

DRAINAGE REPORT

For

***MID-CONTINENT
SEWAGE TREATMENT PLANT
Wichita, Kansas***

October 2007



CDM

P&E
POE & ASSOCIATES, INC.
CONSULTING ENGINEERS



Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: _____	Date: _____
Subdivision Name: _____	Location: _____
Total Land Area Of Ownership: _____ Acres	
Type: _____ Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other	
Applicant: _____	Contact: _____ Phone #: _____
Engineer: _____	Contact: _____ Phone #: _____

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development
(If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Site Location Map, using USGS Map					
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain					
C. Discussion of offsite conditions					
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series					
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design					
F. Copy of the plat					
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)					
H. Professional Engineer seal, signature and date on cover of report					
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover					

Tab 2. Existing Conditions Runoff Calculations	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)					
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)					
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)					
D. Total Site Area and Total Impervious Area (acres)					
E. Benchmarks used for site control					
F. Streams, creeks, and waterway labeled					
G. Predominant soils from USDA soil surveys, and/or on site soil borings					
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted					
I. Location of existing roads, buildings, parking lots and other impervious areas.					



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements					
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
L. Flow paths					
M. Location and dimensions of existing channels, bridges or culvert crossings					
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration					
O. Assumed pre-developed runoff curve numbers					
P. Existing time of concentrations used in calculations					
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site					
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)					
S. Cross-section data for open channels					
T. Ground water elevations, if applicable					

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)					
B. Proposed time of concentrations used in calculations					
C. Assumed post-developed runoff curve numbers					
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)					
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration					
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities					
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary					
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)					
I. Design water surface elevations and normal pool elevation for ponds.					
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.					
K. Proposed limits of clearing and grading					
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.					
M. Location of existing and proposed utilities (e.g., water, sewer) and easements					
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings					

P. Preliminary selection and location of stormwater controls	✓			✓	
Q. Emergency overflow structure's flow path	✓			✓	
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	✓			✓	
S. The 100-year 24-hour HWL delineated on the plan for detention pond	✓			✓	
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	✓			✓	
U. Stormwater Management Facilities located within a Reserve	✓			✓	
V. Maintenance responsibility of stormwater management facility shall be specified in the plat's text. (e.g. HOA, Lot Owners Association, or lot)	✓			✓	
W. Off-site drainage easements or agreements required, where necessary	✓			✓	

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile	✓		No changes to floodplain or floodway limits		✓
B. Nearest base flood elevations	✓		No changes to floodplain or floodway limits		✓
C. Delineation of pre-developed regulatory floodplain/floodway limits	✓		No changes to floodplain or floodway limits		✓
D. Delineation of post-developed regulatory floodplain and floodway limits	✓		No changes to floodplain or floodway limits		✓
E. Floodplain boundary determination per elevation (project limits shown)		✓	No changes to floodplain or floodway limits		✓
F. Provide source of floodway data table and discharges	✓		No changes to floodplain or floodway limits		✓
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits	✓		No changes to floodplain or floodway limits		✓
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		✓	No changes to floodplain or floodway limits		✓
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)	✓		No changes to floodplain or floodway limits		✓
J. Flood plains and floodways located within a Reserve, where necessary	✓			✓	

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		✓	Not Required		✓
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		✓	Not Required		✓
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		✓	Not Required		✓
D. Kansas Department of Transportation		✓	Highway Permit, Use of Right of Way		✓
E. Sedgwick County Right-of-way Permit		✓	Not Required		✓
F. FAA Approval			Required		

**DRAINAGE REPORT
MID-CONTINENT STP
Wichita, KS**

TAB 1

Location and Project Narrative

The subject property is in the City of Wichita, Sedgwick County, Kansas covering an area of 7.5 acres in the currently platted Lot 1, Block 1, Mid-Continent 6th Addition. The 7.5 acre project site is Parcel is a Lot Split of said Lot 1, Block 1. There are 2 existing basins that drain across Parcel 1, a Lot Split of Lot 1, Block 1, Mid-Continent 6th Addition. The existing basins are identified as E1 and E2 and both drain into the Cowskin Creek. Basin E1 drains across the portion of said Parcel 1 that will have the sewage treatment plant improvements constructed on it. Basin E2 will not have any improvements constructed on it. A USGS 7.5 minute quadrangle map and plat is included in Appendix A. All offsite drainage (outside said Parcel 1) is generated from within the Mid-Continent Airport site in which existing runoff conditions and proposed runoff conditions will be the same. The ground cover for the offsite areas is a combination of planted fescue, industrial and wooded lands. The proposed conditions basins are identified as P1A, P1B, and P2. Basins P1A + P1B are the same drainage area as basin E1. Basin P1A is the proposed sub-basin that is offsite of said Parcel 1. Basin P1B is the proposed sub-basin that is within said Parcel 1 and contains the Proposed Sewage Treatment Plant improvements. Proposed conditions basin P2 is the same as existing conditions basin E2.

The best management practices to be implemented shall include maintaining existing vegetative strips (20 ft. wide), linear sediment barriers for ditch checks (hay bale, silt fence or other), silt fencing, and temporary earthen berms. All drainage that enters and exits the Parcel 1 site leaves at 2 point sources – both are existing storm sewer pipes that outlet to the Cowskin Creek. Therefore all best management practices implemented shall have the purpose of controlling sediment runoff prior to reaching those exit points and keeping any erosion on the project site.

Table 1. Summary Table - Existing Conditions vs. Proposed Conditions Drainage

Basin	Area (Acres)	Tc (mins.)	24 Hour Rainfall Event (cfs)				
			2 Yr	5 Yr	10 Yr	25 Yr	100 Yr
E1	51.0	111.4	17.7	32.0	42.0	55.4	82.1
P1A+B	51.0	N/A	17.1	30.2	39.4	51.6	76.0
E2	6.0	24.7	5.2	9.2	12.1	15.9	23.6
P2	6.0	24.7	5.2	9.2	12.1	15.9	23.6

TAB 2
Pre-Developed Conditions (Existing Conditions)

Development

The 7.5 acre site is currently undeveloped with the basin partially developed. See attached Aerial Photo of Existing Site in Appendix D. Also attached in Appendix D is an Existing Conditions plan.

Drainage Conditions

The site was analyzed using the SCS method for curve numbers and time of concentrations. Hydraflow Hydrographs by Intellisolve was the software used. The existing conditions drainage that enters Parcel 1 (Lot Split of Lot 1, Block 1, Mid-Continent 6th Addition) is separated into 2 basins E-1 and E-2. Basin E-2 (existing conditions) will be same as P-2. There will be no change in runoff conditions for basin E-2 as part of this project.

Soil Survey

A copy of the USDA soil survey map is included in Appendix B.

Site Area

The 7.5 acre Parcel 1 site (Lot Split of Lot 1, Block 1, Mid-Continent 6th Addition) is currently grassed open space in fair condition. There are 3.7 acres of impervious area in the 51.0 acre basin, E1.

Table 2. Existing Conditions Drainage

Basin	Area (Acres)	Tc (mins.)	24 Hour Rainfall Event (cfs)				
			2 Yr	5 Yr	10 Yr	25 Yr	100 Yr
E1	51.0	111.4	17.7	32.0	42.0	55.4	82.1
E2	6.0	24.7	5.2	9.2	12.1	15.9	23.6

TAB 3
Post-Developed Conditions Hydrologic Analysis (Proposed Conditions)

Development

The 7.5 acre Parcel 1 site (Lot Split of Lot 1, Block 1, Mid-Continent 6th Addition) will be developed with 2.4 acres of an enclosed wastewater treatment plant, asphalt pavement access road and parking area. The remaining 5.1 acres of the site will remain un-developed, grassed open space.

FEMA Floodplain

The Base Flood Elevation (BFE) for the subject area varies from 1303.0 to 1303.7. The finished floor elevation of the proposed Mid-Continent STP is 1311.9 (124.5 City of Wichita Datum). See Appendix C.

Drainage Conditions

The 7.5 acre proposed developed site was evaluated with 3 sub-basins. Subbasin P1A includes 44.7 acres offsite and to the Northeast of the Project Site, subbasin P1B includes 6.3 acres of the 7.5 acres of the Project Site, and subbasin P2 includes 30.5 acres offsite and on the Project Site. The onsite portion of the P2 basin will remain undeveloped.

Table 3. Proposed Conditions Drainage

Basin	Area (Acres)	Tc (mins.)	24 Hour Rainfall Event (cfs)				
			2 Yr	5 Yr	10 Yr	25 Yr	100 Yr
P1A	44.7	110.8	15.8	28.4	37.1	48.9	72.3
P1B	6.3	30.3	7.4	11.6	14.4	18.1	25.4
P1A+B	51.0	N/A	17.1	30.2	39.4	51.6	76.0
P2	6.0	24.7	5.2	9.2	12.1	15.9	23.6

Utilities

The proposed Project Site is an enclosed sewage treatment plant. Water utility to the site is from connection to a 16” water main. The sanitary sewer effluent outfalls to the Cowskin Creek. The sanitary sewer outfall and storm sewer are shown on the on the Road/Pavement Site Plan. See Appendix E.

Summary of Proposed Conditions

As shown in Table 1, there is no increase in the peak runoff. There is a slight decrease in the peak which becomes more pronounced at the 100 year storm interval.

TAB 4 - FLOODPLAIN

FEMA Floodplain.

The FEMA map (FIRM Panels 340 & 345, Wichita, Sedgwick County, KS, February 2, 2007) of the area is attached. See Appendix C.

The Base Flood Elevation (BFE) for the subject area along Cowskin Creek varies from 1303.0 to 1303.7 (See Appendix C). The finished floor elevation of the proposed Mid-Continent STP is 1311.9 (124.5 City of Wichita Datum) (See Site Plan in Appendix E).

All fill constructed on the proposed project site is outside of the FEMA Floodway and Floodplain (Zone A).

TAB 5 – FEDERAL, STATE and LOCAL PERMITS

Federal Permits

The drainage portion of the Mid-Continent STP project does not include improvements within the Cowskin Creek. A U.S. Army Corps of Engineers permit is not needed for site or drainage improvements. All fill constructed within this project will be outside of Zone A of the Federal Emergency Management Agency and will not require a LOMR-F. All applicable permits required by the Federal Aviation Administration shall be applied for.

State Permits

All fill constructed within this project will be outside of Zone A of the FEMA floodplain. A Kansas Department of Agriculture Division of Water Resources permit(s) will not be needed.

Kansas Department of Transportation and Sedgwick County Permits

All site, drainage and road improvements being constructed are within the Parcel, part of a Lot Split of Lot 1, Mid-Continent 6th Addition to Wichita, Sedgwick County, KS. Access to the project site is via an existing entrance of K-42 and 31st Street South. KDOT and Sedgwick County permits are not required.

CD of Drainage Plan

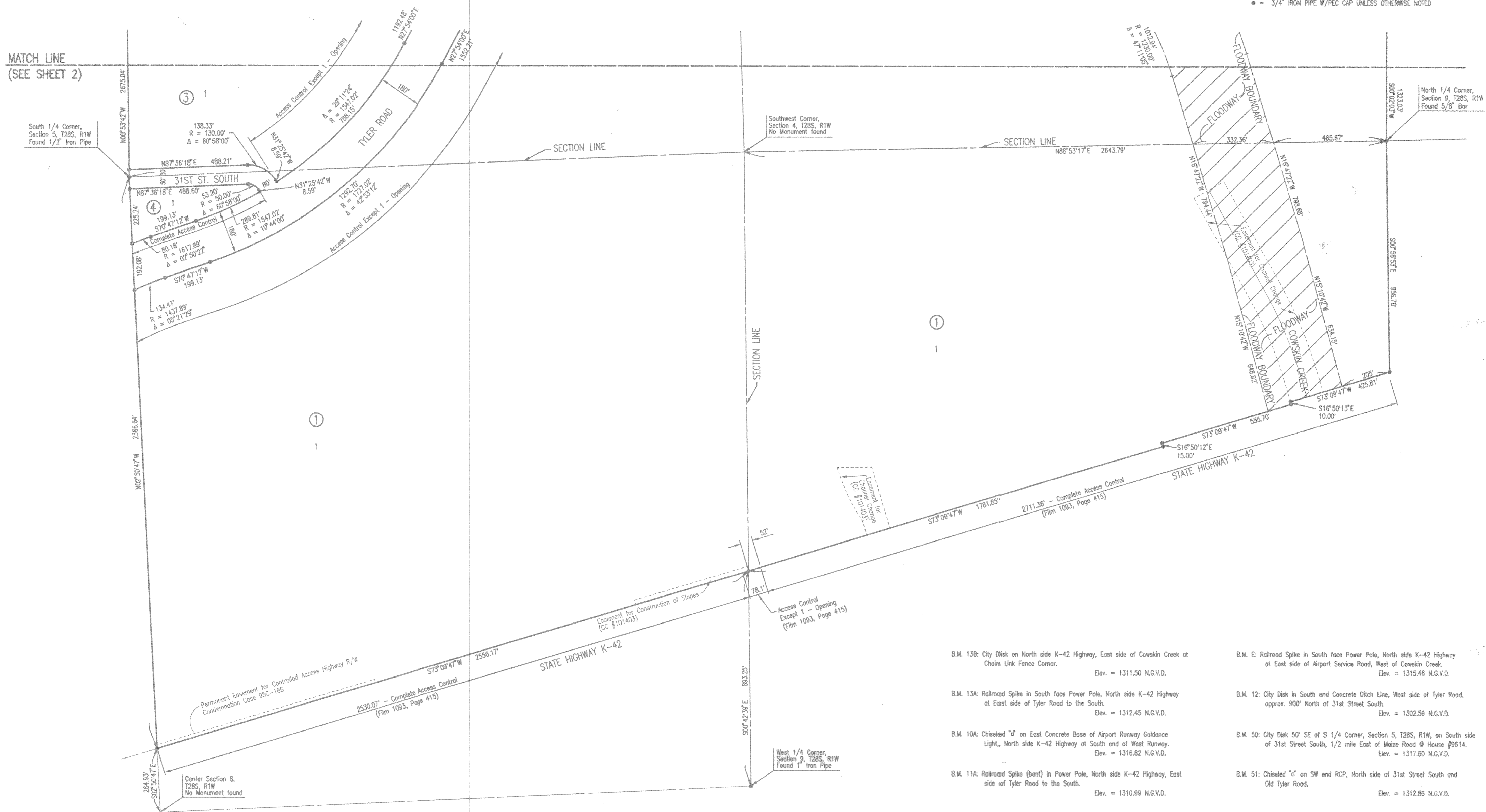
Appendix A

*Quadrangle Map &
Final Plat*

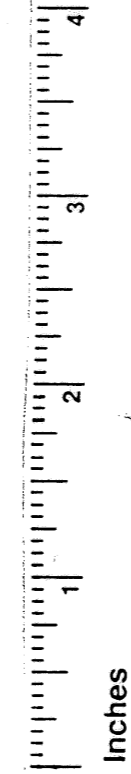
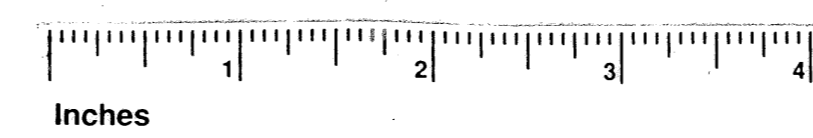
MID-CONTINENT AIRPORT 6TH ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS


SCALE: 1" = 200'

• = 3/4" IRON PIPE W/PEC CAP UNLESS OTHERWISE NOTED

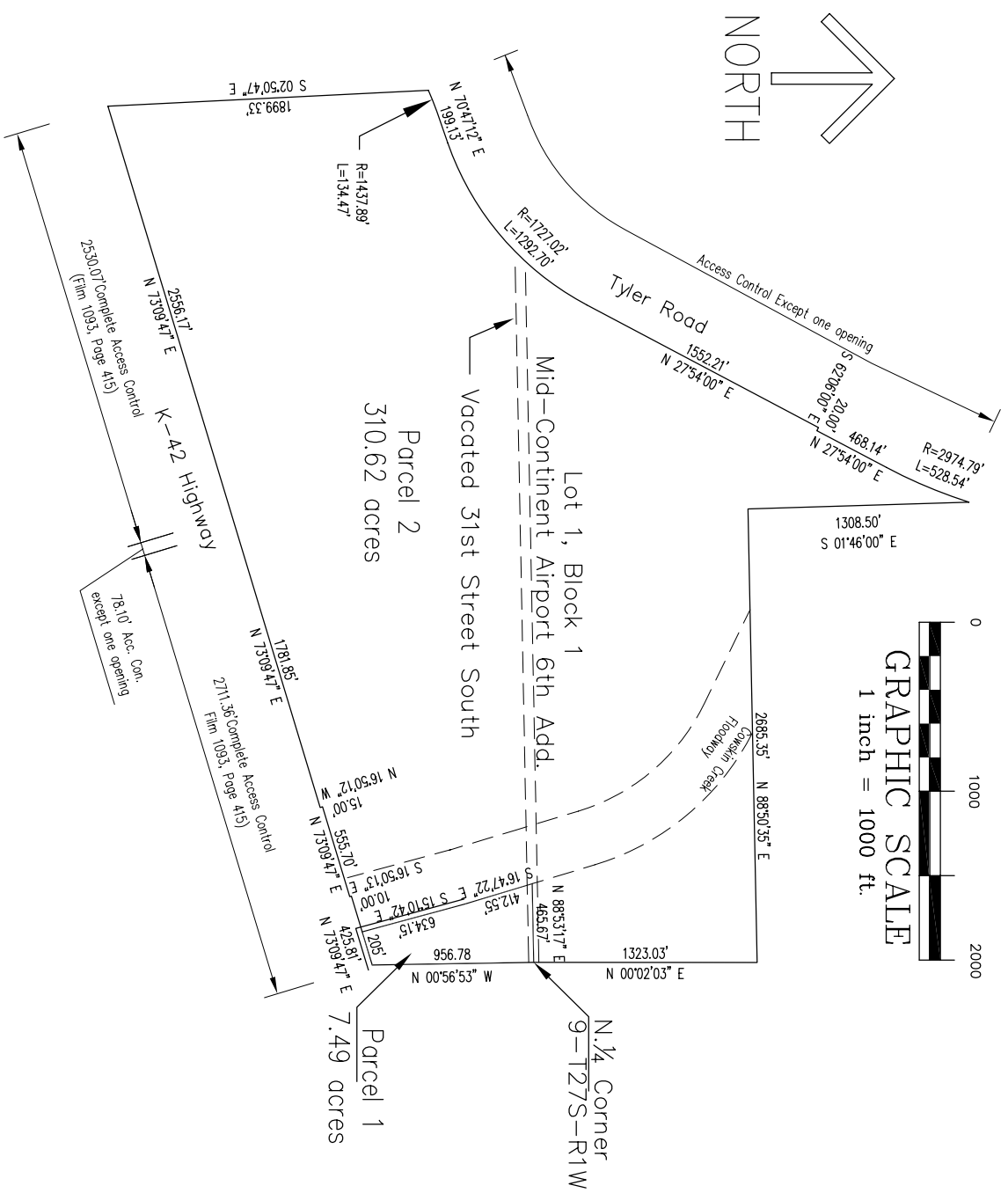


DSNR: GLM OPER: GLM SCALE: 1"=200.00
 Q:\1999\95642_Airport_Plat6.dwg\FINAL 6TH-2 10-25-2000 04:09:57 pm




 This digital plat record accurately reproduces in all details the original plat filed with the Sedgwick County Register of Deeds. Digitized under the supervision of Register of Deeds Bill Meek by Sedgwick County Geographic Information Systems.

Bill Meek, Register of Deeds
 Digitized rendition of original signature



Lot Split

Mid-Continent Airport 6th Addition to Wichita, Sedgwick County, Kansas

Parcel 1

A tract of land being part of Lot 1, Block 1 Mid-Continent Airport 6th Addition to Wichita, Sedgwick County, Kansas, said tract being more particularly described as follows: Beginning at the North Quarter Corner of Section 9, Township 28 South, Range 1 West of the Sixth P.M., Sedgwick County, Kansas, thence on an assumed bearing of South 00°56'53" East along the East line of the Northwest Quarter of Section 9-T28S-R1W for 956.78 feet to the South line of Lot 1, Block 1, Mid-Continent Airport 6th Addition, thence South 73°09'47" West along the South line of said Lot 1, Block1 for 205 feet to the East Floodway Boundary as shown on Mid-Continent Airport 6th Addition plat, thence North 15°10'42" West along said East Floodway Boundary for 634.15 feet, thence North 16°47'22" West along said East Floodway Boundary for 412.55 feet to the North line of the Northwest Quarter of Section 9-T28S-R1W, thence North 88°53'17" East along said North line of the Northwest Quarter for 465.67 feet to the point of beginning. Said tract contains 7.49 acres, more or less.

Parcel 2

A tract of land being part of Lot 1, Block 1 Mid-Continent Airport 6th Addition to Wichita, Sedgwick County, Kansas, said tract being more particularly described as follows: All of Lot 1, Block 1, Mid-Continent Airport 6th Addition to Wichita, Sedgwick County, Kansas, EXCEPT the following described tract; Beginning at the North Quarter Corner of Section 9, Township 28 South, Range 1 West of the Sixth P.M., Sedgwick County, Kansas, thence on an assumed bearing of South 00°56'53" East along the East line of the Northwest Quarter of Section 9-T28S-R1W for 956.78 feet to the South line of Lot 1, Block 1, Mid-Continent Airport 6th Addition, thence South 73°09'47" West along the South line of said Lot 1, Block1 for 205 feet to the East Floodway Boundary as shown on Mid-Continent Airport 6th Addition plat, thence North 15°10'42" West along said East Floodway Boundary for 634.15 feet, thence North 16°47'22" West along said East Floodway Boundary for 412.55 feet to the North line of the Northwest Quarter of Section 9-T28S-R1W, thence North 88°53'17" East along said North line of the Northwest Quarter for 465.67 feet to the point of beginning. Said tract contains 310.60 acres, more or less.

Access Control, Easements and Cowskin Creek Floodway are as shown on the plat of Mid-Continent Airport 6th Addition to Wichita, Sedgwick County, Kansas

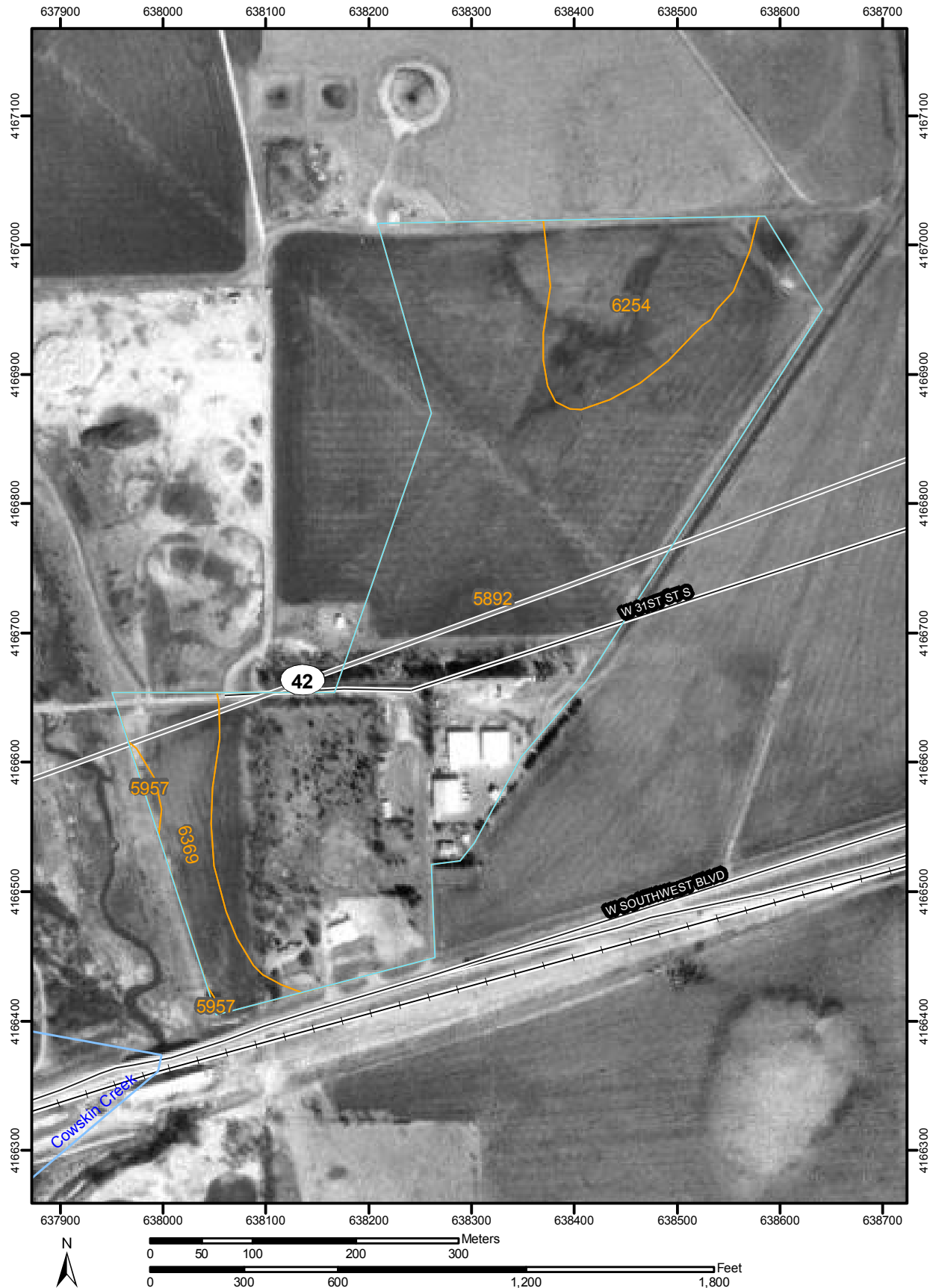
JOB NAME: Mid-Continent STP Lot Split	DRAWN BY: wpf
LOCATION: Mid-Continent Airport	CHECKED BY:
	DATE: April 2007
	SHEET: 1 of 2
	JOB NUMBER: 1859



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Appendix B
Soil Survey Map

Soil Map—Sedgwick County, Kansas
(Mid-Continent STP - Soil Map)



MAP LEGEND






















Area of Interest (AOI)




 Area of Interest (AOI)

Soils




 Soil Map Units

Special Point Features

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



-  Very Stony Spot
-  Wet Spot
-  Other

Special Line Features



-  Gully
-  Short Steep Slope
-  Other

Political Features

Municipalities

-  Cities
-  Urban Areas






Water Features

-  Oceans
-  Streams and Canals

Transportation

-  Rails

Roads

-  Interstate Highways
-  US Routes
-  State Highways
-  Local Roads
-  Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 14N

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 3, Dec 21, 2006

Date(s) aerial images were photographed: 3/20/1996; 3/31/1996

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

Map Unit Legend

Sedgwick County, Kansas (KS173)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5892	Farnum loam, 0 to 1 percent slopes	46.5	80.0%
5957	Shellabarger sandy loam, 3 to 6 percent slopes	0.2	0.4%
6254	Waurika silt loam, 0 to 1 percent slopes	6.9	11.8%
6369	Milan loam, 1 to 3 percent slopes	4.5	7.8%
Totals for Area of Interest (AOI)		58.2	100.0%

WATER FEATURES
Sedgwick County, Kansas

The Water Features table gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations. 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 four hydrologic soil groups are:

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.

