



## City of Wichita/Sedgwick County Subdivision Drainage Plan Checklist



Submit completed forms to:  
City of Wichita Public Works & Utilities, 455 N. Main 8th Floor, Wichita KS 67202; or  
Sedgwick County Stormwater Management, 1144 S. Seneca, Wichita KS 67213.

<b>Project Name:</b>	CVS PHARMACY - SWC 13TH AND MAIZE		
<b>Total Area of Project:</b>	2.2	acres	
<b>Development Type:</b>	Commercial	<b>Other:</b>	
<b>Developer Name:</b>	VELMEIR COMPANIES	<b>Contact:</b>	JIM COLLIER
		<b>Phone:</b>	248-794-9768
<b>Email:</b>	jcollier@velmeir.com		
<b>Engineer Name:</b>	PREMIER CIVIL ENGINEERING	<b>Contact:</b>	MATT FOGARTY
		<b>Phone:</b>	636-485-5966
<b>Email:</b>			

**Directions:**

(1) Fill-out this checklist completely and include it with the Drainage Plan submittal. This checklist should be included in the bound copy, behind the cover sheet for the submittal. Incomplete Drainage Plans and checklists will not be accepted.

(2) Indicate whether a plan element is included or not included in the submittal by choosing "Yes" or "No" from the dropdown list in the "Element Included?" column. The question must be answered for every plan element for this checklist to be considered complete. An explanation must be provided for all "No" answers.

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
<b>1.0 General</b>			
1.1	Digital copy of drainage plan, including preliminary Master Grading Plan, preliminary plat and proposed plat, in PDF format and one half size, bound, paper copy.	Yes	
1.2	Professional Engineer's seal, signature and date on plan cover.	Yes	
1.3	Site location map, using color ortho-imagery and showing the project boundaries, a north arrow and an accurate scale.	Yes	
1.4	Narrative of the development type, existing conditions and proposed impacts on stormwater runoff, wetlands, riparian zones and floodplains/floodways.	Yes	
1.5	Discussion of off-site conditions surrounding the proposed development.	Yes	
1.6	Summary table of runoff calculations (pre/post development).	Yes	
1.7	Narrative description of the type and function of the permanent structural stormwater management facilities.	Yes	
<b>2.0 Existing Conditions Information</b>			
<b>2.1 Existing Conditions Drainage Map</b>			
2.1.1	On-site and off-site topography: NAVD 88 datum, one-foot contours with spot elevations.	Yes	SHOWN ON PLAN
2.1.2	On-site and off-site drainage features, including perennial and intermittent streams (with names labeled), conveyance systems such as open channels, ditches, swales and areas of overland flow. Flow direction must be indicated by arrows.	Yes	SHOWN ON PLAN
2.1.3	Storm sewer system components, including storm drains, inlets, catch basins, gutters, manholes, headwalls, pipes and culverts. Material and size must be noted for all pipes and culverts.	Yes	SHOWN ON PLAN
2.1.4	Location and boundaries of natural features such as wetlands, lakes, ponds with the normal water elevation noted, rock outcroppings, wooded areas and tree rows.	Yes	SHOWN ON PLAN
2.1.5	Location, dimensions and elevations of existing bridges and culvert crossings.	Yes	SHOWN ON PLAN
2.1.6	Location of existing utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	SHOWN ON PLAN
2.1.7	Groundwater elevations, if applicable.	Yes	SHOWN ON PLAN
2.1.8	Delineation of predominant soil based on USDA soil surveys and/or on-site soil borings; indicate NRCS soil name and Hydrologic Soil Group for undisturbed surface soils.	Yes	SHOWN ON PLAN
2.1.9	Land use types per NRCS nomenclature.	Yes	SHOWN ON PLAN
2.1.10	Footprint of existing impervious areas (labeled, area given in acres).	Yes	SHOWN ON PLAN
2.1.11	Internal drainage subbasin boundaries used for hydrologic calculations (labeled with ID, total area in acres, impervious area in acres and curve number).	Yes	
2.1.12	Time of concentration flow paths. Indicate and label each segment separately (i.e., overland flow, shallow concentrated, channel1, channel2, etc.). For each segment, provide the appropriate data to calculate Tc (e.g., length, slope, cover type, paved/unpaved, roughness parameters, geometric properties, etc.).	Yes	SHOWN ON PLAN

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
<b>2.2</b>	<b>Existing Conditions Hydrology and Hydraulics Analysis</b>		
2.2.1	Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	SEE COORESPONDING SECTION IN REPORT
2.2.2	A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	
2.2.3	Table of existing condition runoff curve numbers with supporting data and calculations.	Yes	SEE COORESPONDING SECTION IN REPORT
2.2.4	Table of existing condition times of concentration with supporting data and calculations.	Yes	SEE COORESPONDING SECTION IN REPORT
2.2.5	A summary table of rainfall data used in the hydrologic analysis, and a reference for the source of the data.	Yes	SEE COORESPONDING SECTION IN REPORT
2.2.6	Cross-sections and other diagrams of existing open channels, bridge and culvert sections and other hydraulic features as required to illustrate the basis for hydraulic analysis.	No	Not applicable to this report
2.2.7	Hydrologic and hydraulic analyses for runoff rates, volumes, velocities and elevations. Provide supporting data not specified above and identify assumptions. Include detailed calculations for the 2, 5, 10, 25 & 100-year, 24-hour storm events. Provide results in a tabular form. Provide digital copies of any computer files and models used.	Yes	SEE COORESPONDING SECTION IN REPORT
<b>3.0</b>	<b>postdevelopment Conditions Information</b>		
<b>3.1</b>	<b>postdevelopment Conditions Drainage Map</b>		
3.1.1	Proposed project boundary.	Yes	SHOWN ON PLAN
3.1.2	on-site and off-site topography: NAVD 88 datum, one-foot contours with spot elevations.	Yes	SHOWN ON PLAN
3.1.3	Existing on-site and off-site drainage features that are to remain after development, including perennial and intermittent streams (with names labeled), conveyance systems such as open channels, ditches, swales and areas of overland flow. Flow direction must be indicated by arrows.	Yes	SHOWN ON PLAN
3.1.4	Location and description of off-site through-drainage conveyances which are confined to an easement, dedication and/or reserve.	Yes	SHOWN ON PLAN
3.1.5	Footprint of proposed impervious areas, including roads, parking lots, buildings and other structures.	Yes	SHOWN ON PLAN
3.1.6	Location of proposed utilities (e.g., water, sewer, gas, electric, cable, etc.) with labels and easement boundaries.	Yes	SHOWN ON PLAN
3.1.7	Delineation of predominant soils, based on anticipated soil textures and NRCS guidelines if different from predevelopment soil conditions; indicate NRCS soil name and Hydrologic Soil Group for surface soils.	Yes	SHOWN ON PLAN
3.1.8	Land use cover per NRCS nomenclature.	Yes	SHOWN ON PLAN
3.1.9	Internal drainage subbasin boundaries used for hydrologic calculations (labeled with ID, total area in acres, impervious area in acres and curve number).	Yes	SHOWN ON PLAN
3.1.10	Proposed limits of land disturbing activity (i.e., grading limits).	Yes	SHOWN ON PLAN
3.1.11	Time of concentration flow paths. Indicate and label each segment separately (i.e., overland flow, shallow concentrated, channel1, channel2, etc.). For each segment, provide the appropriate data to calculate Tc (e.g., length, slope, cover type, paved/unpaved, roughness parameters, geometric properties, etc.).	Yes	SHOWN ON PLAN
<b>3.2</b>	<b>Proposed Conveyances Map</b>		
3.2.1	on-site and off-site drainage features, including perennial and intermittent streams (with names labeled), proposed conveyance systems (such as open channels, ditches, swales and areas of overland flow, including backyard drainage). Flow direction must be indicated by arrows.	Yes	SEE POSTDEVELOPMENT CONDITIONS DRAINAGE MAP
3.2.2	Storm sewer system components, including storm drains, inlets, catchbasins, gutters, manholes, headwalls, pipes and culverts. Material and size must be noted for all pipes and culverts.	Yes	SHOWN ON PLAN
3.2.3	For any subbasin or drainage area > 40 acres, show that the stormwater flow is confined to an open channel with required side benches and freeboard, or conformance to applicable policy and design requirements if partially enclosed.	Yes	SHOWN ON PLAN
3.2.4	Location(s) of stormwater management facilities and any associated drainage easements.	Yes	
3.2.5	Proposed energy dissipaters and other channel protection devices.	Yes	SHOWN ON PLAN
3.2.6	Location(s) and dimension(s) of proposed channel, bridge and culvert crossings.	Yes	SHOWN ON PLAN
3.2.7	Normal pool and 100-year pool elevations for ponds and lakes.	Yes	
3.2.8	Permanent concrete outfall control structure(s) for ponds.	Yes	SHOWN ON PLAN
3.2.9	Emergency overflow spillways and top of berm elevations for ponds and other volume/peak discharge control facilities.	Yes	SHOWN ON PLAN
3.2.10	Floodplains, ponds, and stormwater management facilities located in reserves.	Yes	SHOWN ON PLAN
<b>3.3</b>	<b>postdevelopment Conditions Hydrology &amp; Hydraulics</b>		

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
3.3.1	Narrative of the hydrologic analysis methodology used (e.g., unit hydrograph or other approved methods).	Yes	
3.3.2	A summary table of drainage subbasin hydrologic parameters (subbasin ID, area in acres, curve number, Tc, etc.).	Yes	
3.3.3	Table of postdevelopment condition runoff curve numbers with supporting data and calculations.	No	Does not apply to this project due to limited Green Area CN values based on 100% impervious. This would enhance the conservative factor for the site detention.
3.3.4	Table of postdevelopment condition times of concentration with supporting data and calculations.	Yes	
3.3.5	Cross-sections and other diagrams of existing open channels, bridge and culvert sections and other hydraulic features as	No	Does not apply to this project.
3.3.6	Hydrologic and hydraulic analyses for runoff rates, volumes, velocities and elevations. Provide supporting data not specified above and identify assumptions. Include detailed calculations for the 2, 5, 10, 25 & 100-year, 24-hour storm events. Provide results in a tabular form. Provide digital copies of any computer files and models used.	Yes	Hydroflow Report as part of Project Analysis
3.3.7	Downstream peak discharge assessment (10% Rule) results and supporting data and calculations. Provide digital copies of any computer files and models used.	No	10% rule does not apply for this project, total disturbed area is 2.19 acres.
3.3.8	Stage-storage-discharge or other outlet rating curves and inflow/outflow hydrographs for all ponds.	Yes	
3.3.9	Demonstrate that the pond contours on the master grading plan and the stage-storage-discharge data are consistent for all ponds.	No	Does not apply for this project based on providing underground detention and porous pavement.
3.3.10	Demonstrate that all ponds have one foot of freeboard above the 100-year, 24-hour high water level.	Yes	Underground Detention/Porous Pavement
3.3.11	Demonstrate that runoff from the proposed project site is discharged in the same manner as prior to development, using level spreaders, energy dissipaters, other devices or grading as required, or identify an appropriate flowage easement.	Yes	Refer to section 3.3.6, pursuant to conversations with Tim Davidson, Watershed area A has been reduced to remove runoff to residential area to the Southwest of the project.
<b>3.4 Stormwater Quantity Control Sizing</b>			
3.4.1	Hydraulic sizing calculations for all stormwater management controls.	Yes	
3.4.2	Table(s) listing all stormwater management controls. Present the types, sizes, elevations, flows, velocities and depths for each control, as applicable. Verify that velocities are self-cleaning and non-erosive.	Yes	
3.4.3	Typical details (including cross-sections where applicable) for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc.	Yes	Included details from Wichita Public Works for SB 303 and SB 108. Additional Details will be provided at the Construction Document Phase
<b>3.5 Stormwater Quality Management Facilities</b>			
3.5.1	Table(s) listing all stormwater management facilities. Present the description, % TSS removal value, water quality volume handled, contributing drainage area in acres and contributing impervious area in acres.	Yes	
3.5.2	Indicate the responsible party for maintenance, as shown in the plat text (i.e., Home Owners Association, Lot Owners Association, property owner, etc.).	Yes	
3.5.3	Water quality volume (total and by facility), with supporting data and calculations.	Yes	
3.5.4	% TSS removal value (total and by facility) with supporting data and calculation. Must be equal to or greater than 80%.	Yes	
3.5.5	Channel protection volume with supporting data and calculations.	Yes	
3.5.6	Water quality volume and channel protection volume orifice size calculations.	Yes	See section 3.3.6
3.5.7	Other calculations required for each stormwater management facility as specified in the Wichita/Sedgwick County Stormwater Manual.	No	This section is not applicable to this project.
3.5.8	Typical details (including cross-sections where applicable) for outlet structures, embankments, internal grading, forebays and other siltation prefilters, filtration/infiltration media, vegetation, check dams, operational controls, etc.	Yes	
<b>4.0 Floodplains</b>			
4.1	Reference the source of flood profile, floodplain, floodway and stream discharge information.	No	This section is not applicable to this project.
4.2	Delineation of nearest base flood elevations.	No	
4.3	Delineation of predevelopment regulatory floodplain/floodway limits using FEMA's current GIS database; limits to be per elevation and scaled location.	No	This section is not applicable to this project.
4.4	Delineation of postdevelopment regulatory floodplain/floodway limits; limits to be per elevation and scaled location, with project limits shown.	No	This section is not applicable to this project.
4.5	Floodway data table and discharges.	No	This section is not applicable to this project.
4.6	Hydrologic and hydraulic study information for local floodplain analysis, unnumbered Zone A elevation determinations and floodplain map revisions or required permits.	No	This section is not applicable to this project.
4.7	Regulatory floodway and four natural profile models (10, 50, 100 and 500-year) for existing and postdevelopment conditions.	No	This section is not applicable to this project.
4.8	Floodplains and floodways located within a reserve, where necessary.	No	This section is not applicable to this project.

Drainage Plan Checklist			
#	Plan Element Description	Element Included?	Explanation/Notes
4.9	Floodplain cut and fill calculations for volume sensitive basins.	No	This section is not applicable to this project.
4.10	Demonstrate that floodway elevations and velocities do not increase due to construction in the floodway ("No Rise Certification").	No	This section is not applicable to this project.
<b>5.0 Federal, State and Local Permits</b>			
5.1	US Army Corps of Engineers regulatory program permits (Section 404 permit)	No	All permits will be obtained throughout the construction document review and approval process.
5.2	Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Floodplain Fill, Levee, Water Appropriations, Dam Safety permit, etc.)	No	
5.3	FEMA letters of map change/revision - LOMA, LOMR, LOMR-f, CLOMR, etc.; shall be included and approved when project modifies the limits of the floodplain/floodway.	No	All permits will be obtained throughout the construction document review and approval process.
<b>6.0 Half Scale Preliminary Master Grading Plan</b>			
6.1	One set of plans and associated PDF of plans.	Yes	
6.2	Professional Engineer's seal, signature and date.	Yes	
6.3	Title block including subdivision name and phase and dated revision documentation.	Yes	
6.4	Future phases shown but cross-hatched as information only.	Yes	
6.5	Scale, not greater than 1-inch = 60 feet.	Yes	
6.6	North arrow.	Yes	
6.7	Index or legend key.	Yes	
6.8	Benchmarks (minimum of 2) used for site control (NAVD 88 vertical datum).	Yes	
6.9	Existing contours of entire site with contour interval of one foot.	Yes	
6.10	Proposed contours for channels, ponds, and other permanent stormwater management facilities, with contour interval of one foot.	Yes	
6.11	Spot elevations shown to the nearest tenth of a foot for critical locations, including lot and property boundaries.	Yes	
6.12	Proposed lot and street layout.	Yes	
6.13	Locations of underground storm drains.	Yes	
6.14	Overflow locations for storms exceeding storm drain capacity, with elevations.	Yes	
6.15	Top elevations of storm drains at all inlets, manholes, and flow line elevations for all outfalls.	Yes	
6.16	Locations of open ditches and lakes.	No	Not applicable to project
6.17	Flow direction arrows.	Yes	
6.18	Proposed flow line elevations of all open ditches at maximum 100 foot intervals, and 100-year flood elevations thereon.	No	Not applicable to project
6.19	Ponds: Location, bottom elevation, normal pool elevation, 100-year flood elevation, emergency overflow elevation.	No	
6.20	Proposed top-of-curb elevations at points where drainage will be required to flow over the curb.	No	No drainage over curb proposed for site
6.21	Platted minimum building opening elevation for each lot, in table form for all lots (excluding basement floor elevations).	Yes	
6.22	Standard foundation and elevation detail for slab on grade, full basement, view-out, partial view-out and/or walk-out construction.	No	
6.23	Top of foundation elevation for each lot.	Yes	
6.24	Notation for builders for each lot as to the type of structure that may be constructed and the view-out, walk-out or pad elevation, as applicable.	No	Does not apply to project
6.25	Indicate that all lots are above the 100-year flood elevation.	Yes	
6.26	Indicate that grading around structures conforms to perimeter drainage requirements.	Yes	
6.27	Indicate that backyard drainage grading conforms to backyard drainage requirements.	No	Site is a commercial lot
6.28	Adjacent subdivision lot lines, with lot labels and subdivision names.	Yes	
6.29	Boundaries and labels for all easements, rights-of-way and reserves.	Yes	
6.30	Statement on proposed final plat: "A drainage plan has been developed for the subdivision and all drainage easements, rights-of-way, or reserves shall remain at the established grades and remain unobstructed to allow for the conveyance of stormwater."	Yes	
<b>End of Checklist</b>			



# PREMIER CIVIL ENGINEERING



April 6, 2012

Scott Lindeback P.E.  
City of Wichita  
455 N. Main  
Wichita, KS 67202

RE: CVS Store#10077-SWC W 13th Street and Maize Road

Mr. Lindeback,

Pursuant to the Subdivision Drainage Plan Checklist for the City of Wichita/Sedgwick County, please let this letter serve notice for the Project Narrative and Discussion of Off-site conditions that are required per the Drainage Plan Checklist. Located below this paragraph is a summary that has been placed into sections per the Drainage Plan Checklist.



