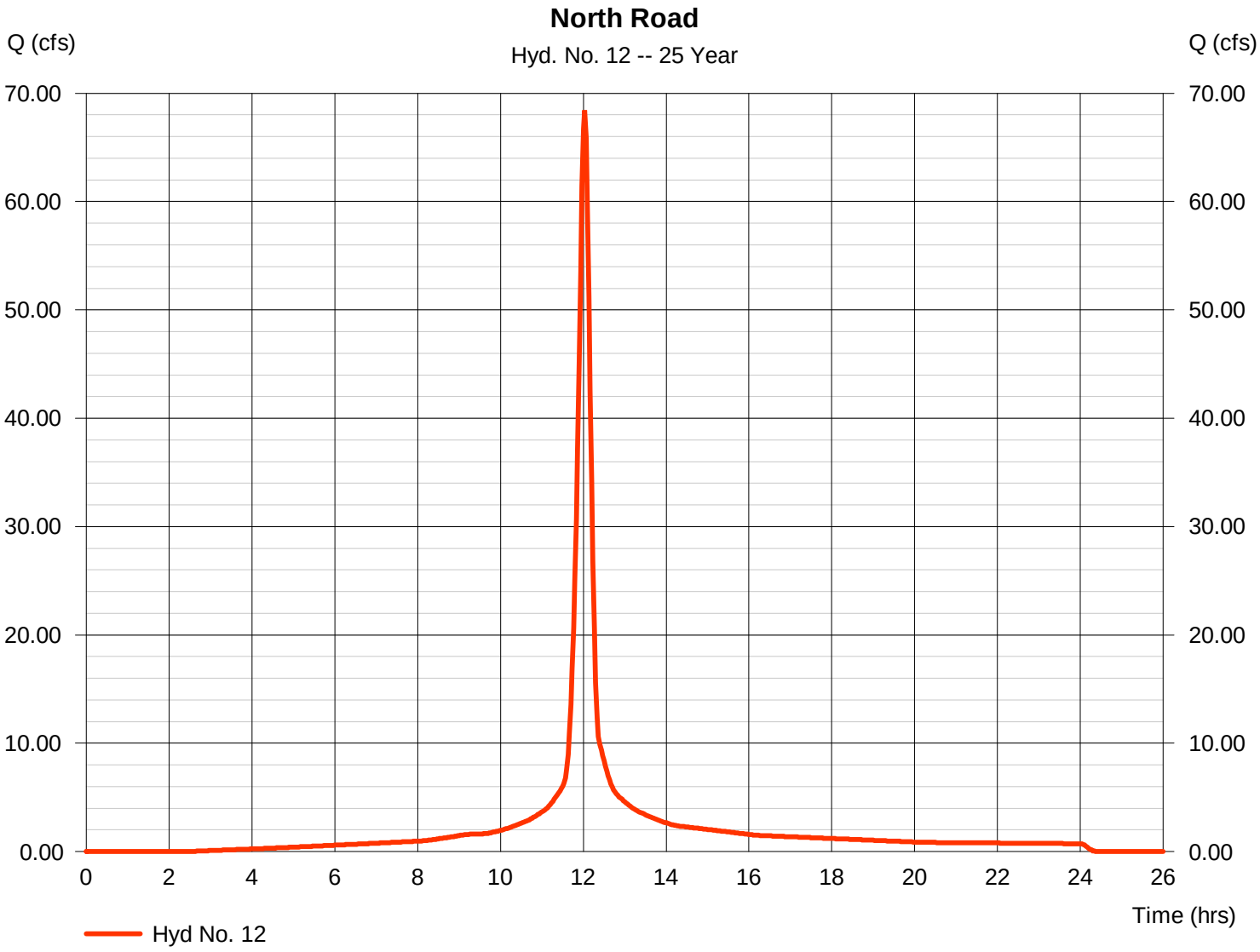


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	68.43 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.763 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

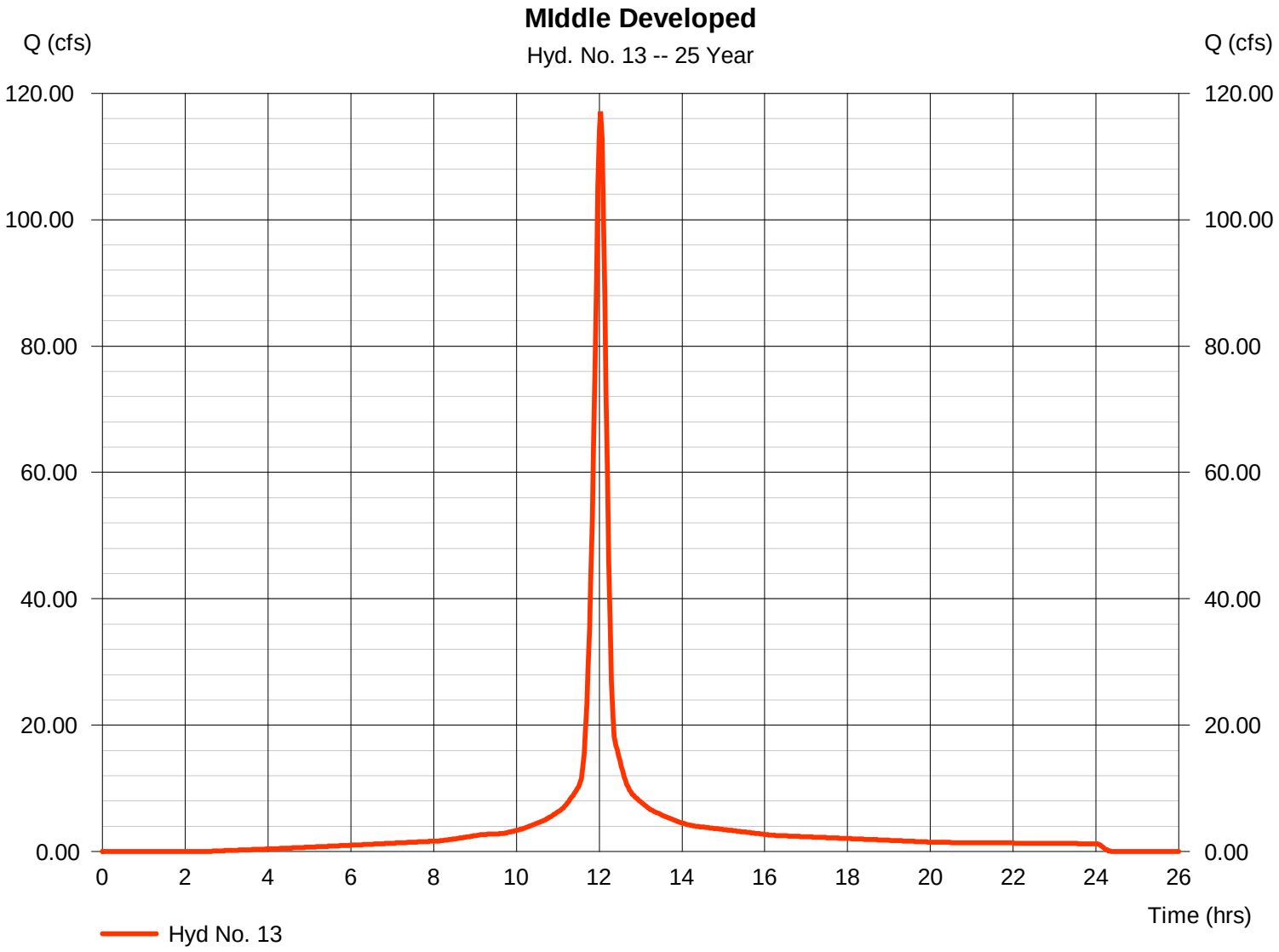


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	117.13 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	8.153 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

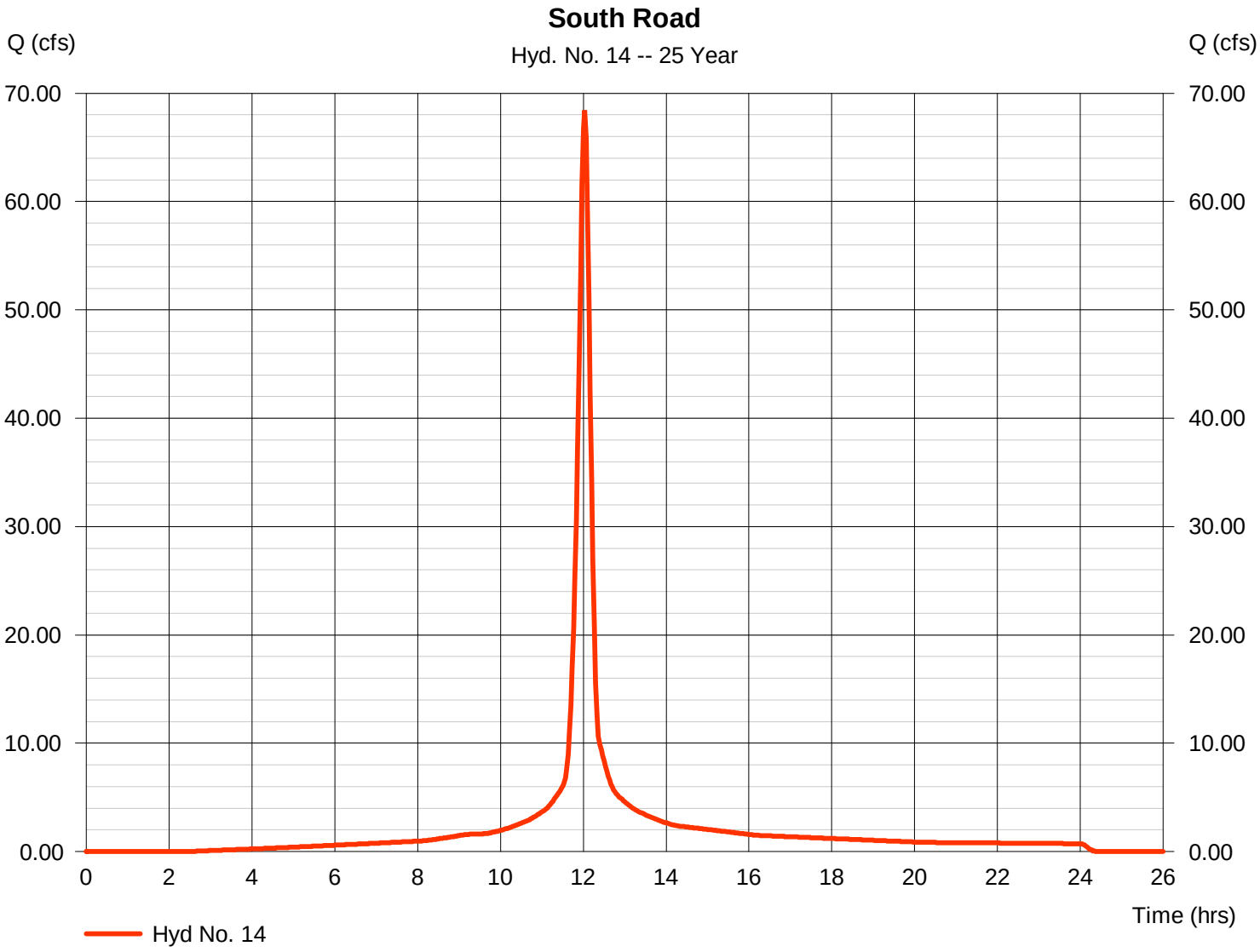


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	68.43 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.763 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