The months in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. The Water Features table indicates, by month, depth to the top (upper limit) and base (lower limit) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The Water Features table indicates surface water depth and the duration and frequency of ponding. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. None means that ponding is not probable; rare that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); occasional that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and frequent that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and frequency are estimated. Duration is expressed as extremely brief if 0.1 hour to 4 hours, very brief if 4 hours to 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. None means that flooding is not probable; very rare that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); rare that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); occasional that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); frequent that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and very frequent that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

WATER FEATURES--Continued
Sedgwick County, Kansas

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro- logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
015LS: Ladysmith-----	D	April	0.0	2.0-3.0	---	---	None	---	None
		May	2.0-3.0	2.0-3.0	---	---	None	---	None
		June	2.0-3.0	2.0-3.0	---	---	None	---	None
079CR: Crete-----	C		---	---	---	---	---	---	---
079CT: Crete-----	C		---	---	---	---	---	---	---
079DE: Detroit-----	C	January	---	---	---	---	---	---	Rare
		February	---	---	---	---	---	---	Rare
		March	---	---	---	---	---	---	Rare
		April	---	---	---	---	---	---	Rare
		May	---	---	---	---	---	---	Rare
		June	---	---	---	---	---	---	Rare
		July	---	---	---	---	---	---	Rare
		August	---	---	---	---	---	---	Rare
		September	---	---	---	---	---	---	Rare
		October	---	---	---	---	---	---	Rare
		November	---	---	---	---	---	---	Rare
		December	---	---	---	---	---	---	Rare
079DU: Drummond-----	D	January	2.0-4.0	>6.0	---	---	---	---	None
		February	2.0-4.0	>6.0	---	---	---	---	None
		March	2.0-4.0	>6.0	---	---	---	---	None
		April	2.0-4.0	>6.0	---	---	---	---	None
		November	2.0-4.0	>6.0	---	---	---	---	None
		December	2.0-4.0	>6.0	---	---	---	---	None
079FA: Farnum-----	B		---	---	---	---	---	---	---
079FE: Farnum-----	B		---	---	---	---	---	---	---
079GD: Geary-----	B		---	---	---	---	---	---	---
079KA: Kaski-----	B	March	---	---	---	---	---	Very brief	Occasional
		April	---	---	---	---	---	Very brief	Occasional
		May	---	---	---	---	---	Very brief	Occasional
		June	---	---	---	---	---	Very brief	Occasional
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
079LA: Ladysmith-----	D		---	---	---	---	---	---	---
079LB: Ladysmith-----	D		---	---	---	---	---	---	---
079SM: Smolan-----	C		---	---	---	---	---	---	---
095AD: Albion-----	B		---	---	---	---	---	---	---
095LA: Lincoln-----	A	January	5.0-6.0	>6.0	---	---	---	---	None
		February	5.0-6.0	>6.0	---	---	---	---	None
		March	5.0-6.0	>6.0	---	---	---	---	None
		April	5.0-6.0	>6.0	---	---	---	Very brief	Occasional
		May	5.0-6.0	>6.0	---	---	---	Very brief	Occasional
		June	---	---	---	---	---	Very brief	Occasional
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
		September	---	---	---	---	---	Very brief	Occasional
		October	---	---	---	---	---	---	None
		November	5.0-6.0	>6.0	---	---	---	---	None
		December	5.0-6.0	>6.0	---	---	---	---	None
095WA:									

WATER FEATURES--Continued
Sedgwick County, Kansas

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
Waldeck-----	C	January	2.0-4.0	>6.0	---	---	---	---	None
		February	2.0-4.0	>6.0	---	---	---	---	None
		March	2.0-4.0	>6.0	---	---	---	Brief	Occasional
		April	2.0-4.0	>6.0	---	---	---	Brief	Occasional
		May	---	---	---	---	---	Brief	Occasional
		June	---	---	---	---	---	Brief	Occasional
		July	---	---	---	---	---	Brief	Occasional
		August	---	---	---	---	---	Brief	Occasional
		September	---	---	---	---	---	Brief	Occasional
		October	2.0-4.0	>6.0	---	---	---	Brief	Occasional
		November	2.0-4.0	>6.0	---	---	---	---	None
		December	2.0-4.0	>6.0	---	---	---	---	None
191BA: Bethany-----	C		---	---	---	---	---	---	
191BB: Bethany-----	C		---	---	---	---	---	---	
191DR: Dale-----	B	March	---	---	---	---	---	Rare	
April		---	---	---	---	---	---	Rare	
May		---	---	---	---	---	---	Rare	
June		---	---	---	---	---	---	Rare	
Reinach-----	B	March	---	---	---	---	---	Rare	
April		---	---	---	---	---	---	Rare	
May		---	---	---	---	---	---	Rare	
June		---	---	---	---	---	---	Rare	
191EA: Elandco-----	B	January	---	---	---	---	---	Rare	
February		---	---	---	---	---	---	Rare	
March		---	---	---	---	---	---	Rare	
April		---	---	---	---	---	---	Rare	
May		---	---	---	---	---	---	Rare	
June		---	---	---	---	---	---	Rare	
July		---	---	---	---	---	---	Rare	
August		---	---	---	---	---	---	Rare	
September		---	---	---	---	---	---	Rare	
October		---	---	---	---	---	---	Rare	
November		---	---	---	---	---	---	Rare	
December		---	---	---	---	---	---	Rare	
191LO: Lesho-----	C	March	2.0-4.0	>6.0	---	---	---	Very brief	Occasional
April		2.0-4.0	>6.0	---	---	---	---	Very brief	Occasional
May		2.0-4.0	>6.0	---	---	---	---	Very brief	Occasional
June		2.0-4.0	>6.0	---	---	---	---	Very brief	Occasional
July		---	---	---	---	---	---	Very brief	Occasional
1011: Albion-----	B		---	---	---	---	---	---	
Shellabarger-----	B		---	---	---	---	---	---	
1070: Avans-----	B		---	---	---	---	---	---	
1071: Avans-----	B		---	---	---	---	---	---	
1072: Avans-----	B		---	---	---	---	---	---	
2204: Jamash-----	D		---	---	---	---	---	---	
Piedmont-----			---	---	---	---	---	---	
2205: Jamash-----	D		---	---	---	---	---	---	
Piedmont-----			---	---	---	---	---	---	
2207: Jamash-----	D		---	---	---	---	---	---	
			---	---	---	---	---	---	
2381:			---	---	---	---	---	---	

WATER FEATURES--Continued
Sedgwick County, Kansas

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
Kanza-----	D	January	0.0-3.0	>6.0	---	---	---	Very brief	Frequent
		February	0.0-3.0	>6.0	---	---	---	Very brief	Frequent
		March	0.0-3.0	>6.0	---	---	---	Very brief	Frequent
		April	---	---	---	---	---	Very brief	Frequent
		May	---	---	---	---	---	Very brief	Frequent
		June	---	---	---	---	---	Very brief	Frequent
		July	---	---	---	---	---	Very brief	Frequent
		August	---	---	---	---	---	Very brief	Frequent
		September	---	---	---	---	---	Very brief	Frequent
		October	---	---	---	---	---	Very brief	Frequent
		November	---	---	---	---	---	Very brief	Frequent
		December	0.0-3.0	>6.0	---	---	---	Very brief	Frequent
Ninnescah-----	B	February	2.0	>6.0	---	---	---	---	None
		March	2.0	>6.0	---	---	---	Long	Occasional
		April	2.0	>6.0	---	---	---	Long	Occasional
		May	2.0	>6.0	---	---	---	Long	Occasional
		June	2.0	>6.0	---	---	---	Long	Occasional
		July	---	---	---	---	---	Long	Occasional
		August	---	---	---	---	---	Long	Occasional
		September	---	---	---	---	---	Long	Occasional
		October	---	---	---	---	---	Long	Occasional
		2587: Imano-----	C	March	2.0-4.0	>6.0	---	---	None
April	2.0-4.0	>6.0		---	---	None	Very brief	Occasional	
May	2.0-4.0	>6.0		---	---	None	Very brief	Occasional	
June	2.0-4.0	>6.0		---	---	None	Very brief	Occasional	
July	2.0-4.0	>6.0		---	---	None	Very brief	Occasional	
2948: Nalim-----	B								
3052: Ost-----	B								
Clark-----	B								
3170: Penalosa-----	C								
3171: Penalosa-----	C								
3535: Shellabarger-----	B								
Nalim-----	B								
3639: Taver-----	D								
3966: Willowbrook-----	B	February	2.0-4.0	>6.0	---	---	None	---	None
March		2.0-4.0	>6.0	---	---	None	Brief	Occasional	
April		2.0-4.0	>6.0	---	---	None	Brief	Occasional	
May		2.0-4.0	>6.0	---	---	None	Brief	Occasional	
June		2.0-4.0	>6.0	---	---	None	Brief	Occasional	
July		---	---	---	---	None	Brief	Occasional	
August		---	---	---	---	None	Brief	Occasional	
September		---	---	---	---	None	Brief	Occasional	
October		---	---	---	---	None	Brief	Occasional	
4004: Yaggy-----		C	January	2.0-4.0	>6.0	---	---	---	---
February	2.0-4.0		>6.0	---	---	---	---	---	None
March	2.0-4.0		>6.0	---	---	---	Brief	Occasional	
April	2.0-4.0		>6.0	---	---	---	Brief	Occasional	
May	2.0-4.0		>6.0	---	---	---	Brief	Occasional	
June	---		---	---	---	---	Brief	Occasional	
July	---		---	---	---	---	Brief	Occasional	
August	---		---	---	---	---	Brief	Occasional	
September	---		---	---	---	---	Brief	Occasional	
October	---		---	---	---	---	Brief	Occasional	
December	2.0-4.0		>6.0	---	---	---	---	---	None
Aa: Albion-----	B								
Shellabarger-----	B								
Ab: Albion-----	B								

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Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
Shellabarger-----	B		Ft	Ft	Ft				
Ba: Blanket-----	C		---	---	---	---	---	---	---
Bb: Blanket-----	C		---	---	---	---	---	---	---
BRR: Brewer-----	C		---	---	---	---	---	---	---
		January	---	---	---	---	---	---	Rare
		February	---	---	---	---	---	---	Rare
		March	---	---	---	---	---	---	Rare
		April	---	---	---	---	---	---	Rare
		May	---	---	---	---	---	---	Rare
		June	---	---	---	---	---	---	Rare
		July	---	---	---	---	---	---	Rare
		August	---	---	---	---	---	---	Rare
		September	---	---	---	---	---	---	Rare
		October	---	---	---	---	---	---	Rare
		November	---	---	---	---	---	---	Rare
		December	---	---	---	---	---	---	Rare
Ca: Canadian-----	B		---	---	---	---	---	---	---
		January	---	---	---	---	---	---	Rare
		February	---	---	---	---	---	---	Rare
		March	---	---	---	---	---	---	Rare
		April	---	---	---	---	---	---	Rare
		May	---	---	---	---	---	---	Rare
		June	---	---	---	---	---	---	Rare
		July	---	---	---	---	---	---	Rare
		August	---	---	---	---	---	---	Rare
		September	---	---	---	---	---	---	Rare
		October	---	---	---	---	---	---	Rare
		November	---	---	---	---	---	---	Rare
		December	---	---	---	---	---	---	Rare
Cb: Canadian-----	B		---	---	---	---	---	---	---
		January	---	---	---	---	---	---	Rare
		February	---	---	---	---	---	---	Rare
		March	---	---	---	---	---	---	Rare
		April	---	---	---	---	---	---	Rare
		May	---	---	---	---	---	---	Rare
		June	---	---	---	---	---	---	Rare
		July	---	---	---	---	---	---	Rare
		August	---	---	---	---	---	---	Rare
		September	---	---	---	---	---	---	Rare
		October	---	---	---	---	---	---	Rare
		November	---	---	---	---	---	---	Rare
		December	---	---	---	---	---	---	Rare
Waldeck-----	C		---	---	---	---	---	---	---
		January	2.0-4.0	>6.0	---	---	---	---	None
		February	2.0-4.0	>6.0	---	---	---	---	None
		March	2.0-4.0	>6.0	---	---	Brief	Occasional	Occasional
		April	2.0-4.0	>6.0	---	---	Brief	Occasional	Occasional
		May	---	---	---	---	Brief	Occasional	Occasional
		June	---	---	---	---	Brief	Occasional	Occasional
		July	---	---	---	---	Brief	Occasional	Occasional
		August	---	---	---	---	Brief	Occasional	Occasional
		September	---	---	---	---	Brief	Occasional	Occasional
		October	2.0-4.0	>6.0	---	---	Brief	Occasional	Occasional
		November	2.0-4.0	>6.0	---	---	---	---	None
		December	2.0-4.0	>6.0	---	---	---	---	None
Cc: Carwile-----	D		---	---	---	---	---	---	---
		January	0.0	>6.0	0.0-1.0	Brief	---	---	None
		February	0.0	>6.0	0.0-1.0	Brief	---	---	None
		March	0.0	>6.0	0.0-1.0	Brief	---	---	None
		April	0.0	>6.0	0.0-1.0	Brief	---	---	None
		May	---	---	0.0	---	---	---	None
		June	---	---	0.0	---	---	---	None
		July	---	---	0.0	---	---	---	None
		August	---	---	0.0	---	---	---	None
		September	---	---	0.0	---	---	---	None
		October	0.0	>6.0	0.0-1.0	Brief	---	---	None
		November	0.0	>6.0	0.0-1.0	Brief	---	---	None
		December	0.0	>6.0	0.0-1.0	Brief	---	---	None
Cd: Clark-----	B		---	---	---	---	---	---	---
Ost-----	B		---	---	---	---	---	---	---

WATER FEATURES--Continued
Sedgwick County, Kansas

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Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
Ce: Clime-----	C		---	---	---	---	---	---	---
Ea: Elandco-----	B	January	---	---	---	---	---	---	Rare
		February	---	---	---	---	---	---	Rare
		March	---	---	---	---	---	---	Rare
		April	---	---	---	---	---	---	Rare
		May	---	---	---	---	---	---	Rare
		June	---	---	---	---	---	---	Rare
		July	---	---	---	---	---	---	Rare
		August	---	---	---	---	---	---	Rare
		September	---	---	---	---	---	---	Rare
		October	---	---	---	---	---	---	Rare
		November	---	---	---	---	---	---	Rare
		December	---	---	---	---	---	---	Rare
Eb: Elandco-----	B	January	---	---	---	---	---	Brief	Occasional
		February	---	---	---	---	---	Brief	Occasional
		March	---	---	---	---	---	Brief	Occasional
		April	---	---	---	---	---	Brief	Occasional
		May	---	---	---	---	---	Brief	Occasional
		October	---	---	---	---	---	Brief	Occasional
		November	---	---	---	---	---	Brief	Occasional
		December	---	---	---	---	---	Brief	Occasional
Ec: Elandco-----	B	January	---	---	---	---	---	Brief	Frequent
		February	---	---	---	---	---	Brief	Frequent
		March	---	---	---	---	---	Brief	Frequent
		April	---	---	---	---	---	Brief	Frequent
		May	---	---	---	---	---	Brief	Frequent
		October	---	---	---	---	---	Brief	Frequent
		November	---	---	---	---	---	Brief	Frequent
		December	---	---	---	---	---	Brief	Frequent
Fa: Farnum-----	B		---	---	---	---	---	---	---
Fb: Farnum-----	B		---	---	---	---	---	---	---
Fc: Farnum-----	B		---	---	---	---	---	---	---
Ga: Goessel-----	D	April	2.0-3.0	>6.0	---	---	---	---	None
		May	2.0-3.0	>6.0	---	---	---	---	None
		June	2.0-3.0	>6.0	---	---	---	---	None
Gb: Goessel-----	D	April	2.0-3.0	>6.0	---	---	---	---	None
		May	2.0-3.0	>6.0	---	---	---	---	None
		June	2.0-3.0	>6.0	---	---	---	---	None
Ia: Irwin-----	D		---	---	---	---	---	---	---
Ib: Irwin-----	D		---	---	---	---	---	---	---
Ic: Irwin-----	D		---	---	---	---	---	---	---
INT: Aqulls-----	C	March	0.0	>6.0	0.0-0.8	Brief	Occasional	---	None
		April	0.0	>6.0	0.0-0.8	Brief	Occasional	---	None
		May	0.0	>6.0	0.0-0.8	Brief	Occasional	---	None
		June	0.0	>6.0	0.0-0.8	Brief	Occasional	---	None
KAA: Kaski-----	B	March	---	---	---	---	---	Very brief	Occasional
		April	---	---	---	---	---	Very brief	Occasional
		May	---	---	---	---	---	Very brief	Occasional
		June	---	---	---	---	---	Very brief	Occasional
		July	---	---	---	---	---	Very brief	Occasional
		August	---	---	---	---	---	Very brief	Occasional
La:									

WATER FEATURES--Continued
Sedgwick County, Kansas

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Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding			
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency		
			Ft	Ft	Ft						
Lesho-----	C	March	2.0-4.0	>6.0	---	---	---	Very brief	Occasional		
		April	2.0-4.0	>6.0	---	---	---	Very brief	Occasional		
		May	2.0-4.0	>6.0	---	---	---	Very brief	Occasional		
		June	2.0-4.0	>6.0	---	---	---	Very brief	Occasional		
		July	---	---	---	---	---	Very brief	Occasional		
		Lb: Lincoln-----	A	January	5.0-6.0	>6.0	---	---	---	---	None
		February		5.0-6.0	>6.0	---	---	---	---	None	
March	5.0-6.0	>6.0		---	---	---	---	None			
April	5.0-6.0	>6.0		---	---	---	Brief	Frequent			
May	5.0-6.0	>6.0		---	---	---	Brief	Frequent			
June	---	---		---	---	---	Brief	Frequent			
July	---	---		---	---	---	Brief	Frequent			
August	---	---		---	---	---	Brief	Frequent			
September	---	---		---	---	---	Brief	Frequent			
October	---	---		---	---	---	Brief	Frequent			
November	5.0-6.0	>6.0		---	---	---	---	None			
December	5.0-6.0	>6.0		---	---	---	---	None			
M-W: Miscellaneous Water-----	---										
Ma: Milan-----	B										
Mb: Milan-----	B										
Mc: Milan-----	B										
Na: Naron-----	B										
Oc: Wellsford-----	D										
Od: Wellsford-----	D										
Rock Outcrop-----	D										
Pa: Pits-----	---										
Pb: Plevna-----	D	January	0.0-2.0	>6.0	---	---	---	---	None		
February		0.0-2.0	>6.0	---	---	---	---	None			
March		0.0-2.0	>6.0	---	---	---	Long	Frequent			
April		0.0-2.0	>6.0	---	---	---	Long	Frequent			
May		0.0-2.0	>6.0	---	---	---	Long	Frequent			
June		0.0-2.0	>6.0	---	---	---	Long	Frequent			
July		0.0-2.0	>6.0	---	---	---	Long	Frequent			
August		0.0-2.0	>6.0	---	---	---	Long	Frequent			
September		0.0-2.0	>6.0	---	---	---	Long	Frequent			
October		0.0-2.0	>6.0	---	---	---	Long	Frequent			
November		0.0-2.0	>6.0	---	---	---	---	None			
December		0.0-2.0	>6.0	---	---	---	---	None			
Pc: Pratt-----	A										
Pd: Pratt-----	A										
Tivoli-----	A										
Ra: Renfrow-----	D										
Rb: Renfrow-----	D										
Rc: Renfrow-----	D										
Wellsford-----	D										
Rd: Rosehill-----	D										
Sa: Shellabarger-----	B										

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Map symbol and soil name	Hydro-logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
Sb: Shellabarger-----	B		---	---	---	---	---	---	---
Sc: Shellabarger-----	B		---	---	---	---	---	---	---
Ta: Tabler-----	D		---	---	---	---	---	---	---
Tb: Tabler-----	D		---	---	---	---	---	---	---
Drummond-----	D		---	---	---	---	---	---	---
		January	2.0-6.0	>6.0	---	---	---	---	None
		February	2.0-6.0	>6.0	---	---	---	---	None
		March	2.0-6.0	>6.0	---	---	---	---	None
		April	2.0-6.0	>6.0	---	---	---	---	None
		November	2.0-6.0	>6.0	---	---	---	---	None
		December	2.0-6.0	>6.0	---	---	---	---	None
Ua: Urban Land-----	---		---	---	---	---	---	---	---
Canadian-----	B		---	---	---	---	---	---	---
Ub: Urban Land-----	---		---	---	---	---	---	---	---
Elandco-----	B		---	---	---	---	---	---	---
Uc: Urban Land-----	---		---	---	---	---	---	---	---
Farnum-----	B		---	---	---	---	---	---	---
Ud: Urban Land-----	---		---	---	---	---	---	---	---
Irwin-----	D		---	---	---	---	---	---	---
Ue: Urban Land-----	---		---	---	---	---	---	---	---
Tabler-----	D		---	---	---	---	---	---	---
Va: Vanoss-----	B		---	---	---	---	---	---	---
Vb: Vanoss-----	B		---	---	---	---	---	---	---
Vc: Vanoss-----	B		---	---	---	---	---	---	---
Vd: Vanoss-----	B		---	---	---	---	---	---	---
Ve: Vernon-----	D		---	---	---	---	---	---	---
Vf: Vernon-----	D		---	---	---	---	---	---	---
W: Water-----	---		---	---	---	---	---	---	---
Wa: Waldeck-----	C		---	---	---	---	---	---	---
		January	2.0-4.0	>6.0	---	---	---	---	None
		February	2.0-4.0	>6.0	---	---	---	---	None
		March	2.0-4.0	>6.0	---	---	Brief	Occasional	
		April	2.0-4.0	>6.0	---	---	Brief	Occasional	
		May	---	---	---	---	Brief	Occasional	
		June	---	---	---	---	Brief	Occasional	
		July	---	---	---	---	Brief	Occasional	
		August	---	---	---	---	Brief	Occasional	
		September	---	---	---	---	Brief	Occasional	
		October	2.0-4.0	>6.0	---	---	Brief	Occasional	
		November	2.0-4.0	>6.0	---	---	---	None	
		December	2.0-4.0	>6.0	---	---	---	None	
Wb:			---	---	---	---	---	---	---