Section 1.4  
Project Narrative

The Proposed CVS/Pharmacy will consist of a 13,225 sq. ft. building located on 1.67 acres. The disturbed area for the site will be approximately 2.20 acres. The site is currently undeveloped ground with an existing in-ground pool. The site is Soil Class "C" Blanket silt loam, 0 to 1 percent slopes pursuant to the USDA soil survey.

Section 1.5  
Offsite Conditions

This area is classified as Zone "X" non-shaded with a 2% annual chance of flooding. Pursuant to the USGS Quadrangle Map for this area this site is tributary to Couskin Creek which is located approximately 0.25 miles southwest of the Proposed CVS/Pharmacy. We have reviewed the Estimated Flood-Inundation Maps for Couskin Creek in Western Wichita, Kansas Water-Resources Investigations Report 03-4074 completed by the Kansas Water Science Center and the USGS. Based on our hydraulic analysis for the site this low impact development will not increase the site runoff based on the Wichita Stormwater Manual 100 Year detention requirements.

Section 1.6  
Summary Table of Runoff Calculations (pre/post development)

	DESIGN STORM FLOWS (cfs)						
	1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
<b>PRE DEVELOPED</b>	5.239	7.956	12.10	15.10	19.02	22.55	26.53
<b>POST DEVELOPED</b>	7.796	9.796	12.64	14.63	17.19	19.46	22.01

Section 1.7  
Description, Type and Function of Stormwater Management Facilities

The proposed impacts on stormwater runoff will be designed to be minimal per the Wichita Stormwater Manual. This site will consist of three separate watersheds. All three watersheds will be impacted, however the watershed that is served by the residential properties to the Southwest will be reduced and no post developed water will drain to the residential properties.

The second and third watershed will drain to the existing curb inlet located on 13th. This watershed will contain a proposed ADS Isolator Row (or equivalent) and a Vortsentry HS unit. Prior to the first row of the underground detention (isolator row), there will be Vortsentry HS to allow the collection of 80% of TSS. The underground detention system will allow the site to contain the post developed runoff conditions that the proposed CVS/Pharmacy would provide.

Section 2.2.1

Narrative of Hydrologic analysis methodology used

The runoff method used for modeling the site was based on the 24 Hour SCS Hydrograph Method in Hydraflow Hydrographs.

Section 2.2.2

Summary Table of Drainage Sub basin Hydrologic Parameters

	AREA 1	AREA 2	AREA 3	AREA 4	AREA 5	AREA 6	AREA 7
<b>AREA IN ACRES</b>	5.07	0.40	0.28	0.52	0.78	0.39	0.60
<b>COEFFICIENT</b>	.35	.35	.35	.011	.011	.011	.37
<b>CURVE NUMBER</b>	80	80	80	98	98	98	80
<b>TIME OF CONCENTRATION</b>	32.10	25.30	18.40	5.00	3.90	4.00	35.70

\*\*\* Areas 4 and 6 are user defined inputs due to Q less than the time of concentration 2 minute interval. \*\*\*

Section 2.2.3

Table of Existing Condition Runoff Curve Numbers

Located in Section 2.2.2

Section 2.2.4

Table of Existing Conditions Time of Concentration

Located in Section 2.2.2

Section 2.2.5

Table of Rainfall data used in the Hydrologic Analysis

Located in Hydrographs Section 2.2.7

Section 2.2.7

Hydrologic and Hydraulic analyses for runoff Rates, Volumes Velocities and Elevations.

Section 3.3

Section 3.3.1

The hydrologic analysis methodology used is the SCS Hydrograph based on TR-55 using Autodesk Storm and Sanitary Sewer Analysis 2012.

Section 3.3.2.

Summary Table of Drainage Sub-Basin Hydrologic Parameters

	<b>DESIGN STORM FLOWS (cfs)</b>							
	AREA A	AREA B	AREA C	AREA D	AREA E	AREA F	AREA G	AREA H
<b>AREA IN ACRES</b>	3.85	0.08	0.34	0.19	0.47	0.32	0.17	0.55
<b>CURVE NUMBER</b>	80	80	98	98	98	98	98	98
<b>COEFFICIENT</b>	0.35	0.011	0.011	0.011	0.011	0.011	0.011	0.011
<b>TIME OF CONCENTRATION</b>	34.8	4*	3.1*	3.2	3.1	3.1	3.5	3.1

Section 3.3.3

Does not apply for project. Due to limited Green Area CN values based on 100% impervious. This would enhance the conservative factor for the site detention.

Section 3.3.4

Table of Post Development Conditions Time of Concentration

See Section 3.3.2

Section 3.3.5

Section does not apply for this project.

Section 3.3.6

Hydrologic and Hydraulic Analyses for Runoff Rates, Volumes, Velocities and Elevations

Section 3.3.7

10% Rule does not apply for project. Total disturbed area for site is 2.19 Acres

Section 3.3.8

Stage-Storage-Discharge or other Outlet Rating Curves and Inflow/Outflow hydrographs for all ponds.

Section 3.3.9

Section does not apply to project. Project is providing underground detention.

Section 3.3.10

Refer to Section 3.3.6

Section 3.3.11

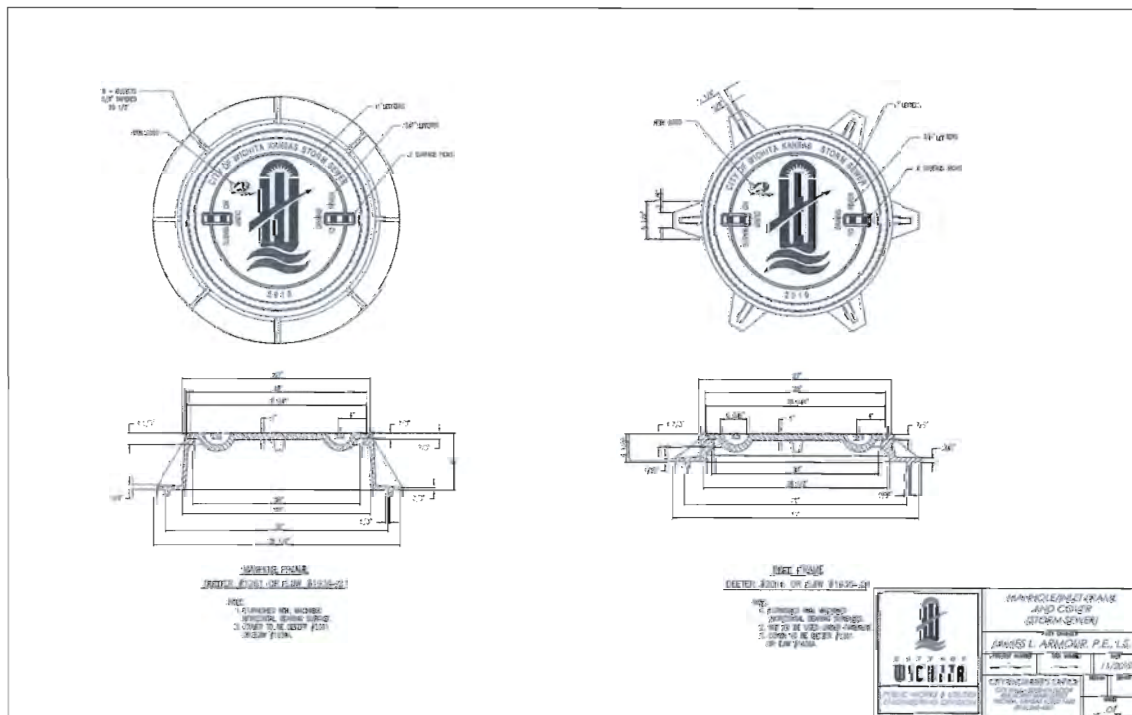
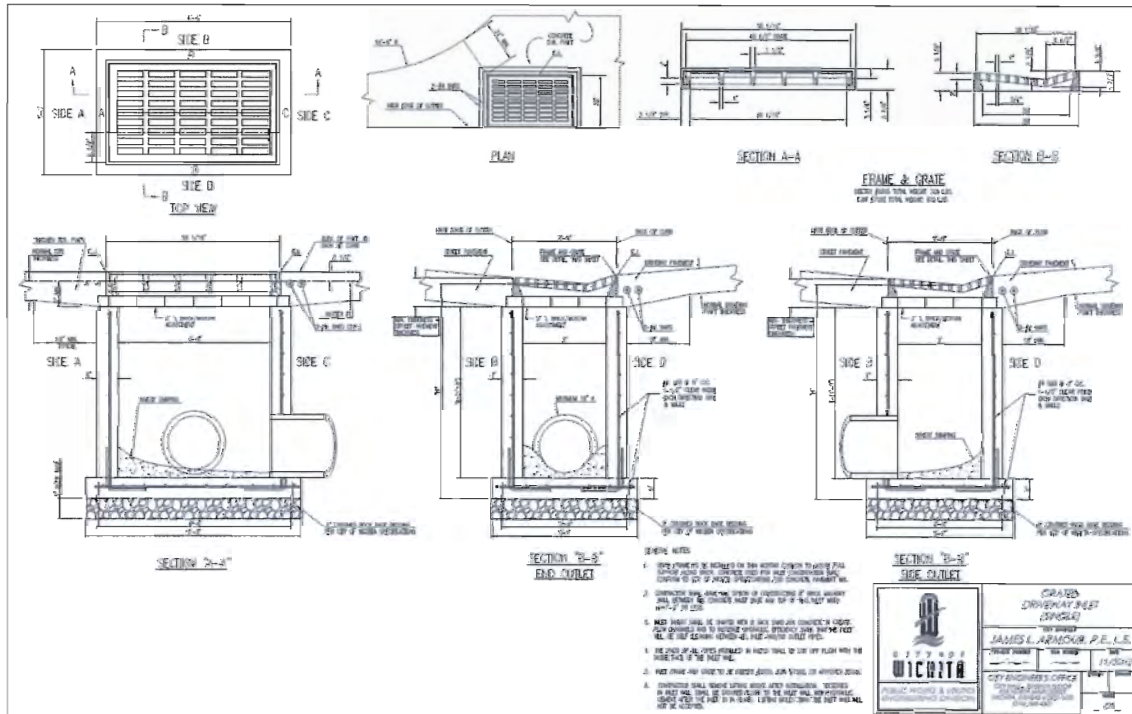
Refer to section 3.3.6, pursuant to conversations with Tim Davidson Watershed Area "A" has been reduced to remove runoff to residential area to the Southwest of the Project.

Section 3.4  
Stormwater Quantity Control Sizing  
Hydraulic Sizing calculations for all Stormwater Management controls.

Section 3.4.2 Table listing all stormwater Management Controls.

Section 3.4.3  
Typical details

Below are generic details that will be further analyzed based upon the approval of the Plat and preparation of the construction documents.



Section 3.5

Section 3.5.1

Table listing all Stormwater Management Facilities

	Stormwater Management Facilities	
	% TSS	WATER QUALITY VOLUME/FLOW
<i>STORMTECH ISOLATOR ROW</i>	80%	0.1558 ac-ft
<i>VORTSENTRY HS</i>	80%	0.0523 ac-ft

Section 3.5.2

Responsible Party for Maintenance

The proposed Plat will indicate that it will be the responsibility of each individual property to own and maintain their Stormwater Management Controls and Facilities.

Section 3.5.3

Water Quality Volume for Facilities

Land Use	Hydrologic Soil Group			
	A	B	C	D
<i>Undisturbed Woods, Meadows or Ag Land (R<sub>VU</sub>)</i>	0.02	0.03	0.04	0.05
<i>Turf or Disturbed Soils (R<sub>VD</sub>)</i>	0.15	0.20	0.22	0.25
<i>Impervious Cover (R<sub>V</sub>)</i>	0.95	0.95	0.95	0.95

Calculation equation:

$$WQv = P \cdot Rv \cdot A / 12 \text{ ac-ft}$$

Therefore: WQv for Tributary to Storm Isolator Row =  $1.2 \cdot .95 \cdot 2.19 / 12 = 0.2081 \text{ ac-ft}$

Section 3.5.4  
%TSS removal value for Facilities



FINAL REPORT ON FIELD VERIFICATION TESTING  
OF THE  
STORMTECH ISOLATOR ROW<sup>TM</sup> TREATMENT UNIT

Submitted to

StormTech LLC

May 2008

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**University of New Hampshire Stormwater Center (UNHSC)**

Gregg Hall • 35 Colboos Road • Durham, New Hampshire 03824-3534 • <http://www.unh.edu/erg/cstev/>

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**FINAL REPORT ON FIELD VERIFICATION TESTING OF THE STORMTECH  
ISOLATOR ROW™ TREATMENT UNIT  
BY THE UNIVERSITY OF NEW HAMPSHIRE STORMWATER CENTER**

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# **FINAL REPORT ON FIELD VERIFICATION TESTING OF THE STORMTECH ISOLATOR ROW TREATMENT UNIT MAY 2008**

## **1.0 INTRODUCTION**

Under an agreement from StormTech, LLC, field verification testing of a StormTech Isolator Row™ stormwater treatment unit were conducted at University of New Hampshire Stormwater Center, Durham NH. Testing consisted of determining the water quality performance for the following parameters:

- Total Suspended Sediment (TSS)
- Total Petroleum Hydrocarbons-Diesel Range (TPH-D)
- Nitrogen as Nitrate (DIN)
- Total Zinc (TZn)
- Total Phosphorus (TP)

Efficiency tests were conducted under normalized conditions at various ambient rainfall intensities, flow rates, and pollutant concentrations; all variables reflective of natural field performance conditions. The StormTech Isolator Row™ treatment unit is one of 10 devices that are configured and tested in parallel, with a single influent source providing uniform loading to all devices. All treatment strategies were uniformly sized to target a rainfall-runoff depth equivalent to 90% of the annual volume of rainfall. Under the parallel and uniformly sized configuration, a normalized performance evaluation is possible because different treatment strategies of the same scale receive runoff from events of the same duration, intensity, peak flow, volume, antecedent dry period, and watershed loading.

This interim report reflects analyses performed from December 2006 through March 2008. This included monitoring of 17 rainfall runoff events in total.

## **2.0 TEST FACILITY DESCRIPTION**

The UNH Stormwater Center studies stormwater-related water quality and quantity issues. The Stormwater Center's field facility is designed to evaluate and verify the performance of stormwater management devices and technologies in a parallel, event normalized setting. Ten different management systems are currently undergoing side-by-side comparison testing under strictly monitored natural conditions (figure 1).

The site was designed to function as numerous, uniformly sized, isolated, parallel treatment systems. Rainfall-runoff is evenly divided at the head of the facility in a distribution box, designed with the floor slightly higher than the outlet invert elevations to allow for scour across the floor and into the pipe network. Effluent from all systems is piped into a central sampling gallery, where system sampling and flow monitoring conveniently occurs. The parallel configuration normalizes the treatment processes for event and watershed-loading variations.

The Center is located on the perimeter of a 9 acre commuter parking lot at the University of New Hampshire in Durham. The parking lot is standard dense mix asphalt that was installed in 1996, and is used to near capacity throughout the academic year. The sub-catchment area is large enough to generate substantial runoff, which is gravity fed to the parallel treatment processes. The lot is curbed and entirely impervious. Activity is a combination of passenger vehicles and routine bus traffic. The runoff time of concentration for the lot is 22 minutes, with slopes ranging from 1.5-2.5%. The area is subject to frequent plowing, salting, and sanding during the winter months. Literature reviews indicate that contaminant concentrations are above or equal to national norms for parking lot runoff. The climatology of the area is characterized as a coastal, cool temperate forest. Average annual precipitation is 48 inches uniformly distributed throughout the year, with average monthly precipitation of 4.02 in +/- 0.5. The mean annual temperature is 48°F, with the average low in January at 15.8°F, and the average high in July at 82°F.

### 3.0 INSTRUMENTATION AND MEASURING TECHNIQUES

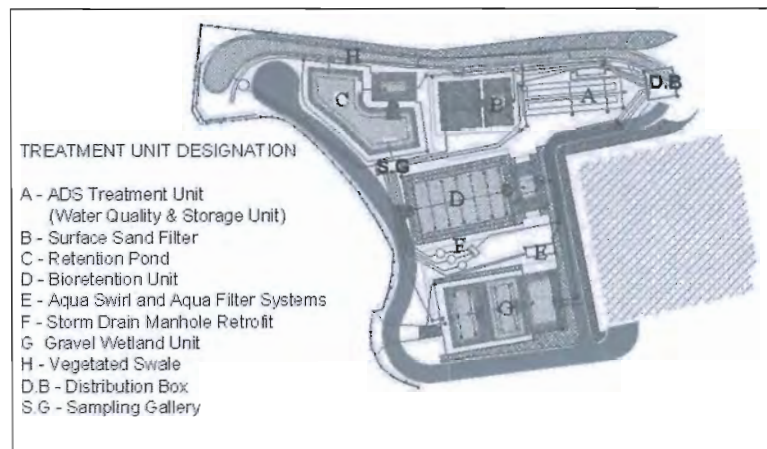
#### 3.1 Flow

Influent and effluent flow levels were measured using Teledyne Isco 6712 Automated samplers accompanied by Teledyne Isco 730 Bubbler Flow Modules in combination with Thelmar compound weirs.