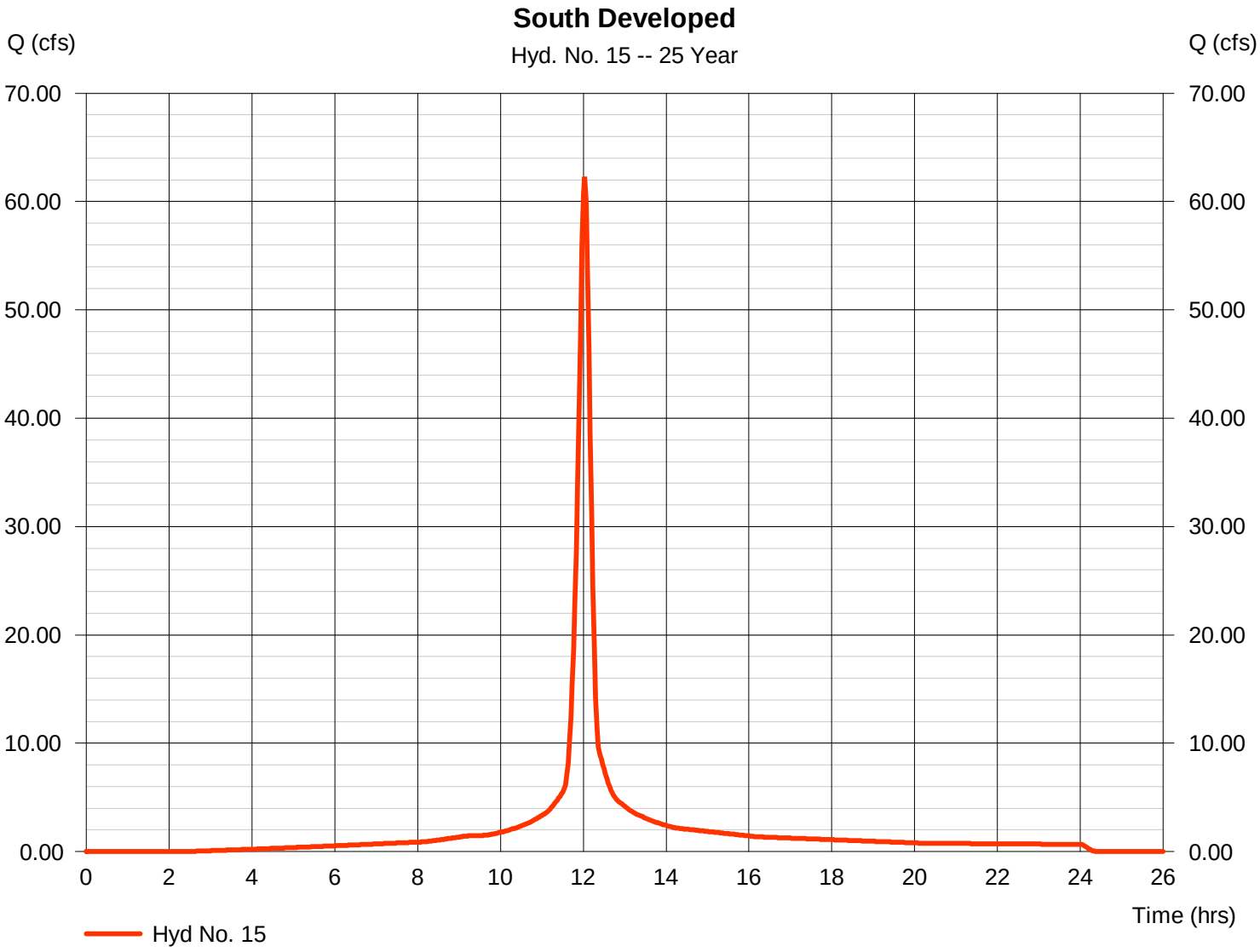


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	62.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	4.334 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

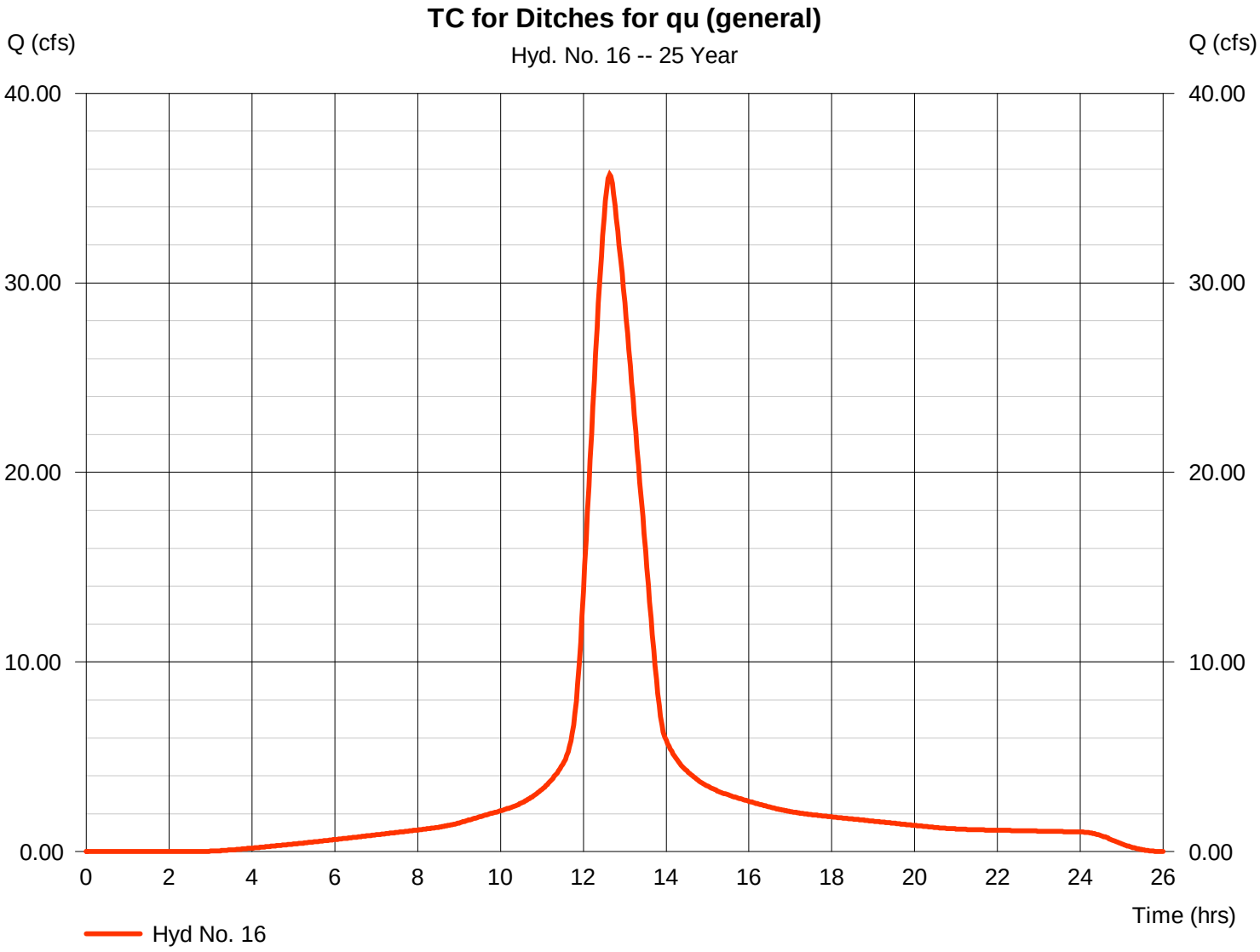


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.72 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.63 hrs
Time interval	=	2 min	Hyd. volume	=	6.566 acft
Drainage area	=	15.000 ac	Curve number	=	93
Basin Slope	=	0.2 %	Hydraulic length	=	2000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

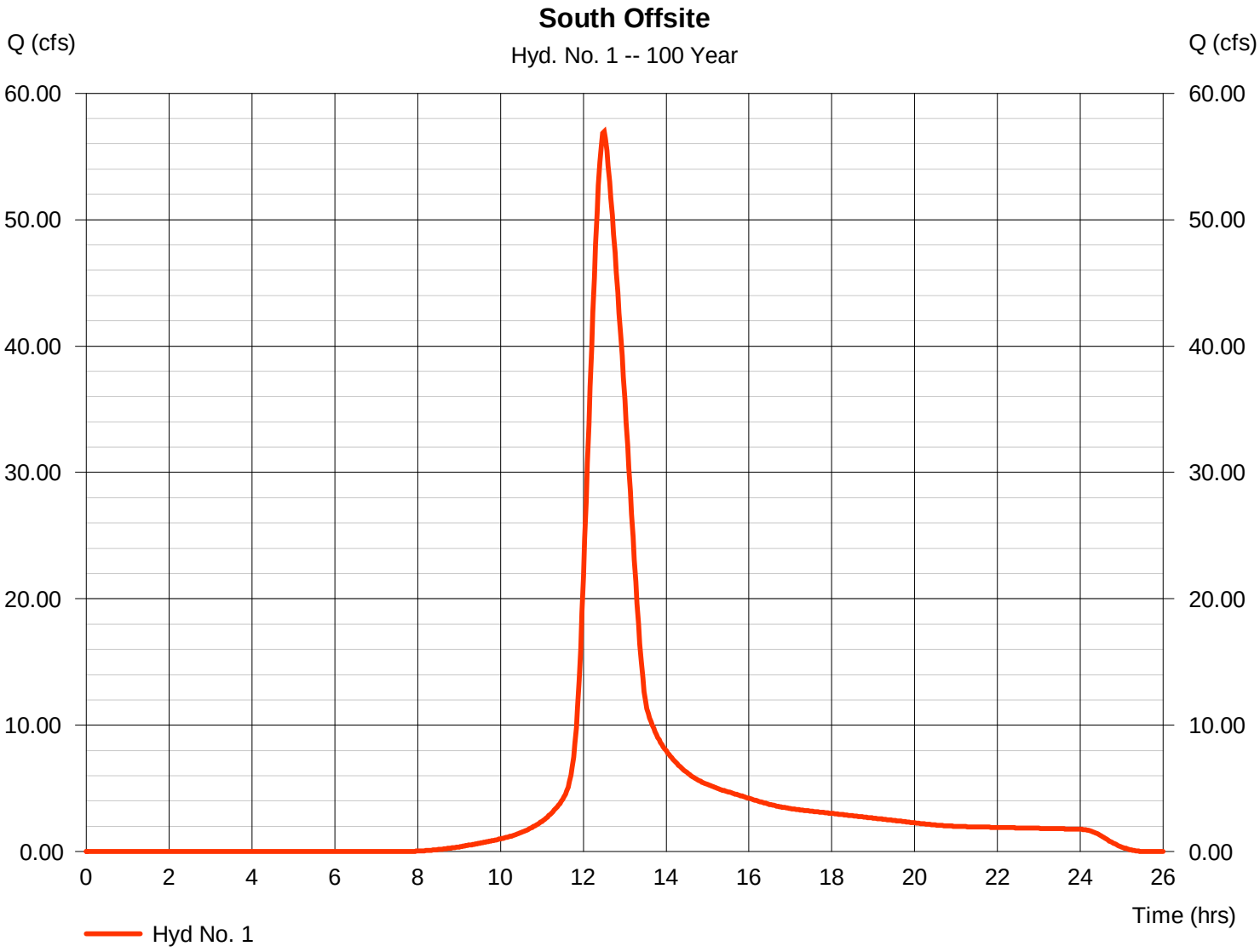
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	56.97	2	750	8.445	------	------	------	South Offsite
2	SCS Runoff	169.71	2	722	11.996	------	------	------	TOTAL SOUTH DITCH
3	Combine	194.46	2	722	20.441	1, 2	------	------	Total to South Ditch
4	Reach	152.13	2	730	20.441	3	------	------	South Channel
5	SCS Runoff	240.95	2	722	17.032	------	------	------	TOTAL MIDDLE DITCH
6	Reach	187.47	2	728	17.032	5	------	------	Middle Channel
7	SCS Runoff	92.06	2	722	6.507	------	------	------	TOTAL NORTH DITCH
8	Reach	66.48	2	730	6.507	7	------	------	North Channel
9	Combine	404.57	2	730	43.979	4, 6, 8	------	------	Total to Pond
10	Reservoir	6.463	2	1450	2.893	9	1330.19	42.4	Groundwater Pond
11	SCS Runoff	92.06	2	722	6.507	------	------	------	North Developed
12	SCS Runoff	88.86	2	722	6.281	------	------	------	North Road
13	SCS Runoff	152.09	2	722	10.751	------	------	------	MIddle Developed
14	SCS Runoff	88.86	2	722	6.281	------	------	------	South Road
15	SCS Runoff	80.85	2	722	5.715	------	------	------	South Developed
16	SCS Runoff	46.52	2	758	8.658	------	------	------	TC for Ditches for qu (general)