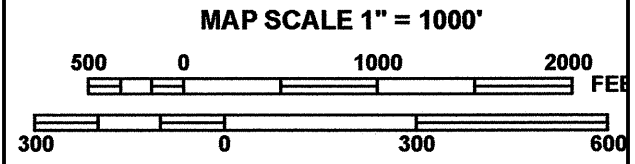
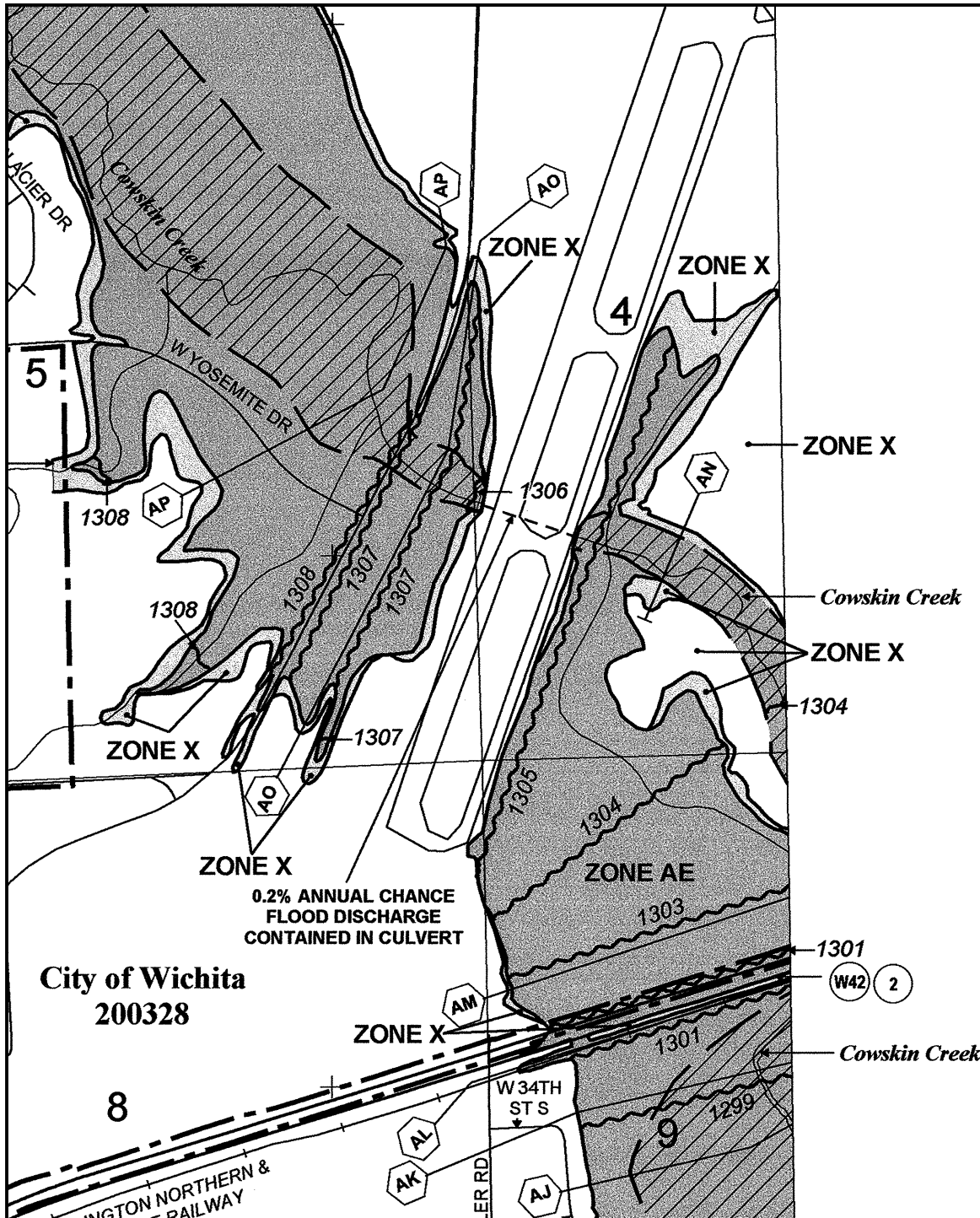
WATER FEATURES--Continued
Sedgwick County, Kansas

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro- logic group	Month	Soil Saturation		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			Ft	Ft	Ft				
Waurika-----	D	January	0.5-1.0	1.0-2.0	---	---	---	---	None
		February	0.5-1.0	1.0-2.0	---	---	---	---	None
		March	0.5-1.0	1.0-2.0	---	---	---	---	None
		April	0.5-1.0	1.0-2.0	---	---	---	---	None
		May	0.5-1.0	1.0-2.0	---	---	---	---	None
		November	0.5-1.0	1.0-2.0	---	---	---	---	None
		December	0.5-1.0	1.0-2.0	---	---	---	---	None

Appendix C

FEMA Flood Insurance Rate Map



NFIP

PANEL 0340E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 340 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0340	E
WICHITA, CITY OF	200328	0340	E

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

MAP NUMBER
20173C0340E

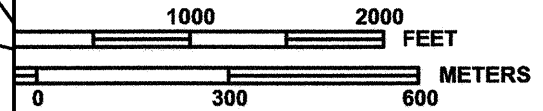
EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

4166000m N

MAP SCALE 1" = 1000'



4

WARNING! THIS AREA IS SH
BEING PROTECTED FROM THE
ANNUAL CHANCE FLOOD HAZAR
DIKE, OR OTHER STRUCTURE. C
OR FAILURE OF THIS STRUCTUR
WHICH COULD RESULT IN DESTR
ELEVATIONS AND WATER VELOC
PROTECTION, FLOOD INSURA
ADHERENCE TO EVACUATION P
ARE STRONGLY RECOMMEN
ADDITIONAL INFORMAT
SEE THE NOTES TO USE

City of Wichita
200328

PANEL 0345E

FIRM
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,
KANSAS
AND INCORPORATED AREAS

PANEL 345 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0345	E
WICHITA, CITY OF	200328	0345	E

4167000m N

W CESSNA

1304
ZONE AE
Cowskin
Creek
ZONE X

BURLINGTON NORTHERN
& SANTA FE RAILWAY

2 W42

Sedgwick County
Unincorporated Areas
200321

1301
1301
ZONE X

1303 AM

AL AK
ZONE X

City of Wichita
200328

9 ZONE X

1299
AJ

4166000m N

W 34TH ST S

CITY OF WICHITA
SEDGWICK COUNTY
RD

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



MAP NUMBER
20173C0345E

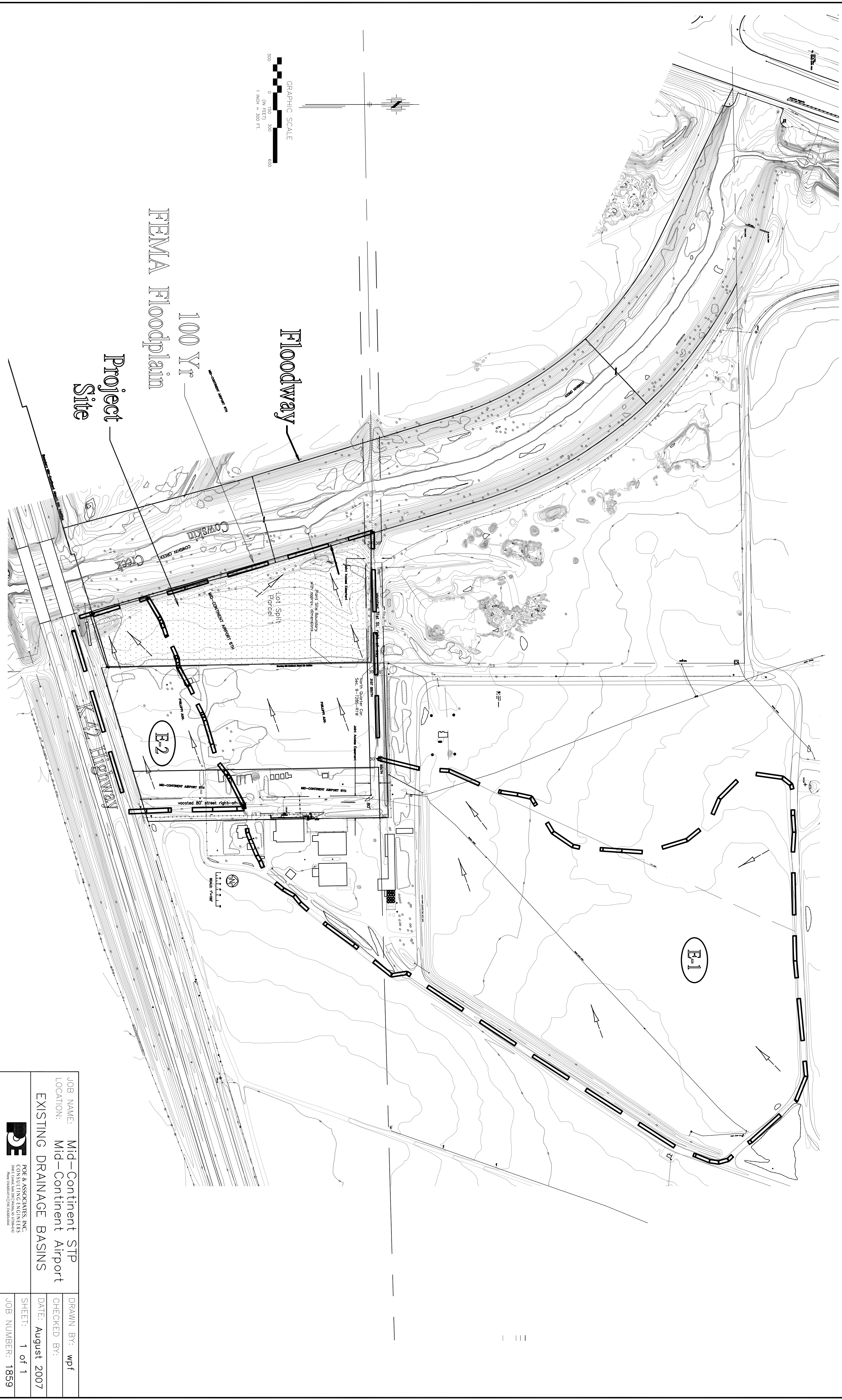
EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix D

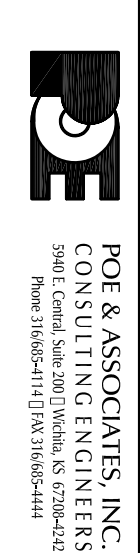
Existing Conditions



FEMA Floodplain
 100 Yr
 Floodway
 Project Site

JOB NAME: Mid-Continent STP
 LOCATION: Mid-Continent Airport
 EXISTING DRAINAGE BASINS

DRAWN BY: wpf
 CHECKED BY:
 DATE: August 2007
 SHEET: 1 of 1
 JOB NUMBER: 1859



NOTE

HORIZONTAL AND VERTICAL CONTROL FURNISHED BY POE & ASSOC OF KS. MAP ACCURACY IS RELATED DIRECTLY TO THE CONTROL FURNISHED. THIS MAP HAS BEEN DESIGNED TO MEET NATIONAL MAP ACCURACY STANDARDS AT ITS ORIGINAL BASIC SCALE OF 1"=40' AND CONTOUR INTERVAL OF 1 FT. MARKHURD'S LIABILITY FOR ANY INACCURACIES FOUND IN THIS MAP SHALL BE LIMITED TO THE CORRECTION OF ANY SUCH INACCURACIES FOUND DUE TO THE PHOTOGRAMMETRIC PROCESS, AND SHALL NOT EXCEED THE CONTRACT VALUE OF THE MAP. IT IS THE RESPONSIBILITY OF THE MAP USER TO ASCERTAIN WHETHER OR NOT THE ABOVE SCALE, CONTOUR INTERVAL AND ACCURACY ARE SATISFACTORY FOR WHATEVER PURPOSE THE MAP IS TO BE USED.

LEGEND

- RAILROAD TRACKS
- ROAD
- ROAD UNDER-CONSTRUCTION
- DRIVEWAY
- TRAIL
- SHOULDER
- DRAIN OR SHORELINE
- SWAMP
- FENCE
- GUARD RAIL
- WALL
- SIDEWALK
- PIPELINE
- FOUNDATION OR SLAB
- WOODS OUTLINE
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- INDEX DEPRESSION CONTOUR
- INTERMEDIATE DEPRESSION
- APPROXIMATE CONTOUR
- UNDER CONSTRUCTION OUTLINE
- UNIDENTIFIED OBJECT
- CULVERT
- END OF CULVERT
- CATCH BASIN
- HYDRANT
- MANHOLE
- UTILITY POLE
- FLAG POLE
- RAILROAD CROSSING SIGN
- RADIO, TV TOWERS
- HORIZONTAL CONTROL POINT
- VERTICAL CONTROL POINT
- SWAMP SYMBOL
- COMMERCIAL SIGN
- TREE

BENCHMARKS:

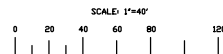
1. COW BM - NW Cor. of bridge on sidewalk. 250.0 +/- ft. North of Yosemite Elev. 121.47 ft (COW Datum) (1308.87 MSL Datum)
2. COW BM - Woodchuck and K42 Highway. NW of center of K42 Highway. 2 ft. West of 1/4 Section Corner Iron. Elev.=124.07 ft (COW Datum) (1311.47 ft MSL Datum)

LEGEND

- | | |
|--------------------------------|-----------------------------|
| Power Pole | Light Pole |
| Fire Hydrant | Guy Anchor |
| No Parking Sign (unless noted) | Manhole |
| Gas Meter | Parking Meter |
| Sewer Clean Out | Electrical Vault |
| Water Valve | Telephone Manhole |
| Water Meter | Roof Drain |
| CARV | Gas Line |
| | Overhead Power Line |
| | Underground Power Cable |
| | Sanitary Sewer |
| | Underground Telephone Cable |
| | Water Line |
| | Force Main |

NOTES:
 The location of underground utilities in the vicinity of the area surveyed were requested to be marked through the "One Call" system. The location of underground utilities shown on this drawing are from observed surface evidence, marks made in the field by the utility owners and from record information.
 The utility companies contacted by the One Call system:
 Ticket No. 6058943, 6058956, 6058986 and 6082407
 Cox Communications
 Westar Energy
 Aquila
 Wichita Water
 Kansas Gas Service
 SBC
 Wichita Airport Authority
 Telcove

Only those easements and rights-of-way shown on the Mid-Continent Airport 8th Addition Plat have been shown on this Topographic Survey.



CONTOUR INTERVAL = 1 FOOT
 TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS TAKEN ON JAN 23, 2006.
 INDEPENDENT HORIZONTAL DATUM.
 VERTICAL DATUM IS CITY OF MICHIGAN GRID SHOWN AT A 200 FOOT INTERVAL.

Mid-Continent STP Plant - Wichita, KS Watershed SCS CN Calculations							
Basin	Area (Acres)	CN (composite)	CN for Subarea #1		CN for Subarea #2		CN for Subarea #3
Existing Pre-Project Conditions							
E1	51						
			5.2 Acres		38.9 Acres		6.9 Acres
			88 CN (Industrial, Soil B)		69 CN (Grass, Fair, Soil B)		65 CN (Woods, Fair, Soil B)
			9.0 CNsubarea1		52.6 CNsubarea1		8.8 CNsubarea1
		70.4					
E2	6.0						
			0.5 Acres		4 Acres		1.5 Acres
			88 CN (Industrial, Soil B)		69 CN (Grass, Fair, Soil B)		65 CN (Woods, Fair, Soil B)
			7.3 CNsubarea1		46.0 CNsubarea2		16.3 CNsubarea3
		69.6					

**Mid-Continent STP Plant
Time of Concentration
SCS Lag Method**

Watershed Name	Area Acre(s)	CN	Length (ft)	Max. Elev. (ft)	Min. Elev. (ft.)	Watershed Slope (Y)%	S	Lag (hrs)	Calculated Tc (min.)	Tc (min.)
E1	51.0	70.4	2845	135.5	114	0.76	4.20	1.11	111.38	111.38
E2	6.0	69.6	900	131	108	2.56	4.37	0.25	24.65	24.65
P1A	44.7	70.6	2845	135.5	114	0.76	4.16	1.11	110.78	110.78
P1B	6.3	78.2	925	124	114	1.08	2.79	0.30	30.35	30.35
P2	6.0	69.6	900	131	108	2.56	4.37	0.25	24.65	24.65

$$S=(1000/CN)-10$$

$$\text{Lag} = (L^{0.8}(S+1)^{0.7})/(1900Y^{0.5})$$

$$\text{TC} = \text{Lag} / 0.6$$

Hydrograph Plot

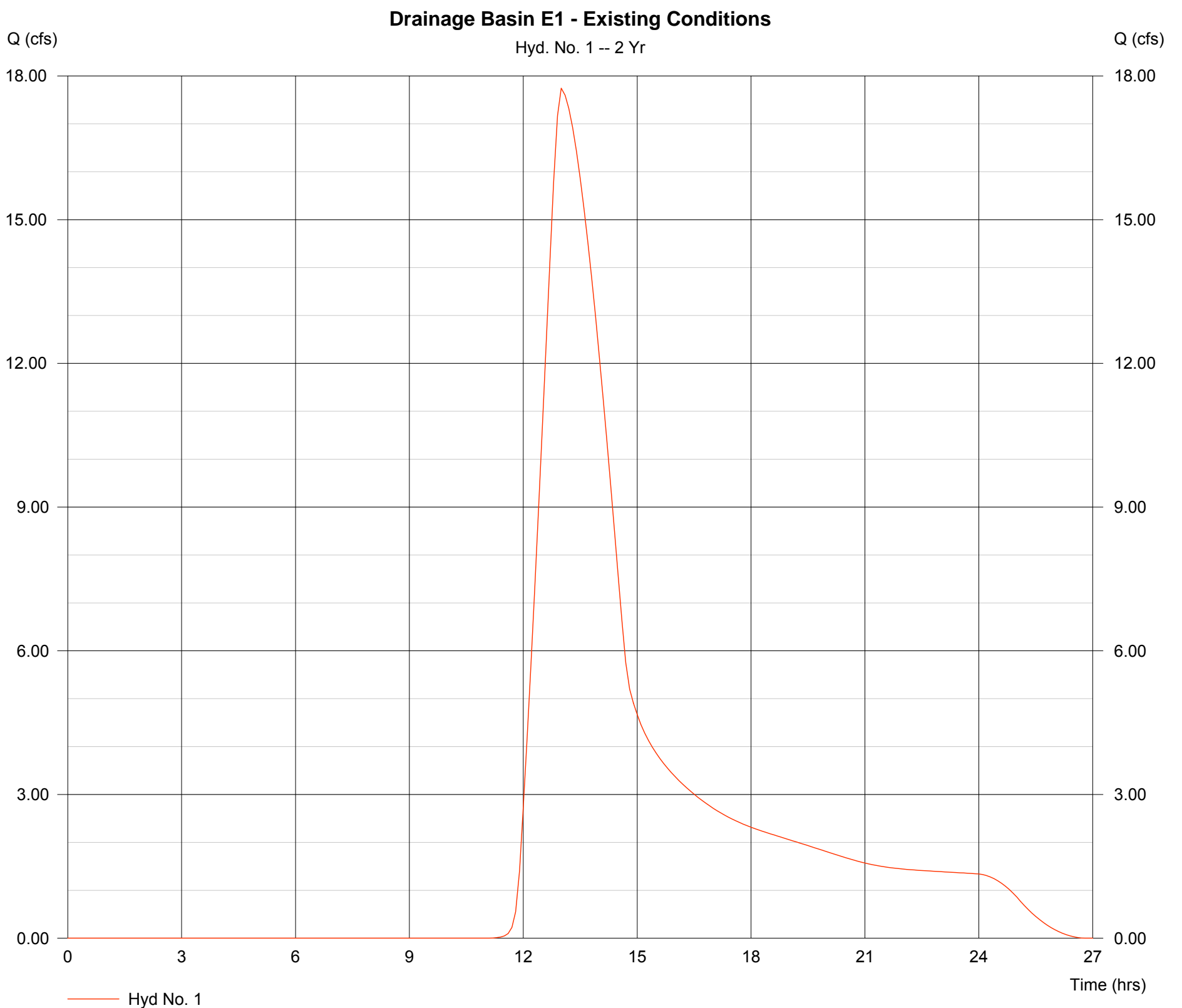
Hyd. No. 1

Drainage Basin E1 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 51.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 3.60 in
Storm duration = 24 hrs

Peak discharge = 17.74 cfs
Time interval = 6 min
Curve number = 70.4
Hydraulic length = 2845 ft
Time of conc. (Tc) = 111.29 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 4.593 acft



Hydrograph Plot

Hyd. No. 1

Drainage Basin E1 - Existing Conditions

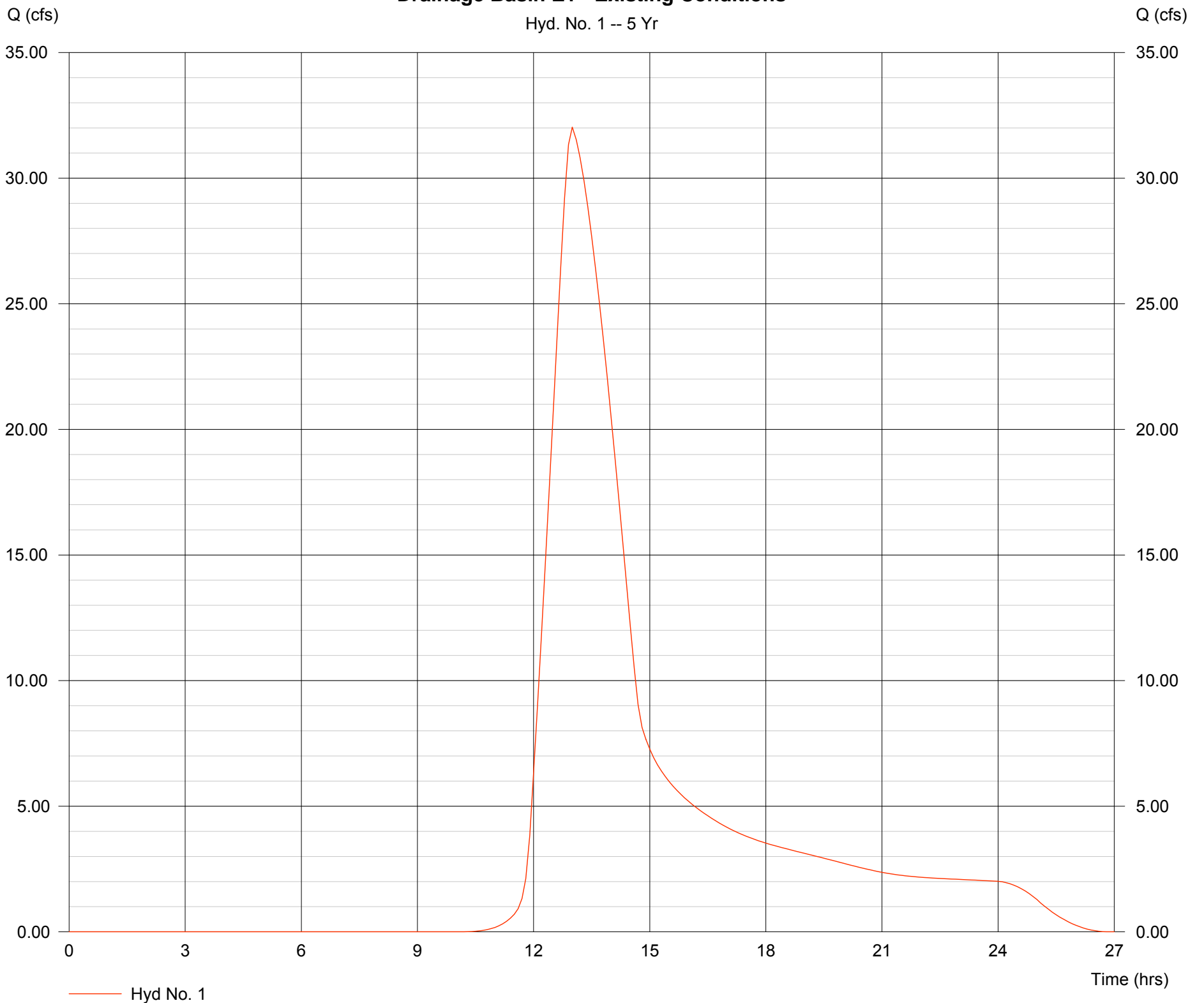
Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Drainage area = 51.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 4.70 in
Storm duration = 24 hrs

Peak discharge = 32.03 cfs
Time interval = 6 min
Curve number = 70.4
Hydraulic length = 2845 ft
Time of conc. (Tc) = 111.29 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 7.760 acft