#### 3.2 Other Measurements

Temperature, pH, Specific Conductivity, and Dissolved Oxygen, are collected by a YSI 600XL sonde. These parameters are monitored real-time the treatment unit, but are outside the scope of work identified under this contract.

Figure 1: Site Plan: Plan view of the University of New Hampshire field research facility



#### 3.3 Water Quality Analysis

Samples were processed and analyzed by an EPA certified laboratory using the standard methodologies outlined in Table 1.

**Table 1: Laboratory analytical methods and detection limits for each analyte.**

Analyte	Analytical Method	Method Detection Limit (mg/L)
Nitrate/Nitrite in water	EPA 300.0A	0.008
Total Suspended Solids	EPA 160.2	0.4
Total Phosphorus	EPA 300.0A	0.008
Zinc in water	EPA 6010b	0.001-0.05
Total Petroleum Hydrocarbons – Diesel Range	EPA 8015B	0.1-3.0 ug/L

## 4.0 TEST PROCEDURES

### 4.1 Rainfall Collection and Measurement.

A rainfall collection system consisting of a 6”diameter 2 foot high anodized aluminum housing, funnel, debris screen, and tipping bucket mechanism is installed at a controlled site within the research complex. Specified components are the ISCO Model 674 Tipping Bucket Rain Sensor with Rain Gauge. The precipitation event data is stored in the ISCO 6712 and the accumulated rainfall is retrieved through FlowLink 4.21 via a desktop computer located on-site.

### 4.2 Field Sampling Procedures.

Discrete samples are taken for influent and effluent waters by automated samplers. Automatic samples are programmed to take samples at uniform time intervals that are determined prior to each independent rain event. Generally at least 10 samples will be taken for each rain event; five discrete samples are taken within the time of concentration and the remaining samples (up to 19 more, 24 in total) taken over the remainder of the hydrograph. Influent time of concentration is approximately 22 minutes. Effluent time of concentrations vary for each device depending on conveyance lengths and treatment strategies. All samples are stored in thermostatically controlled conditions at 39°F.

One Liter disposable LDPE sample bags are used to assure clean, non-contaminated sample containers. Prior to a sampling event, each bag is labeled with a unique, water proof, adhesive bar code that corresponds with a field identification number containing information relating to the stormwater treatment unit, the sample number (1-24) and the date of sampling. Records are kept that correlate sample number with sample time, date, flow, and other real time water quality parameters. Detailed written and electronic records are kept identifying the technician who loaded each sampler, the date, time, and unique bar code and field identification numbers. This begins the chain-of-custody record that accompanies each sample to track handling and transportation of each sample throughout the sampling process.

As a rule our analyses comply with the Technology Acceptance and Reciprocity Partnership (TARP), and the Technology Acceptance Protocol – Ecology (TAPE) guidelines. We operate under a detailed Quality Assurance Project Plan (QAPP) which is available on request.

### 4.3 Sampling for Total Solids

Large 7000 liter first flush samples were taken for 11 storms through out the year to measure total solids (TS) for which a concurrent storm volume was monitored by auto-sampler. Large volume samples enable the capture of the entire sediment load (total solids) for the first flush and respective sampling period. PSDs are determined using wet sieving and hydrometer (ASTM Standard D 422 – 63). PSDs are not to be compared with samples obtained for TSS and which are determined by laser diffraction. Method consistency is needed for PSD to be comparable.

A serial decantation process is used to reduce the volume over a period 96 hours. The TS sample is allowed to settle for 48 hours. Half of the volume is then decanted transferred into a settling tank. After an additional 48 hours, a second decanting occurred, which allowed for the sediments to be recovered, wash sieved, and weighed to develop the mass of total solids and influent particle size distribution (PSD).

## 5.0 DATA EVALUATION

Data analyses include a range of approaches. Analyses include:

- evaluation of storm characteristics
- construction of pollutographs
- event mean concentrations
- normalized performance efficiencies

Pollutographs are based on time versus concentration for influent and effluent from discrete sample monitoring. Pollutographs can be used to assess the efficacy of the sampling programs by determining whether the bulk of the mass-load wash-off was monitored. This is determined by the observation of diminishing concentrations over time.

Event mean concentrations (EMC's) are a parameter used to represent the flow-proportional average concentration of a given parameter during a storm event. It is defined as the total constituent mass divided by the total runoff volume. When combined with flow measurement data, the EMC can be used to estimate the pollutant loading from a given storm.

$$EMC = \frac{\sum_i^n V_i C_i}{V_{total}} \quad \text{where } n \text{ is the number of samples}$$

Performance efficiency for individual storms = 100 X  $\frac{EMC_{influent} - EMC_{effluent}}{EMC_{influent}}$

Method 1: Removal Efficiency (RE)=  $\frac{\text{Sum of all Storm Efficiencies}}{\text{Number of Storms}}$

Method 2: Efficiency Ratio (ER)= 
$$\frac{\text{Average EMC}_{\text{influent}} - \text{Average EMC}_{\text{effluent}}}{\text{Average EMC}_{\text{influent}}}$$

Pollutant loadings adjusted for event mean concentrations, are compared for each pollutant parameter using simple statistics. The data provides a basis to evaluate the primary study question; i.e., to discern whether stormwater treatment unit BMP's have served to produce observable (and perhaps statistically significant) improvement in quality and reduction in volume of stormwater runoff.

## 6.0 RESULTS

Table 2 displays rainfall event characteristics for the 17 monitored storm events. Storms ranged in size from low intensity to high intensity, small volume to large volume. Every attempt was made to sample rainfall events across the range of seasons and while there is variation there are predominantly more winter storms in the data set. With subsurface infiltration systems like the StormTech Isolator Row™ seasonal fluctuations do not have significant effects on system performance. It should be noted that a number of events were not included in final calculations due to strict quality assurance procedures followed by UNHSC.

**Table 2: Rainfall-Runoff event characteristics for 17 storm events**

Rainfall Event	Peak Intensity (in/hr)	Storm Duration (min)	Total Depth (in)	Peak Flow (gpm)	Volume (gal)	Season
12/23/2006	0.36	1020	1.21	225	80300	Winter
1/6/2007	0.36	760	0.50	346	43404	Winter
3/2/2007	0.48	535	1.02	200	52718	Winter
3/11/2007	0.12	430	0.28	85	23324	Winter
4/12/2007	0.12	590	0.37	115	30421	Spring
4/27/2007	0.24	450	0.54	146	31004	Spring
5/11/2007	0.60	125	0.26	488	13150	Spring
7/4/2007	0.48	235	0.45	260	23979	Summer
9/9/2007	1.32	345	0.48	923	27626	Summer
12/24/2007	1.08	305	0.33	499	22196	Winter
12/29/2007	0.36	655	0.42	114	32563	Winter
1/11/2008	0.72	690	0.68	233	47832	Winter
1/18/2008	0.48	250	0.59	47	2215	Winter
2/1/2008	0.11	645	1.23	187	21859	Winter
2/13/2008	0.40	411	2.74	39	6542	Winter
3/7/2008	0.24	365	0.34	139	27391	Winter
3/8/2008	0.60	500	1.21	288	70938	Winter

## **6.1 Event Mean Concentrations and Removal Efficiencies**

Performance statistics and EMC values are presented for each storm for the 5 contaminants across 17 monitored storm events in tables 3-7 below. A variety of performance characterizations are made. In general use of removal efficiencies can be complicated, however in this setting such measures are appropriate as all systems tested receive the same stormwater from the same watershed. In addition to median and average REs, ERs are also displayed. Advantages and disadvantages of each measure are discussed in further detail in the summary and conclusion section of this report. In addition influent and effluent EMC probabilities are presented in figure 2 as box and whisker box plots for the range of storms monitored and the range of contaminants measured. Effluent probability plots are useful in discerning overall performance trends and in comparing UNHSC results to other datasets that may exist for the treatment technology.

**Table 3: Total Suspended Solids Event Mean Concentrations and Removal Efficiencies for 17 storm events at influent and effluent points of the StormTech Isolator Row Unit™ (A3)**

Date	Analyte Process	Units	TSS	
			Influent	Effluent
12/23/2006	RE EMC	% mg/l		
1/6/2007	RE EMC	% mg/l	18.096	13% 15.815
3/2/2007	RE EMC	% mg/l	128.683	64% 46.086
3/11/2007	RE EMC	% mg/l	65.661	62% 24.883
4/12/2006	RE EMC	% mg/l	36.234	85% 5.482
4/27/2007	RE EMC	% mg/l	15.555	3% 15.123
5/11/2007	RE EMC	% mg/l	123.364	81% 23.482
7/4/2007	RE EMC	% mg/l	48.402	90% 4.602
9/9/2007	RE EMC	% mg/l	32.032	38% 19.981
12/24/2007	RE EMC	% mg/l	120.000	62% 46.000
12/29/2007	RE EMC	% mg/l	16.000	100% 0.000
1/11/2008	RE EMC	% mg/l	94.000	85% 14.000
1/18/2008	RE EMC	% mg/l	130.000	86% 18.000
2/1/2008	RE EMC	% mg/l	21.000	100% 0.000
2/13/2008	RE EMC	% mg/l	22.000	86% 3.000
3/7/2008	RE EMC	% mg/l	14.000	14% 12.000
3/8/2008	RE EMC	% mg/l	48.000	79% 10.000
<b>Process Ave RE Median RE ER</b>			<b>TSS</b>	<b>66% 80% 72%</b>

**Table 4: Total Petroleum Hydrocarbons-Diesel Range Event Mean Concentrations and Removal Efficiencies for 17 storm events at influent and effluent points of the StormTech Isolator Row Unit™ (A3)**

Date	Analyte Process	Units	TPH-D	
			Influent	Effluent
12/23/2006	RE	%		100%
	EMC	ug/l	378.692	0.000
1/6/2007	RE	%		52%
	EMC	ug/l	1094.223	520.344
3/2/2007	RE	%		65%
	EMC	ug/l	2239.940	783.313
3/11/2007	RE	%		71%
	EMC	ug/l	1647.889	472.401
4/12/2006	RE	%		33%
	EMC	ug/l	631.229	421.917
4/27/2007	RE	%		90%
	EMC	ug/l	455.725	45.428
5/11/2007	RE	%		59%
	EMC	ug/l	969.972	401.795
7/4/2007	RE	%		53%
	EMC	ug/l	926.978	435.902
9/9/2007	RE	%		100%
	EMC	ug/l	261.366	0.000
12/24/2007	RE	%		62%
	EMC	ug/l	890.000	340.000
12/29/2007	RE	%		
	EMC	ug/l		
1/11/2008	RE	%		100%
	EMC	ug/l	750.000	0.000
1/18/2008	RE	%		91%
	EMC	ug/l	3200.000	300.000
2/1/2008	RE	%		
	EMC	ug/l	400.000	
2/13/2008	RE	%		100%
	EMC	ug/l	870.000	0.000
3/7/2008	RE	%		100%
	EMC	ug/l	850.000	0.000
3/8/2008	RE	%		100%
	EMC	ug/l	490.000	0.000
Process Ave RE			TPH-D	
Median RE			78%	
ER			90%	
			75%	

**Table 5: Dissolved Inorganic Nitrogen Event Mean Concentrations and Removal Efficiencies for 17 storm events at influent and effluent points of the StormTech Isolator Row Unit™ (A3)**

Date	Analyte Process	Units	DIN	
			Influent	Effluent
12/23/2006	RE	%		-26%
	EMC	mg/l	0.259	0.326
1/6/2007	RE	%		64%
	EMC	mg/l	0.383	0.138
3/2/2007	RE	%		-28%
	EMC	mg/l	0.193	0.247
3/11/2007	RE	%		-8%
	EMC	mg/l	0.429	0.464
4/12/2006	RE	%		-421%
	EMC	mg/l	0.050	0.259
4/27/2007	RE	%		-117%
	EMC	mg/l	0.111	0.240
5/11/2007	RE	%		-77%
	EMC	mg/l	0.258	0.456
7/4/2007	RE	%		
	EMC	mg/l		
9/9/2007	RE	%		-221%
	EMC	mg/l	0.189	0.605
12/24/2007	RE	%		
	EMC	mg/l		
12/29/2007	RE	%		-40%
	EMC	mg/l	0.500	0.700
1/11/2008	RE	%		-150%
	EMC	mg/l	0.200	0.500
1/18/2008	RE	%		
	EMC	mg/l		
2/1/2008	RE	%		
	EMC	mg/l		
2/13/2008	RE	%		-100%
	EMC	mg/l	0.200	0.400
3/7/2008	RE	%		
	EMC	mg/l		
3/8/2008	RE	%		-150%
	EMC	mg/l	0.200	0.500
Process			DIN	
Ave RE			-106%	
Median RE			-88%	
IER			63%	

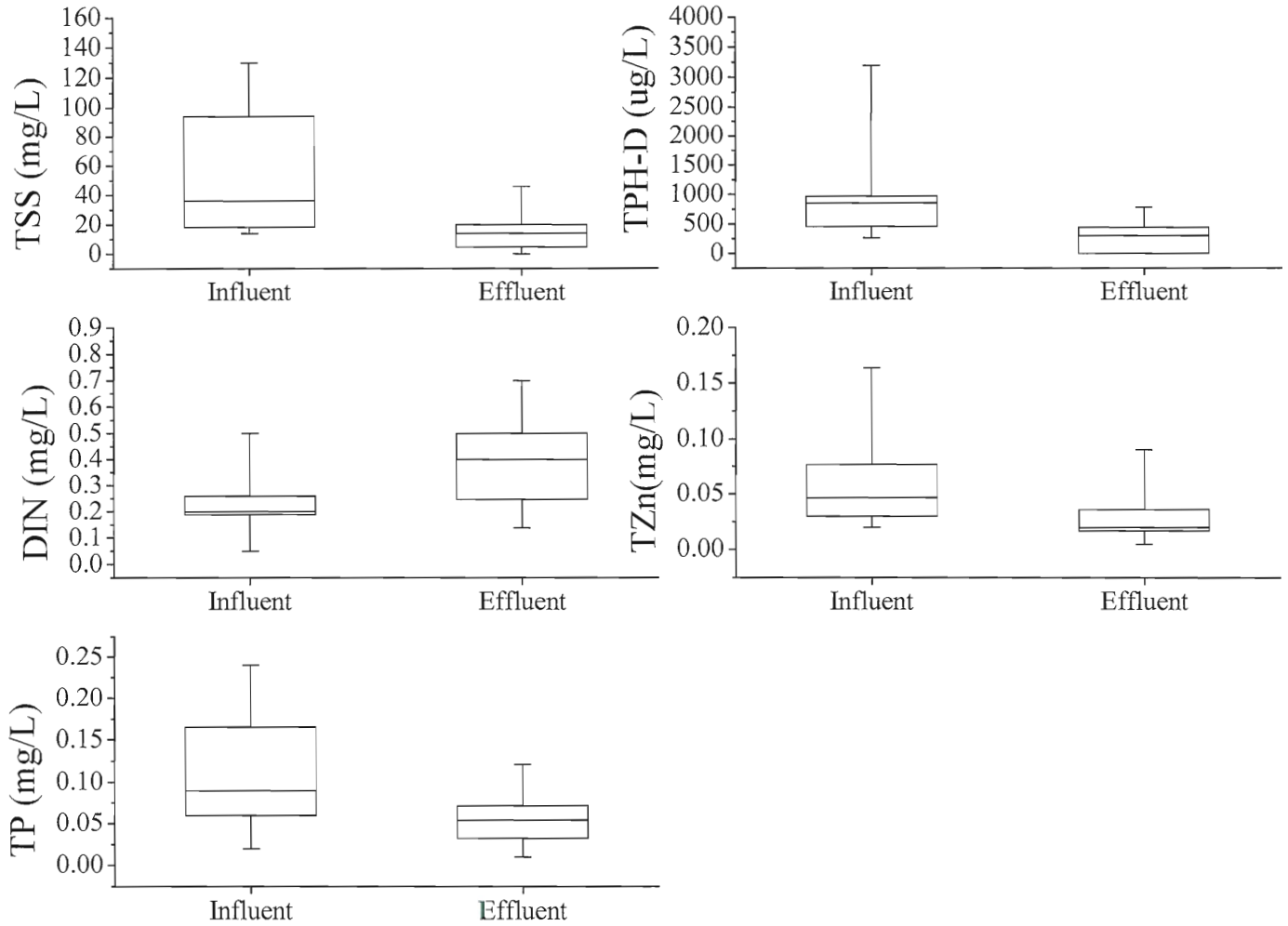
**Table 6: Total Zinc Event Mean Concentrations and Removal Efficiencies for 17 storm events at influent and effluent points of the StormTech Isolator Row Unit™ (A3)**