Hydrograph Report

Hyd. No. 1

South Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.97 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	8.445 acft
Drainage area	=	23.000 ac	Curve number	=	71
Basin Slope	=	0.5 %	Hydraulic length	=	1000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	58.40 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

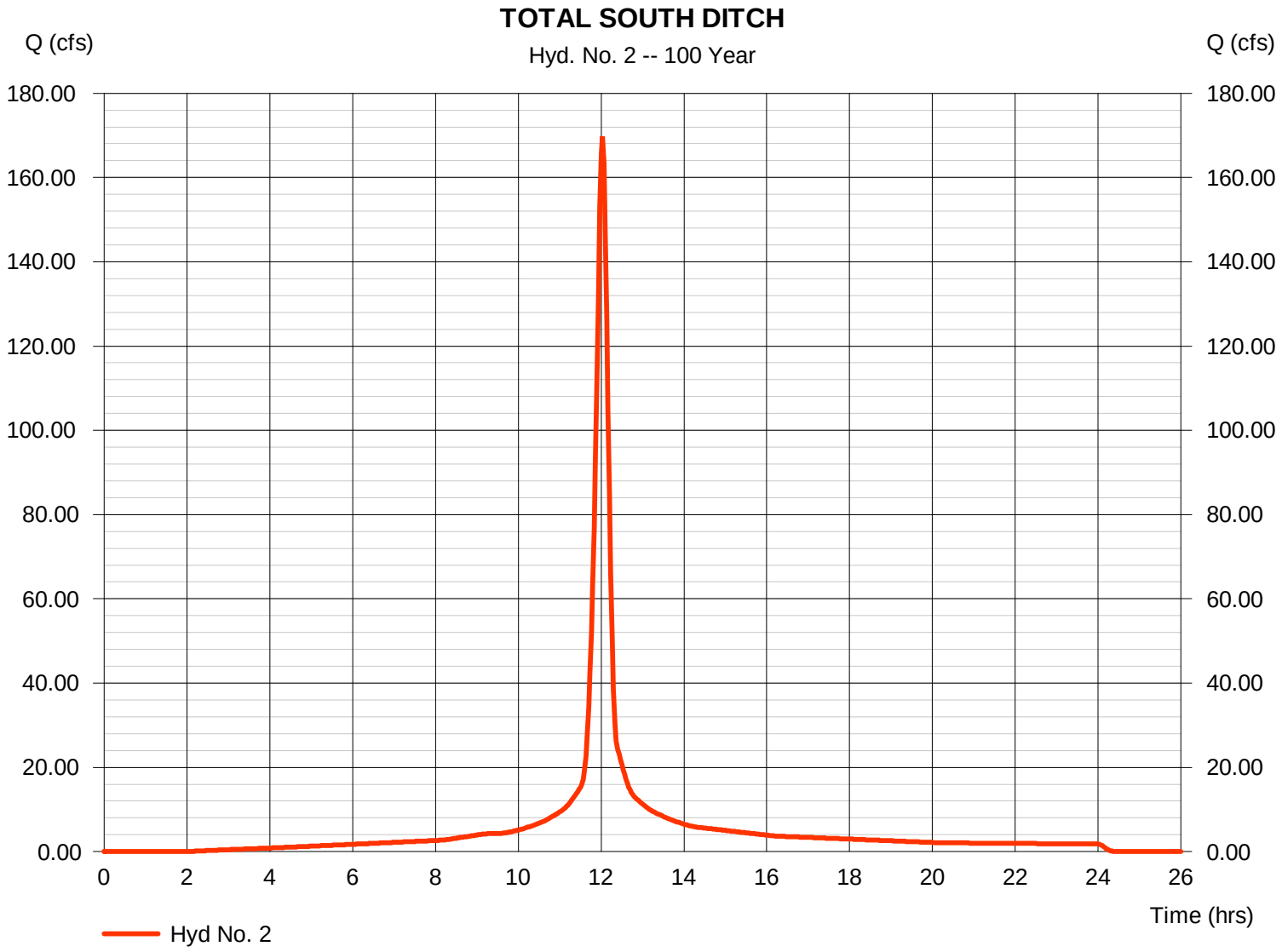


Hydrograph Report

Hyd. No. 2

TOTAL SOUTH DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 169.71 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 11.996 acft
Drainage area	= 21.200 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 300 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

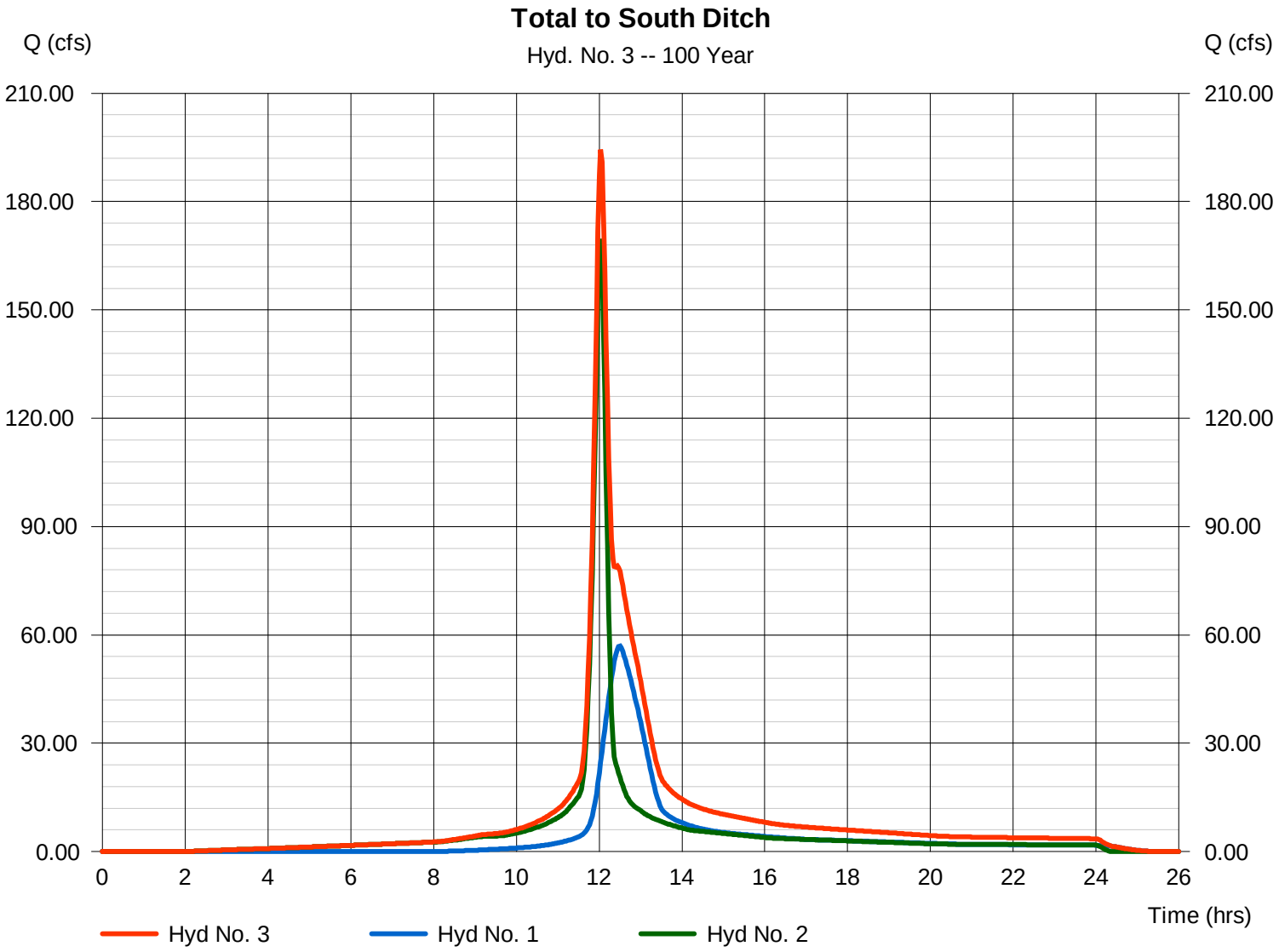


Hydrograph Report

Hyd. No. 3

Total to South Ditch

Hydrograph type	= Combine	Peak discharge	= 194.46 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 20.441 acft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 44.200 ac



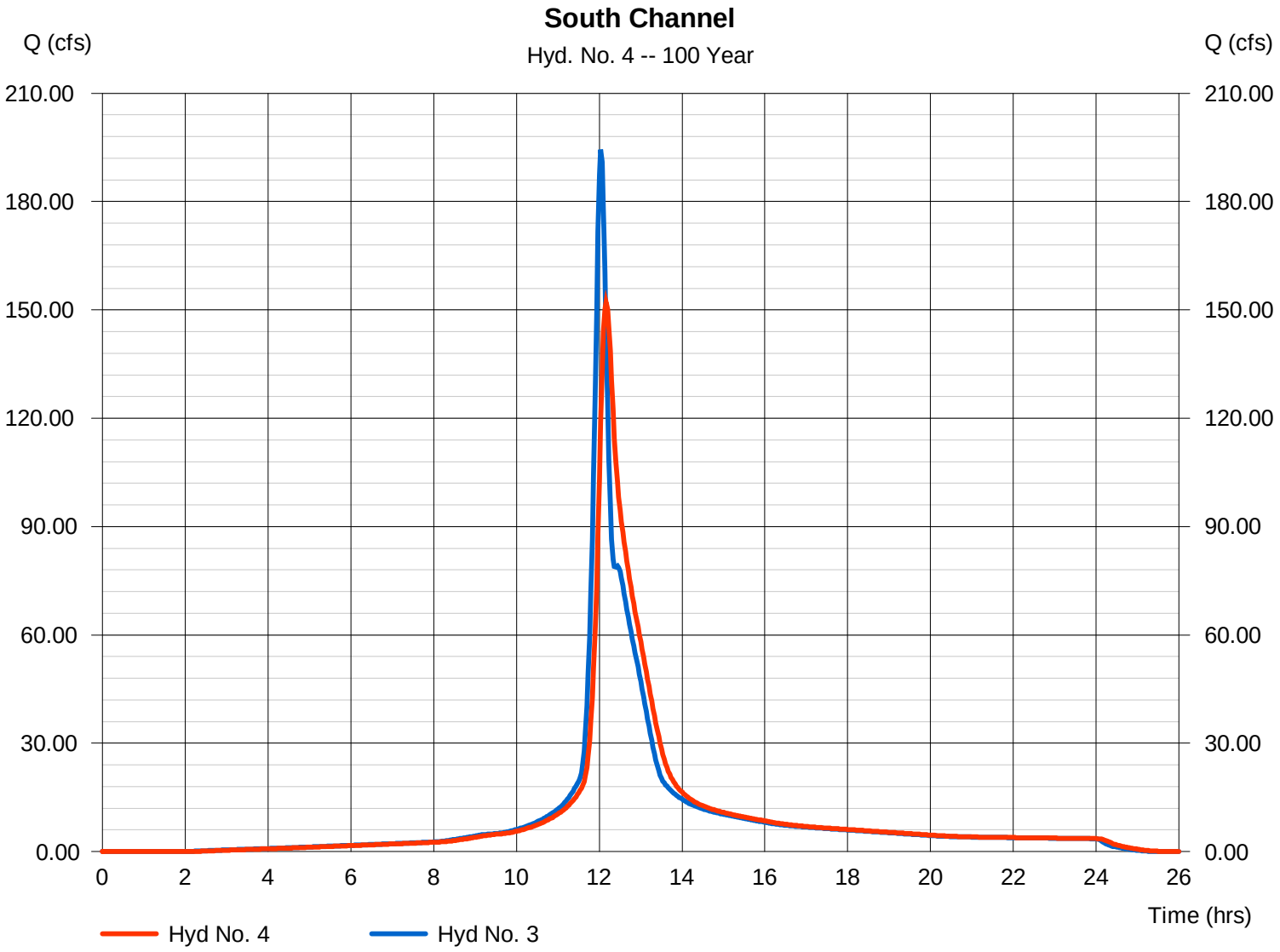
Hydrograph Report

Hyd. No. 4

South Channel

Hydrograph type	=	Reach	Peak discharge	=	152.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	20.441 acft
Inflow hyd. No.	=	3 - Total to South Ditch	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.60 ft/s	Routing coeff.	=	0.1867

Modified Att-Kin routing method used.