Drainage Basin E1 - Existing Conditions

Hyd. No. 1 -- 5 Yr



Hydrograph Plot

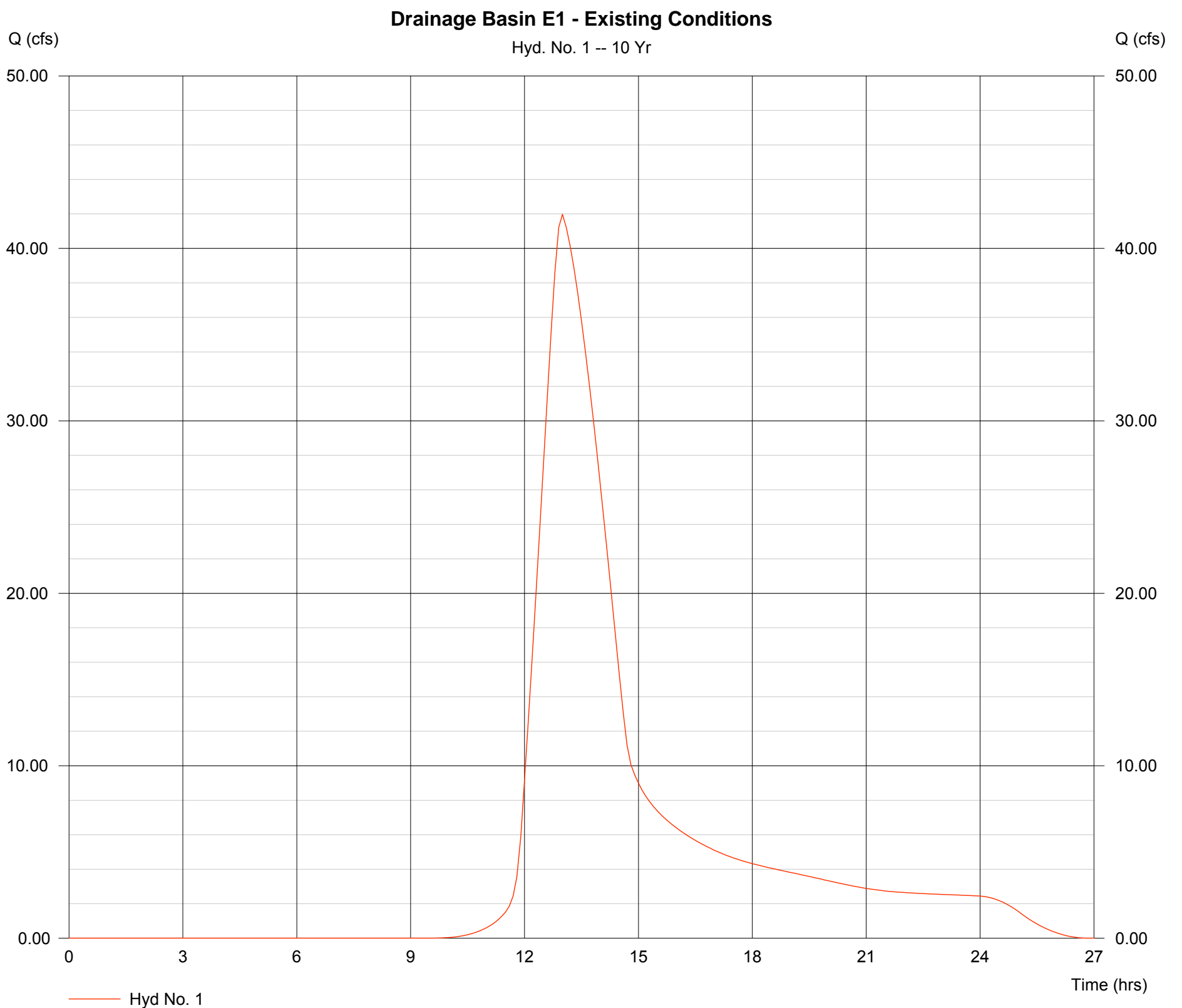
Hyd. No. 1

Drainage Basin E1 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 51.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 5.40 in
Storm duration = 24 hrs

Peak discharge = 41.97 cfs
Time interval = 6 min
Curve number = 70.4
Hydraulic length = 2845 ft
Time of conc. (Tc) = 111.29 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 9.965 acft



Hydrograph Plot

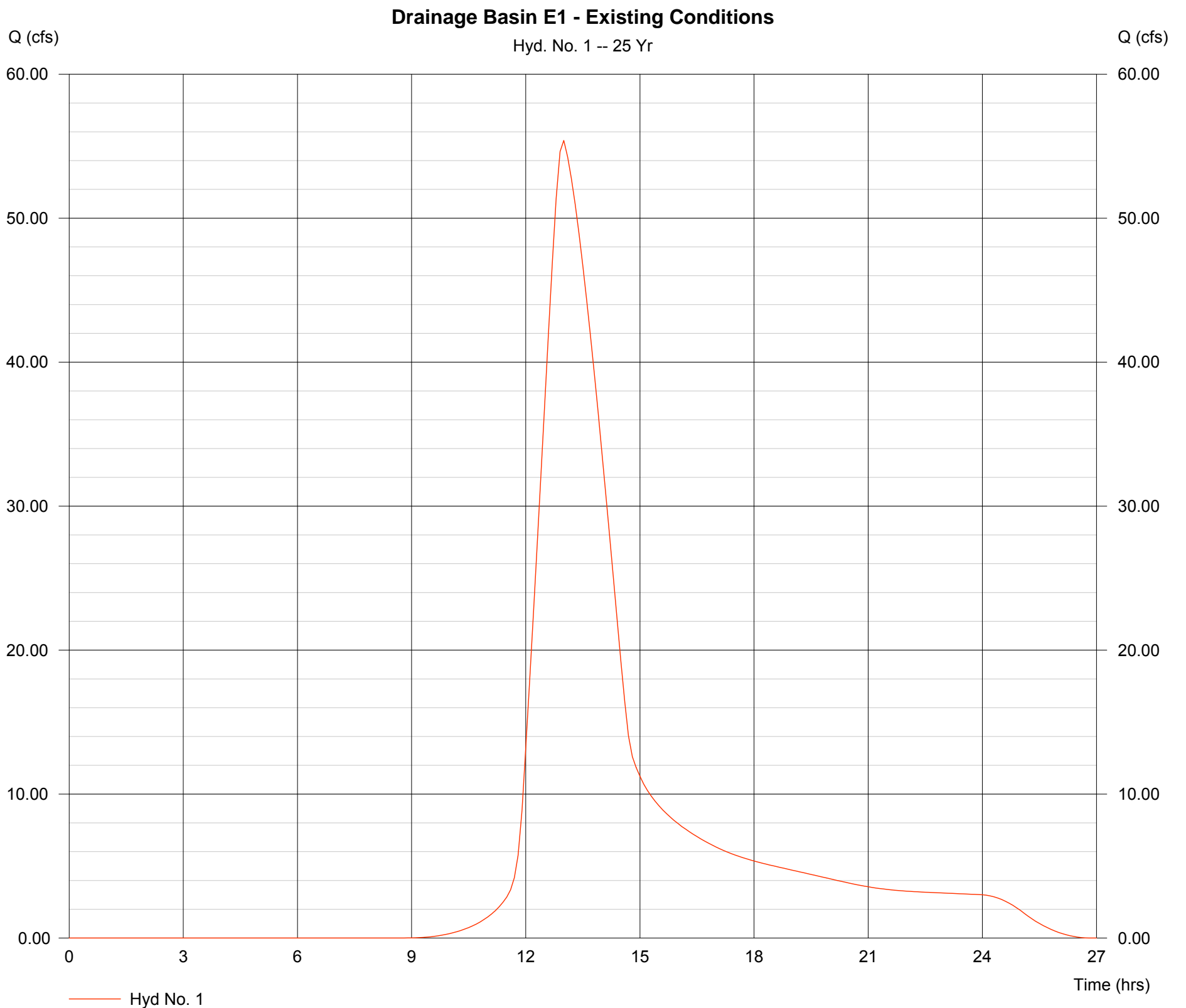
Hyd. No. 1

Drainage Basin E1 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Drainage area = 51.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 6.30 in
Storm duration = 24 hrs

Peak discharge = 55.40 cfs
Time interval = 6 min
Curve number = 70.4
Hydraulic length = 2845 ft
Time of conc. (Tc) = 111.29 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 12.958 acft



Hydrograph Plot

Hyd. No. 1

Drainage Basin E1 - Existing Conditions

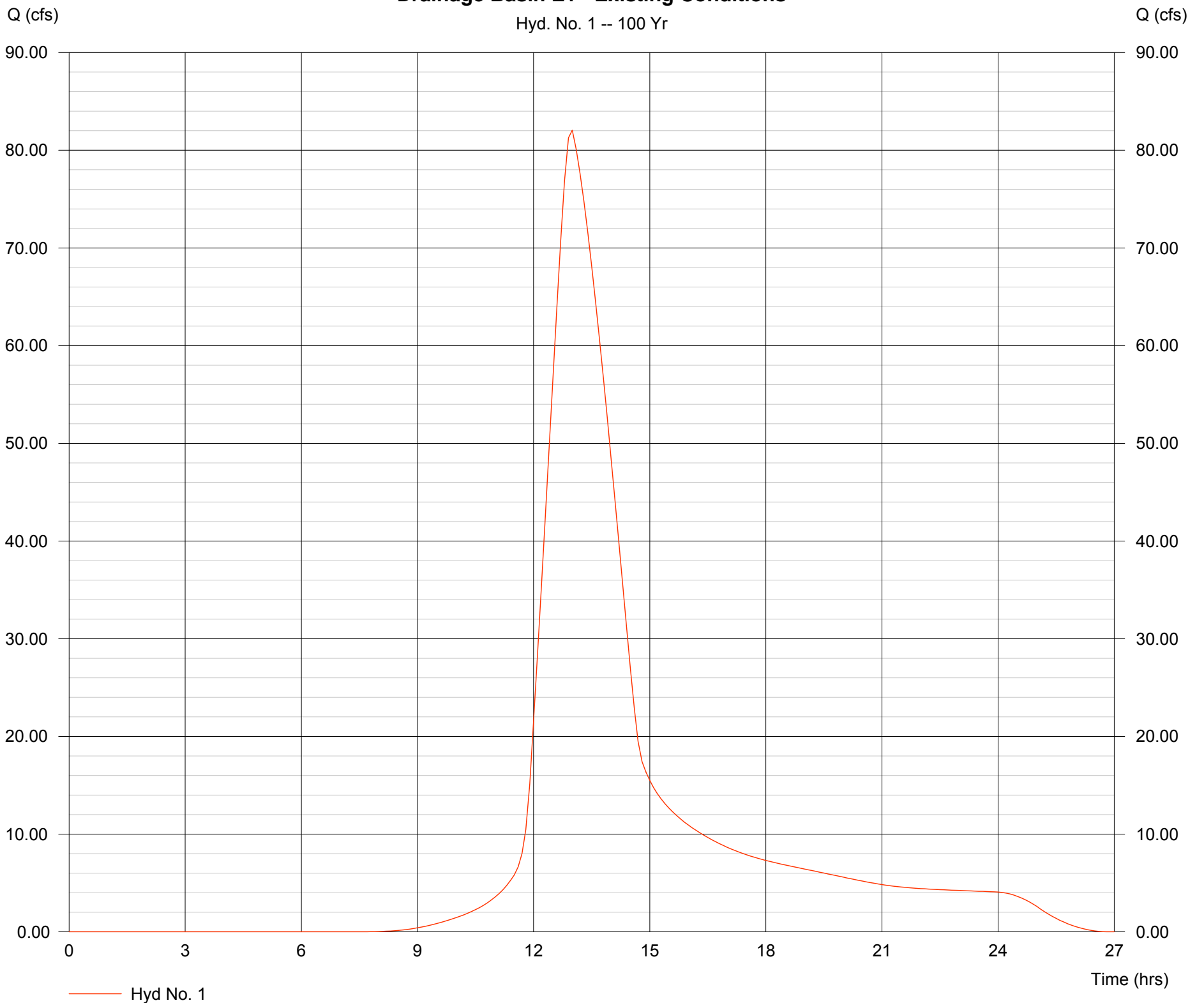
Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 51.000 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 8.00 in
Storm duration = 24 hrs

Peak discharge = 82.05 cfs
Time interval = 6 min
Curve number = 70.4
Hydraulic length = 2845 ft
Time of conc. (Tc) = 111.29 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 18.951 acft

Drainage Basin E1 - Existing Conditions

Hyd. No. 1 -- 100 Yr



Hydrograph Plot

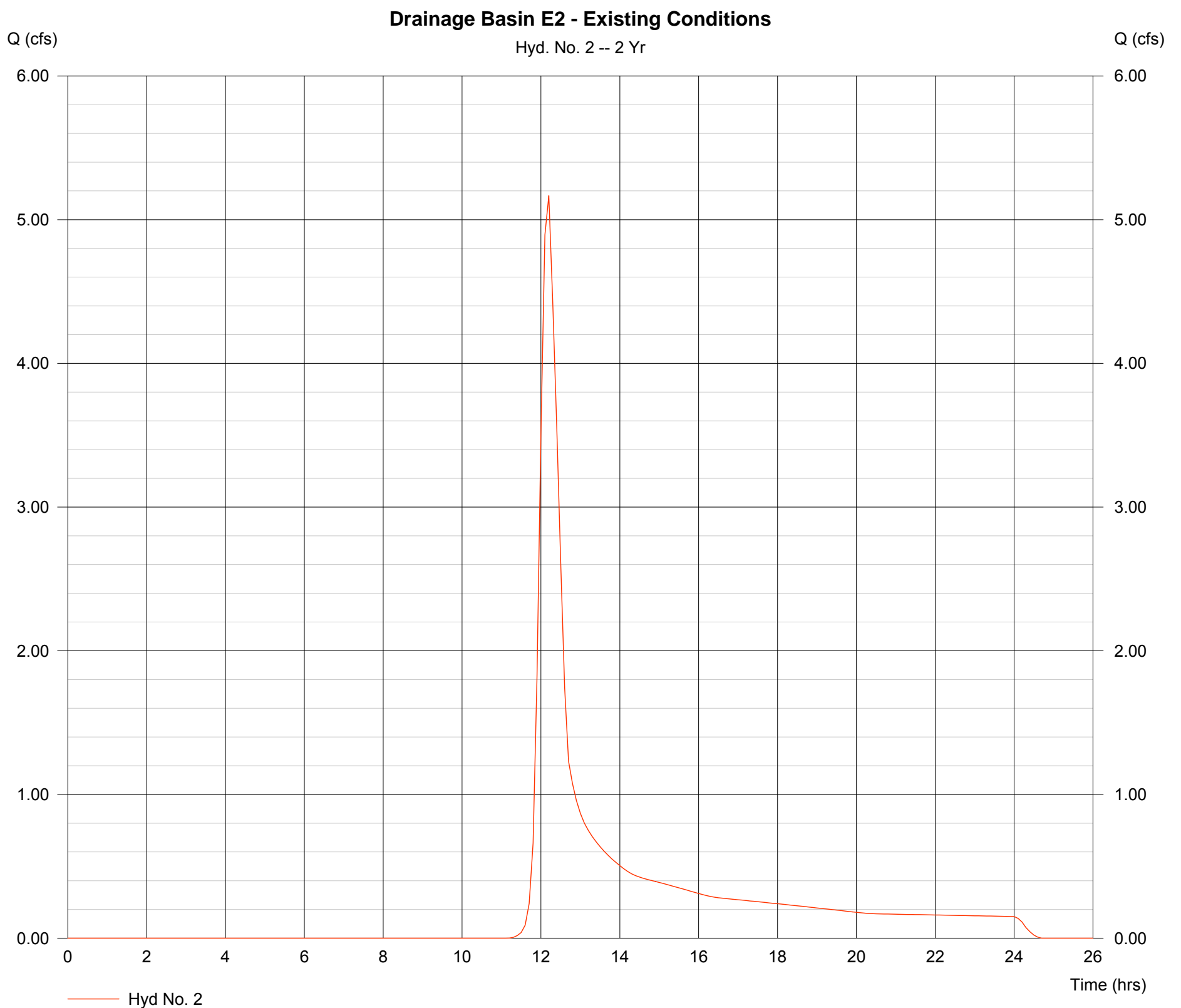
Hyd. No. 2

Drainage Basin E2 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 3.60 in
Storm duration = 24 hrs

Peak discharge = 5.17 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.67 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 0.524 acft



Hydrograph Plot

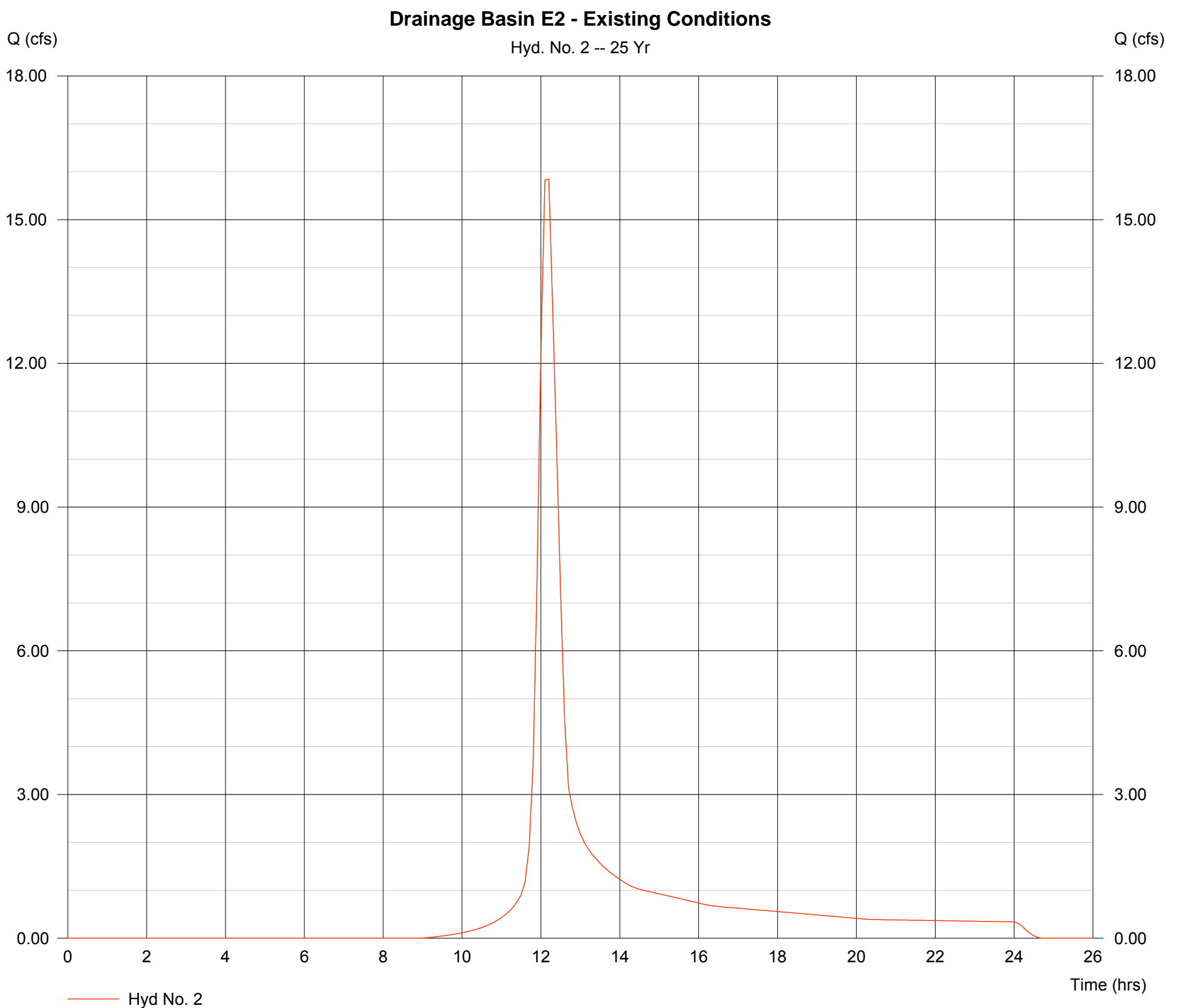
Hyd. No. 2

Drainage Basin E2 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 6.30 in
Storm duration = 24 hrs

Peak discharge = 15.85 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.67 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.503 acft



Hydrograph Plot

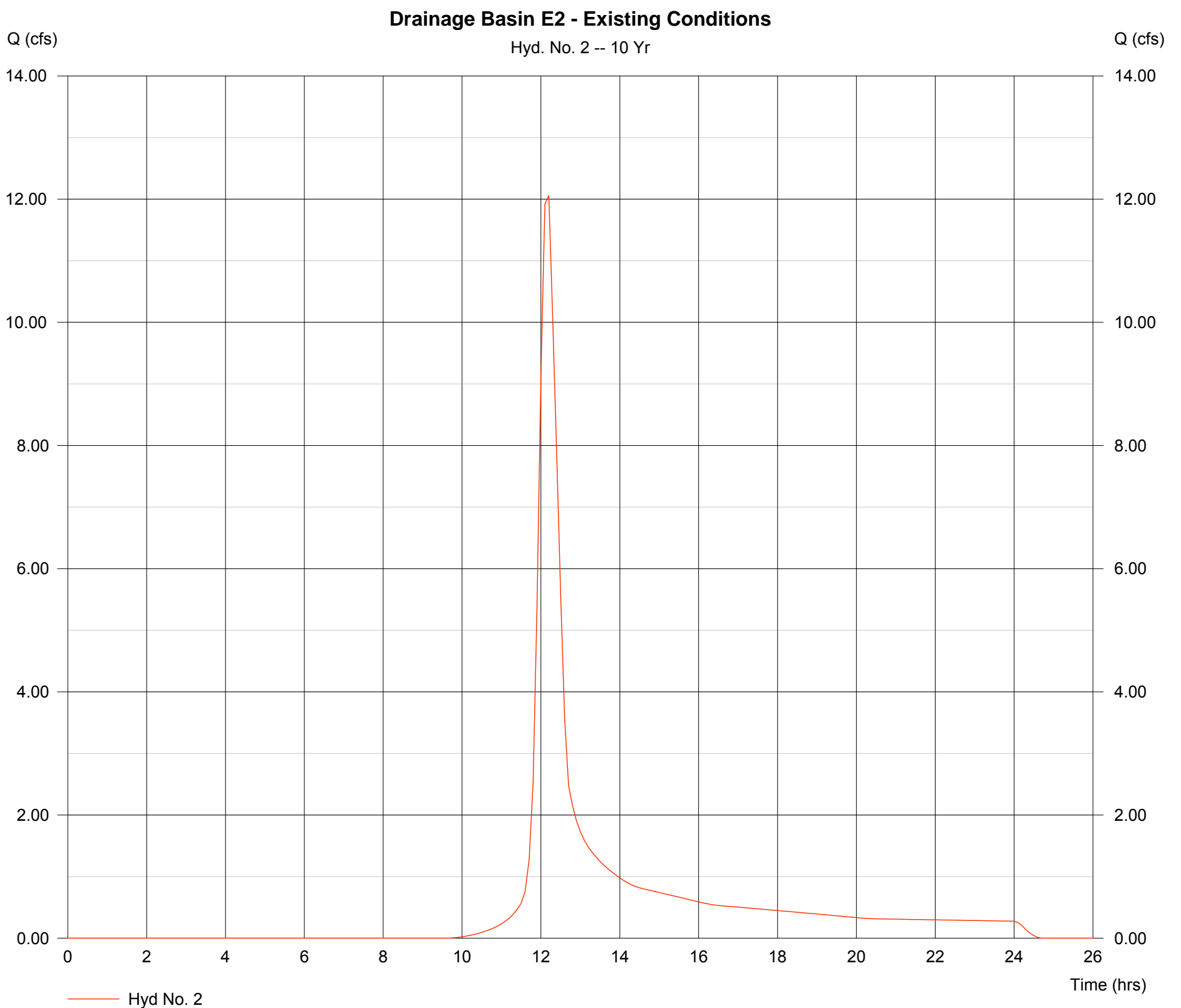
Hyd. No. 2

Drainage Basin E2 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 5.40 in
Storm duration = 24 hrs

Peak discharge = 12.06 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.67 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.152 acft



Hydrograph Plot

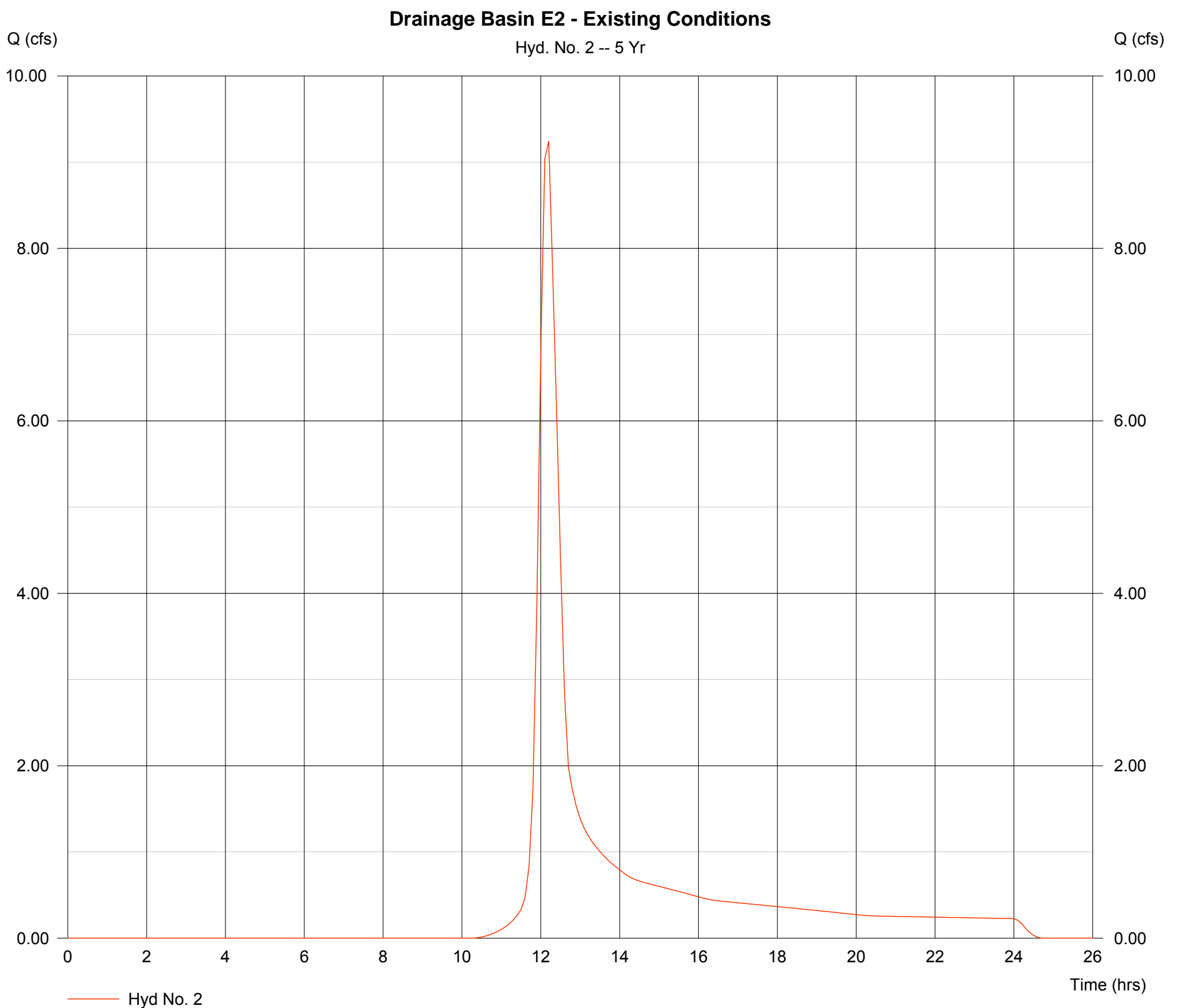
Hyd. No. 2

Drainage Basin E2 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 4.70 in
Storm duration = 24 hrs