Date	Analyte Process	Units	TZn	
			Influent	Effluent
12/23/2006	RE EMC	% mg/l		
1/6/2007	RE EMC	% mg/l	0.027	37% 0.017
3/2/2007	RE EMC	% mg/l	0.163	57% 0.071
3/11/2007	RE EMC	% mg/l	0.077	53% 0.036
4/12/2006	RE EMC	% mg/l	0.046	53% 0.022
4/27/2007	RE EMC	% mg/l	0.021	76% 0.005
5/11/2007	RE EMC	% mg/l	0.087	58% 0.036
7/4/2007	RE EMC	% mg/l	0.046	63% 0.017
9/9/2007	RE EMC	% mg/l	0.049	37% 0.030
12/24/2007	RE EMC	% mg/l	0.150	40% 0.090
12/29/2007	RE EMC	% mg/l	0.030	33% 0.020
1/11/2008	RE EMC	% mg/l	0.060	83% 0.010
1/18/2008	RE EMC	% mg/l	0.090	56% 0.040
2/1/2008	RE EMC	% mg/l	0.040	50% 0.020
2/13/2008	RE EMC	% mg/l	0.040	50% 0.020
3/7/2008	RE EMC	% mg/l	0.020	0% 0.020
3/8/2008	RE EMC	% mg/l	0.050	60% 0.020
Process Ave RE				TZn 50%
Median RE				53%
ER				52%

**Table 7: Total Phosphorus Event Mean Concentrations and Removal Efficiencies for 17 storm events at influent and effluent points of the StormTech Isolator Row Unit™ (A3)**

Date	Analyte Process	Units	TP	
			Influent	Effluent
12/23/2006	RE	%		1%
	EMC	mg/l	0.033	0.033
1/6/2007	RE	%		19%
	EMC	mg/l	0.081	0.065
3/2/2007	RE	%		49%
	EMC	mg/l	0.240	0.121
3/11/2007	RE	%		42%
	EMC	mg/l	0.175	0.102
4/12/2006	RE	%		22%
	EMC	mg/l	0.069	0.054
4/27/2007	RE	%		22%
	EMC	mg/l	0.051	0.039
5/11/2007	RE	%		64%
	EMC	mg/l	0.198	0.072
7/4/2007	RE	%		54%
	EMC	mg/l	0.165	0.076
9/9/2007	RE	%		2%
	EMC	mg/l	0.096	0.094
12/24/2007	RE	%		59%
	EMC	mg/l	0.170	0.070
12/29/2007	RE	%		50%
	EMC	mg/l	0.040	0.020
1/11/2008	RE	%		67%
	EMC	mg/l	0.120	0.040
1/18/2008	RE	%		67%
	EMC	mg/l	0.120	0.040
2/1/2008	RE	%		50%
	EMC	mg/l	0.060	0.030
2/13/2008	RE	%		25%
	EMC	mg/l	0.080	0.060
3/7/2008	RE	%		-50%
	EMC	mg/l	0.020	0.030
3/8/2008	RE	%		89%
	EMC	mg/l	0.090	0.010
Process			TP	
Ave RE				37%
Median RE				49%
ER				47%

Figure 2: Effluent EMC box and whisker plot comparisons for the range of contaminants. Box reflects the 25<sup>th</sup> and 75<sup>th</sup> percentile, the line reflects the median and the whiskers reflect minimum and maximum.



## 6.2 Particle Size Distributions (PSD)

Particle size information for 3 influent events are presented in Figures 3 - 4 and. Two distinct methods were employed to assess influent PSD, a total capture method and an autosampler method. In general the total capture method refers to actual sediments existing in a full volume sample of influent first flush. Autosampler PSD is reflective of the particle size range pulled by a pre-programmed automatic sampler utilizing a 3/8<sup>th</sup> ID sampling line and a peristaltic pump. In both methods, PSDs were quantified using wet sieving and hydrometer (ASTM Standard D 422 – 63).

Figure 3: Influent particle size information

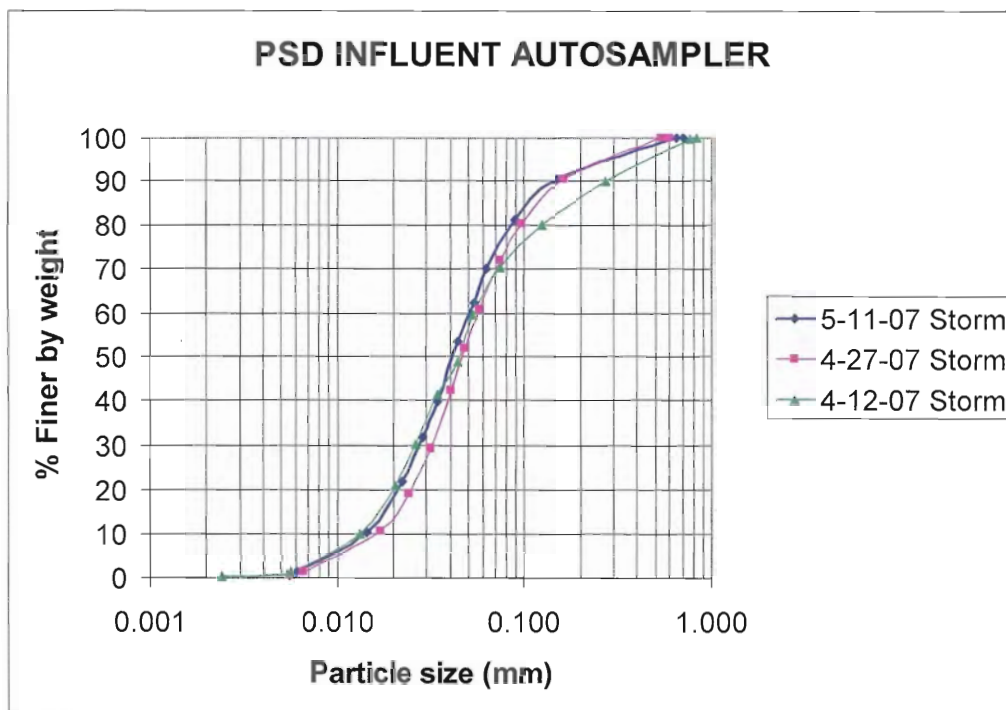
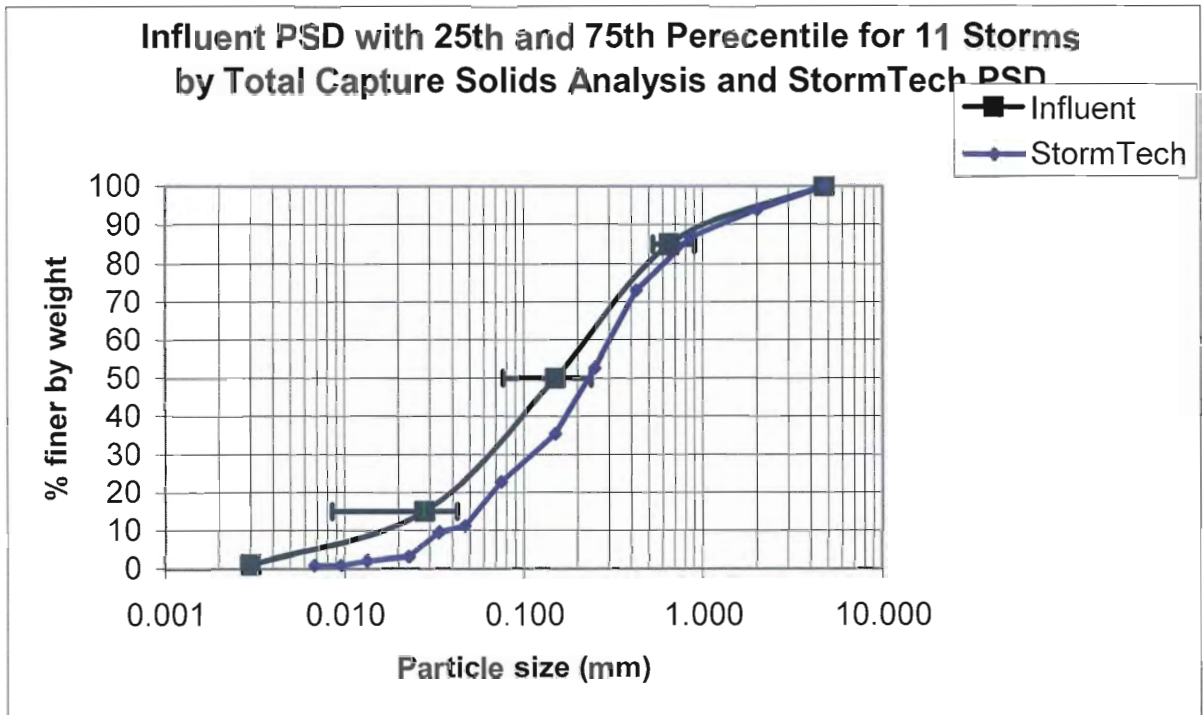


Figure 4: Influent PSD with 25<sup>th</sup> and 75<sup>th</sup> percentile for 11 storms by total capture analysis with StormTech sediment survey PSD.



Particle size ranges represented by the auto sampler are the same sampling method representative of the TSS sediment characterization used to report water quality performance.

Table 8: Particle Size Summary for Parking Lot Runoff 2006-2008

Particle	Influent Total Capture (mm)	Influent Autosampler (mm)
d15	0.028	0.015
d50	0.150	0.038
d85	0.650	0.103

## **7.0 SUMMARY AND CONCLUSIONS**

The range of statistical analyses presented reveal a range of performance trends. Efficiency Ratio (ER) analysis was performed on the final dataset for both treatment devices. For many stormwater treatment system datasets ER is a stable estimation of overall treatment performance as it minimizes the impact of low concentration values, or relatively clean storms with low influent EMC concentrations. Where Removal Efficiencies (RE) reflect treatment unit performance on a storm by storm basis, ERs weight all storms equally and reflect overall influent and effluent averages across the entire data set. REs are presented as an average of aggregate storms and as a median value. In general median RE values are more reliable in highly variable, non-normally distributed datasets such as those experienced in stormwater treatment unit performance studies. A review of REs on a per event basis, ERs for the entire period of monitoring, and EMCs per event and probabilistically over the entire period of monitoring will reveal the measured performance variations attributable to season, flow, concentration, and other factors.

Overall the StormTech Isolator Row™ does well at removing nearly all contaminants assessed with the exception of dissolved inorganic nitrogen. This system achieves a median removal efficiency of 80% for TSS which meets most municipal recommended levels for water quality treatment. The isolator row system does marginally better (90% RE) for TPH and demonstrates good removal for TP (49% RE). Of interest is the system's treatment improvement over the study period. Interim results, which evaluated 5 storms were significantly lower than that of removal efficiencies reported in this report.

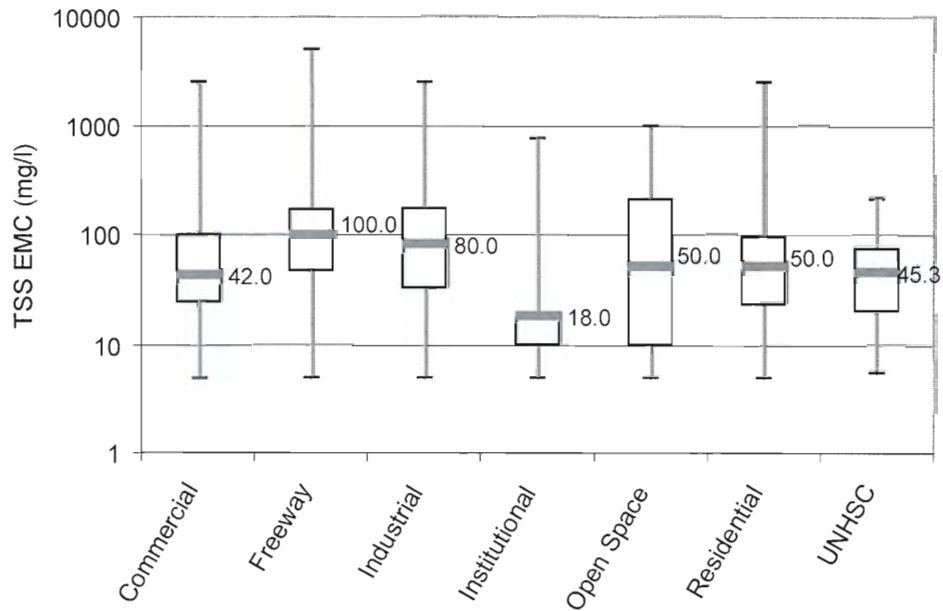
### **7.2 Future Research Recommendations**

The StormTech Isolator Row™ demonstrates advanced ability to meet current federal guidelines for stormwater management for all contaminants assessed with the exception of nitrogen. Data suggests enhanced removal efficiencies over time. Naturally a stasis point will be reached where treatment efficiencies enhanced by the accumulation of organic matter on the filter are offset by reduced infiltration capacity of the isolator row coupled with increase incidence of bypass. To date, this analysis can not be completed. Future research on such matters could greatly inform suggested maintenance recommendations and guidelines.

## 8.0 REFERENCE TSS INFORMATION

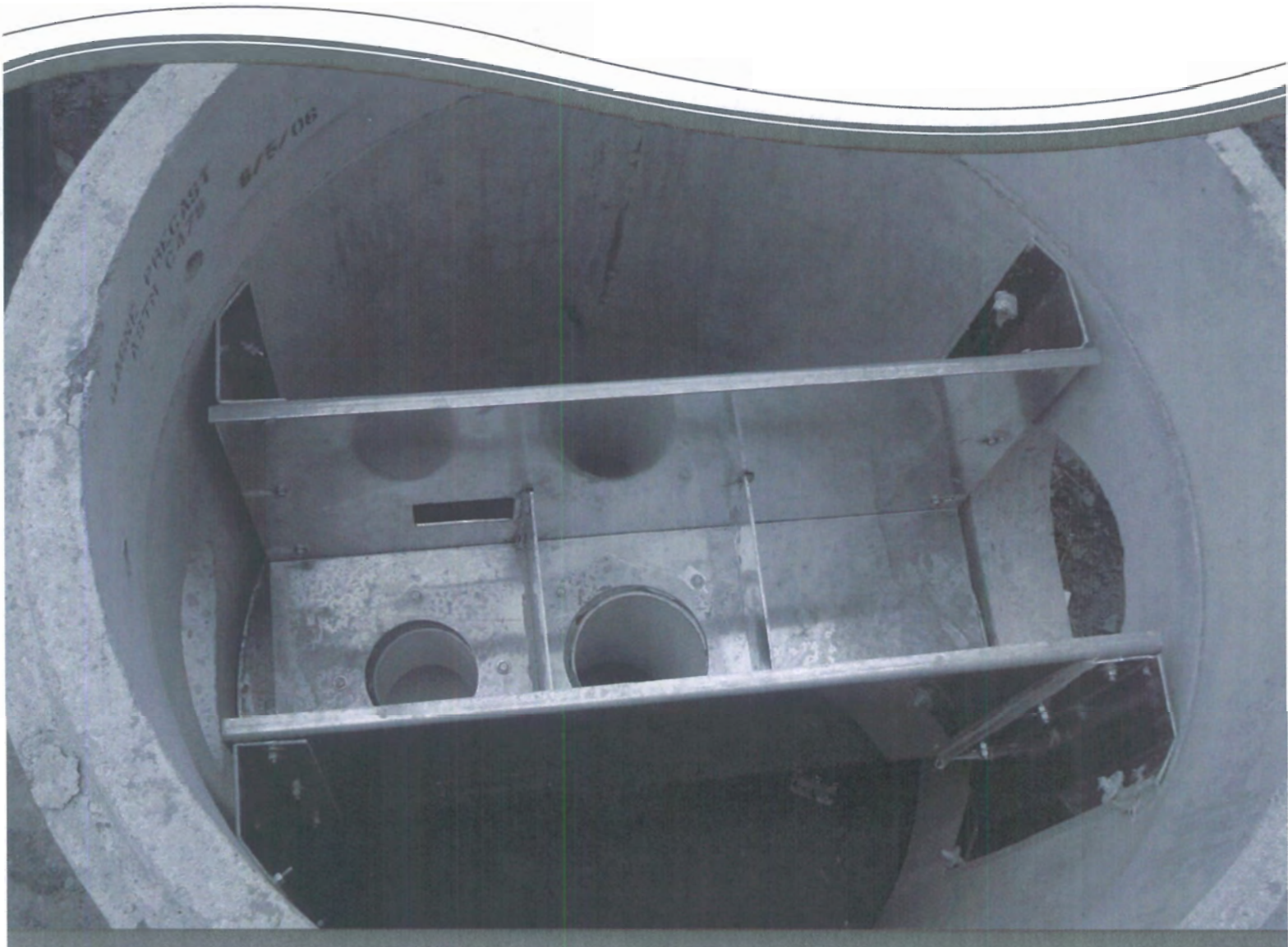
Comparisons of the TSS concentrations for varied land uses are presented in Figure 5. Urban highways pollutant concentrations tend to be twice the mean measured concentrations for parking lots and residential uses. The UNH facility data is within the national norm for parking lots.

**Figure 5: Total Suspended Solids (TSS) for varied land uses and at the UNH Stormwater Center (mg/L); (Source: National Stormwater Quality Database, 2005)**



Pitt, R. E., Maestre, A., and Center for Watershed Protection. (2005) "The National Stormwater Quality Database (NSQD, version 1.1)." USEPA Office of Water, Washington, D.C.