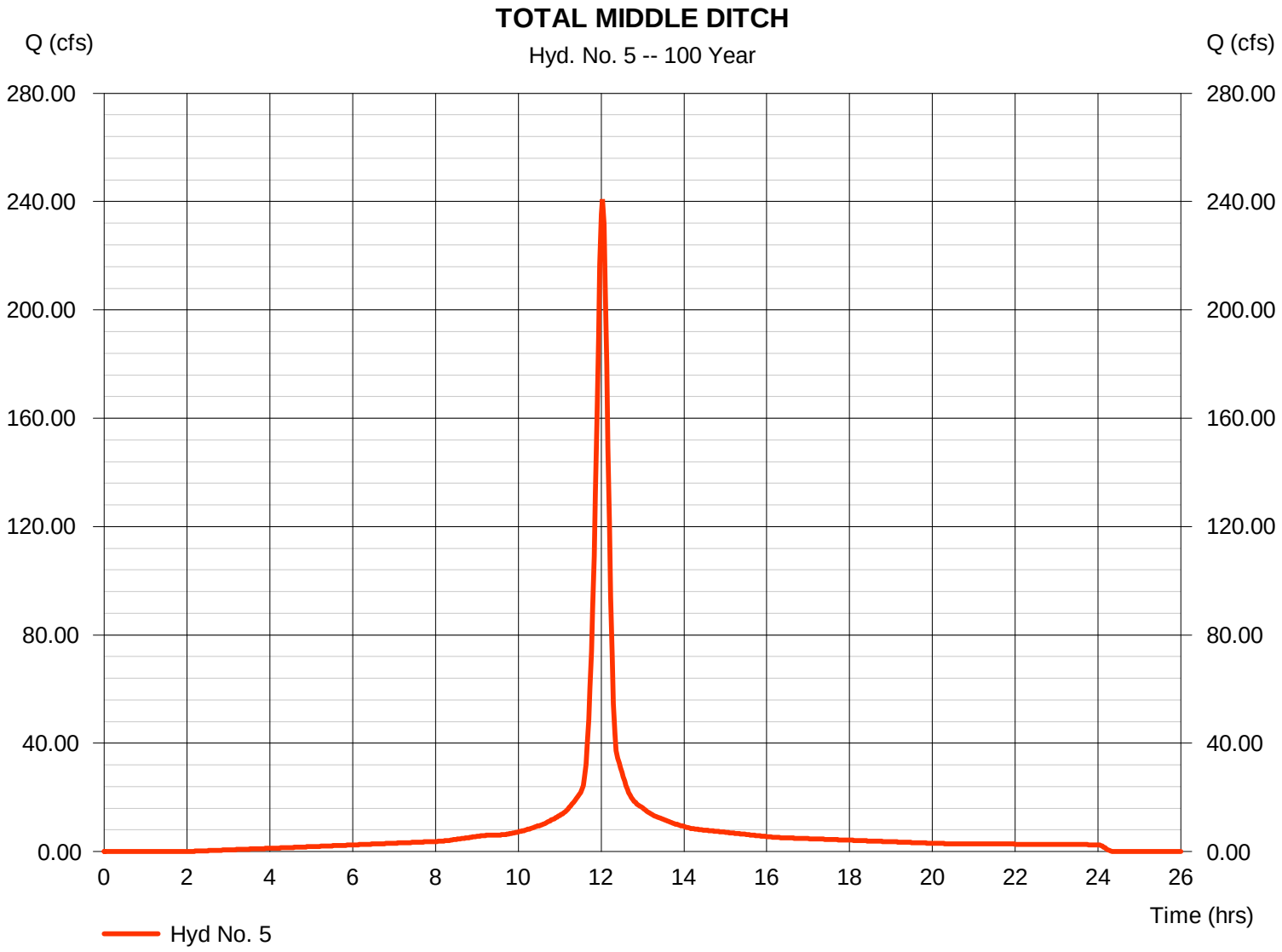


Hydrograph Report

Hyd. No. 5

TOTAL MIDDLE DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 240.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 17.032 acft
Drainage area	= 30.100 ac	Curve number	= 93
Basin Slope	= 0.5 %	Hydraulic length	= 200 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



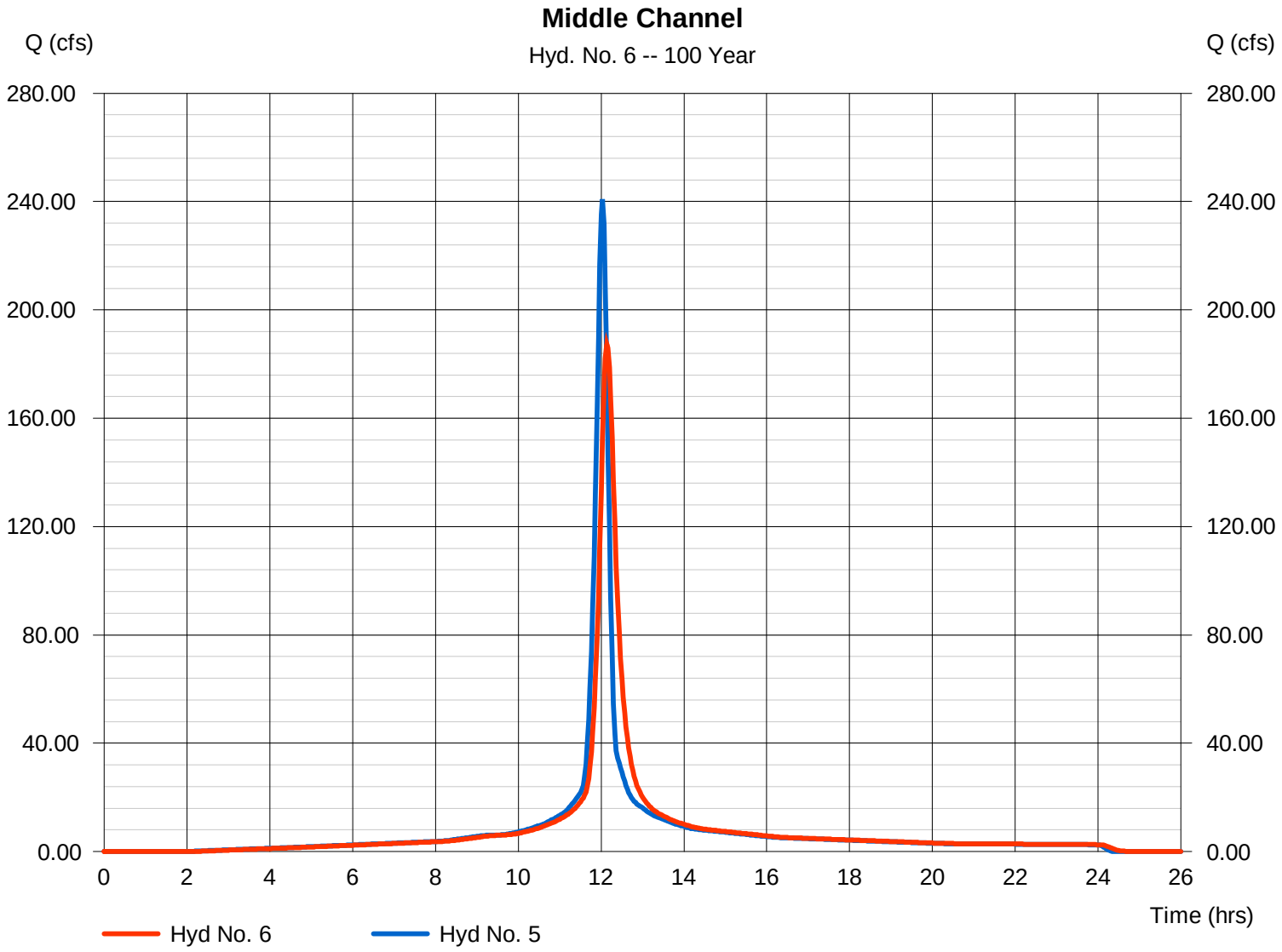
Hydrograph Report

Hyd. No. 6

Middle Channel

Hydrograph type	=	Reach	Peak discharge	=	187.47 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	17.032 acft
Inflow hyd. No.	=	5 - TOTAL MIDDLE DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.74 ft/s	Routing coeff.	=	0.1957

Modified Att-Kin routing method used.