Peak discharge = 9.24 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.67 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 0.893 acft



Hydrograph Plot

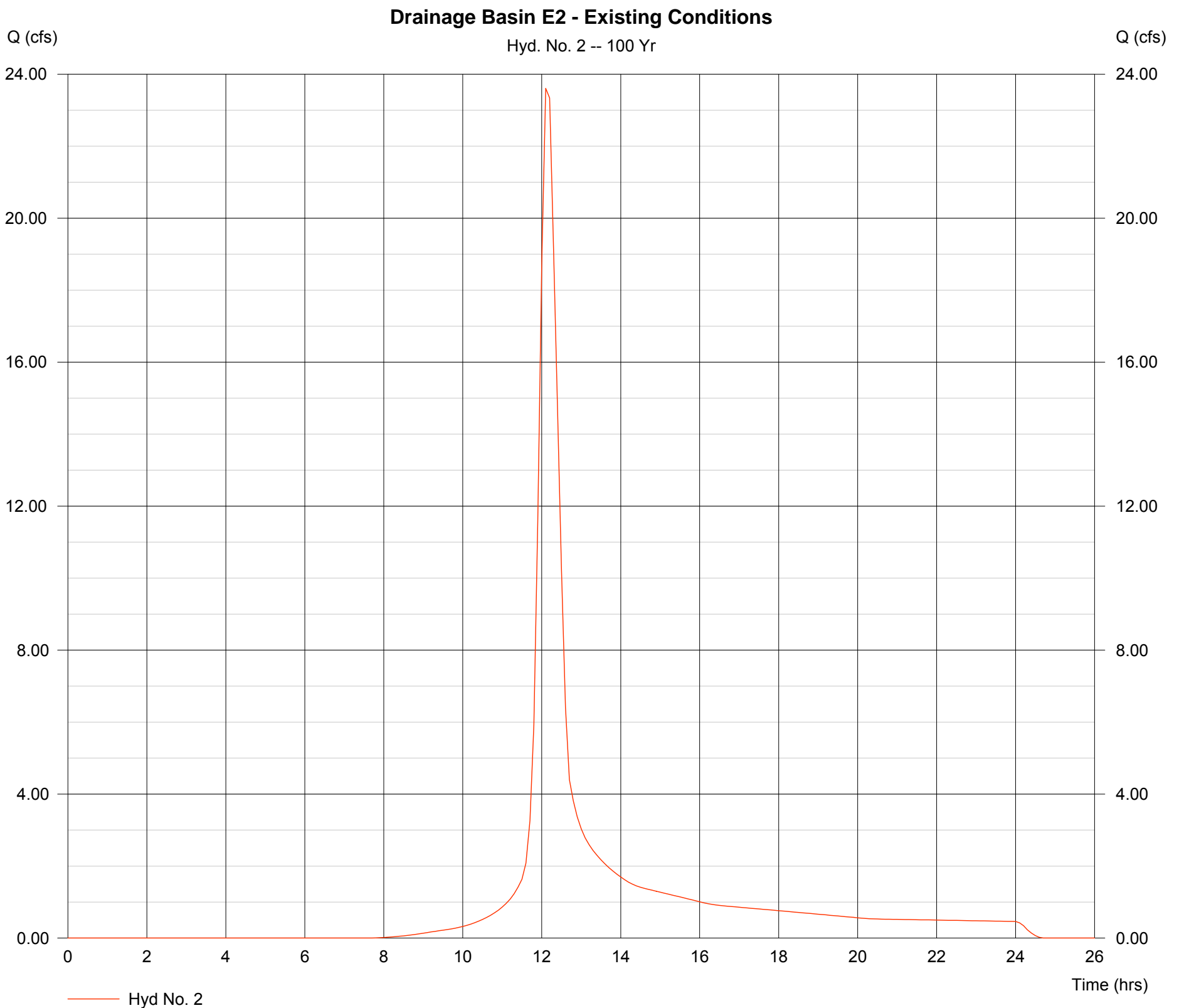
Hyd. No. 2

Drainage Basin E2 - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 8.00 in
Storm duration = 24 hrs

Peak discharge = 23.61 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.67 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 2.209 acft



Appendix E

Proposed Conditions

REV.	DATE	ORGN	CHGO	REMARKS

DESIGNED BY: MBR
 DRAWN BY: WLB
 SHEET CHECK BY: _____
 GROSS CHECK BY: _____
 APPROVED BY: _____
 DATE: OCTOBER 2007

CDM Camp Dresser & McKee, Inc.
 345 Riverchase, Suite 530
 Wichita, Kansas 67203
 Tel: 316-686-6700
 Fax: 316-264-3025

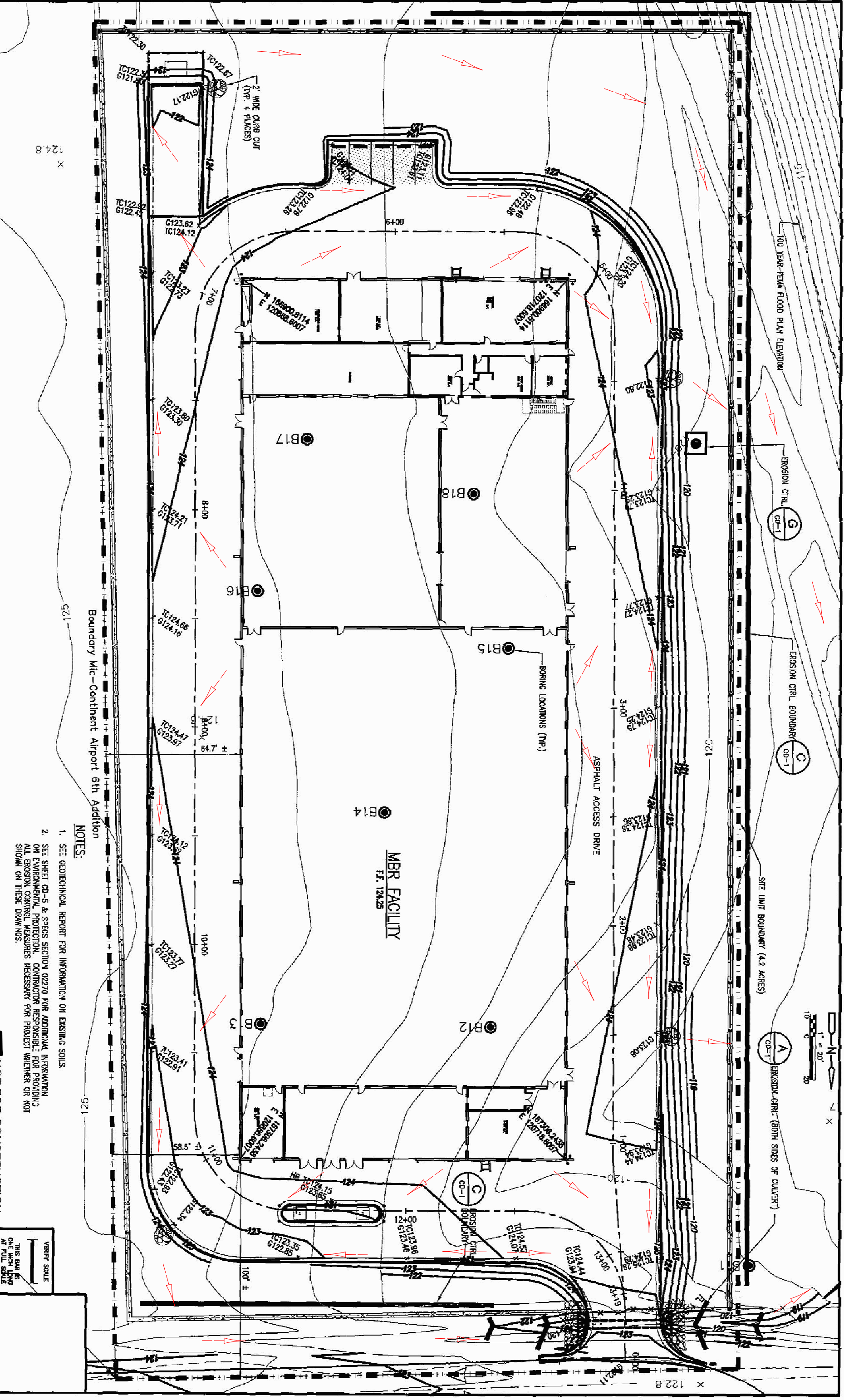
D&S CONSULTANTS, INC.
 5272 SHORE PARKWAY
 KANSAS CITY, MISSOURI 64130
 WWW.D&S.COM

MID-CONTINENT WATER QUALITY RECLAMATION FACILITY
 CITY OF WICHITA, KANSAS
 WICHITA WATER UTILITIES

NOT FOR CONSTRUCTION

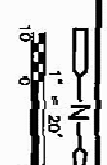
MBR FACILITY AND EROSION CONTROL SITE PLAN

PROJECT NO. 2393-48925
 FILE NAME CSTPL100
 SHEET NO. C-2
 OF 7



- NOTES:**
1. SEE GEOTECHNICAL REPORT FOR INFORMATION ON EXISTING SOILS.
 2. SEE SHEET GD-5 & SPECS SECTION 02270 FOR ADDITIONAL INFORMATION ON ENVIRONMENTAL PROTECTION. CONTRACTOR RESPONSIBLE FOR PROVIDING ALL EROSION CONTROL MEASURES NECESSARY FOR PROJECT WHETHER OR NOT SHOWN ON THESE DRAWINGS.

VERIFY SCALE
 THIS BAR IS ONE INCH LONG AT FULL SCALE



1248 X

1228 X

REV	DATE	BY	CHKD	REMARKS

DESIGNED BY: WLB
 DRAWN BY: WLB
 CHECKED BY: WLB
 APPROVED BY: WLB
 DATE: OCTOBER 2007

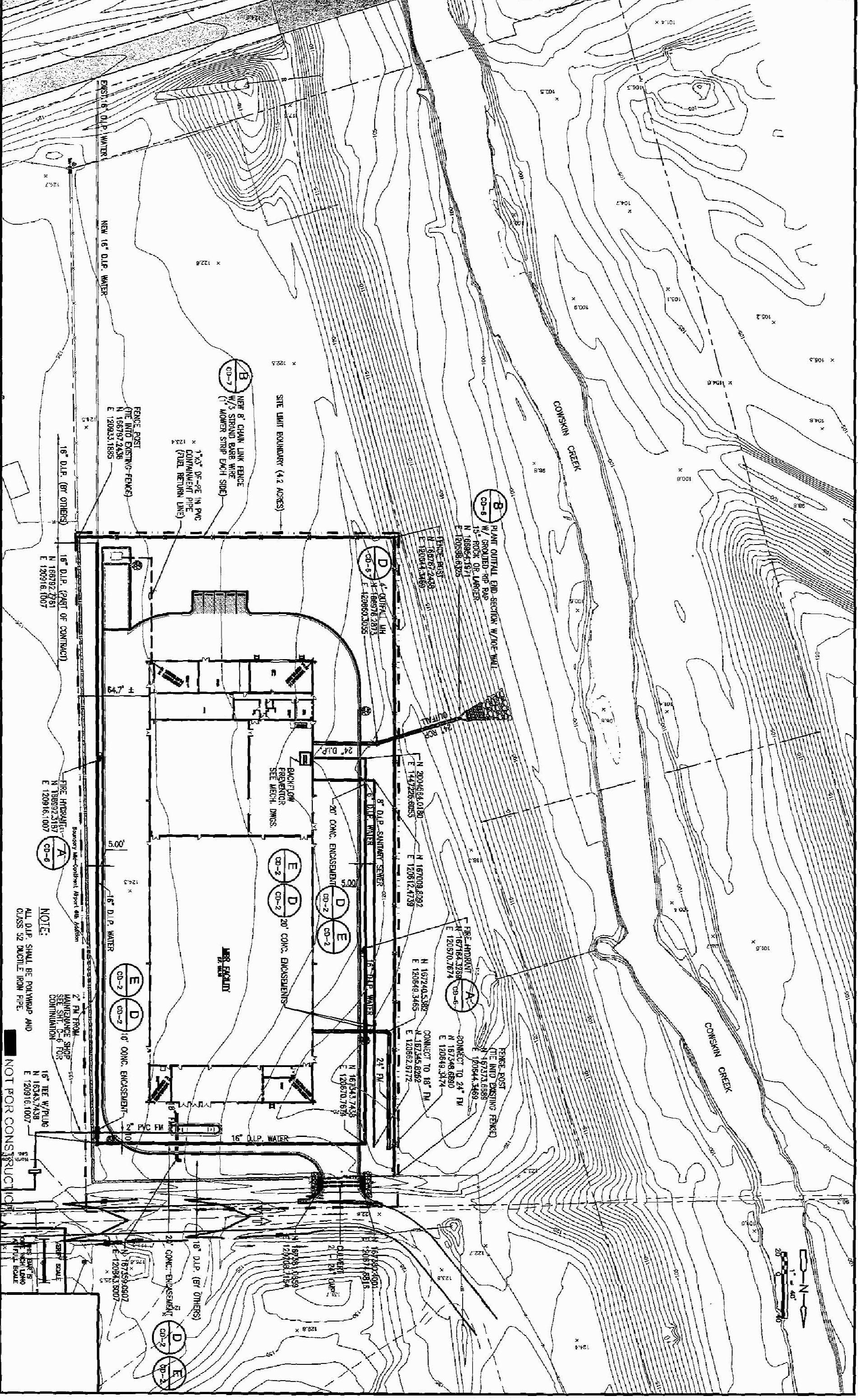
CDM
 Camp Dresser & McKee Inc.
 346 Riverway, Suite 500
 Wichita, Kansas 67203
 Tel: 316-861-6700
 Fax: 316-261-3082

ADVIS CONSULTANTS, INC.
 5221 S. WYOMING AVE.
 WICHITA, KS 67208
 WWW.ADCONKS.COM

MID-CONTINENT WATER QUALITY RECLAMATION FACILITY
 CITY OF WICHITA, KANSAS
WICHITA WATER UTILITIES

MBR FACILITY
PLANT OUTFALL PIPE & YARD PIPING SITE PLAN

PROJECT NO: 2385-48835
 FILE NAME: CSP1100
 SHEET NO: C-4
 OF 2



**Mid-Continent STP Plant
Time of Concentration
SCS Lag Method**

Watershed Name	Area Acre(s)	CN	Length (ft)	Max. Elev. (ft)	Min. Elev. (ft.)	Watershed Slope (Y)%	S	Lag (hrs)	Calculated Tc (min.)	Tc (min.)
E1	51.0	70.4	2845	135.5	114	0.76	4.20	1.11	111.38	111.38
E2	6.0	69.6	900	131	108	2.56	4.37	0.25	24.65	24.65
P1A	44.7	70.6	2845	135.5	114	0.76	4.16	1.11	110.78	110.78
P1B	6.3	78.2	925	124	114	1.08	2.79	0.30	30.35	30.35
P2	6.0	69.6	900	131	108	2.56	4.37	0.25	24.65	24.65

$$S=(1000/CN)-10$$

$$\text{Lag} = (L^{0.8}(S+1)^{0.7})/(1900Y^{0.5})$$

$$\text{TC} = \text{Lag} / 0.6$$

Mid-Continent STP Plant - Wichita, KS Watershed SCS CN Calculations							
Basin	Area (Acres)	CN (composite)	CN for Subarea #1		CN for Subarea #2		CN for Subarea #3
Proposed							
Post-Project Conditions							
P1A	44.7						
			5.2 Acres		32.6 Acres		6.9 Acres
			88 CN (Industrial, Soil B)		69 CN (Grass, Fair, Soil B)		65 CN (Woods, Fair, Soil B)
			10.2 CNsubarea1		50.3 CNsubarea1		10.0 CNsubarea1
		70.6					
P1B	6.3						
			2.4 Acres		3.9 Acres		Acres
			98 CN (Pavmt & Rooftop)		69 CN (Grass, Fair, Soil B)		CN
			37.3 CNsubarea1		42.7 CNsubarea1		CNsubarea1
		80.0					
P2	6.0						
			0.5 Acres		4 Acres		1.5 Acres
			88 CN (Industrial, Soil B)		69 CN (Grass, Fair, Soil B)		65 CN (Woods, Fair, Soil B)
			7.3 CNsubarea1		46.0 CNsubarea2		16.3 CNsubarea3
		69.6					

Hydrograph Plot

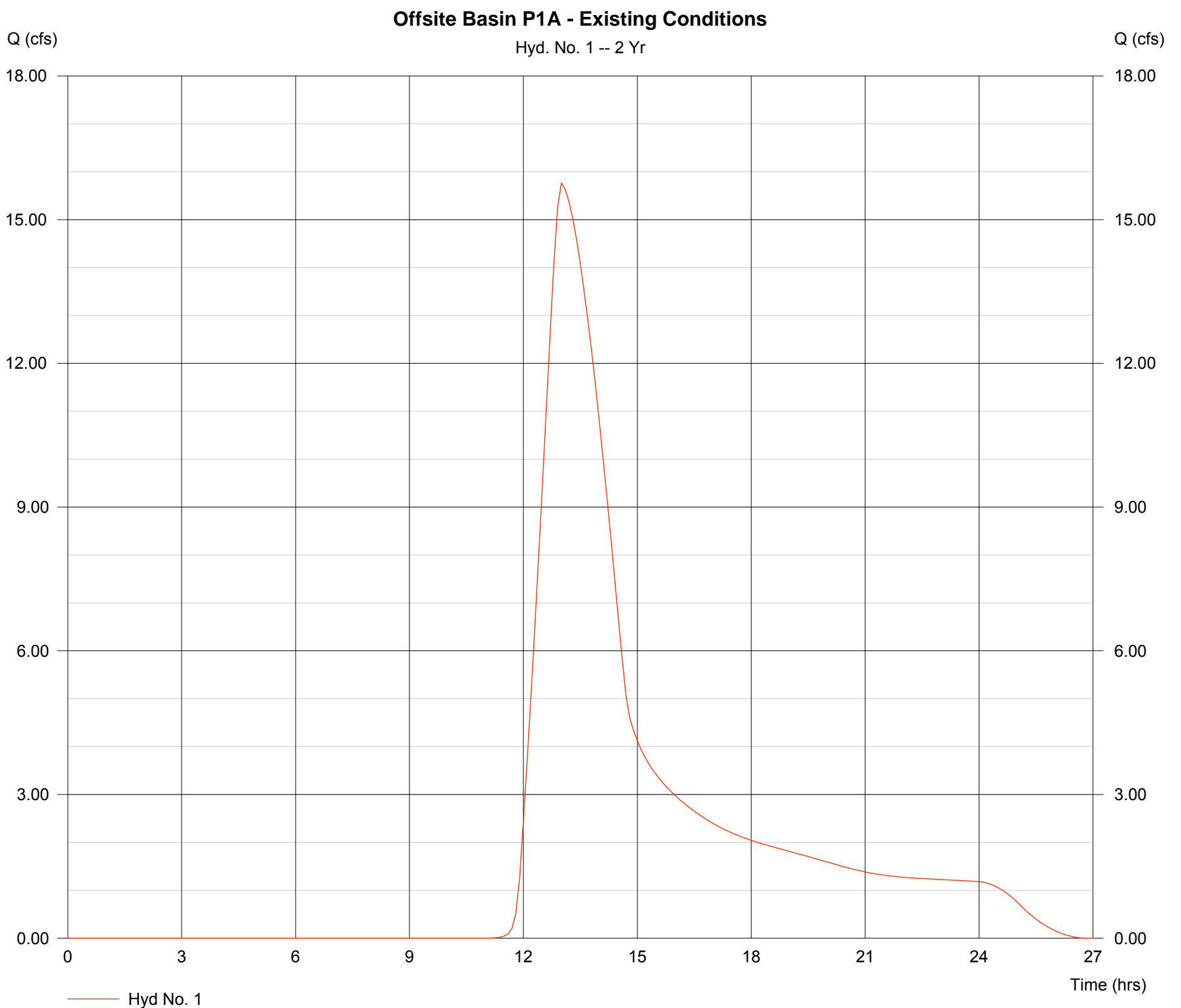
Hyd. No. 1

Offsite Basin P1A - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 44.700 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 3.60 in
Storm duration = 24 hrs

Peak discharge = 15.76 cfs
Time interval = 6 min
Curve number = 70.6
Hydraulic length = 2850 ft
Time of conc. (Tc) = 110.84 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 4.068 acft



Hydrograph Plot

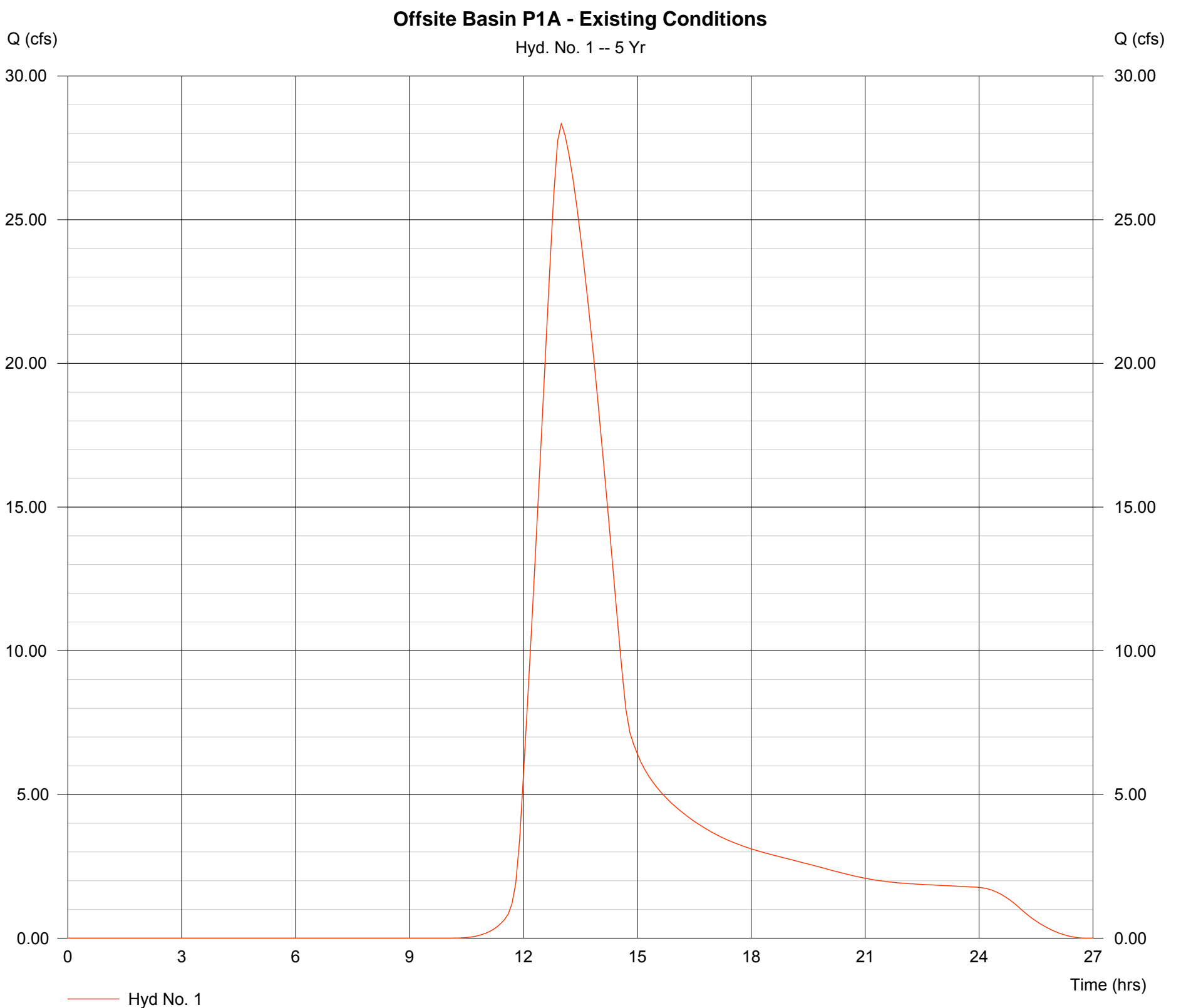
Hyd. No. 1

Offsite Basin P1A - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Drainage area = 44.700 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 4.70 in
Storm duration = 24 hrs