## VortSentry<sup>®</sup> HS Guide Operation, Design, Performance and Maintenance



## VortSentry® HS

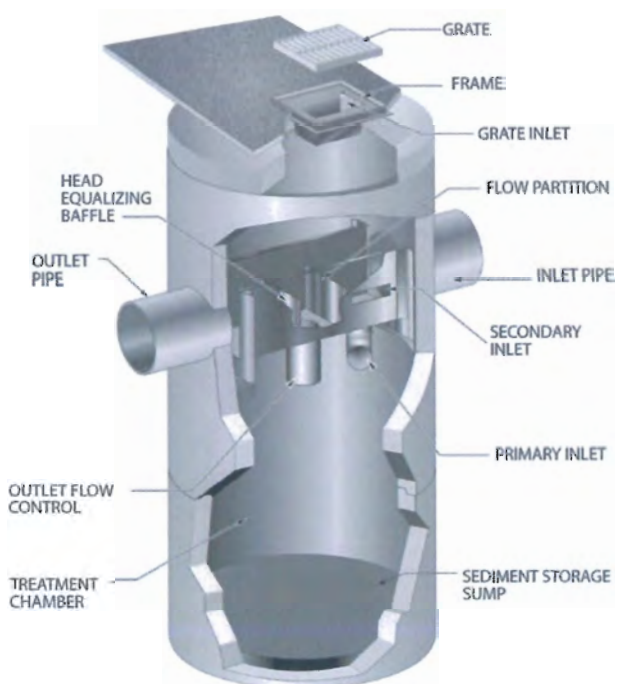
The VortSentry HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofit installations.

## Operation Overview

Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.



## Design Basics

There are two primary methods of sizing a VortSentry HS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow for a defined particle size. The summation process of the Rational Rainfall Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically, VortSentry HS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a particle gradation with an average particle size ( $d_{50}$ ) of 240-microns ( $\mu\text{m}$ ).

### Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The VortSentry HS is designed to treat all flows up to the WQQ. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the WQQ is surpassed. At influent rates higher than the WQQ, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the VortSentry HS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

### Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. The Rational Rainfall Method is a sizing program CONTECH developed to estimate a net annual sediment load reduction for a particular VortSentry HS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics. For more information on the Rational Rainfall Method, see *Vortechs Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method*, available at [www.contechstormwater.com](http://www.contechstormwater.com).

### Treatment Flow Rate

The outlet flow control is sized to allow the WQQ to pass entirely through the treatment chamber at a water surface elevation equal to the crest of the flow partition. The head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber when bypass occurs, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

### Hydraulic Capacity

The VortSentry HS is available in three standard configurations: inline (with inlet and outlet pipes at 180° to each other), grated inlet, and a combination of grate and pipe inlets. All three configurations are available in 36-inch (900-mm) through 96-inch (2400-mm) diameter manholes.

The configuration of the system is determined by the suffix of the model name:

- A model name without a suffix denotes a standard pipe inlet (Example HS48).
- A "G" at the end of the model designation denotes a grate inlet (Example HS48G).
- A "GP" at the end of the model designation denotes a combination of grate and pipe inlets (Example HS48GP).

## Performance

### Full-Scale Laboratory Test Results

Laboratory testing of the VortSentry HS was conducted using F-55 Silica, a commercially available sand product with an average particle size of 240- $\mu\text{m}$  (Table 1). This material was metered into a model HS48 VortSentry HS at an average concentration of between 250-mg/L and 300-mg/L at flow rates ranging from 0.50-cfs to 1.5-cfs (14-L/s to 56-L/s).

US Standard Sieve Size	Particle Size Micron ( $\mu\text{m}$ )	Cumulative Passing %
30	600	99.7%
40	425	95.7%
50	300	74.7%
70	212	33.7%
100	150	6.7%
140	106	0.7%

Table 1 : US Silica F-55 Particle Size Distribution

Removal efficiencies at each flow rate were calculated based on net sediment loads passing the influent and effluent sampling points. Results are illustrated in Figure 1.

Assuming that sediment in the inlet chamber is ideally mixed, removal rates through the system will decay according to the percentage of flow bypassed. This effect has been observed in the laboratory where the test system is designed to produce a

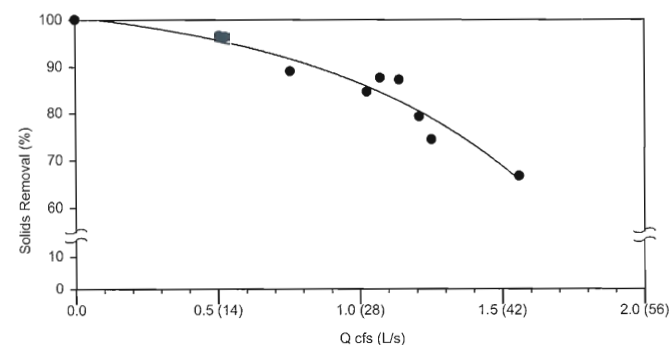


Figure 1: VortSentry HS Removal Efficiencies for 240- $\mu\text{m}$  Particle Gradation

thoroughly mixed inlet stream. All VortSentry HS models have the same aspect ratio regardless of system diameter (i.e. an increase in diameter results in a corresponding increase in depth). Operating rates are expressed volumetrically.

Removal efficiency at each operating rate is calculated according to the average of volumetric and Froude scaling methods and is described by Equation 1.

$$\text{Equation 1: } \left( \frac{\text{Diameter Prototype}}{\text{Diameter Model}} \right)^{2.75} = \left( \frac{\text{Flow Rate Prototype}}{\text{Flow Rate Model}} \right)$$

Equation 1 and actual laboratory test results were used to determine the flow rate which would be required for the various VortSentry HS models to remove 80% of solids.

View full report at [www.contechstormwater.com](http://www.contechstormwater.com)

## Maintenance

The VortSentry HS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, i.e., unstable soils or heavy winter sanding will cause the treatment chamber to fill more quickly, but regular sweeping will slow accumulation.

### Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations of a large volume of sediment. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is available for download at [www.contechstormwater.com](http://www.contechstormwater.com).

The VortSentry HS should be cleaned when the sediment has accumulated to a depth of two feet in the treatment chamber. This determination can be made by taking two measurements with a stadia rod or similar measuring device; one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the distance given in Table 2, the VortSentry HS should be maintained to ensure effective treatment.

### Cleaning

Cleaning of the VortSentry HS should be done during dry weather conditions when no flow is entering the system. Cleanout of the VortSentry HS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. All pollutants can be removed from this one access point from the surface with no requirements for Confined Space Entry.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads, which solidify the oils. These are usually much easier to remove from the unit individually, and less expensive to dispose than the oil/water emulsion that may be

created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the VortSentry HS should be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

VortSentry HS Model	Diameter		Distance		Sediment Storage		Oil Spill Storage	
			Between Water Surface and Top of Storage Sump					
	in.	m	ft.	m	yd <sup>3</sup>	m <sup>3</sup>	gal.	liter
HS36	36	0.9	3.6	1.1	0.5	0.4	83	314
HS48	48	1.2	4.7	1.4	0.9	0.7	158	598
HS60	60	1.5	6.0	1.8	1.5	1.1	258	978
HS72	72	1.8	7.1	2.2	2.1	1.6	372	1409
HS84	84	2.1	8.4	2.6	2.9	2.2	649	2458
HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile. Finer, silty particles at the top of the pile may be more difficult to feel with the measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Table 2: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

Logon to [www.contechstormwater.com](http://www.contechstormwater.com) to download the VortSentry HS Inspection and Maintenance Log.

For assistance with maintaining your VortSentry HS, contact us regarding the CONTECH Maintenance compliance certification program.



## Support

- Drawings and specifications are available at [www.contechstormwater.com](http://www.contechstormwater.com).
- Site-specific design support is available from our engineers.



800.925.5240

[contechstormwater.com](http://contechstormwater.com)

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The product(s) described may be protected by one or more of 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

Section 3.5.5  
Channel Protection Volume  
SEE ATTACHED HYDROGRAPHS AS PART OF SECTION

Section 3.5.6  
Water quality volume and Channel Protection volume orifice Calculations

See Section 3.3.6

Section 3.5.7  
Not Applicable for this project

Section 3.5.8

Typical Details for Outlet Structures, Isolator Row, and Vortsenry HS

# VortSentry® HS Maintenance

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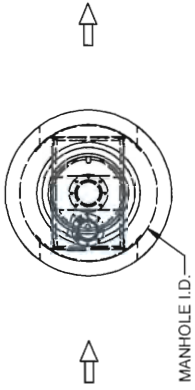
VortSentry HS Model	Diameter		Distance		Sediment Storage		Oil Spill Storage	
			Between Water Surface and Top of Storage Sump					
	in.	m	ft.	m	yd <sup>3</sup>	m <sup>3</sup>	gal.	liter
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HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Table 1: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

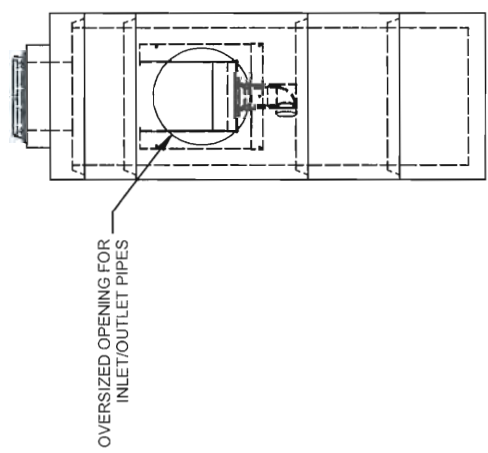


This CADD file is for the purpose of specifying stormwater treatment equipment to be furnished by CONTECH Stormwater Solutions and may only be transferred to other documents exactly as provided by CONTECH Stormwater Solutions. Title block information, **excluding** the CONTECH Stormwater Solutions logo and the VortSentry HS Stormwater Treatment System designation and patent number, may be deleted if necessary. Revisions to any part of this CADD file without prior coordination with CONTECH Stormwater Solutions shall be considered unauthorized use of proprietary information.

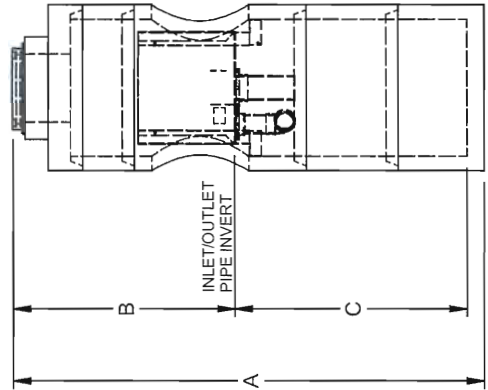
THE VORTSENTRY HS CONTROL SECTION SHALL BE STENCILED WITH THE CONTECH STORMWATER SOLUTIONS NAME AND LOGO. PIPE OPENINGS SHALL BE STENCILED "INLET" OR "OUTLET" AS APPROPRIATE



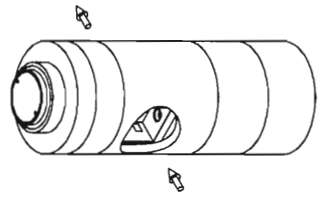
**FLAN**



**LEFT SIDE**



**ELEVATION**



**ASSEMBLED VIEW**

**NOTES:**

1. STORMWATER TREATMENT SYSTEM (SWTS) SHALL REMOVE 80% OF A SEDIMENT GRADATION WITH AN AVERAGE PARTICLE SIZE OF 240 MICRONS AT THE DESIGNATED TREATMENT FLOW RATE LISTED IN THE TABLE FOR EACH CORRESPONDING MODEL.
2. SWTS REMOVAL EFFICIENCY CLAIM SHALL BE CORROBORATED BY FULL SCALE LABORATORY TEST PERFORMANCE DATA.
3. SWTS MAINTENANCE RECOMMENDATION SHALL BE SUPPORTED BY FULL SCALE WASH-OUT TESTING.
4. SWTS SHALL PROVIDE INTERNAL BYPASS OF FLOWS THAT EXCEED THE TREATMENT FLOW RATE.
5. SWTS MAXIMUM HYDRAULIC CAPACITY MAY VARY DEPENDING UPON THE INLET PIPE DIAMETER, MATERIAL AND SLOPE.
6. SWTS INVERTS IN AND OUT SHALL BE AT THE SAME ELEVATION. INLET AND OUTLET PIPES MUST BE 180° FROM EACH OTHER.
7. MINIMUM RIM TO INVERT DISTANCE MAY BE REDUCED DEPENDING UPON ACTUAL PIPE DIAMETER. CONTACT CONTECH STORMWATER SOLUTIONS FOR SITE SPECIFIC INFORMATION.
8. PIPE SIZE MAY BE SMALLER THAN THE MAXIMUM PIPE SHOWN ON THE TABLE; SEE SITE PLAN FOR PIPE SIZE.
9. PURCHASER SHALL NOT BE RESPONSIBLE FOR ASSEMBLY OF INTERNAL COMPONENTS.
10. ACCESS FRAME AND COVER SUPPLIED WITH SYSTEM, NOT INSTALLED. SWTS MAY ALSO HAVE A GRATED INLET COVER (NOT SHOWN).
11. PURCHASER TO PREPARE EXCAVATION AND PROVIDE LIFTING EQUIPMENT.
12. VORTSENTRY HS BY CONTECH STORMWATER SOLUTIONS; PORTLAND, OR (800) 548-4667; SCARBOROUGH, ME (877) 907-8676; LINTHICUM, MD (866) 740-3318.

VortSentry Model	Manhole Diameter (ID)		Total Treatment Flow Rate		Typical Total Distance Rim to Outside Bottom		Typical Distance Rim to Invert		Typical Depth Below Invert (Inside)		Approximate Minimum Distance Rim to Invert (See Note 7)		Maximum Pipe Diameter (ID)	
	ft	mm	cfs	l/s	ft	m	ft	m	ft	m	ft	m	in	mm
HS36	3	900	0.55	15.6	10.16	3.10	4.08	1.24	5.5833	1702	3.00	0.91	18	450
HS48	4	1200	1.20	34.0	13.25	4.04	6.00	1.83	6.75	2057	4.00	1.22	24	600
HS60	5	1500	2.20	62.3	16.38	4.99	6.50	1.98	9.21	2807	4.82	1.47	30	750
HS72	6	1800	3.70	104.8	16.56	5.05	6.75	2.06	9.15	2788	5.59	1.70	36	900
HS84	7	2100	5.60	158.6	18.85	5.75	7.75	2.36	10.35	3156	4.77	1.45	42	1050
HS96	8	2400	8.10	229.4	20.87	6.36	8.50	2.59	11.54	3518	6.91	2.11	48	1200

**FOR INFORMATIONAL PURPOSES ONLY - NOT INTENDED FOR CONSTRUCTION**

TYPICAL DETAIL WITH SIZING TABLE  
 STORMWATER TREATMENT SYSTEM  
 VORTSENTRY® HS US PATENT PENDING



SCALE: NONE  
 DRAWN: NDG  
 CHECKED: GWB  
 FILE NAME: VSHS TYP/TBL  
 DATE: 8/17/07

SP

**Save Valuable Land and  
Protect Water Resources**

  
**StormTech**<sup>®</sup>  
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Subsurface Stormwater Management<sup>SM</sup>



**Isolator™ Row O&M Manual**  
StormTech<sup>®</sup> Chamber System for Stormwater Management

# 1.0 The Isolator™ Row

## 1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.



Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

## 1.2 THE ISOLATOR™ ROW

The Isolator Row is a row of StormTech chambers, either SC-310, SC-740 or MC-3500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

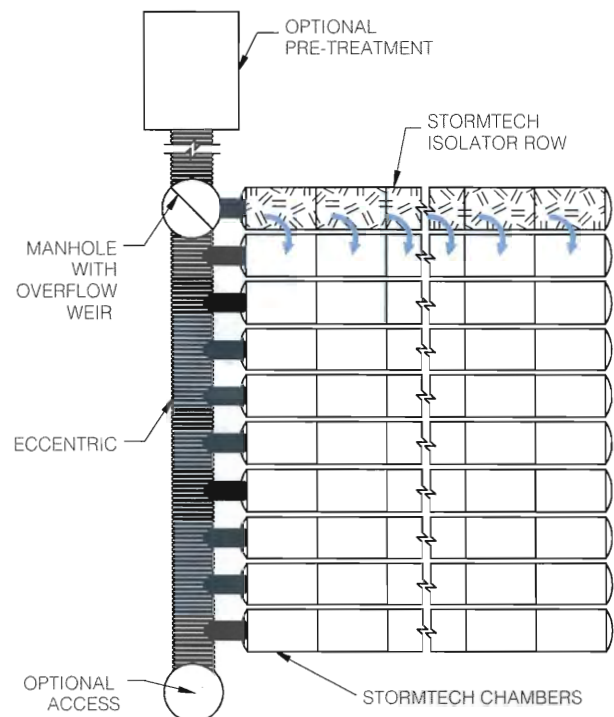
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

*Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.*

### StormTech Isolator Row with Overflow Spillway (not to scale)



## 2.0 Isolator Row Inspection/Maintenance



### 2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

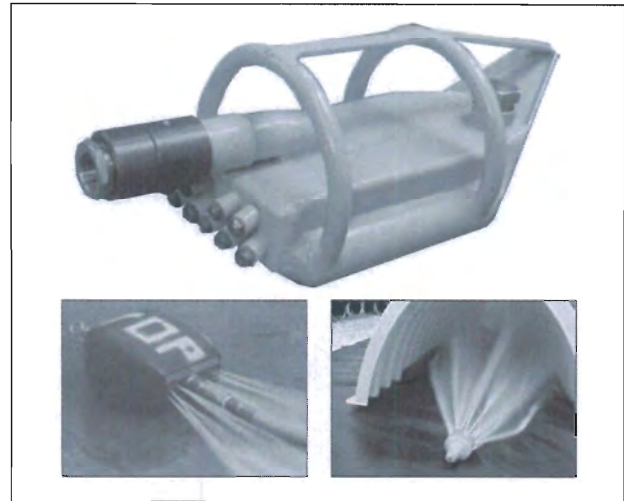
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

### 2.2 MAINTENANCE

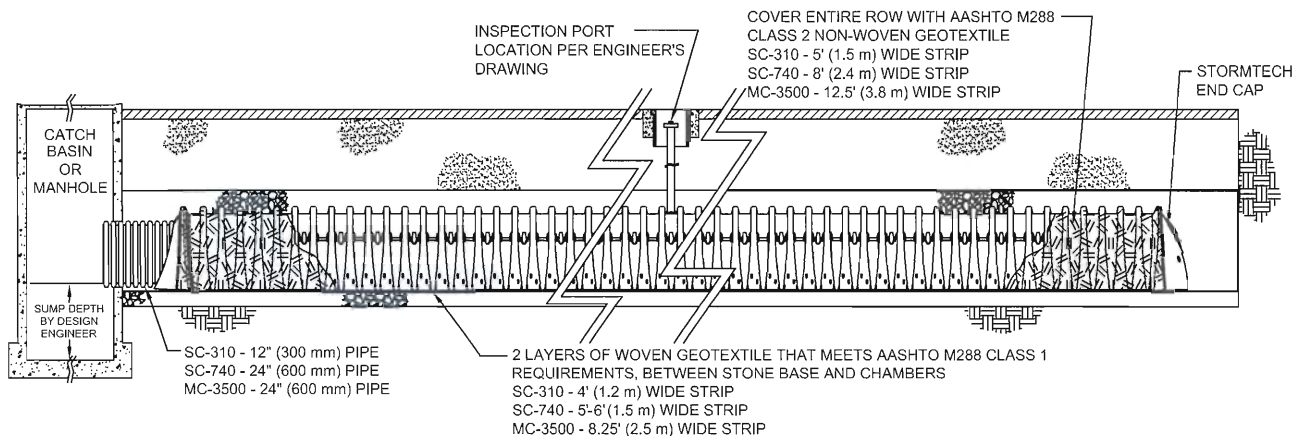
The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

### StormTech Isolator Row (not to scale)



## 3.0 Isolator Row Step By Step Maintenance Procedures

### Step 1) Inspect Isolator Row for sediment

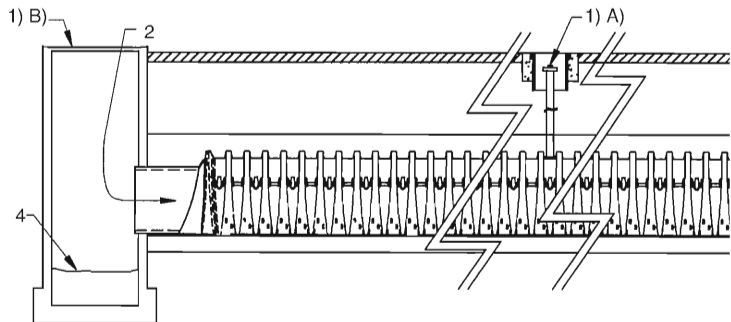
#### A) Inspection ports (if present)

- i. Remove lid from floor box frame
- ii. Remove cap from inspection riser
- iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
- iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

#### B) All Isolator Rows

- i. Remove cover from manhole at upstream end of Isolator Row
- ii. Using a flashlight, inspect down Isolator Row through outlet pipe
  1. Mirrors on poles or cameras may be used to avoid a confined space entry
  2. Follow OSHA regulations for confined space entry if entering manhole
- iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



### Step 2) Clean out Isolator Row using the JetVac process

- A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

### Step 3) Replace all caps, lids and covers, record observations and actions

### Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

### Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm



20 Beaver Road, Suite 104 | Wethersfield | Connecticut | 06109  
 860.529.8188 | 888.892.2694 | fax 866.328.8401 | www.stormtech.com

Section 4.0  
Floodplain (Does not apply to the project)

Section 5.0  
Federal, State and Local Permits

All permits will be obtained throughout the construction document review and approval process.

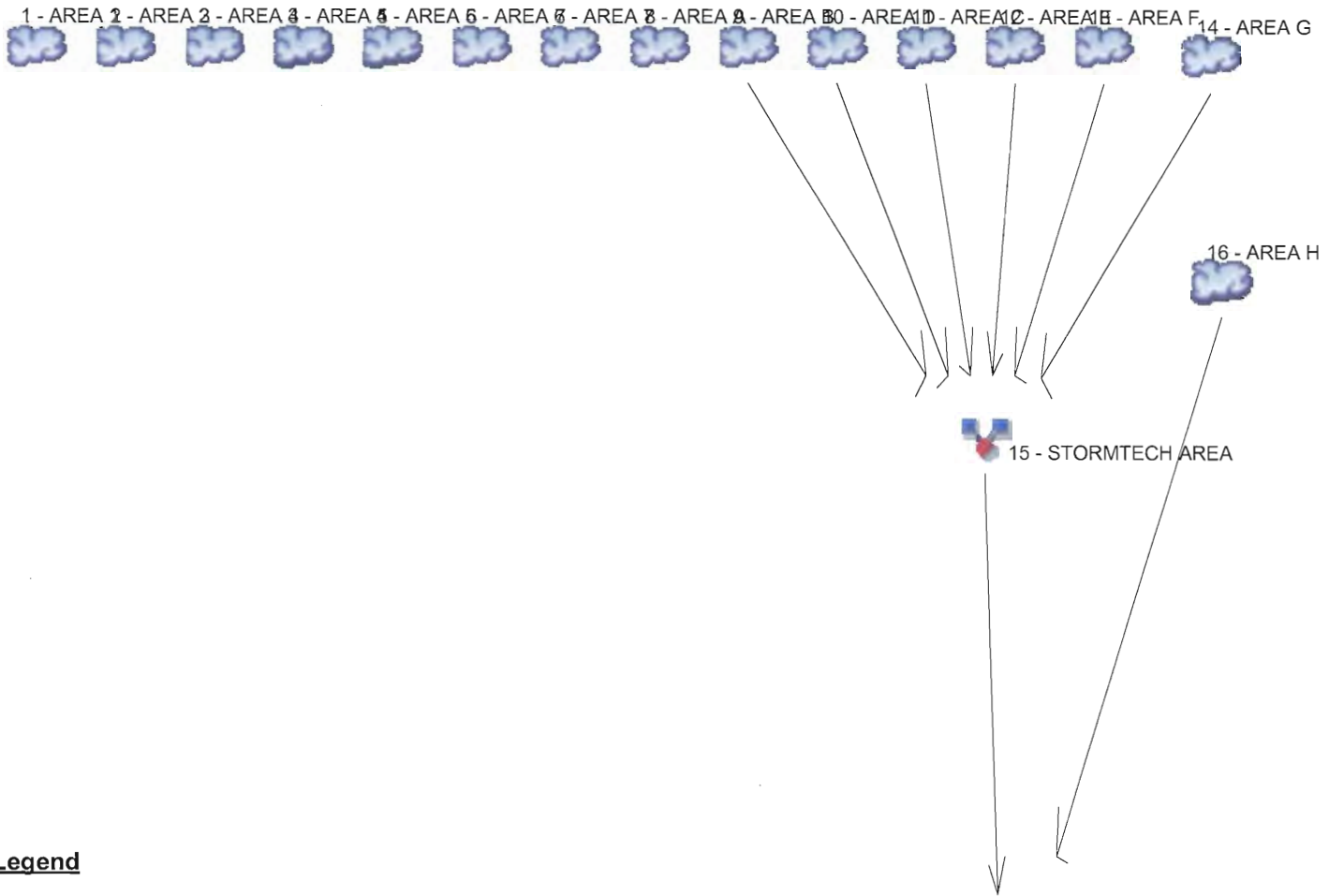
Sincerely,

A handwritten signature in blue ink, appearing to read "M. Fogarty", is written over a light blue horizontal line.

Matt Fogarty

# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



**Legend**

**Hyd. Origin      Description**

Hyd. Origin	Description
1	SCS Runoff AREA 1
2	SCS Runoff AREA 2
3	SCS Runoff AREA 3
4	SCS Runoff AREA 4
5	SCS Runoff AREA 5
6	SCS Runoff AREA 6
7	SCS Runoff AREA 7
8	SCS Runoff AREA A
9	SCS Runoff AREA B
10	SCS Runoff AREA D
11	SCS Runoff AREA C
12	SCS Runoff AREA E
13	SCS Runoff AREA F
14	SCS Runoff AREA G
15	Combine STORMTECH AREA
16	SCS Runoff AREA H
17	Combine COMBINED SYSTEM TO STORMTECH
18	Reservoir STORMTECH/ISOLATOR ROW

18 - STORMTECH/ISOLATOR ROW

# Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	-----	4.602	6.973	-----	10.59	13.23	16.69	19.79	23.31	AREA 1
2	SCS Runoff	-----	0.417	0.630	-----	0.958	1.195	1.506	1.784	2.099	AREA 2
3	SCS Runoff	-----	0.349	0.528	-----	0.800	0.997	1.254	1.485	1.746	AREA 3
4	SCS Runoff	-----	1.958	2.461	-----	3.176	3.676	4.318	4.888	5.529	AREA 4
5	SCS Runoff	-----	1.617	2.342	-----	3.436	4.217	5.229	6.130	7.143	AREA 5
6	SCS Runoff	-----	0.809	1.171	-----	1.718	2.109	2.614	3.065	3.572	AREA 6
7	SCS Runoff	-----	0.507	0.768	-----	1.167	1.459	1.840	2.182	2.570	AREA 7
8	SCS Runoff	-----	0.000	0.000	-----	0.015	0.044	0.184	0.479	1.043	AREA A
9	SCS Runoff	-----	0.301	0.379	-----	0.489	0.566	0.664	0.752	0.851	AREA B
10	SCS Runoff	-----	1.280	1.609	-----	2.077	2.404	2.823	3.196	3.615	AREA D
11	SCS Runoff	-----	0.527	0.663	-----	0.855	0.990	1.163	1.316	1.489	AREA C
12	SCS Runoff	-----	1.770	2.224	-----	2.871	3.323	3.903	4.418	4.998	AREA E
13	SCS Runoff	-----	1.205	1.514	-----	1.955	2.262	2.657	3.008	3.403	AREA F
14	SCS Runoff	-----	0.640	0.805	-----	1.038	1.202	1.412	1.598	1.808	AREA G
15	Combine	9, 10, 11, 12, 13, 14	5.724	7.193	-----	9.285	10.75	12.62	14.29	16.16	STORMTECH AREA
16	SCS Runoff	-----	2.071	2.603	-----	3.360	3.888	4.567	5.170	5.848	AREA H
17	Combine	15, 16	7.796	9.796	-----	12.64	14.63	17.19	19.46	22.01	COMBINED SYSTEM TO STORMTE
18	Reservoir	17	0.571	0.625	-----	0.687	0.729	0.782	0.830	0.888	STORMTECH/ISOLATOR ROW

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	4.602	2	734	0.471	-----	-----	-----	AREA 1
2	SCS Runoff	0.417	2	730	0.036	-----	-----	-----	AREA 2
3	SCS Runoff	0.349	2	726	0.026	-----	-----	-----	AREA 3
4	SCS Runoff	1.958	2	716	0.104	-----	-----	-----	AREA 4
5	SCS Runoff	1.617	2	718	0.075	-----	-----	-----	AREA 5
6	SCS Runoff	0.809	2	718	0.037	-----	-----	-----	AREA 6
7	SCS Runoff	0.507	2	736	0.054	-----	-----	-----	AREA 7
8	SCS Runoff	0.000	2	n/a	0.000	-----	-----	-----	AREA A
9	SCS Runoff	0.301	2	716	0.016	-----	-----	-----	AREA B
10	SCS Runoff	1.280	2	716	0.068	-----	-----	-----	AREA D
11	SCS Runoff	0.527	2	716	0.028	-----	-----	-----	AREA C
12	SCS Runoff	1.770	2	716	0.094	-----	-----	-----	AREA E
13	SCS Runoff	1.205	2	716	0.064	-----	-----	-----	AREA F
14	SCS Runoff	0.640	2	716	0.034	-----	-----	-----	AREA G
15	Combine	5.724	2	716	0.305	9, 10, 11, 12, 13, 14	-----	-----	STORMTECH AREA
16	SCS Runoff	2.071	2	716	0.110	-----	-----	-----	AREA H
17	Combine	7.796	2	716	0.415	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE
18	Reservoir	0.571	2	748	0.415	17	1342.01	0.209	STORMTECH/ISOLATOR ROW
13TH AND MAIZE 3.16.12.gpw					Return Period: 1 Year			Friday, 00 6, 2012	

# Hydrograph Report

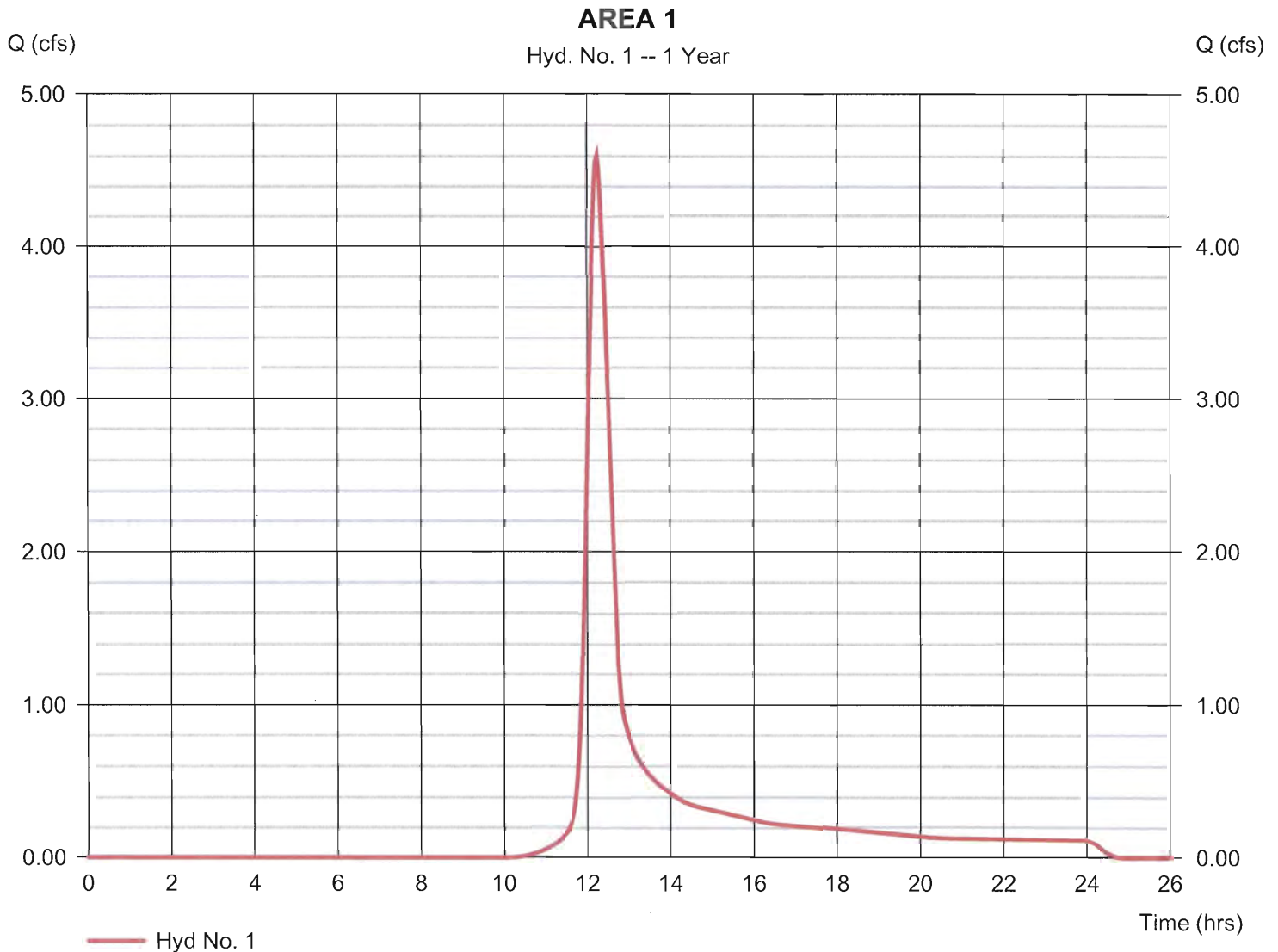
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.602 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.471 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