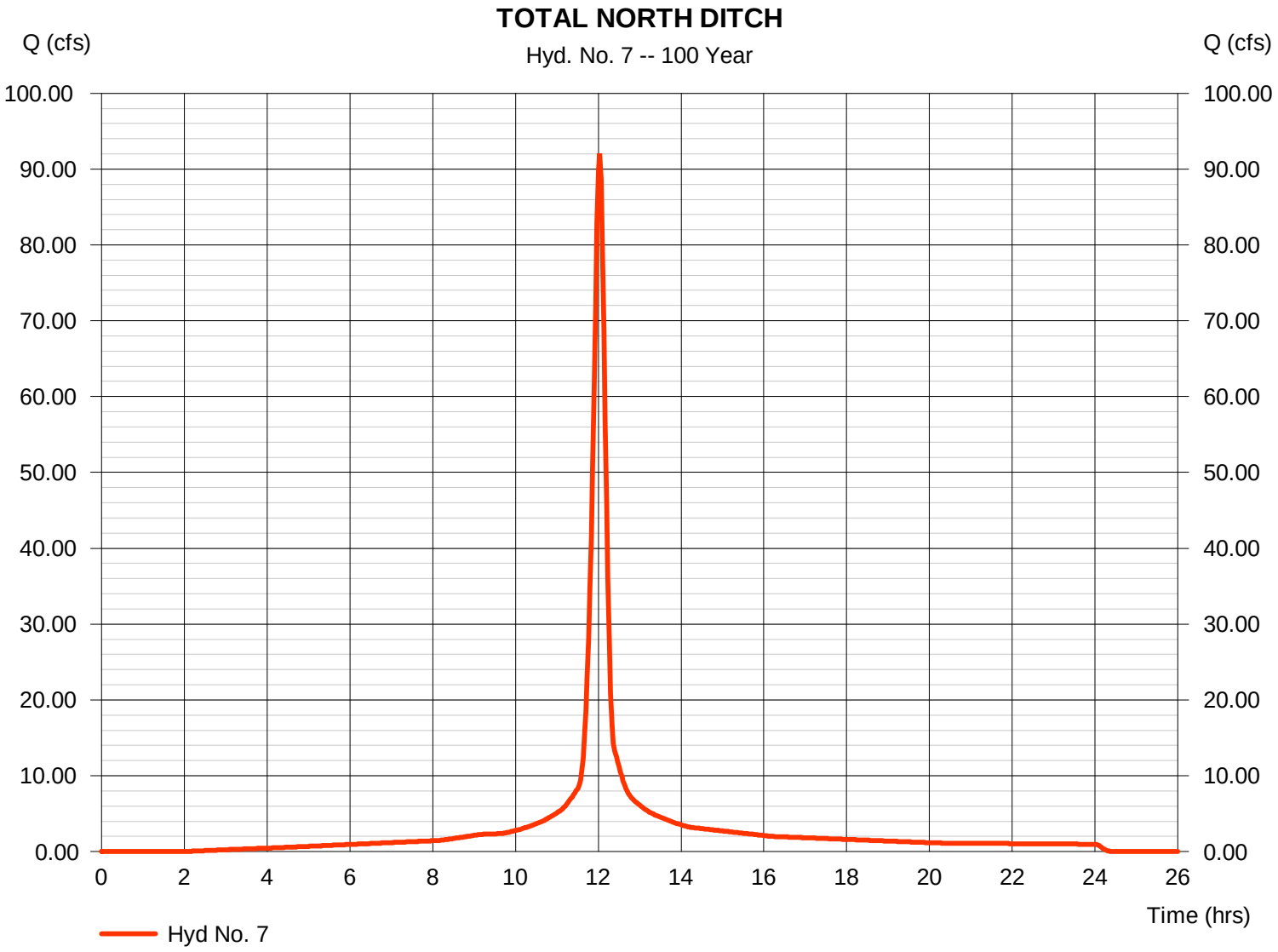


Hydrograph Report

Hyd. No. 7

TOTAL NORTH DITCH

Hydrograph type	=	SCS Runoff	Peak discharge	=	92.06 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.507 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



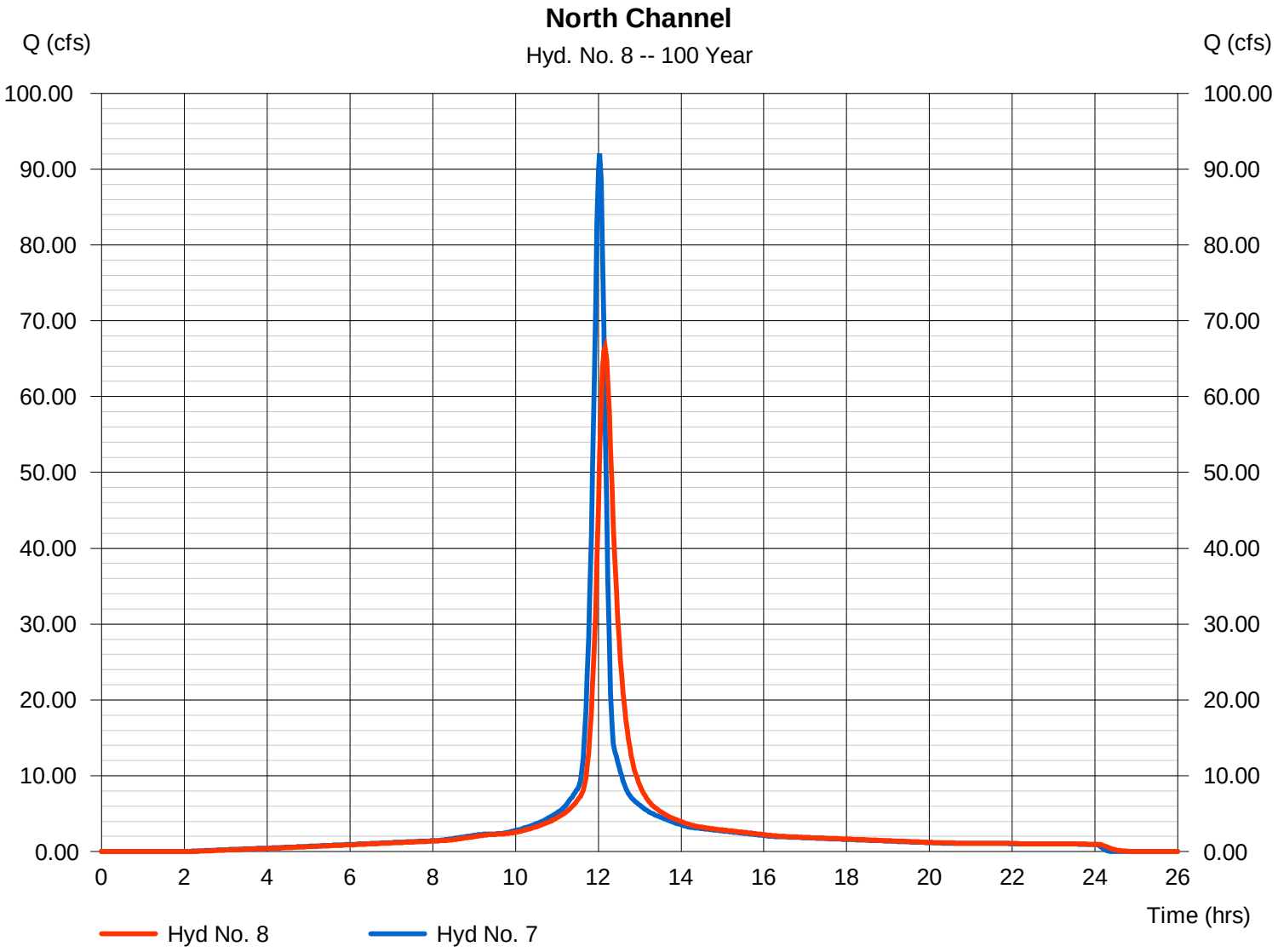
Hydrograph Report

Hyd. No. 8

North Channel

Hydrograph type	=	Reach	Peak discharge	=	66.48 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	6.507 acft
Inflow hyd. No.	=	7 - TOTAL NORTH DITCH	Section type	=	Trapezoidal
Reach length	=	2000.0 ft	Channel slope	=	0.2 %
Manning's n	=	0.035	Bottom width	=	5.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	0.651	Rating curve m	=	1.321
Ave. velocity	=	2.17 ft/s	Routing coeff.	=	0.1581

Modified Att-Kin routing method used.

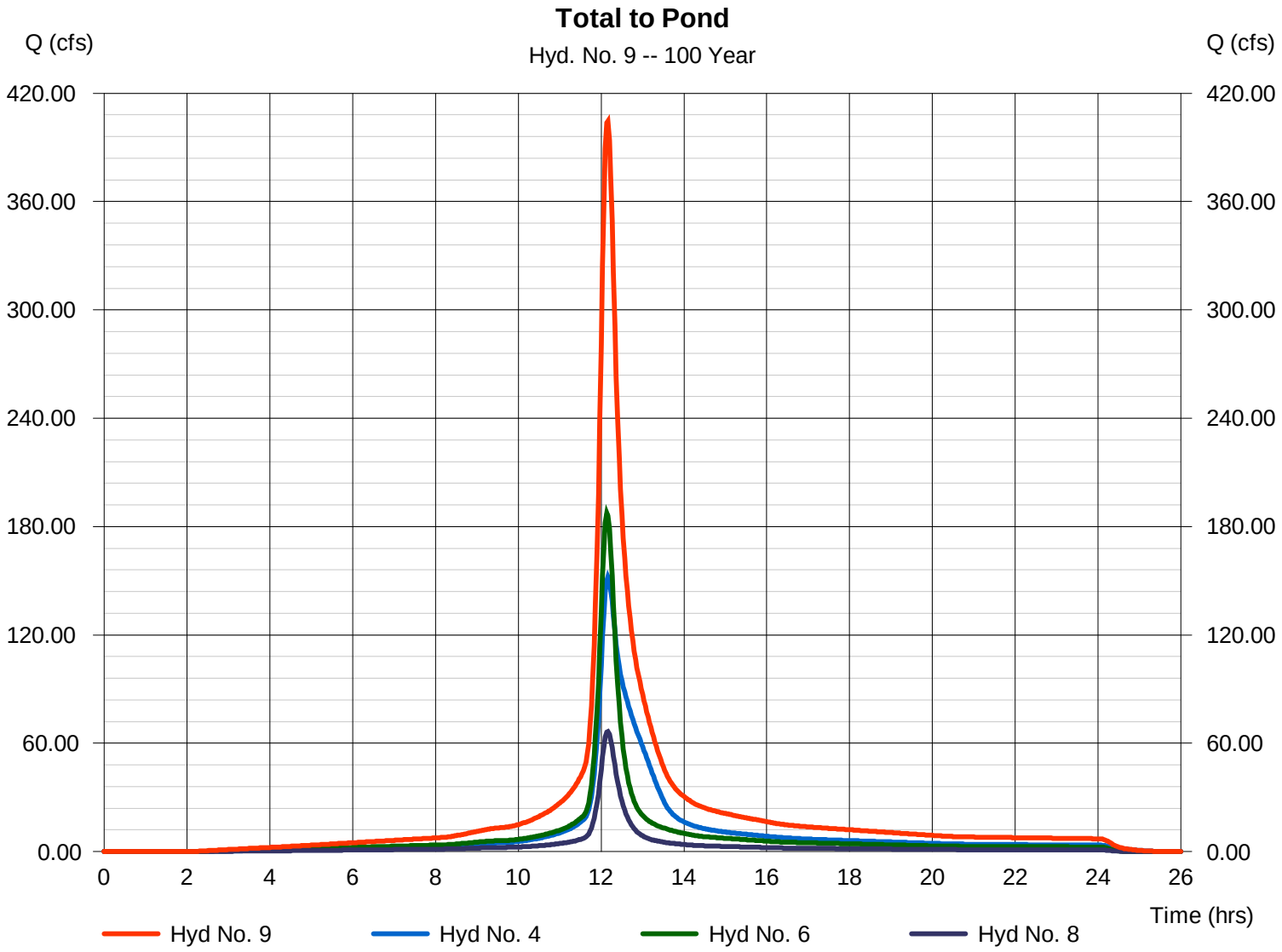


Hydrograph Report

Hyd. No. 9

Total to Pond

Hydrograph type	= Combine	Peak discharge	= 404.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 43.979 acft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 0.000 ac