Peak discharge = 28.35 cfs
Time interval = 6 min
Curve number = 70.6
Hydraulic length = 2850 ft
Time of conc. (Tc) = 110.84 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 6.857 acft



Hydrograph Plot

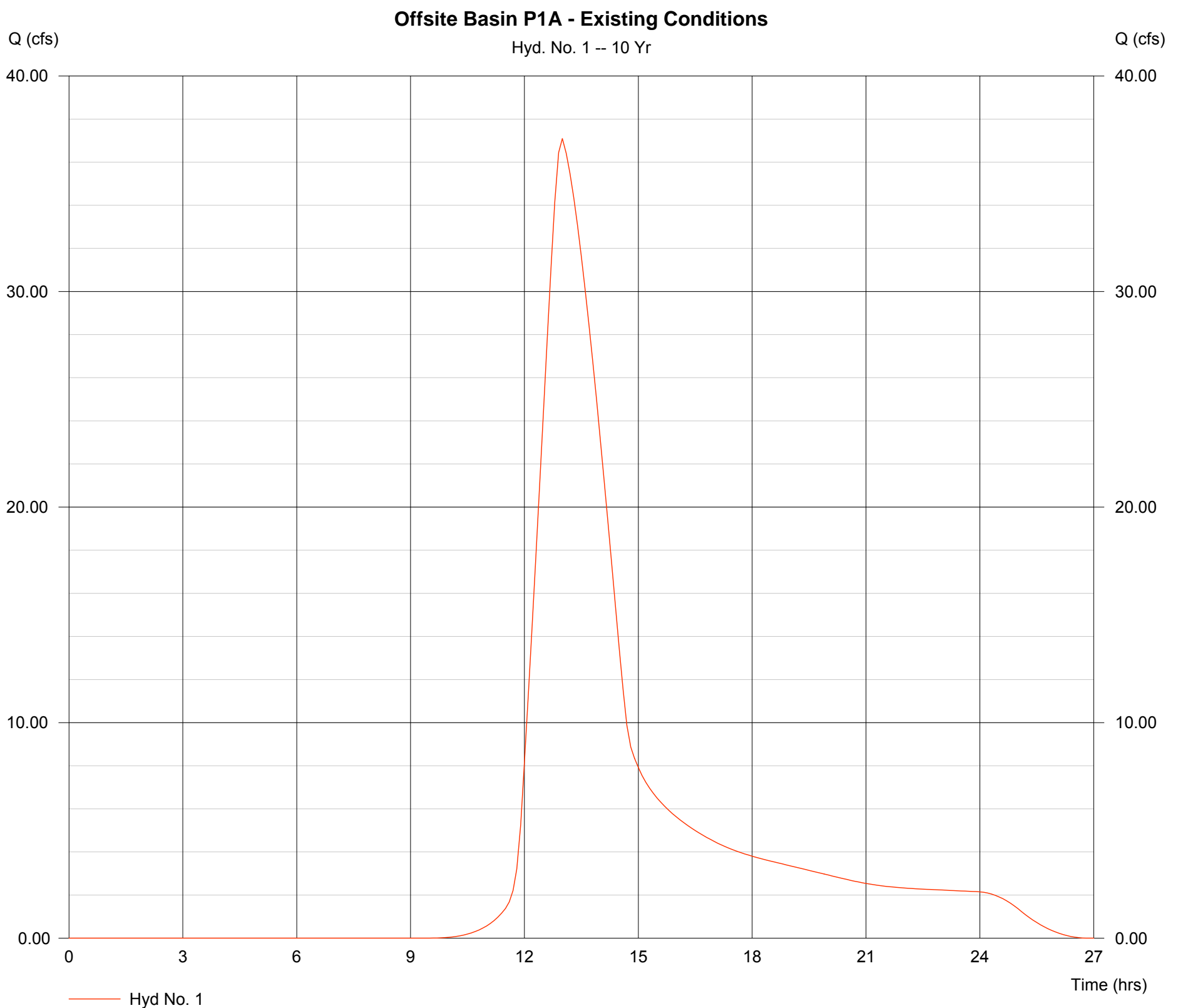
Hyd. No. 1

Offsite Basin P1A - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 44.700 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 5.40 in
Storm duration = 24 hrs

Peak discharge = 37.10 cfs
Time interval = 6 min
Curve number = 70.6
Hydraulic length = 2850 ft
Time of conc. (Tc) = 110.84 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 8.798 acft



Hydrograph Plot

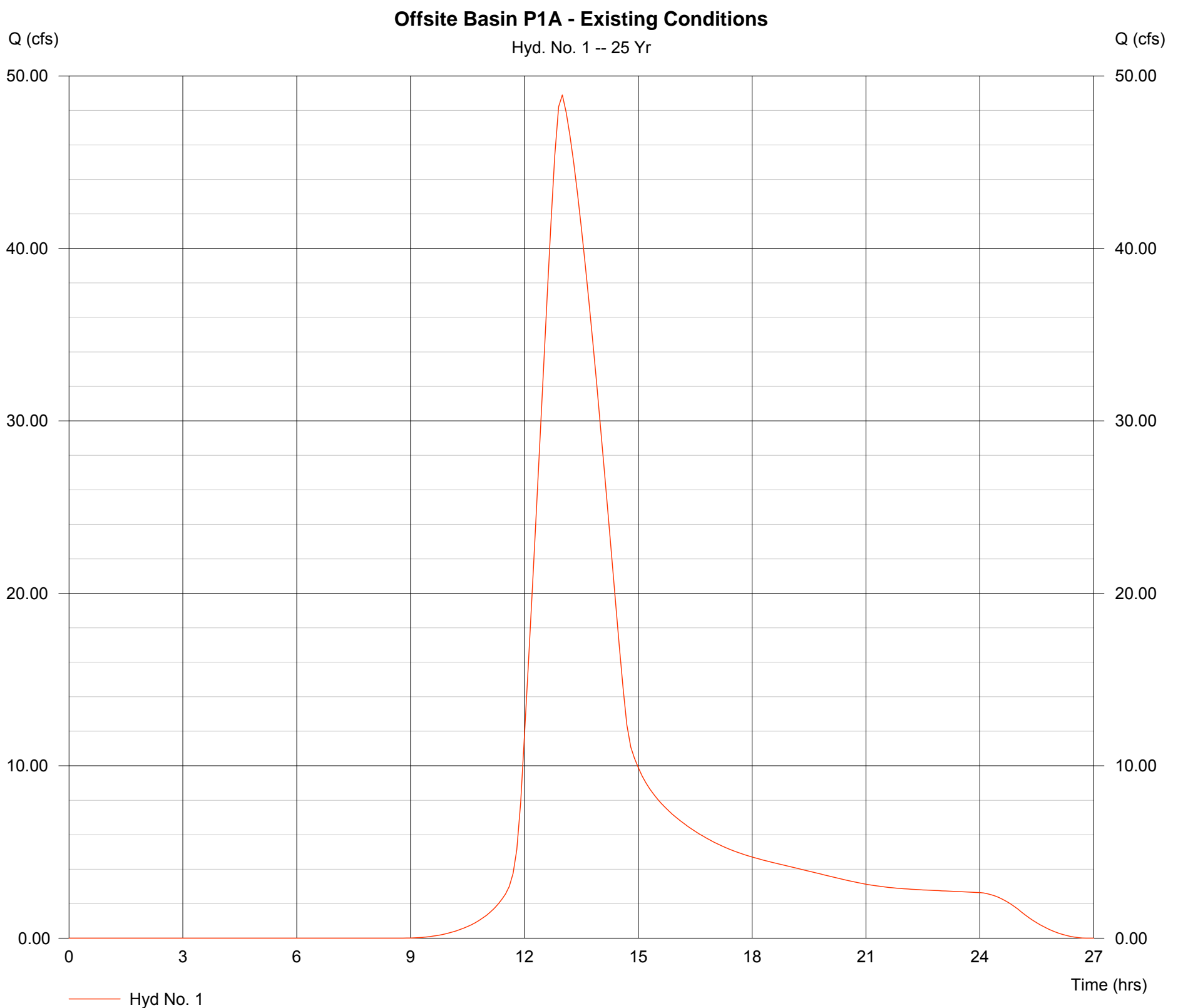
Hyd. No. 1

Offsite Basin P1A - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Drainage area = 44.700 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 6.30 in
Storm duration = 24 hrs

Peak discharge = 48.90 cfs
Time interval = 6 min
Curve number = 70.6
Hydraulic length = 2850 ft
Time of conc. (Tc) = 110.84 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 11.429 acft



Hydrograph Plot

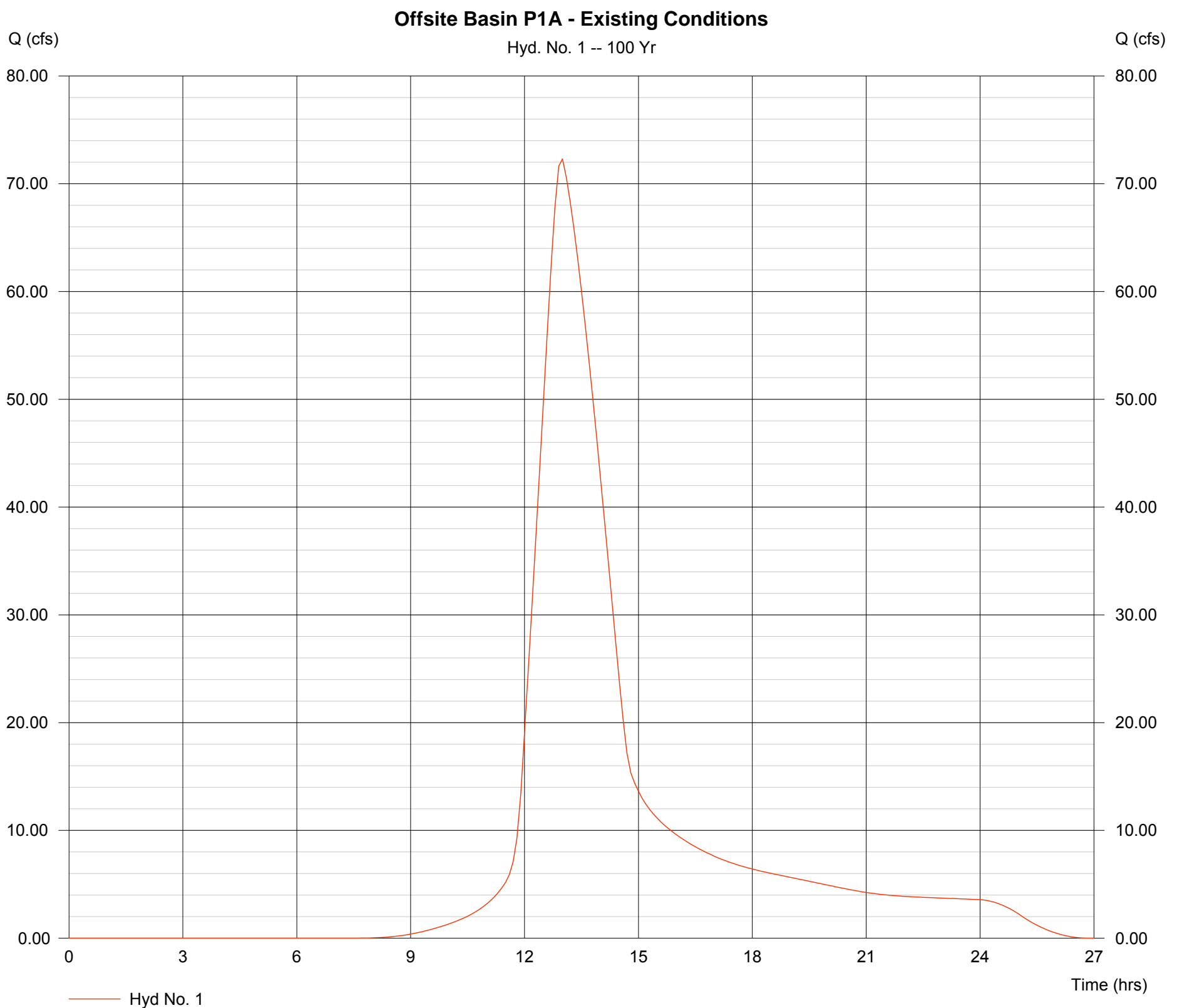
Hyd. No. 1

Offsite Basin P1A - Existing Conditions

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 44.700 ac
Basin Slope = 0.8 %
Tc method = LAG
Total precip. = 8.00 in
Storm duration = 24 hrs

Peak discharge = 72.31 cfs
Time interval = 6 min
Curve number = 70.6
Hydraulic length = 2850 ft
Time of conc. (Tc) = 110.84 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 16.694 acft



Hydrograph Plot

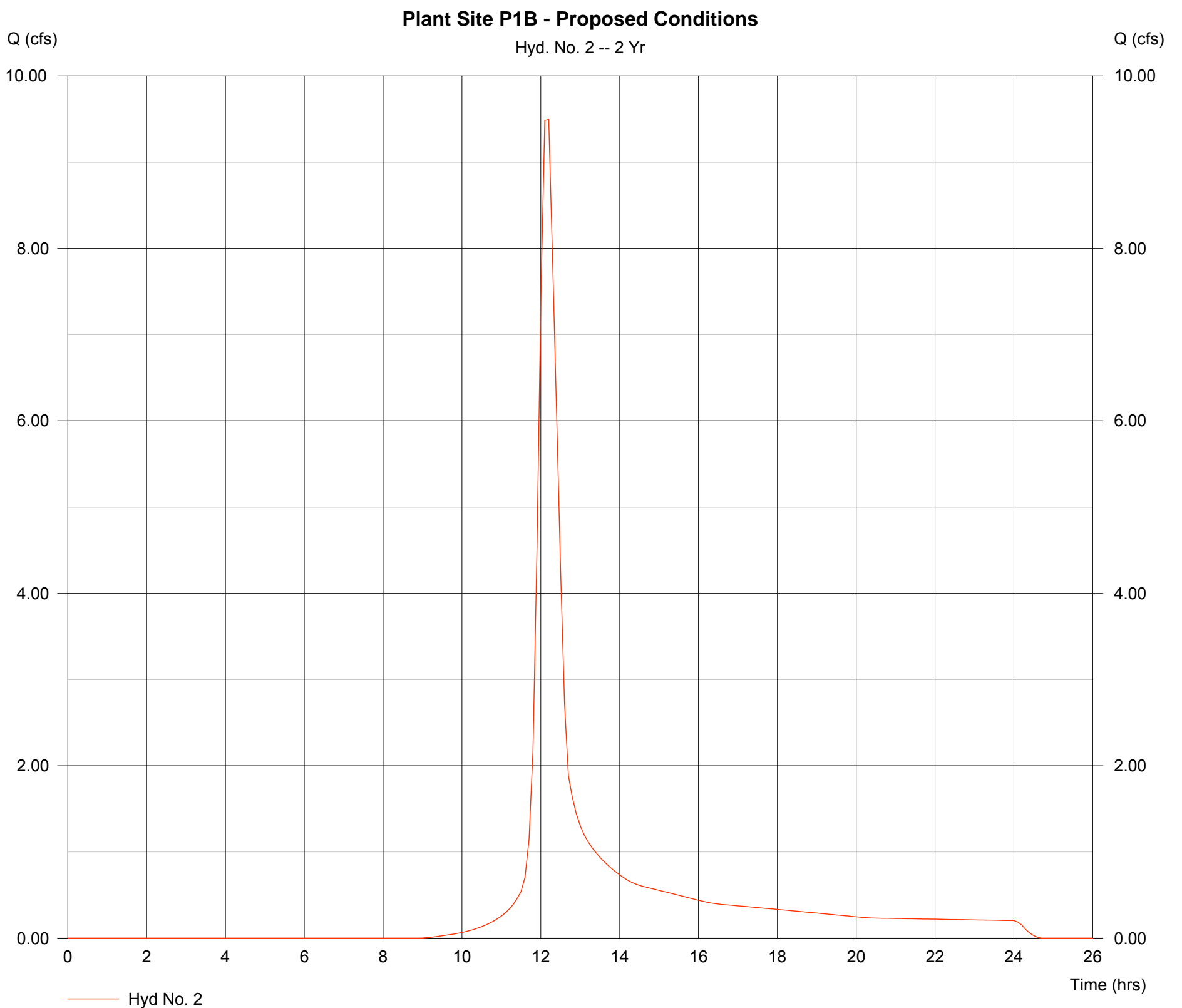
Hyd. No. 2

Plant Site P1B - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 6.300 ac
Basin Slope = 1.1 %
Tc method = LAG
Total precip. = 3.60 in
Storm duration = 24 hrs

Peak discharge = 9.50 cfs
Time interval = 6 min
Curve number = 80
Hydraulic length = 925 ft
Time of conc. (Tc) = 28.52 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 0.901 acft



Hydrograph Plot

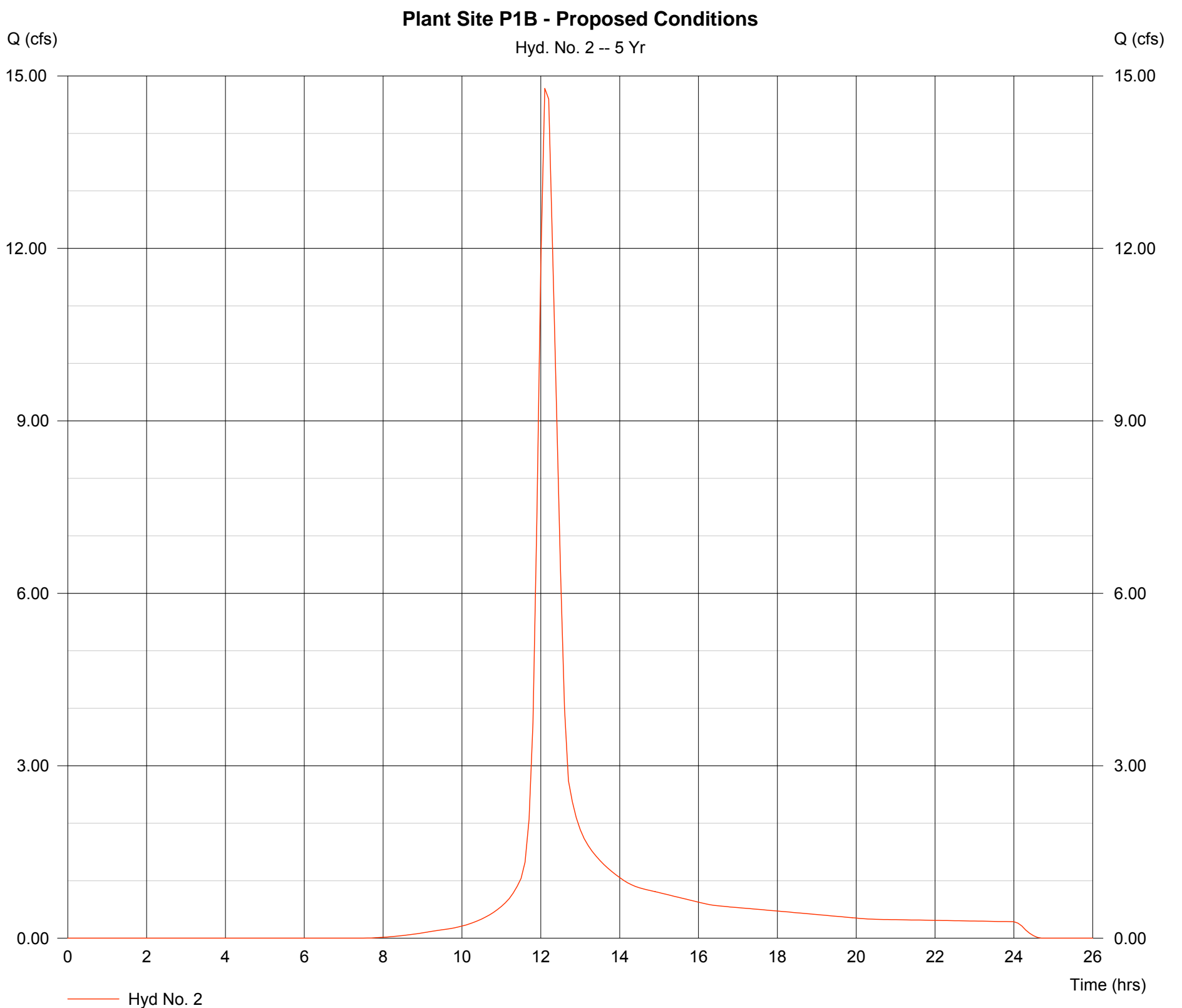
Hyd. No. 2

Plant Site P1B - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Drainage area = 6.300 ac
Basin Slope = 1.1 %
Tc method = LAG
Total precip. = 4.70 in
Storm duration = 24 hrs

Peak discharge = 14.78 cfs
Time interval = 6 min
Curve number = 80
Hydraulic length = 925 ft
Time of conc. (Tc) = 28.52 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.382 acft



Hydrograph Plot

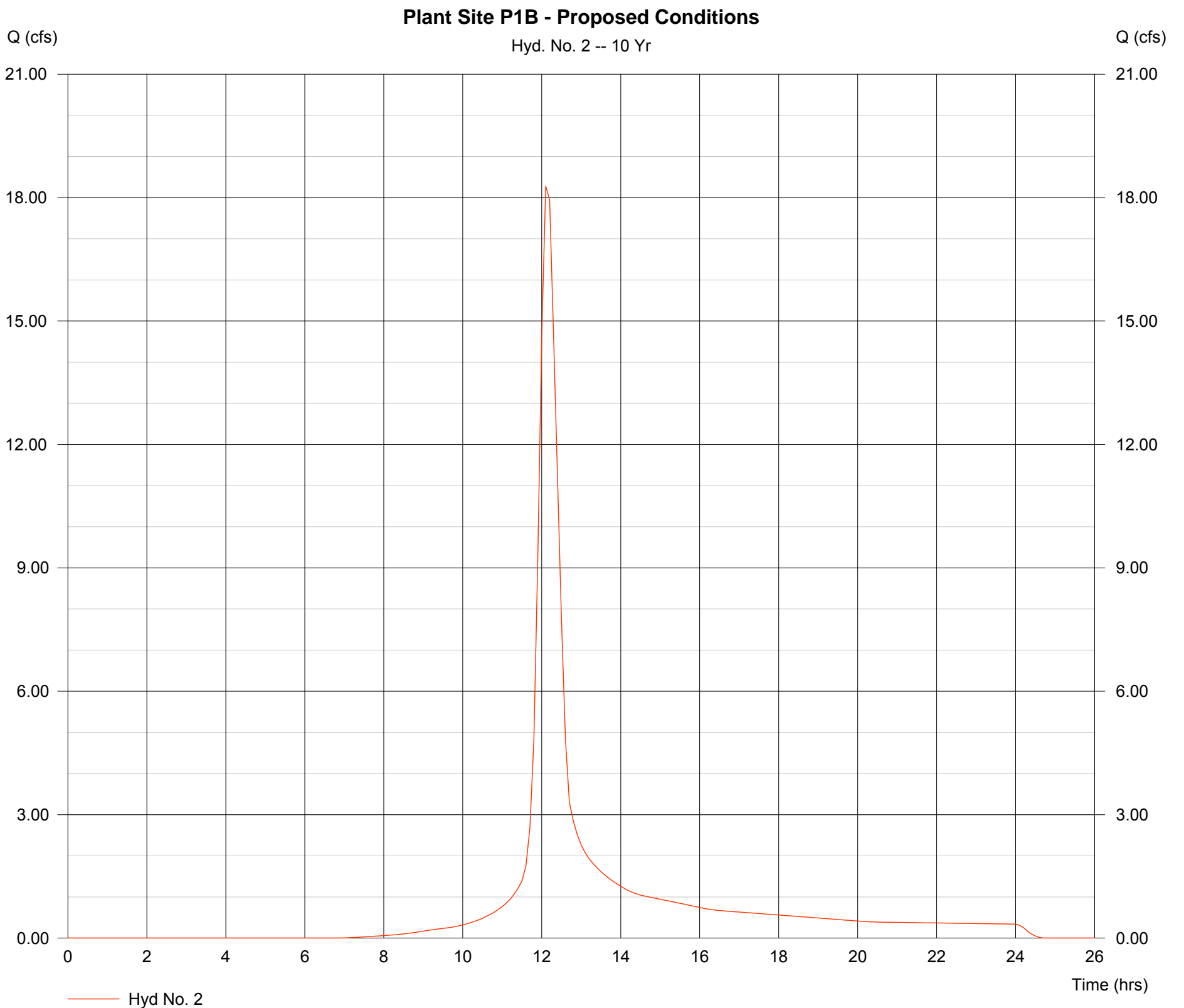
Hyd. No. 2

Plant Site P1B - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 6.300 ac
Basin Slope = 1.1 %
Tc method = LAG
Total precip. = 5.40 in
Storm duration = 24 hrs