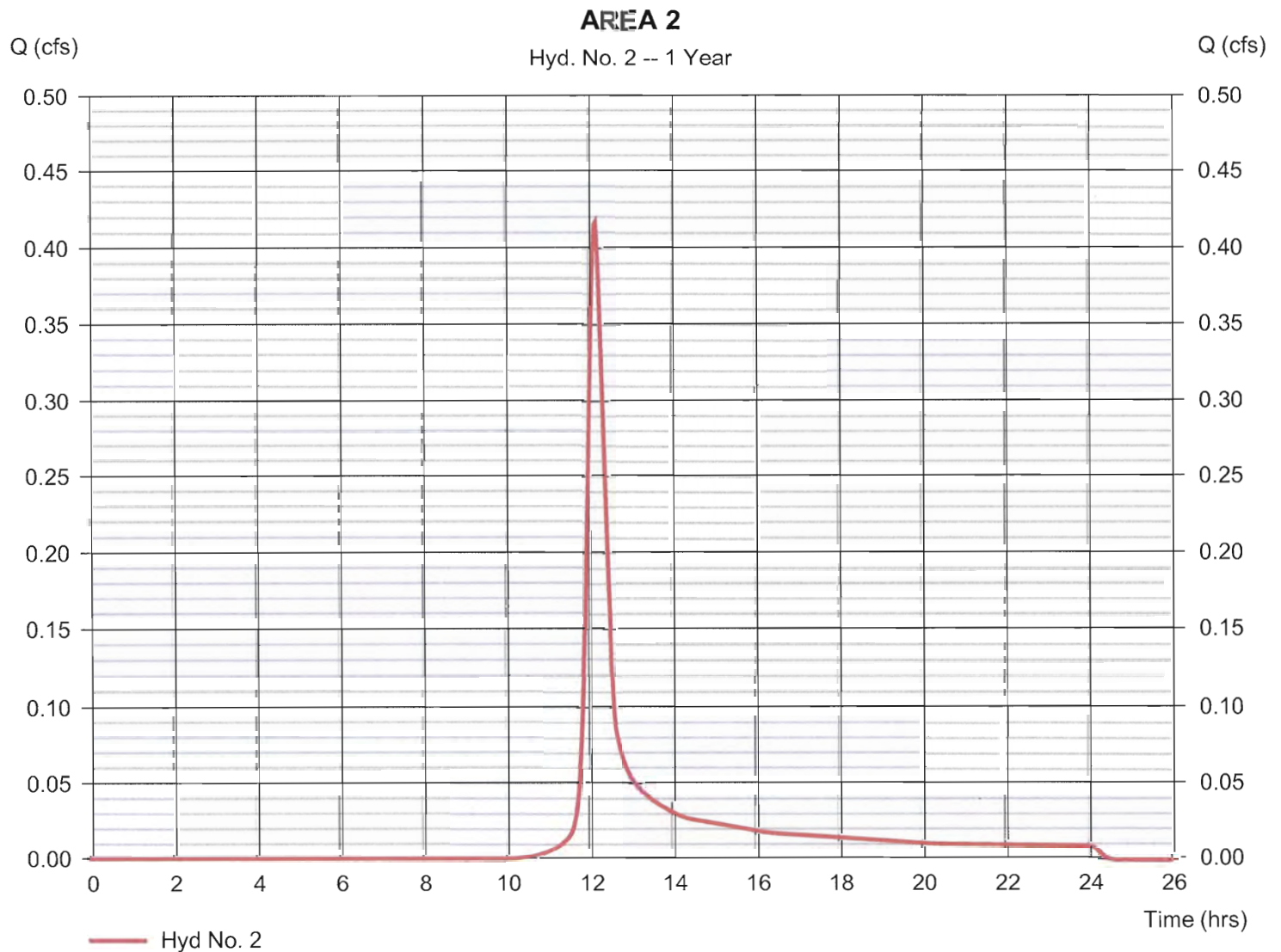
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.417 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 0.036 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

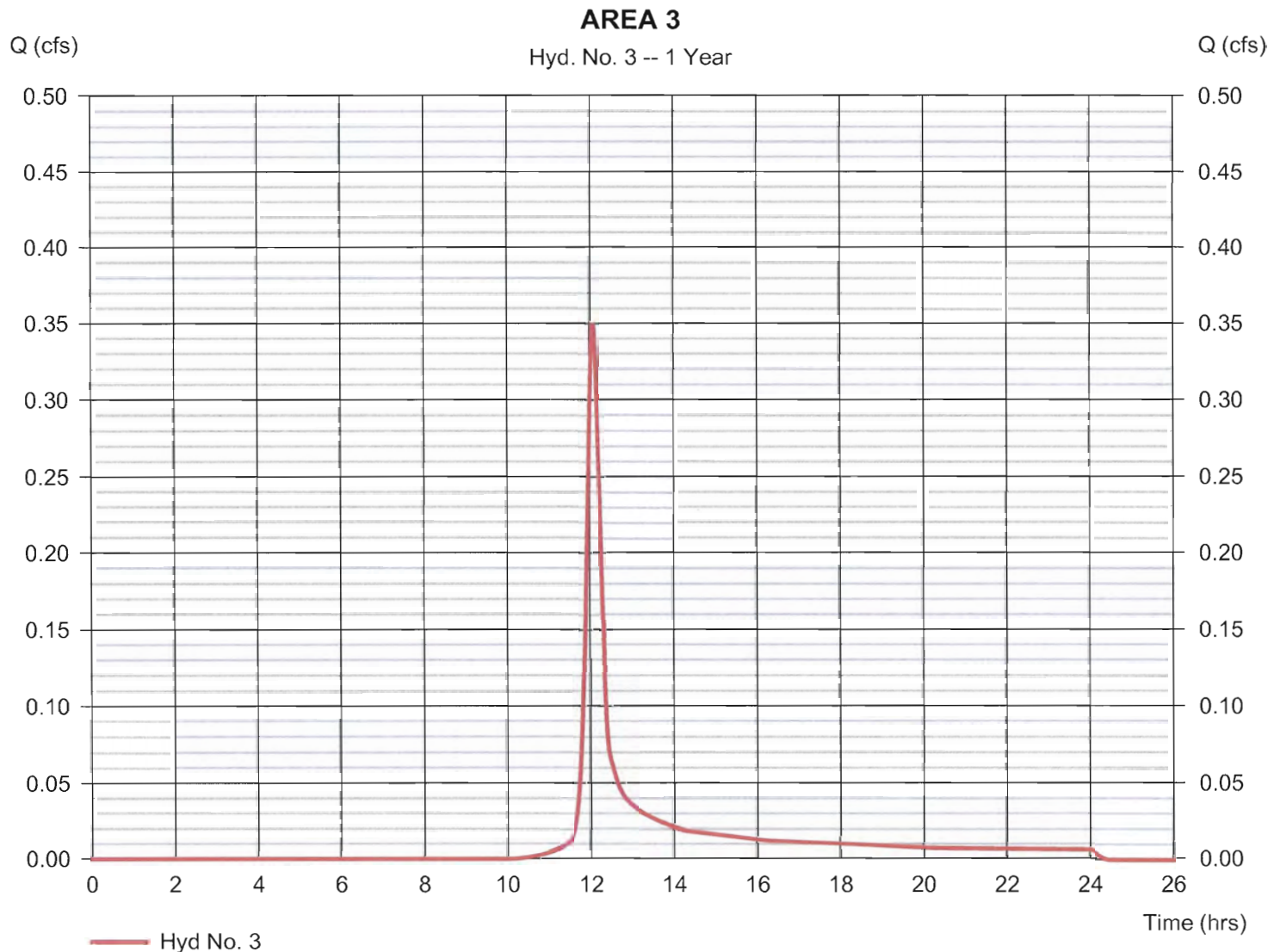


# Hydrograph Report

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.349 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 0.026 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

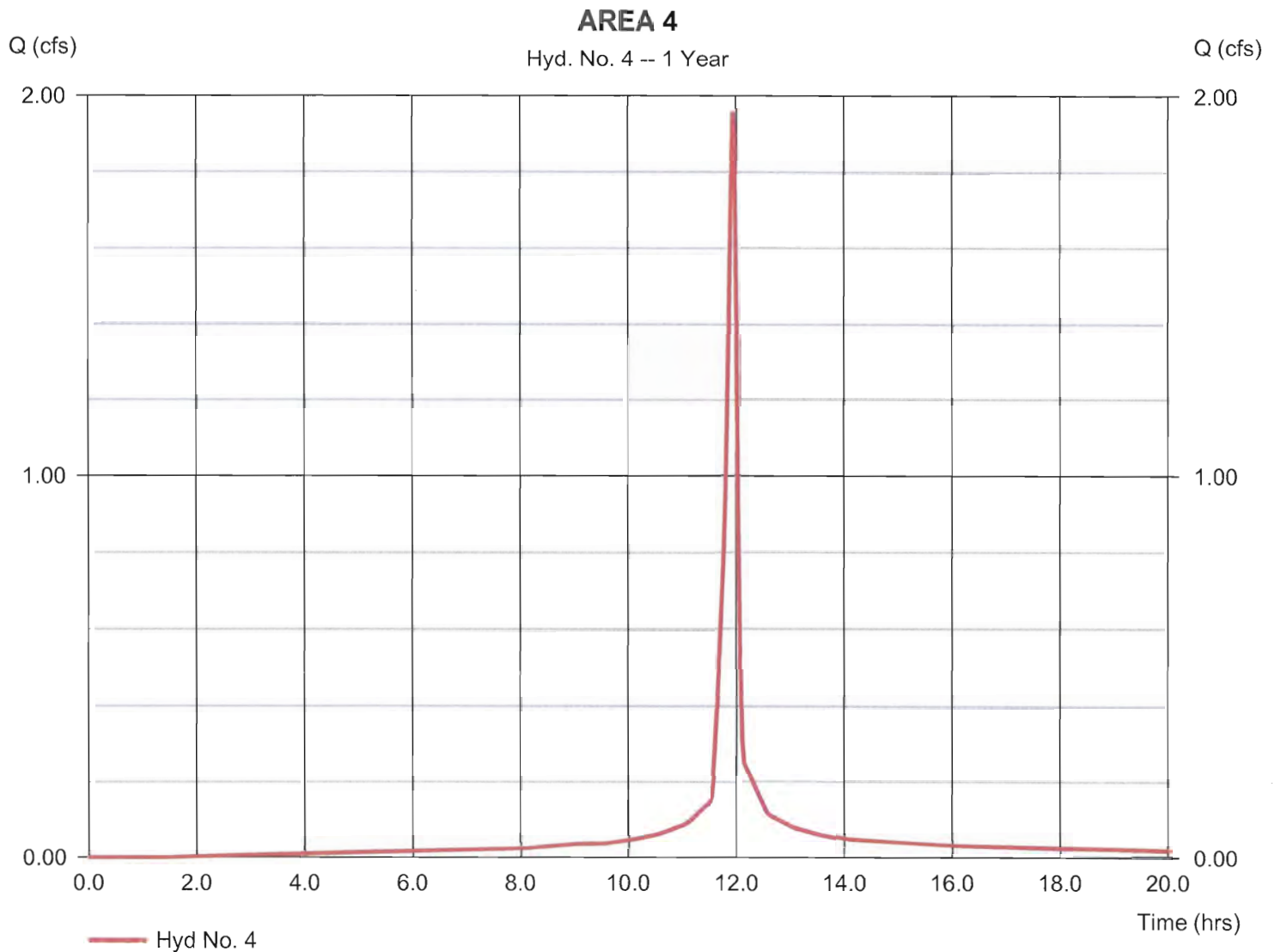
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.958 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.104 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

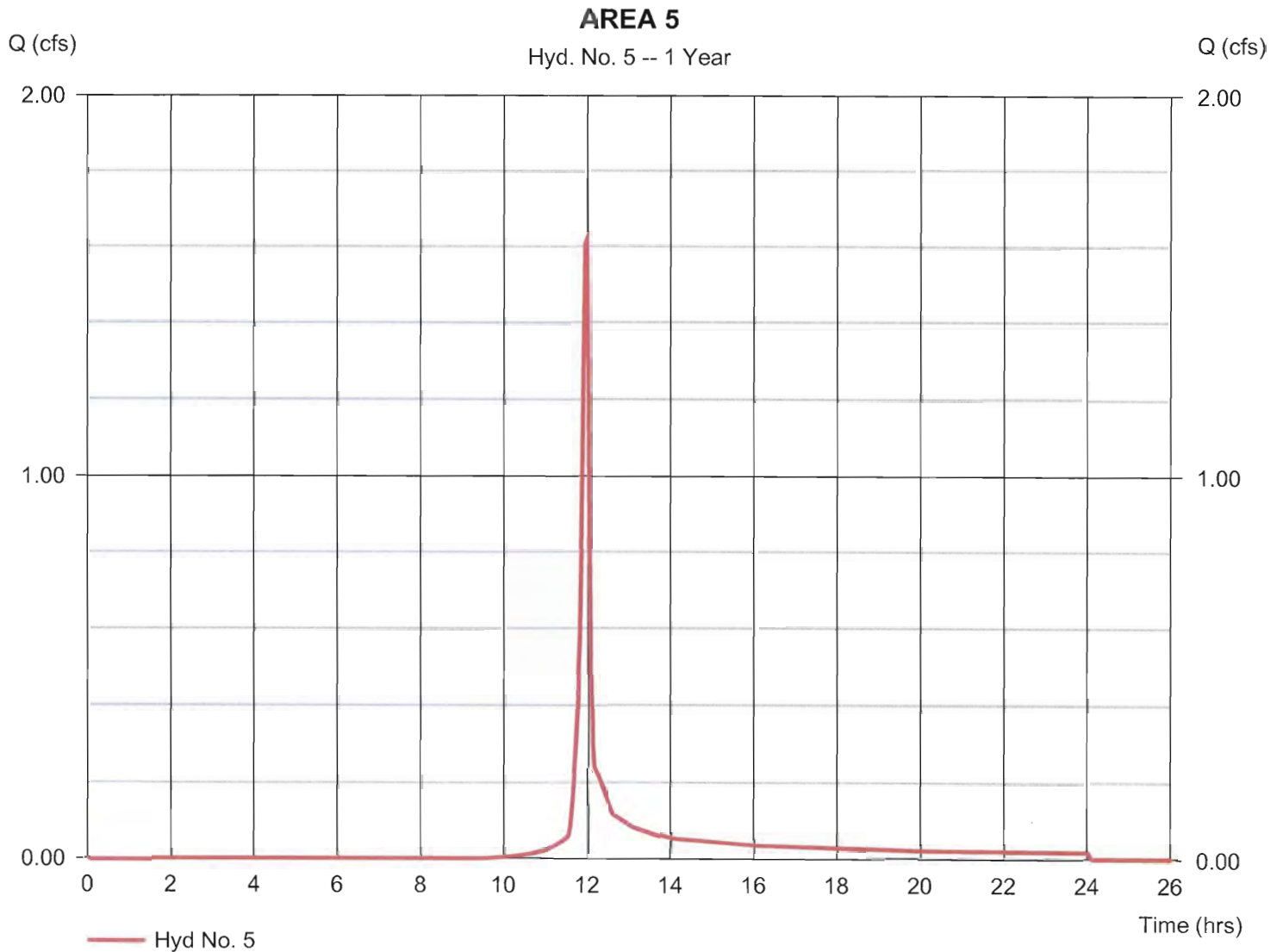


# Hydrograph Report

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 1.617 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 0.075 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