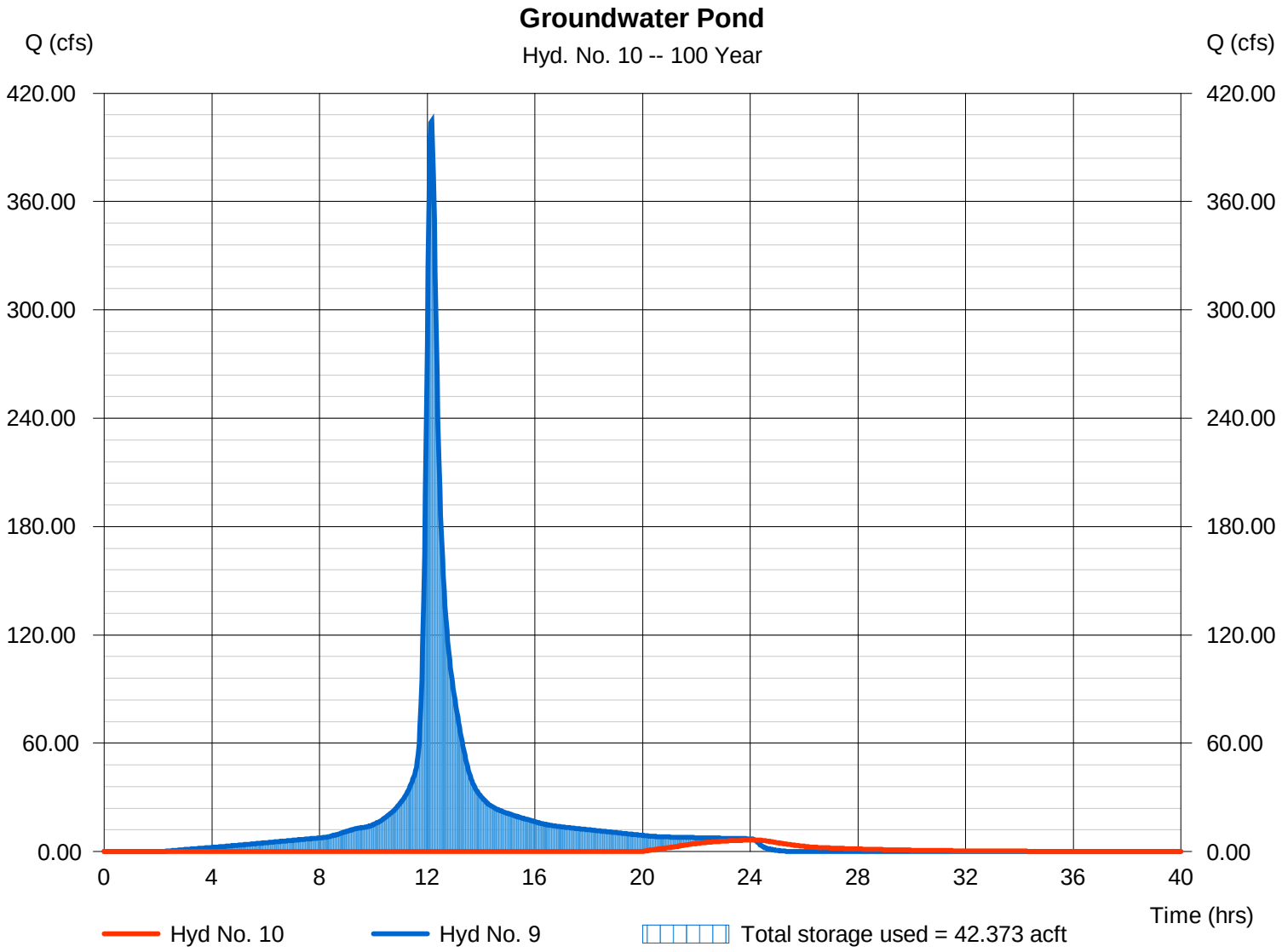
Hydrograph Report

Hyd. No. 10

Groundwater Pond

Hydrograph type	= Reservoir	Peak discharge	= 6.463 cfs
Storm frequency	= 100 yrs	Time to peak	= 24.17 hrs
Time interval	= 2 min	Hyd. volume	= 2.893 acft
Inflow hyd. No.	= 9 - Total to Pond	Max. Elevation	= 1330.19 ft
Reservoir name	= <New Pond>	Max. Storage	= 42.373 acft

Storage Indication method used.

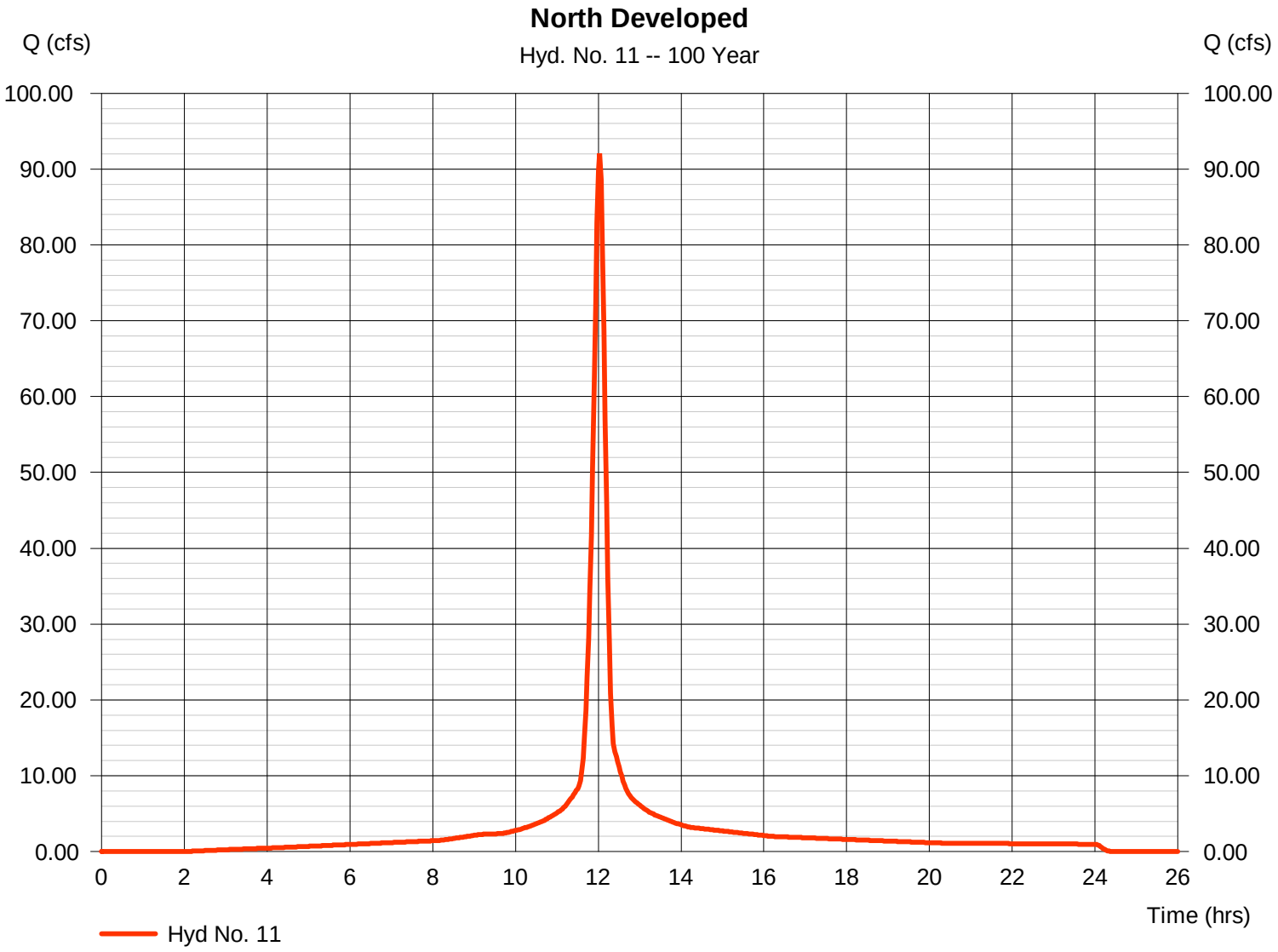


Hydrograph Report

Hyd. No. 11

North Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	92.06 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.507 acft
Drainage area	=	11.500 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

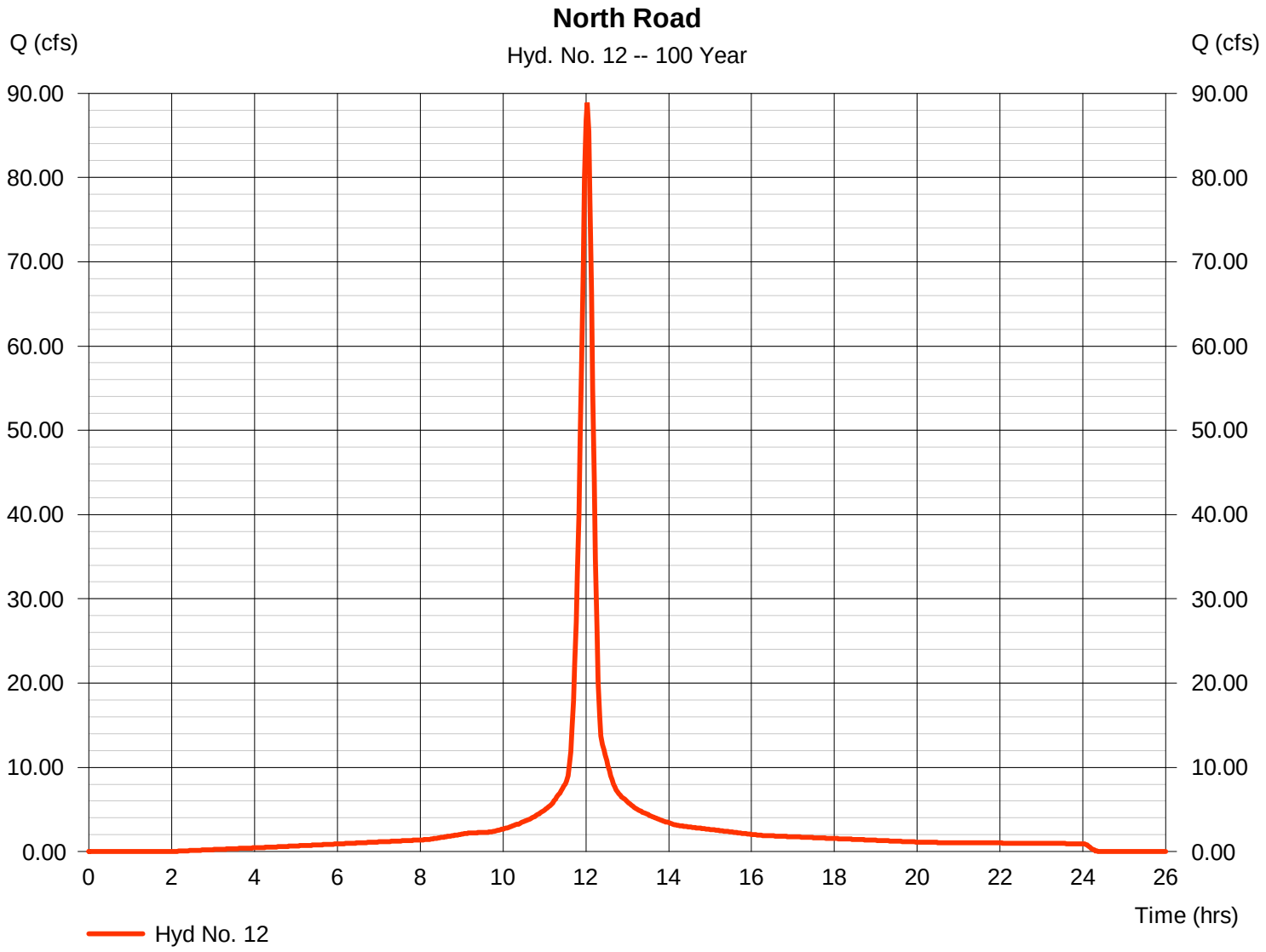


Hydrograph Report

Hyd. No. 12

North Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	88.86 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.281 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