Peak discharge = 18.28 cfs
Time interval = 6 min
Curve number = 80
Hydraulic length = 925 ft
Time of conc. (Tc) = 28.52 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.703 acft



Hydrograph Plot

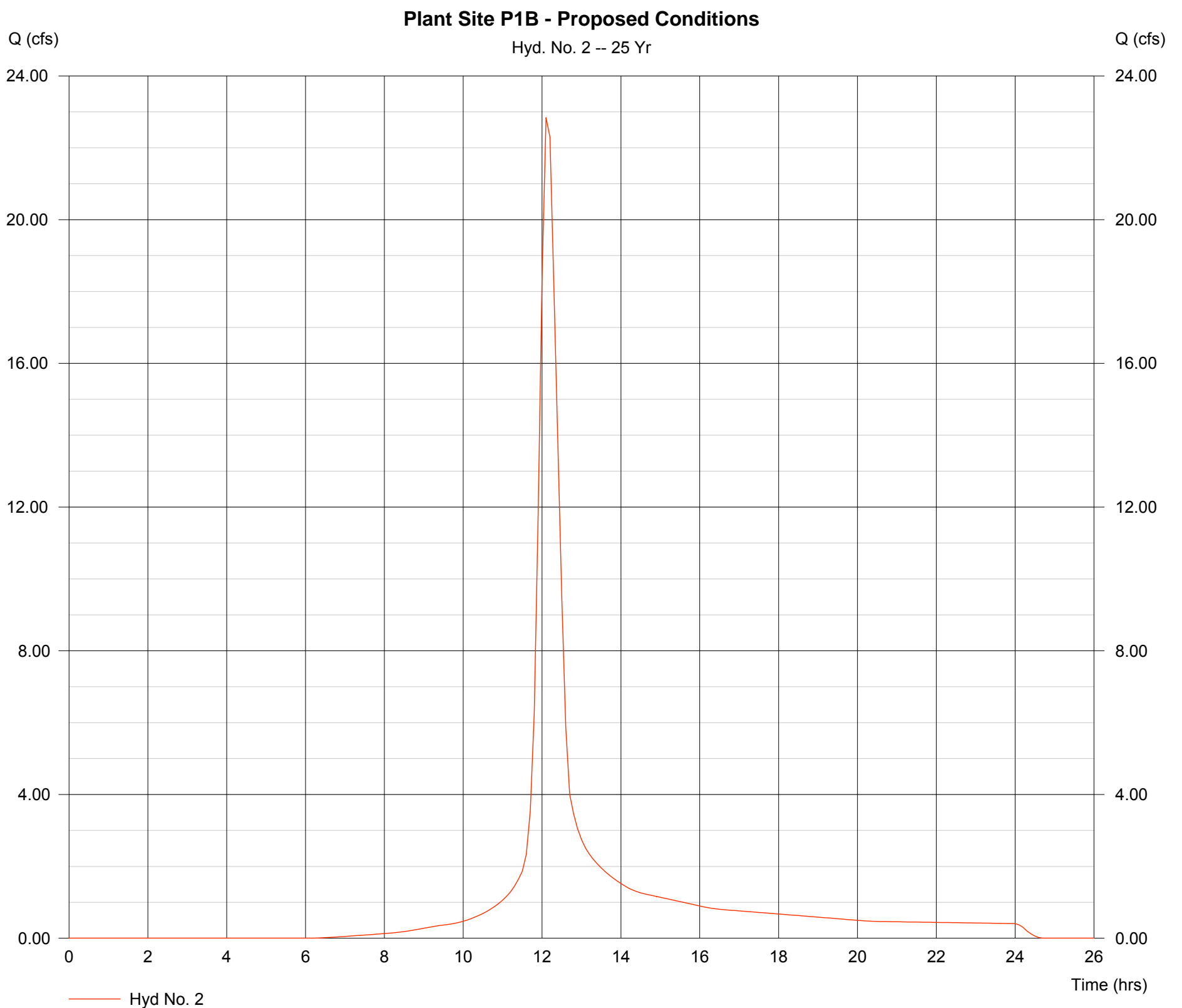
Hyd. No. 2

Plant Site P1B - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Drainage area = 6.300 ac
Basin Slope = 1.1 %
Tc method = LAG
Total precip. = 6.30 in
Storm duration = 24 hrs

Peak discharge = 22.84 cfs
Time interval = 6 min
Curve number = 80
Hydraulic length = 925 ft
Time of conc. (Tc) = 28.52 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 2.128 acft



Hydrograph Plot

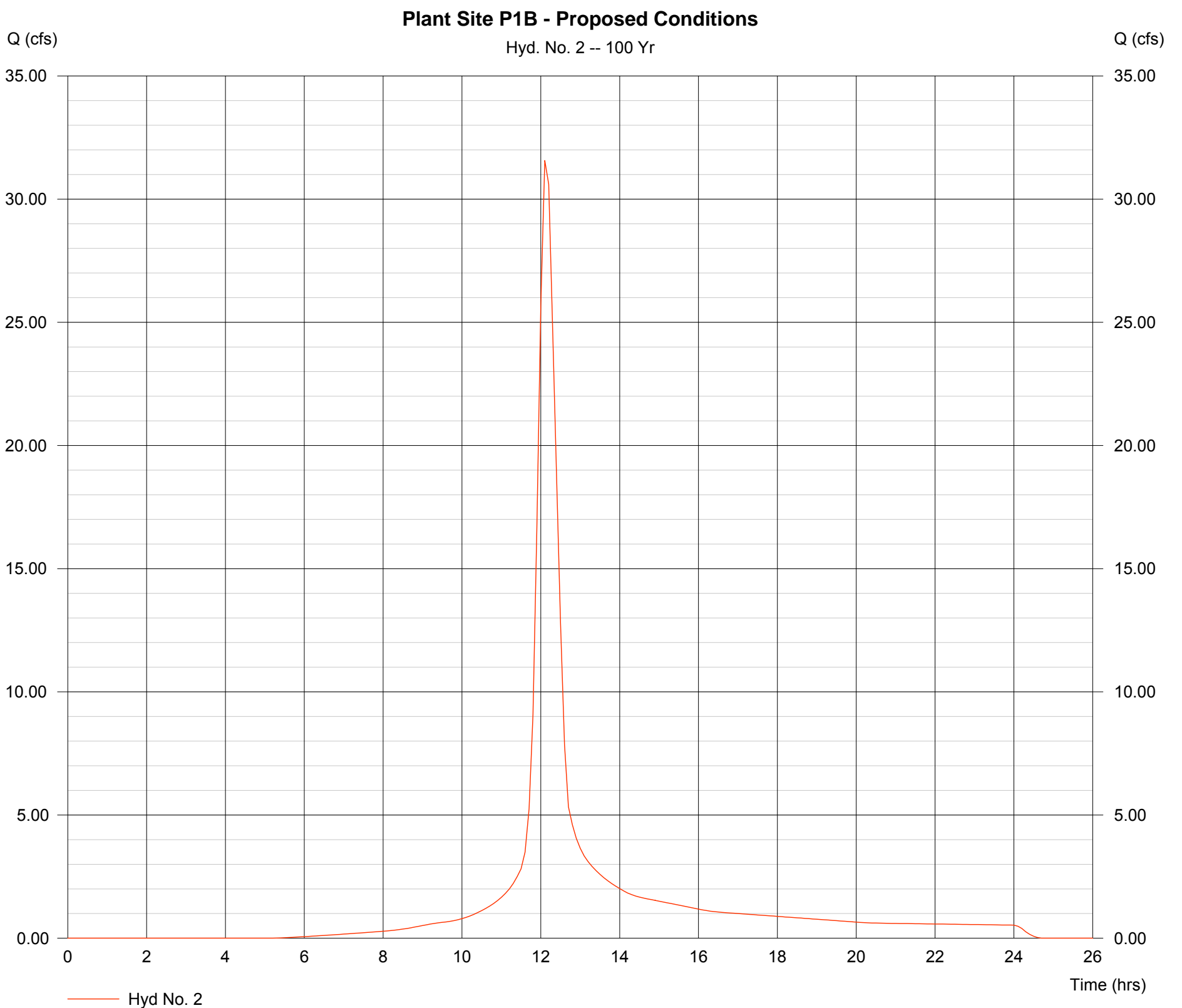
Hyd. No. 2

Plant Site P1B - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 6.300 ac
Basin Slope = 1.1 %
Tc method = LAG
Total precip. = 8.00 in
Storm duration = 24 hrs

Peak discharge = 31.57 cfs
Time interval = 6 min
Curve number = 80
Hydraulic length = 925 ft
Time of conc. (Tc) = 28.52 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 2.953 acft