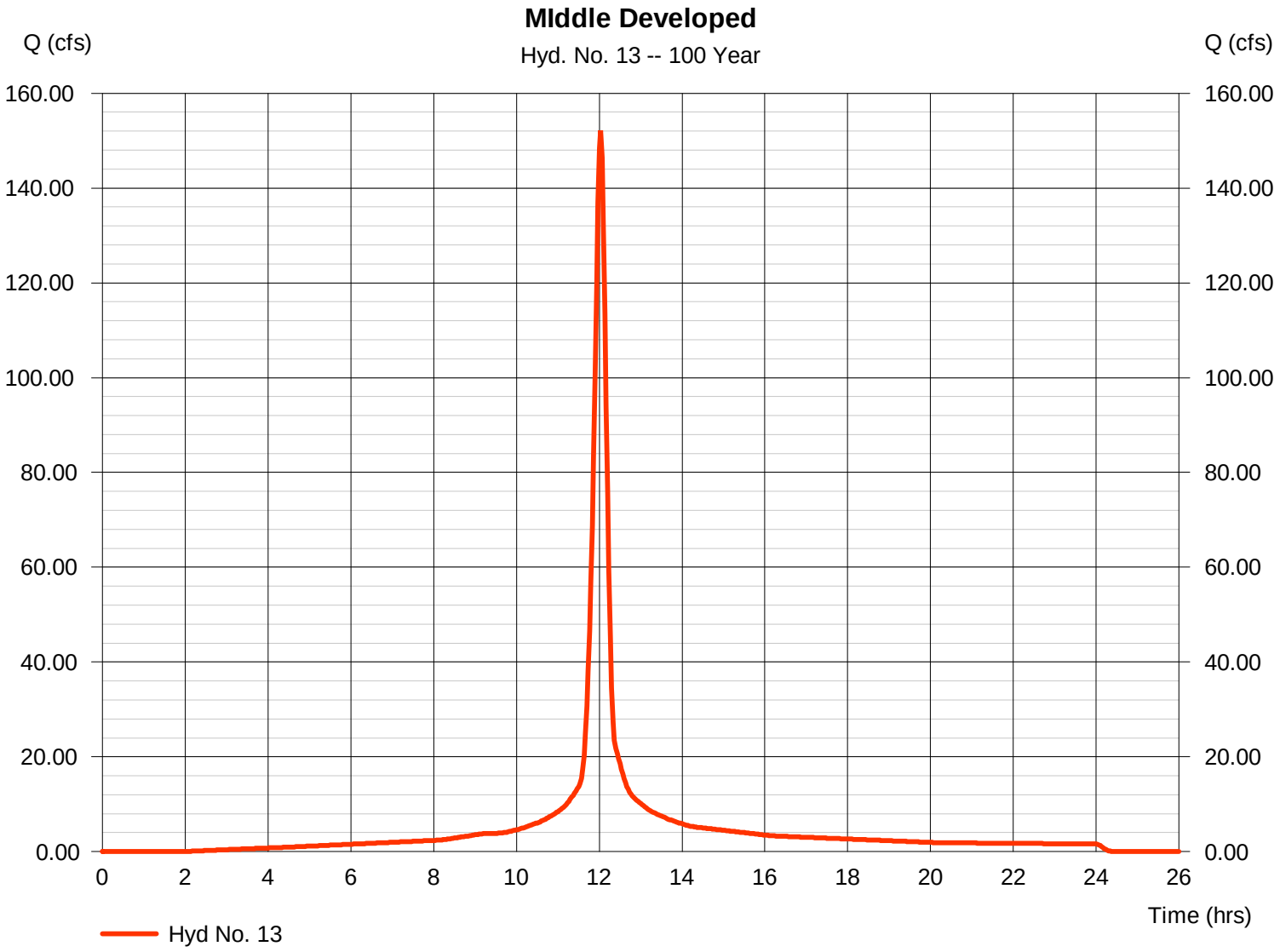


Hydrograph Report

Hyd. No. 13

MIddle Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	152.09 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	10.751 acft
Drainage area	=	19.000 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

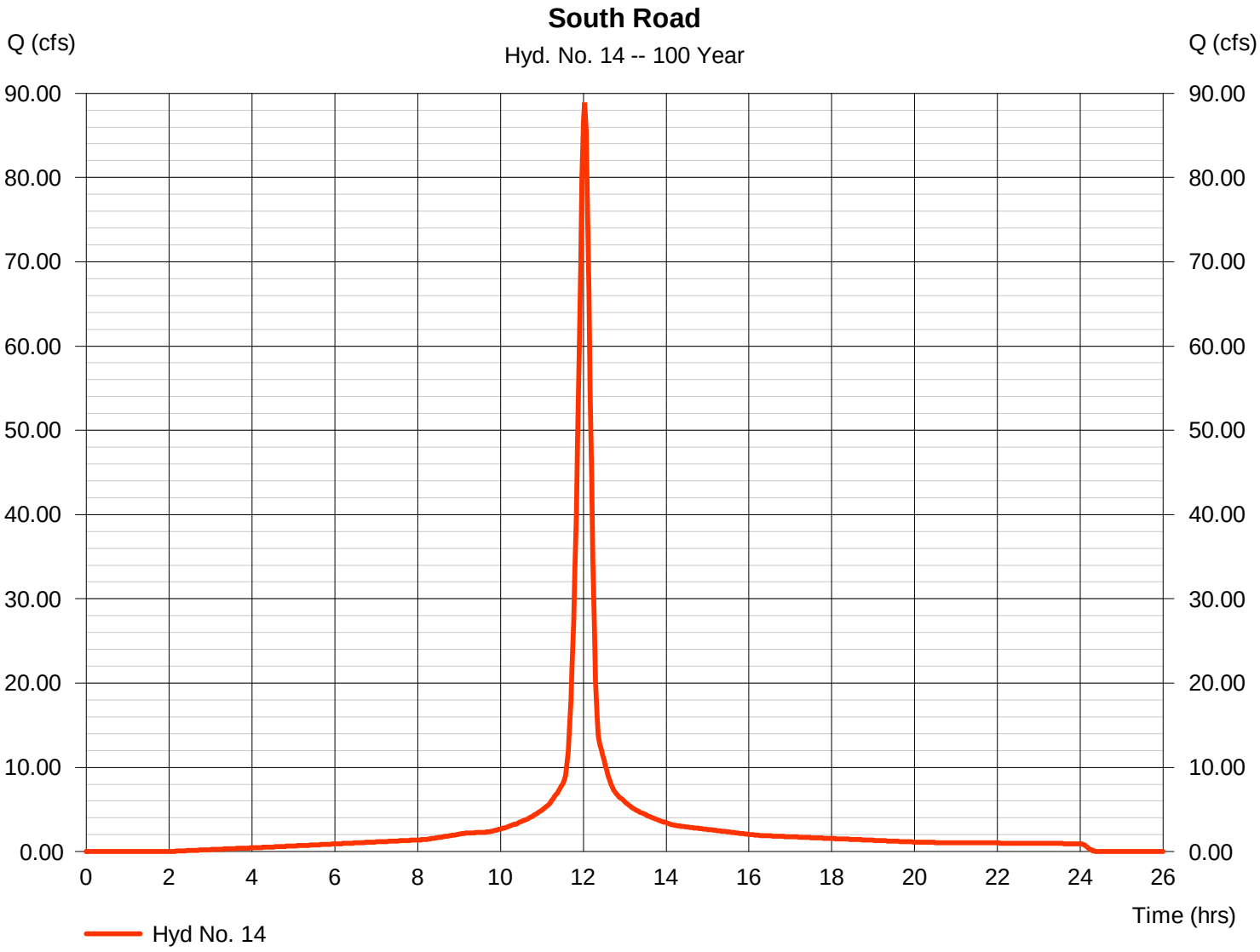


Hydrograph Report

Hyd. No. 14

South Road

Hydrograph type	=	SCS Runoff	Peak discharge	=	88.86 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	6.281 acft
Drainage area	=	11.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

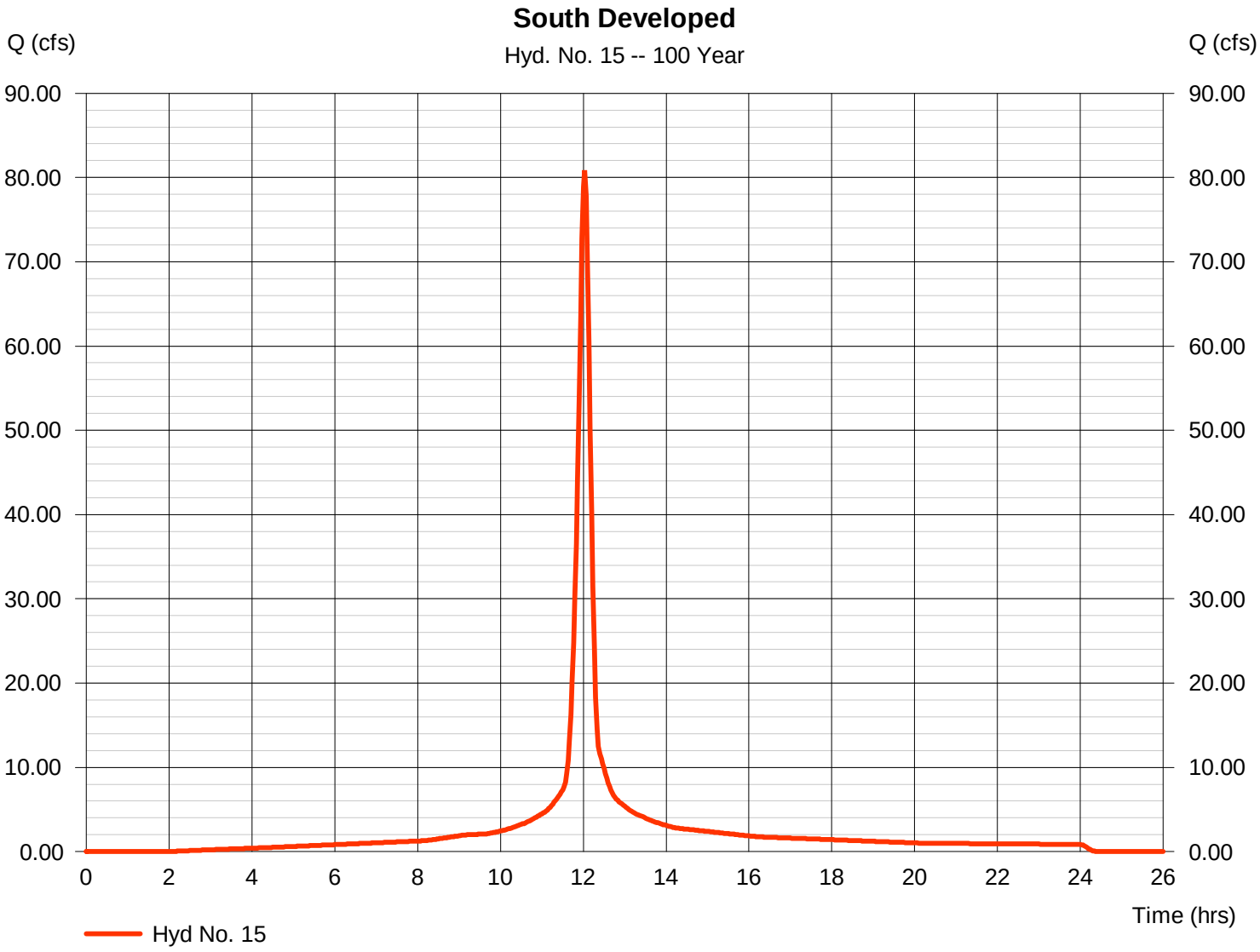


Hydrograph Report

Hyd. No. 15

South Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	80.85 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	5.715 acft
Drainage area	=	10.100 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