Hydrograph Plot

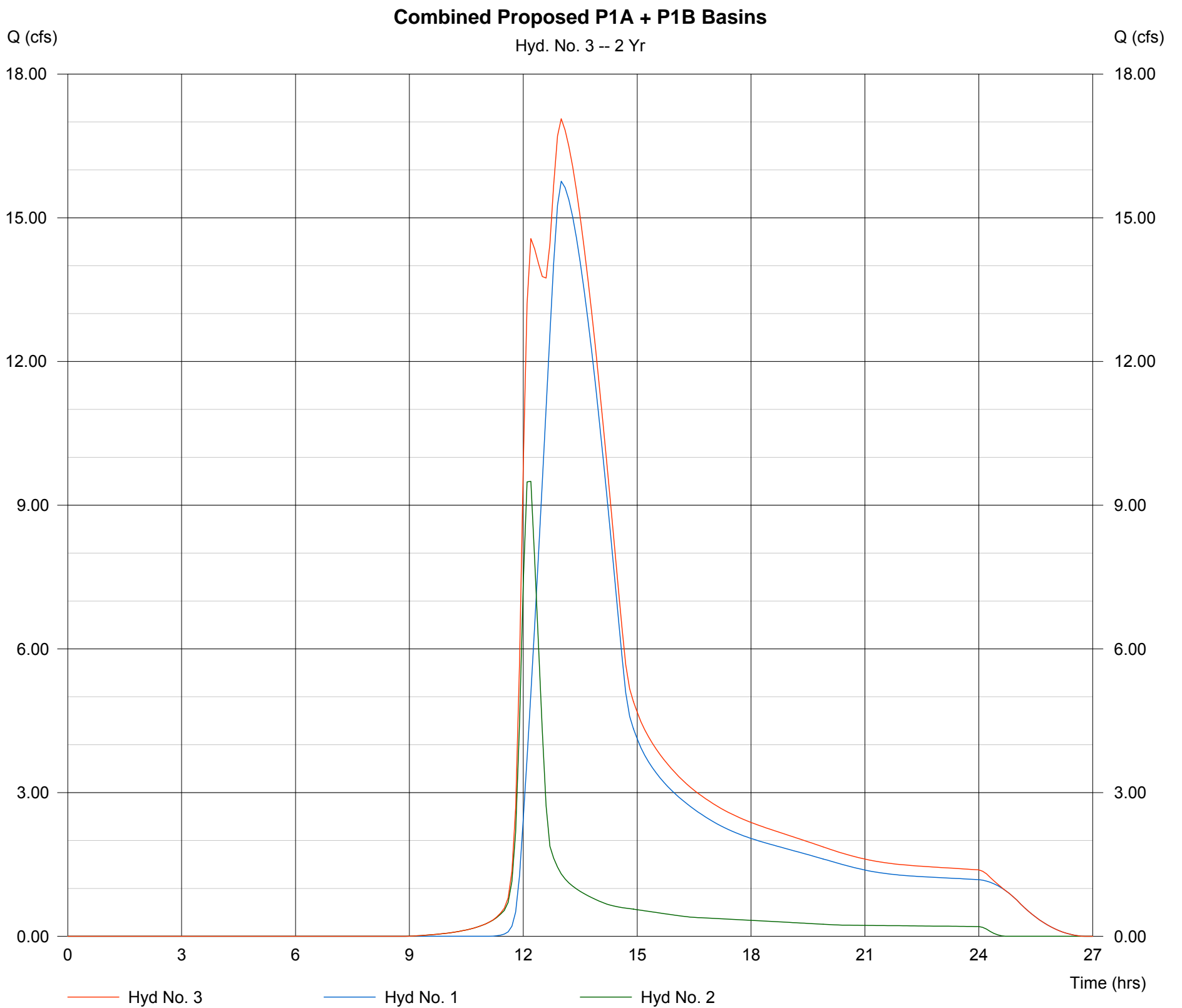
Hyd. No. 3

Combined Proposed P1A + P1B Basins

Hydrograph type = Combine
Storm frequency = 2 yrs
Inflow hyds. = 1, 2

Peak discharge = 17.07 cfs
Time interval = 6 min

Hydrograph Volume = 4.969 acft



Hydrograph Plot

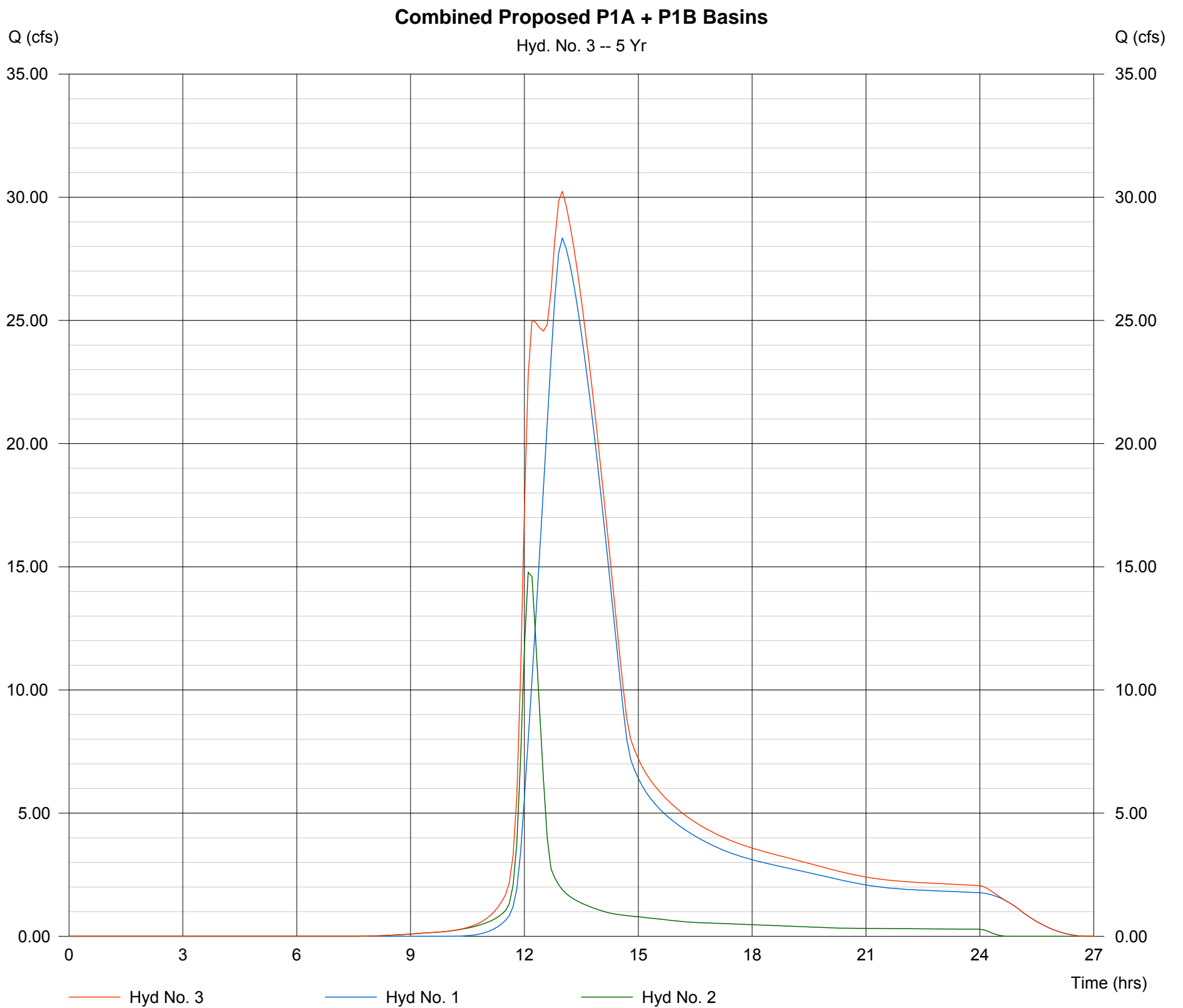
Hyd. No. 3

Combined Proposed P1A + P1B Basins

Hydrograph type = Combine
Storm frequency = 5 yrs
Inflow hyds. = 1, 2

Peak discharge = 30.24 cfs
Time interval = 6 min

Hydrograph Volume = 8.239 acft



Hydrograph Plot

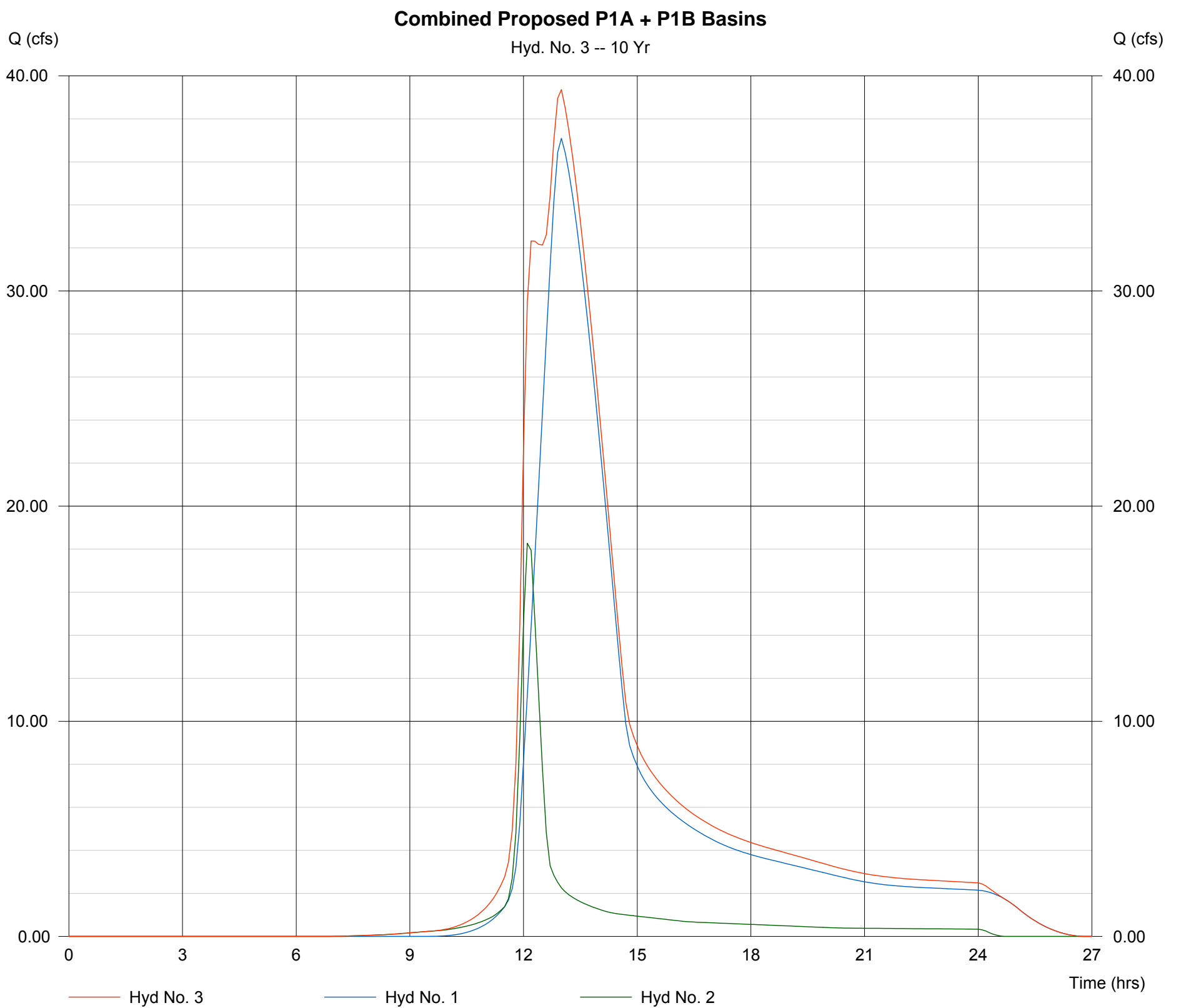
Hyd. No. 3

Combined Proposed P1A + P1B Basins

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 1, 2

Peak discharge = 39.36 cfs
Time interval = 6 min

Hydrograph Volume = 10.501 acft



Hydrograph Plot

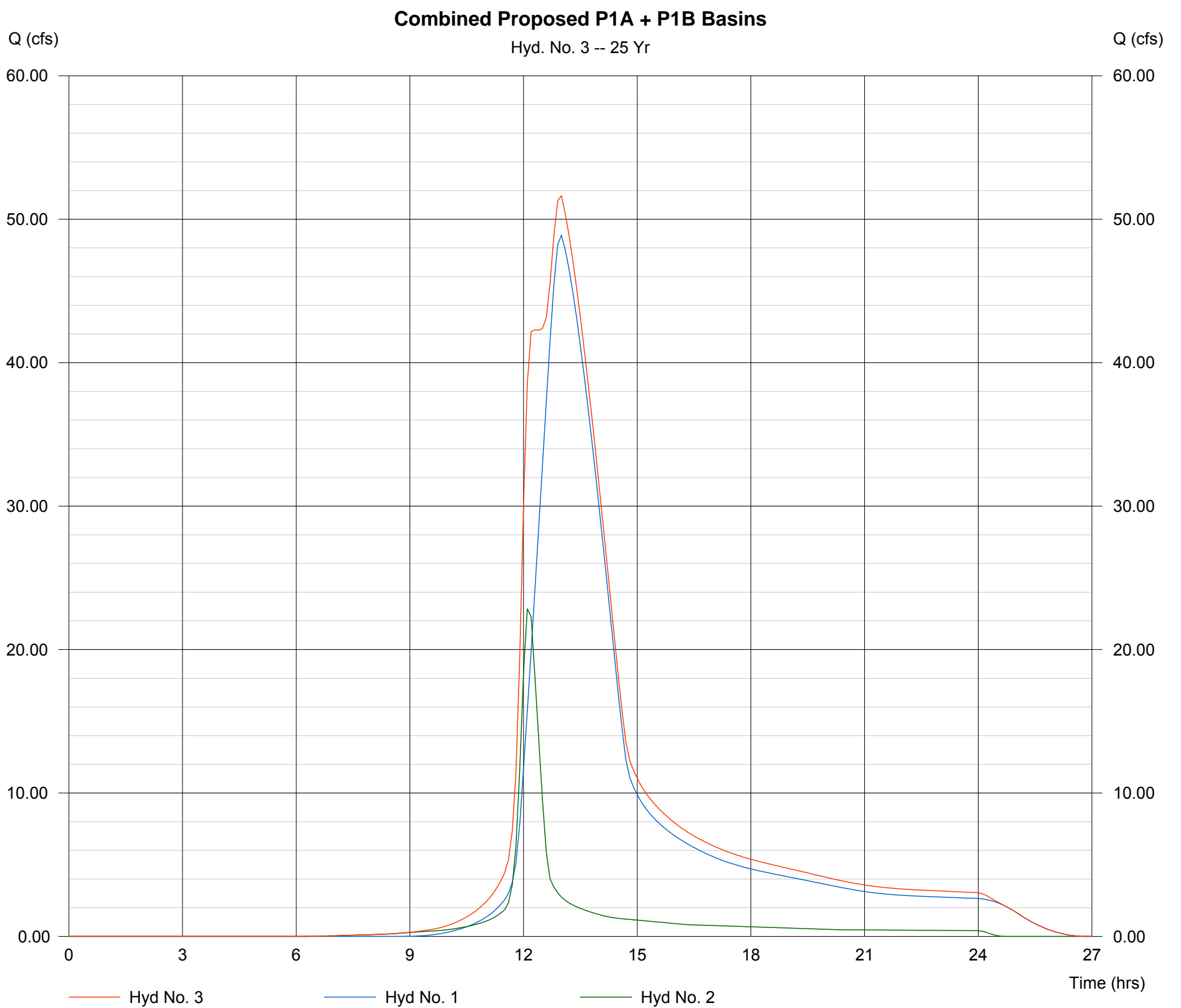
Hyd. No. 3

Combined Proposed P1A + P1B Basins

Hydrograph type = Combine
Storm frequency = 25 yrs
Inflow hyds. = 1, 2

Peak discharge = 51.64 cfs
Time interval = 6 min

Hydrograph Volume = 13.556 acft



Hydrograph Plot

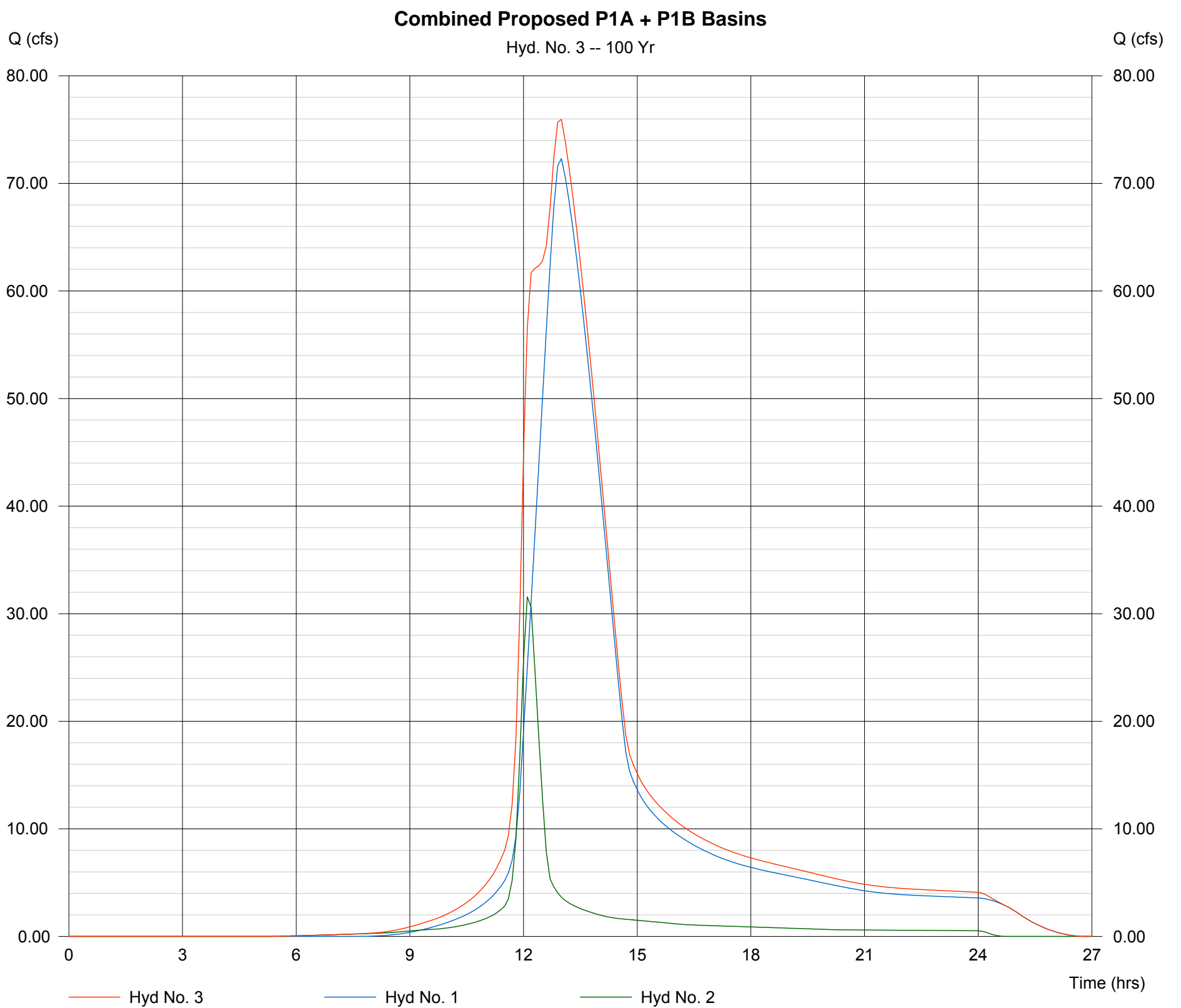
Hyd. No. 3

Combined Proposed P1A + P1B Basins

Hydrograph type = Combine
Storm frequency = 100 yrs
Inflow hyds. = 1, 2

Peak discharge = 75.96 cfs
Time interval = 6 min

Hydrograph Volume = 19.647 acft



Hydrograph Plot

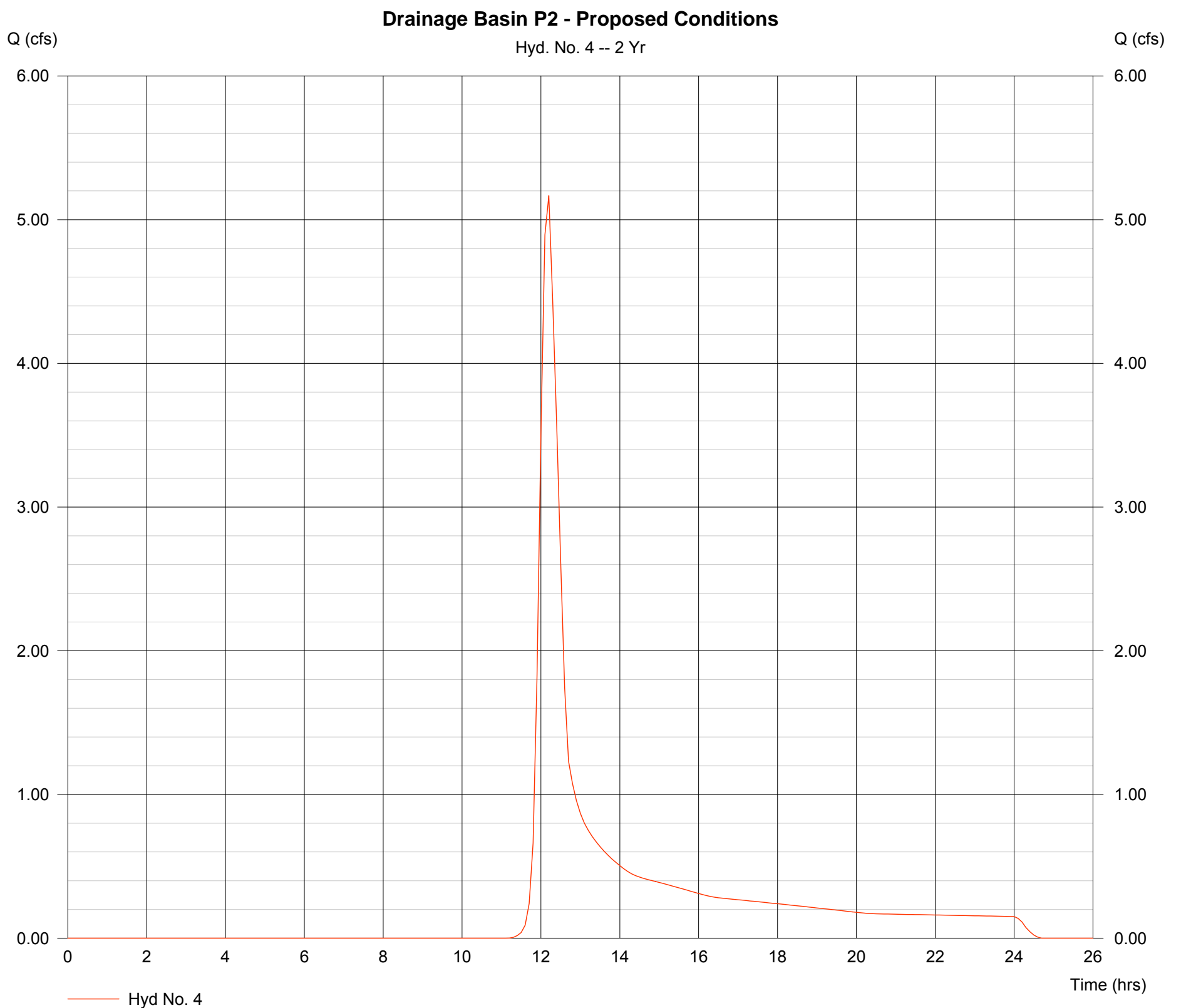
Hyd. No. 4

Drainage Basin P2 - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 3.60 in
Storm duration = 24 hrs

Peak discharge = 5.17 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.48 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 0.524 acft



Hydrograph Plot

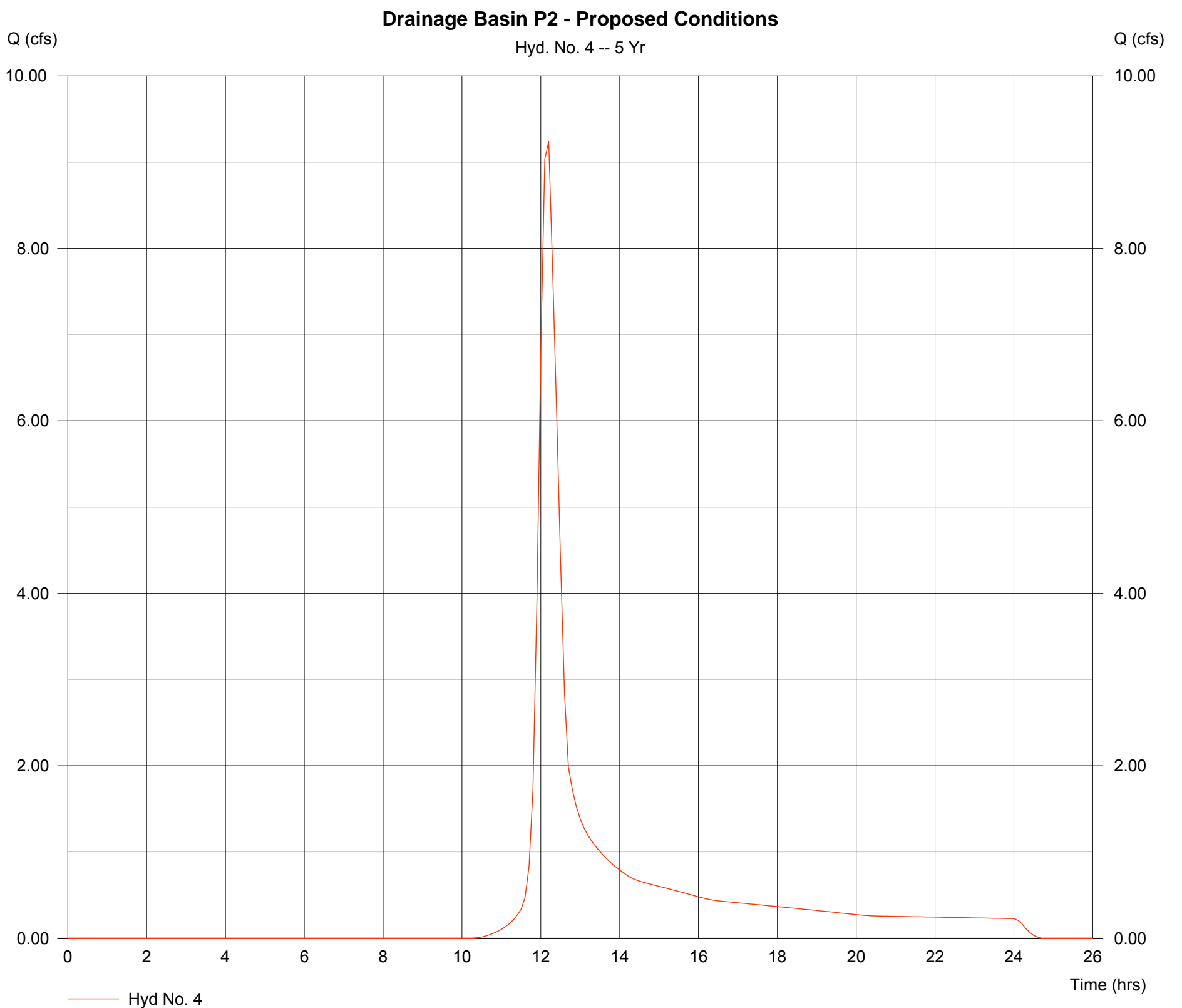
Hyd. No. 4

Drainage Basin P2 - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 5 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 4.70 in
Storm duration = 24 hrs

Peak discharge = 9.24 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.48 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 0.893 acft



Hydrograph Plot

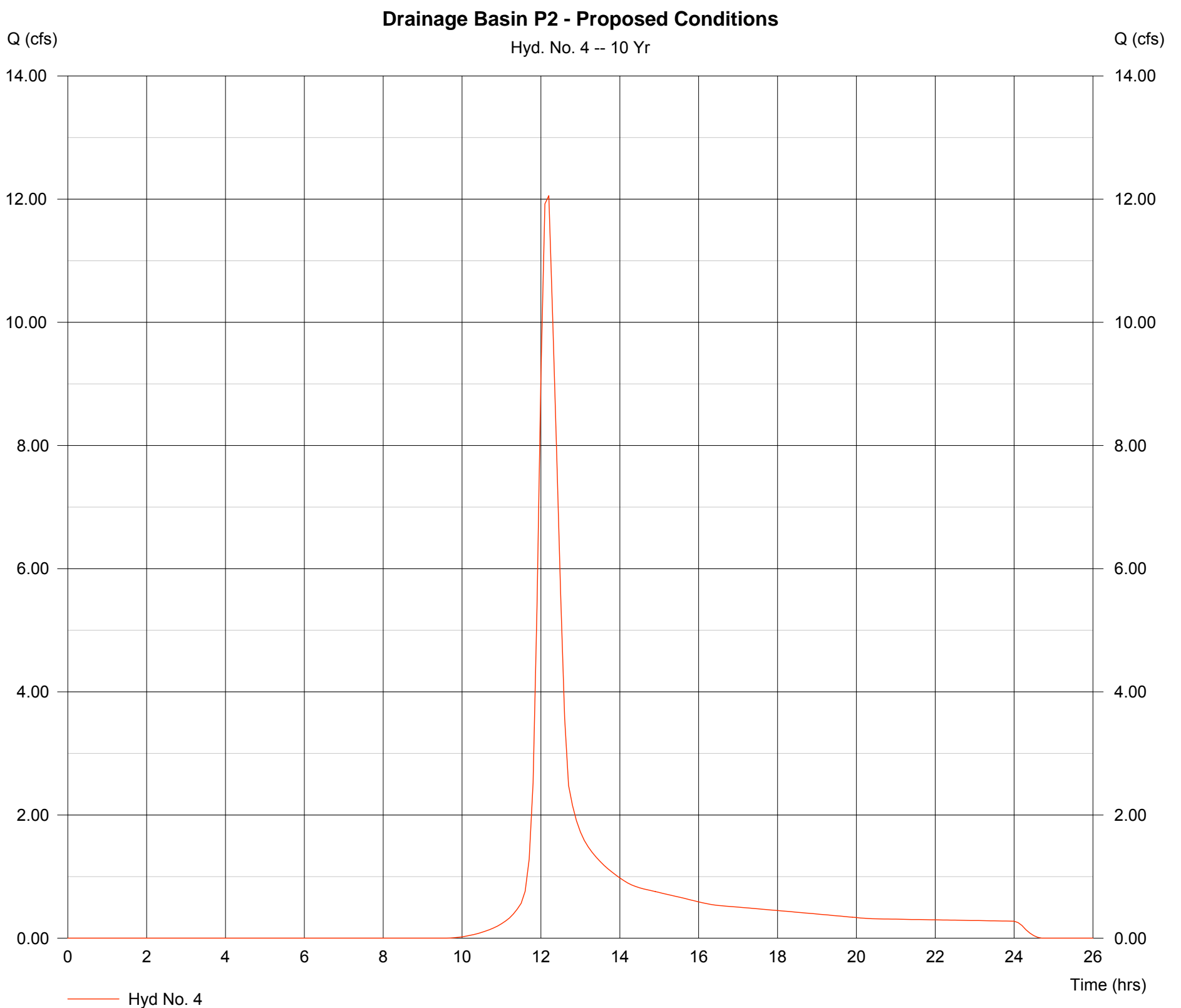
Hyd. No. 4

Drainage Basin P2 - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 5.40 in
Storm duration = 24 hrs

Peak discharge = 12.06 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.48 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.152 acft



Hydrograph Plot

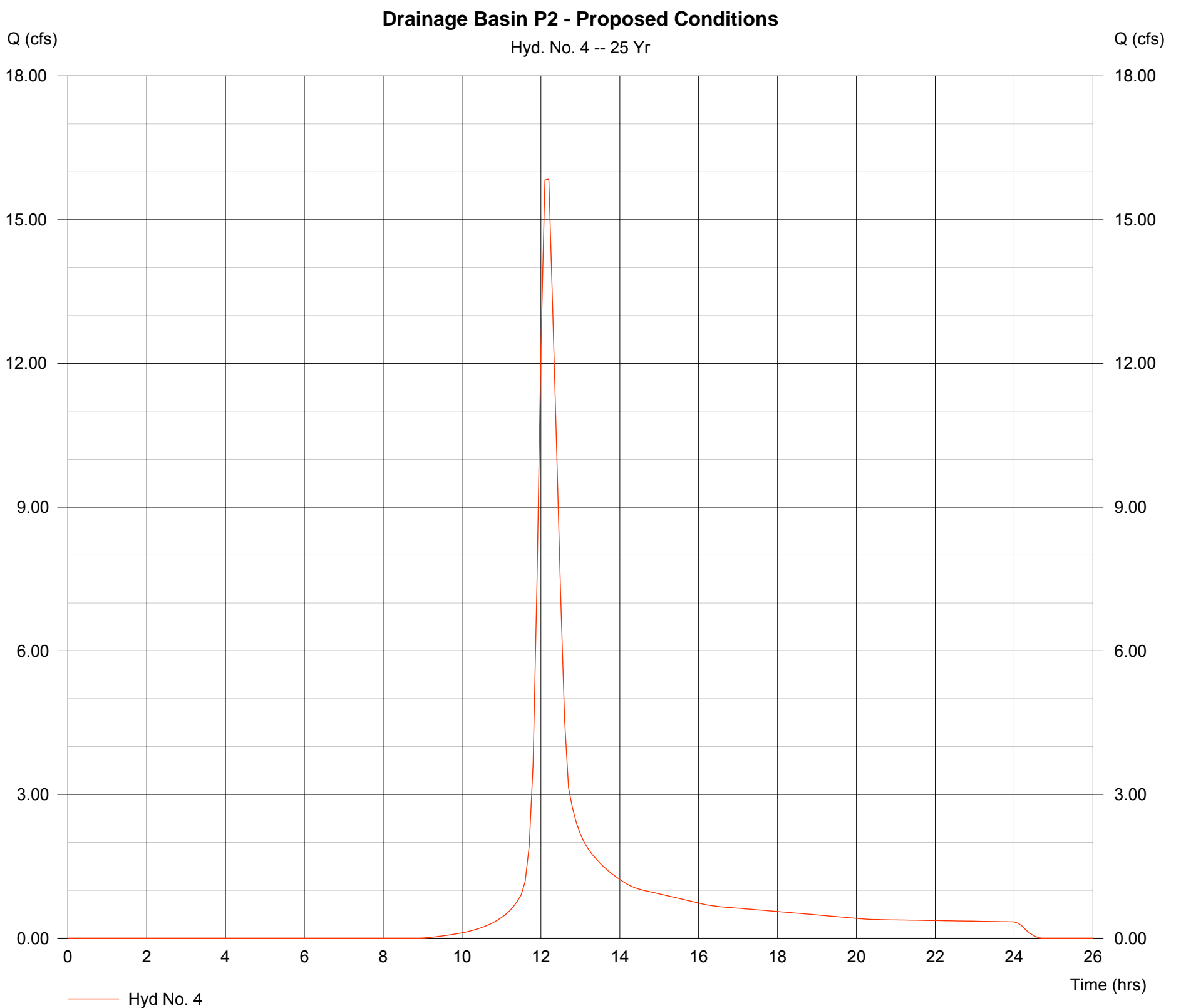
Hyd. No. 4

Drainage Basin P2 - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 6.30 in
Storm duration = 24 hrs

Peak discharge = 15.85 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.48 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 1.503 acft



Hydrograph Plot

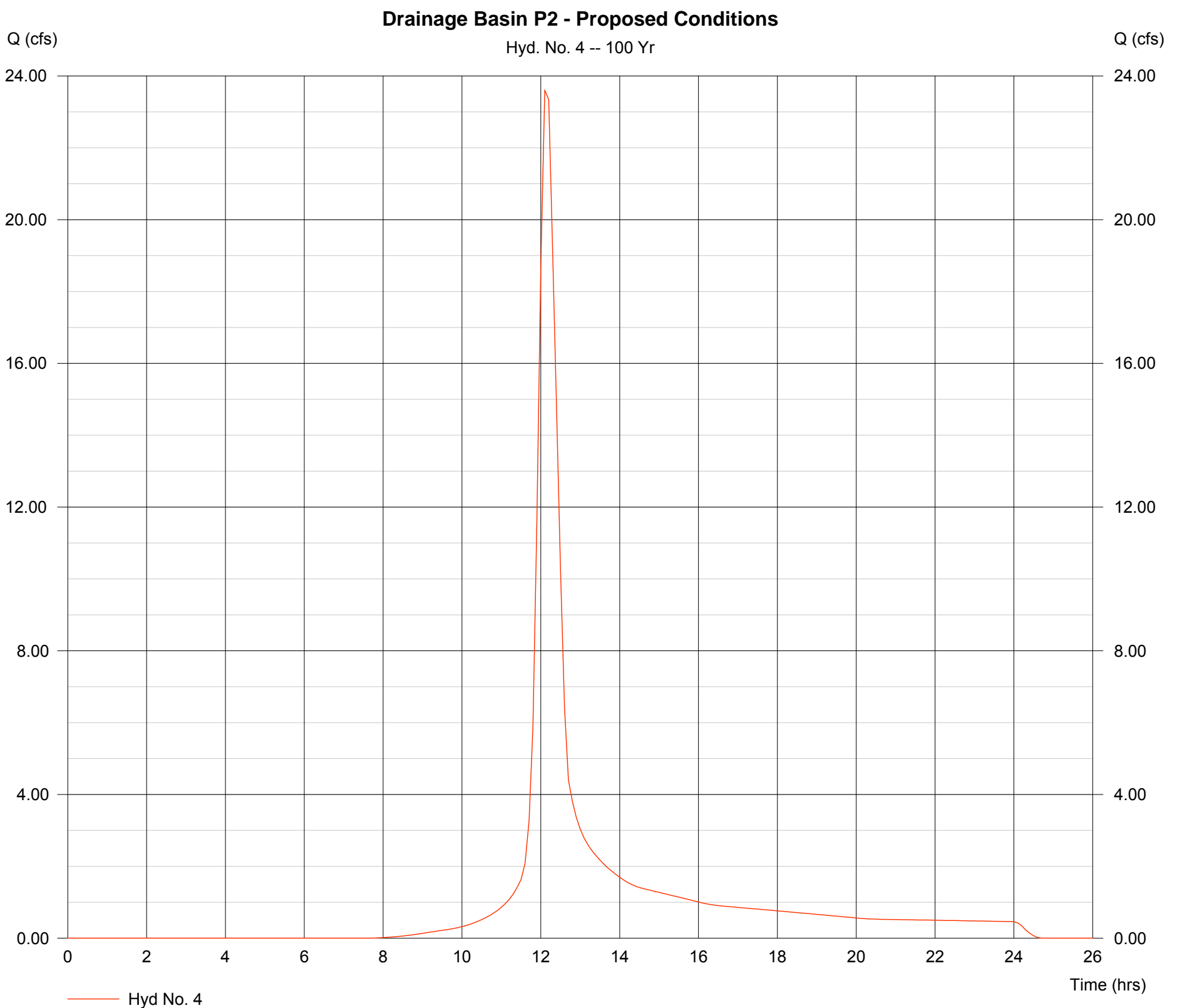
Hyd. No. 4

Drainage Basin P2 - Proposed Conditions

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 6.000 ac
Basin Slope = 2.6 %
Tc method = LAG
Total precip. = 8.00 in
Storm duration = 24 hrs

Peak discharge = 23.61 cfs
Time interval = 6 min
Curve number = 69.6
Hydraulic length = 900 ft
Time of conc. (Tc) = 24.48 min
Distribution = Type II
Shape factor = 484

Hydrograph Volume = 2.209 acft



Appendix F
Pipe Sizing

PIPE SIZING

Hydraflow Stormsewers was used to analyze the proposed culvert just south of 31st Street South under the entrance to the Project Site. A 33" RCP was selected as the size that would accommodate the 24 hour design storm event (5 year rainfall). Due to height restrictions, it is recommended that 2-24" RCPs be used. The open area of 2 – 24" RCPs is 6.28 square feet while the open area of a 33" RCP is 5.94 square feet. Therefore using 2-24" RCPs will be more conservative and practical since a 33" RCP is a size that is not normally kept in inventory and would be a special order.

Hydraflow Plan View



Hydraflow Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	Dns line No.
1		28.40	33 c	60.0	120.00	121.00	1.667	121.74	122.74	0.80	End

Project File: New.stm

IDF File: SedgCo.IDF

Total No. Lines: 1

Run Date: 09-18-2007

NOTES: c = circular; e = elliptical; b = box; Return period = 5 Yrs.; * Indicates surcharge condition.

Hydraflow Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream						Len (ft)	Upstream						Check		JL coeff (K)	Minor loss (ft)								
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)		EGL elev (ft)	Sf (%)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)			EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)				
1	33	28.40	120.00	121.74	1.74	3.95	7.18	0.80	122.54	0.547	60.0	121.00	122.74	1.74**	3.95	7.18	0.80	123.54	0.547	0.547	N/A	1.00	0.80				
Project File: New.stm												IDF File: SedgCo.IDF												Total number of lines: 1		Run Date: 09-18-2007	

NOTES: Initial tailwater elevation = 121.7375 (ft), * Normal depth assumed., ** Critical depth assumed., i Under inlet control.