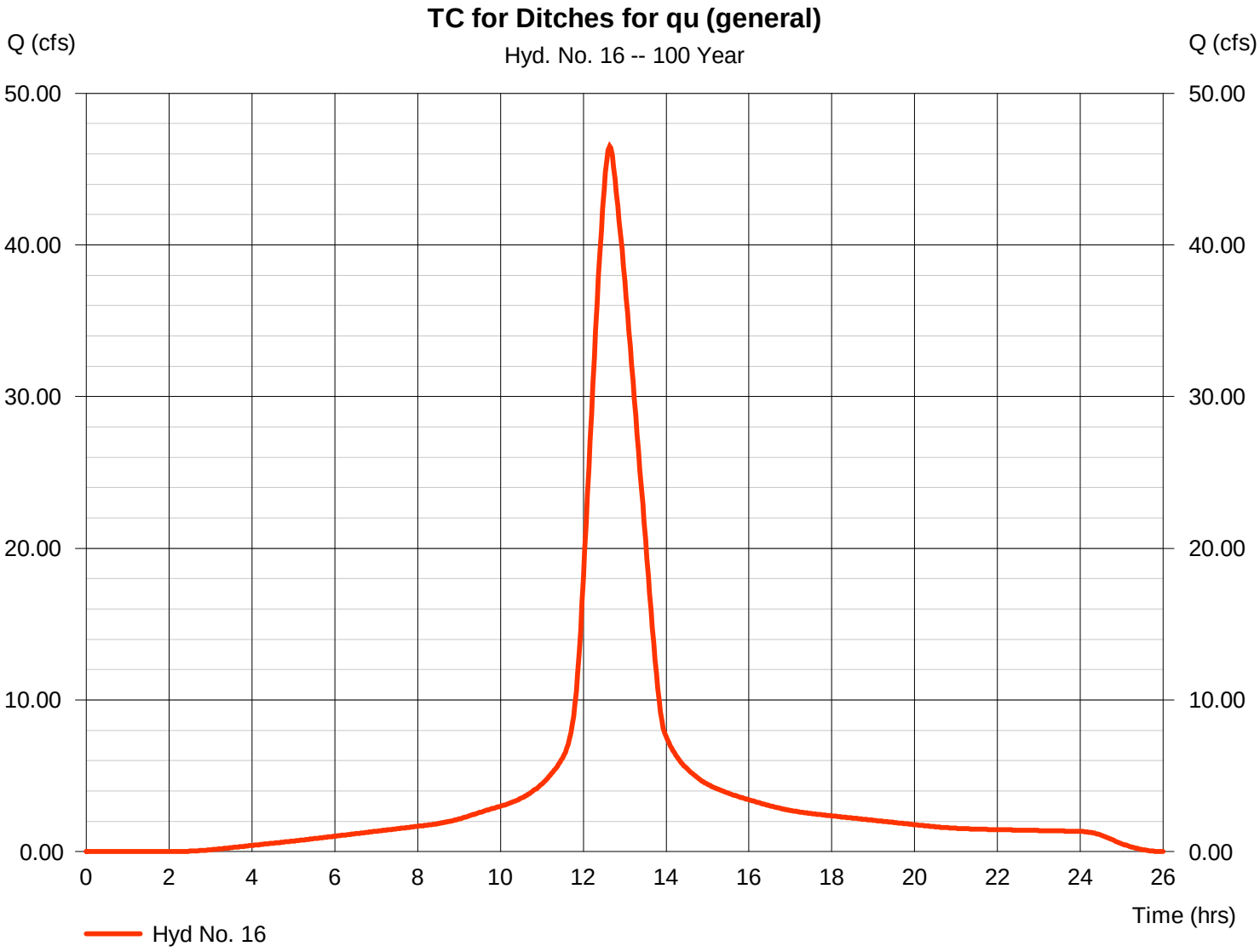


Hydrograph Report

Hyd. No. 16

TC for Ditches for qu (general)

Hydrograph type	=	SCS Runoff	Peak discharge	=	46.52 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.63 hrs
Time interval	=	2 min	Hyd. volume	=	8.658 acft
Drainage area	=	15.000 ac	Curve number	=	93
Basin Slope	=	0.2 %	Hydraulic length	=	2000 ft
Tc method	=	LAG	Time of conc. (Tc)	=	76.30 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	27.8967	9.8000	0.7047	--------
2	76.3137	14.3000	0.8844	--------
3	1.2000	0.1000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: wich_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	4.18	3.40	2.90	2.55	2.29	2.08	1.91	1.78	1.66	1.56	1.48	1.40
2	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
3	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
5	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: wich_24hr.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	2.80	3.50	1.20	4.50	5.20	6.10	6.90	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	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

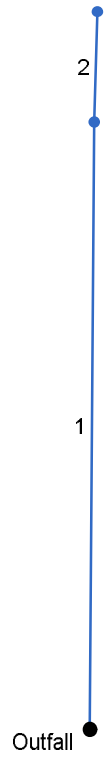
Hydraflow Table of Contents

HydraFlow SWS

Onsite SWS Systems

5-Year Event

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: onsite SWS.stm	Number of lines: 2	Date: 3/19/2014

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
2	1	50.000	1.040	Curb	0.00	2.50	0.90	15.0	1330.30	0.20	1330.40	24	Cir	0.012	1.00	1333.00	
1	End	275.000	-89.582	Curb	0.00	2.50	0.90	15.0	1329.25	0.20	1329.80	30	Cir	0.012	0.50	1333.00	

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
2		Curb-	1333.00	Cir	4.00	4.00	24	Cir	1330.40			
1		Curb-	1333.00	Cir	4.00	4.00	30	Cir	1329.80	24	Cir	1330.30

Project File: onsite SWS.stm | Number of Structures: 2 | Run Date: 3/19/2014

Storm Sewer Summary Report

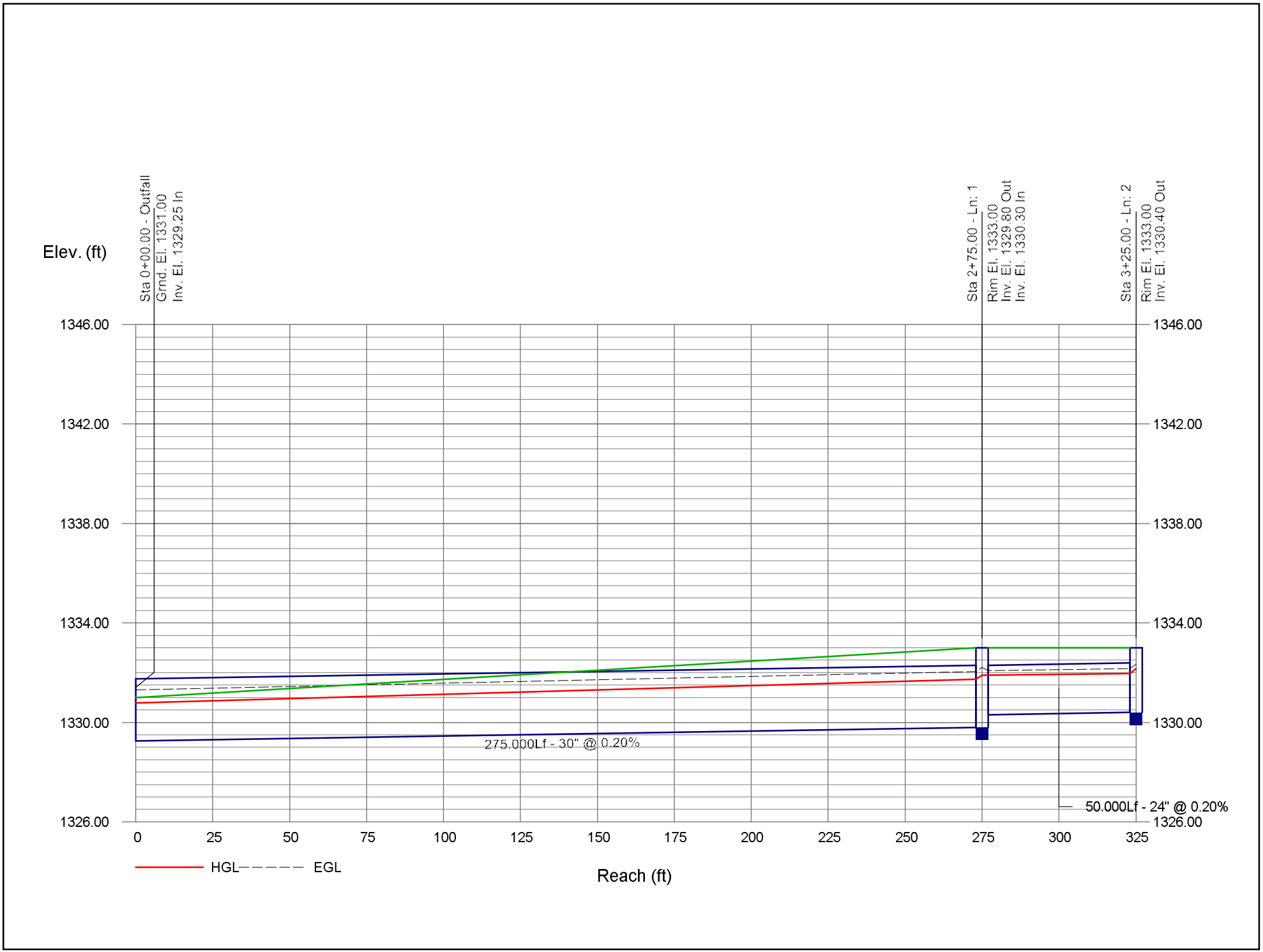
Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
2		9.23	24	Cir	50.000	1330.30	1330.40	0.200	1331.90	1331.97	0.19	1332.16	1	Curb-
1		18.31	30	Cir	275.000	1329.25	1329.80	0.200	1330.78	1331.74	0.16	1331.90	End	Curb-

Project File: onsite SWS.stm | Number of lines: 2 | Run Date: 3/19/2014

NOTES: Return period = 5 Yrs.

Storm Sewer Profile

Proj. file: onsite SWS.stm



WATER QUAILTY

Calculations & HG Unit Flow Rates

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group				Land Use	Hydrologic Soil Group			
	A	**B**	C	D		A	**B**	C	D
Undisturbed	0.02	**0.03**	0.04	0.05	Undisturbed	55	**71**	80	84
Turf or Disturbed Soils	0.15	**0.20**	0.22	0.25	Turf or Disturbed Soils	71	**80**	84	88
Impervious Cover	0.95	**0.95**	0.95	0.95	Impervious Cover	98	**98**	98	98

Basin	Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*)										WQ_v
	Undist.	Dist.	Red. Imp.	New Imp.	Totol	U	D	Redev. I	I	R_v	ft^3
#	ft^2	ft^2	ft^2	ft^2	Area ft^2	%	%	%	%	%	eq. 4-25*
1	*0*	*140,340*	*0*	*360,600*	500,940	0.000	0.056	0.000	0.684	**0.7399**	**37,064**
2	*0*	*145,000*	*0*	*338,500*	483,500	0.000	0.060	0.000	0.665	**0.7251**	**35,058**
3	*0*	*248,000*	*0*	*580,000*	828,000	0.000	0.060	0.000	0.665	**0.7254**	**60,060**
4	*0*	*145,000*	*0*	*338,500*	483,500	0.000	0.060	0.000	0.665	**0.7251**	**35,058**
5	*0*	*132,000*	*0*	*308,000*	440,000	0.000	0.060	0.000	0.665	**0.7250**	**31,900**

Water Quality Peak Flow
POINT X

eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	*93*	Table 4-9
Ia/P =	*0.13*	
Tc =	*75*	min
qu =	*280*	Figure 4-6
A =	*500,940*	ft^2
	11.5	acre
	0.01796875	mi^2
Rv =	*0.7399*	Eq. 4-24
P =	*1.2*	Sedg. Std.
Qwv =	0.88786202	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	**1.34**	**cfs**

Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

Water Quality Peak Flow
POINT Y

eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	*93*	Table 4-9
Ia/P =	*0.13*	
Tc =	*75*	min
qu =	*280*	Figure 4-6
A =	*1,311,500*	ft^2
	30.1	acre
	0.0470436	mi^2
Rv =	*0.7252*	Eq. 4-24
P =	*1.2*	Sedg. Std.
Qwv =	0.8702639	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	**3.44**	**cfs**

Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

Water Quality Peak Flow
POINT Z

eq. 4-18*
Qp = qu * A * Qwv * Fp

CN =	*93*	Table 4-9
Ia/P =	*0.13*	
Tc =	*75*	min
qu =	*280*	Figure 4-6
A =	*923,500*	ft^2
	21.2	acre
	0.033126	mi^2
Rv =	*0.7250*	Eq. 4-24
P =	*1.2*	Sedg. Std.
Qwv =	0.870047	eq. 4-26
Fp =	1.00	Table 4-10
Qp =	**2.42**	**cfs**

Qp = 30% of total WQv needed as ditch section treats 50% TSS before reaching WQ Unit

Drainage Plan

1:100 Scale