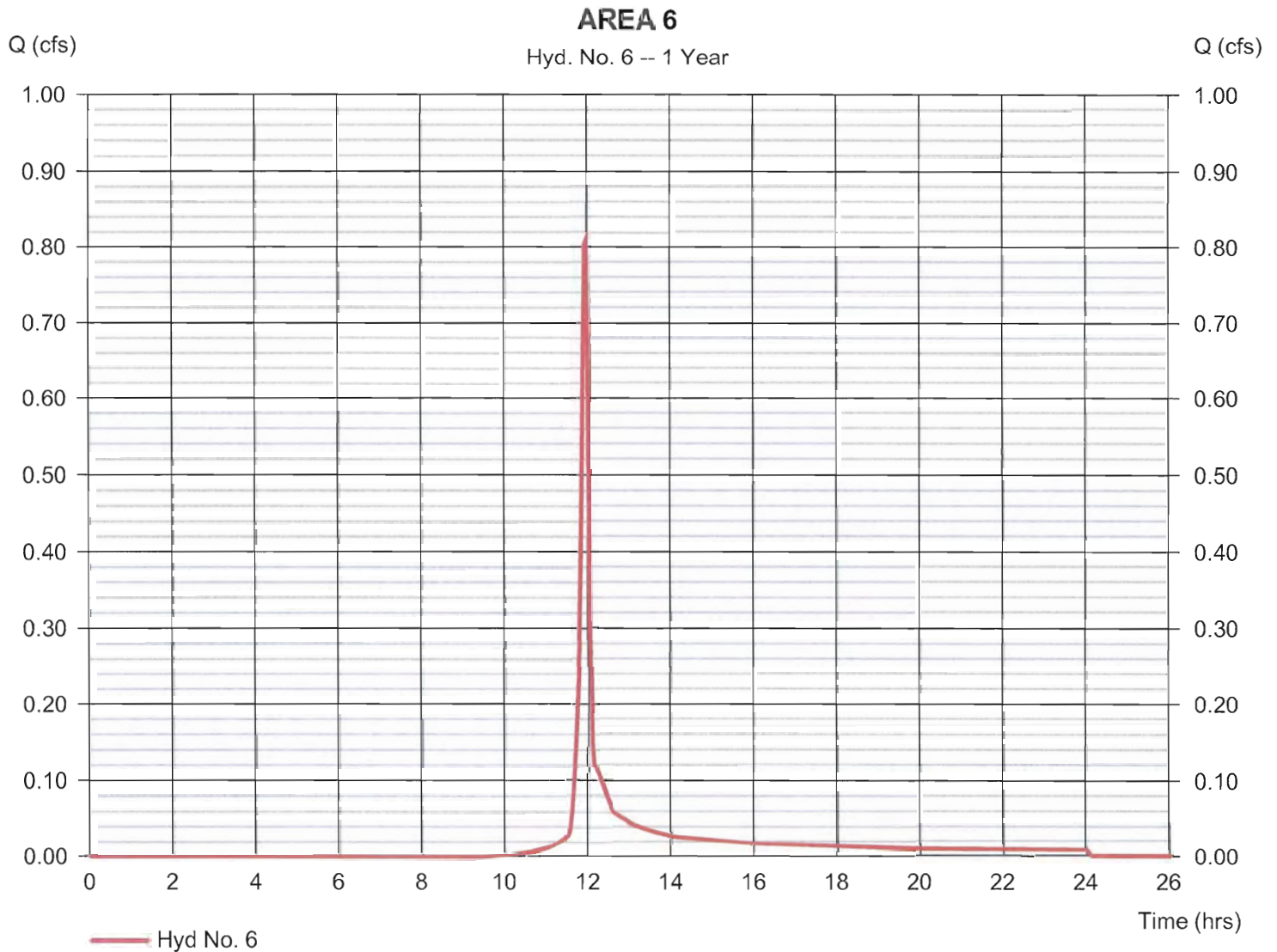
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.809 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 0.037 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

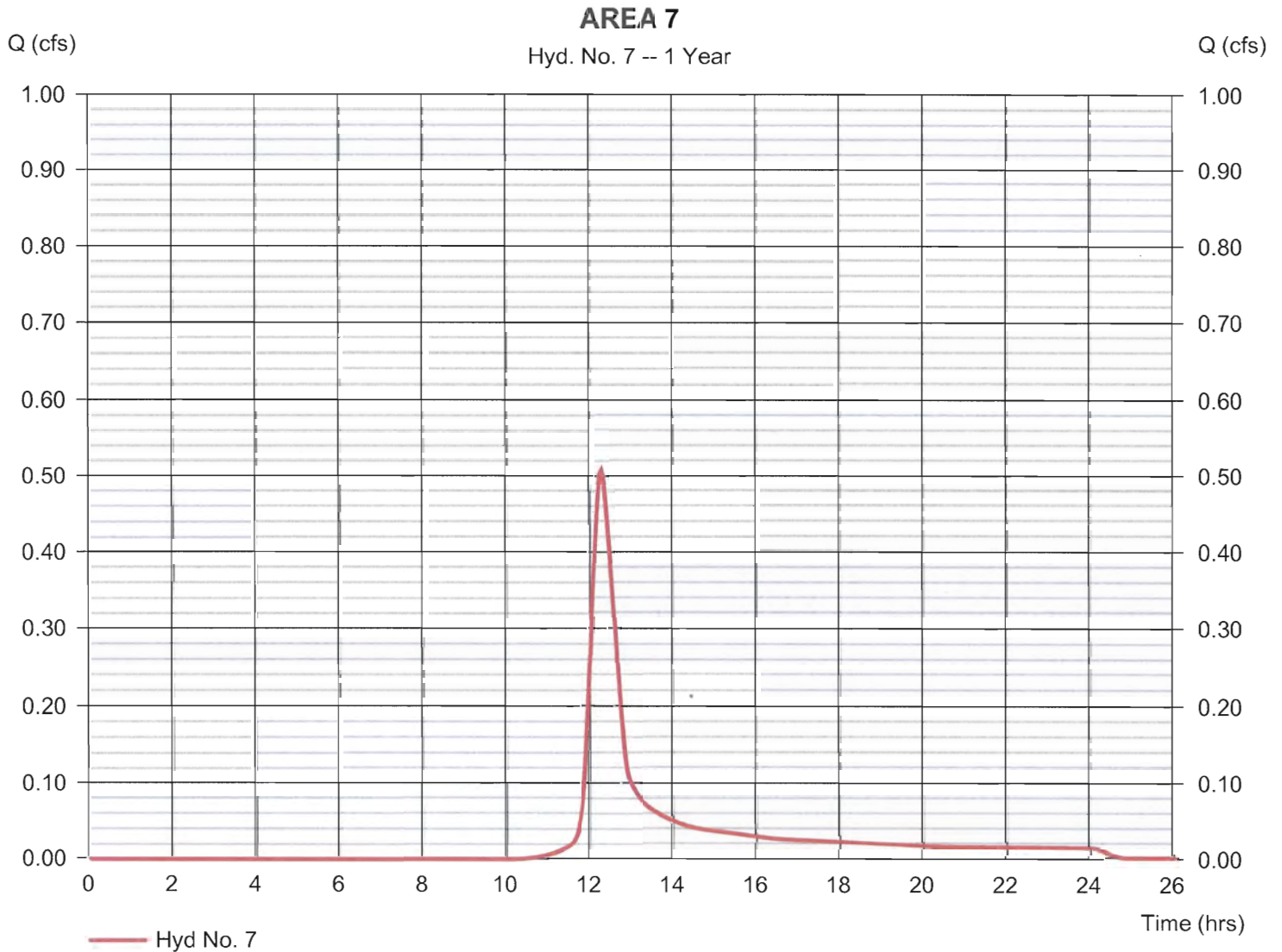


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.507 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 0.054 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

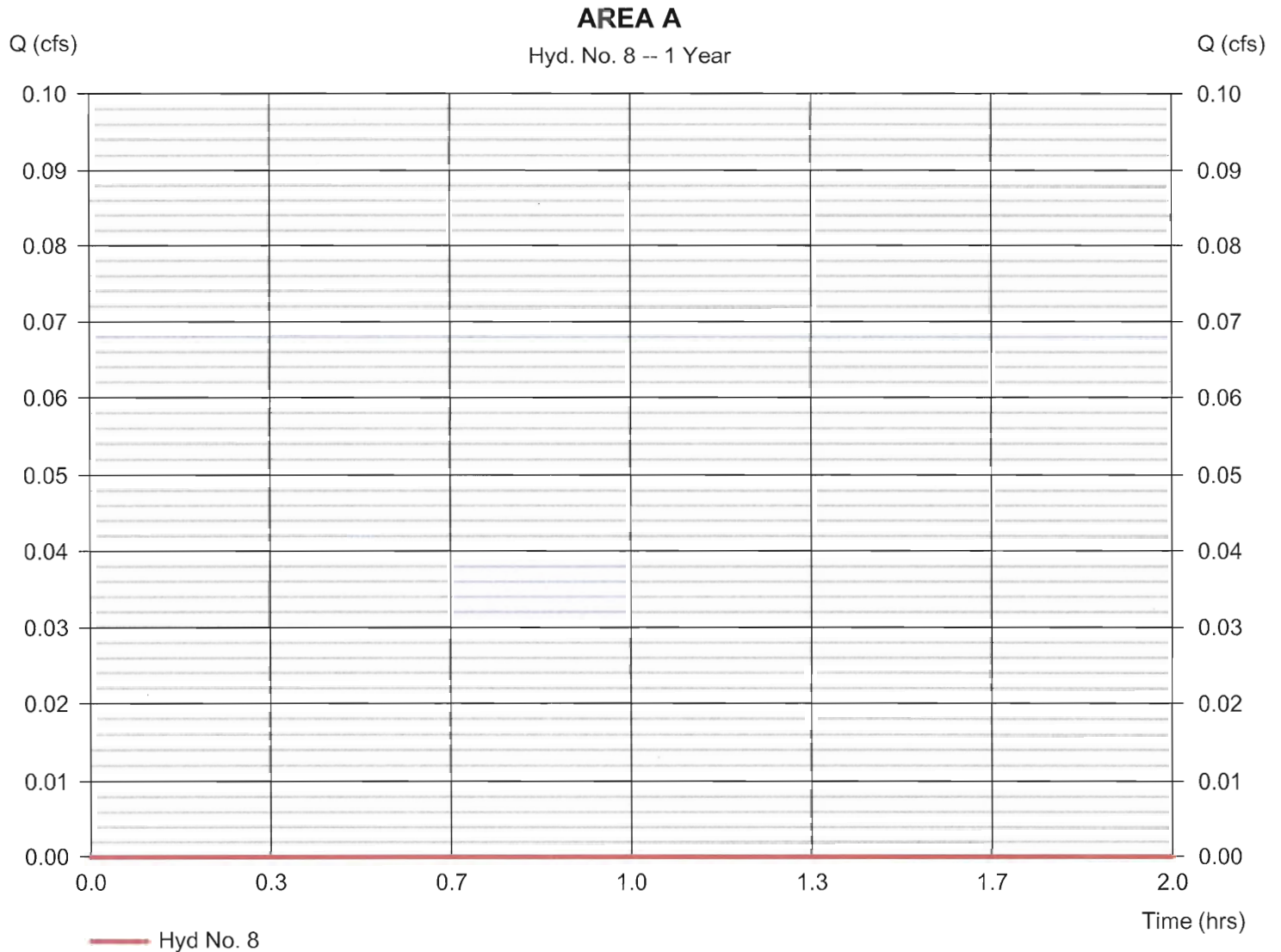


# Hydrograph Report

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

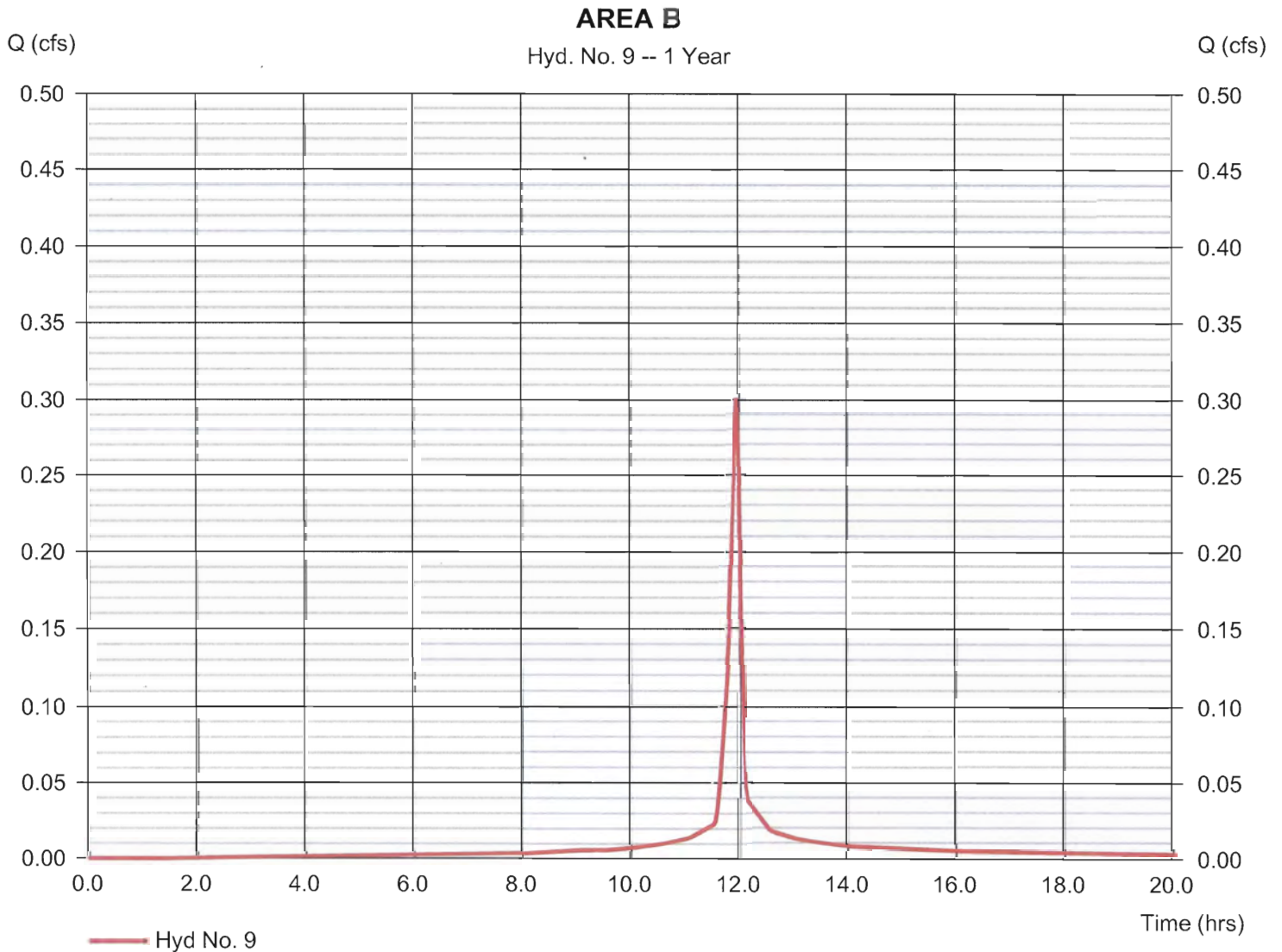
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.301 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.016 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

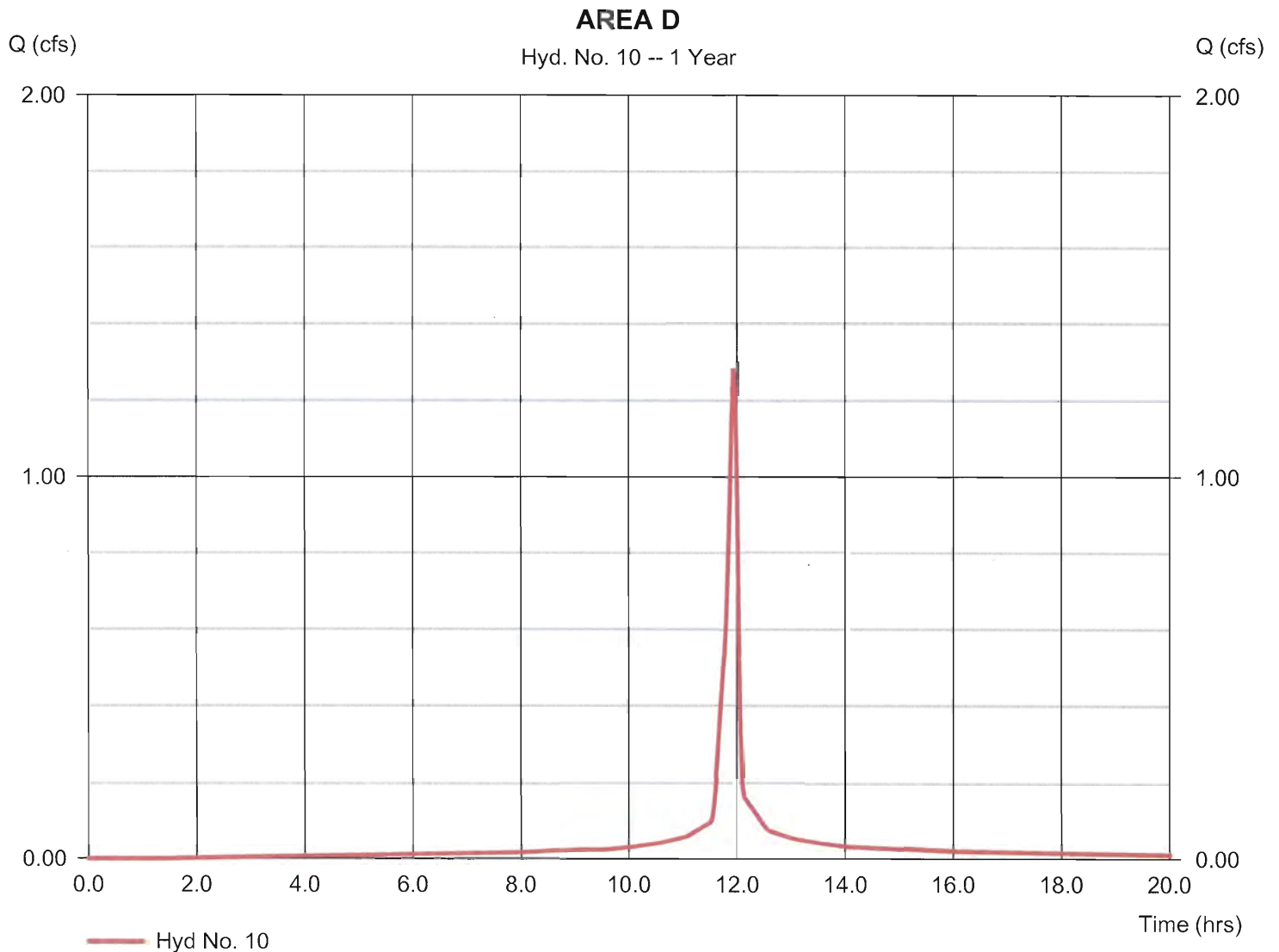
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.280 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.068 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

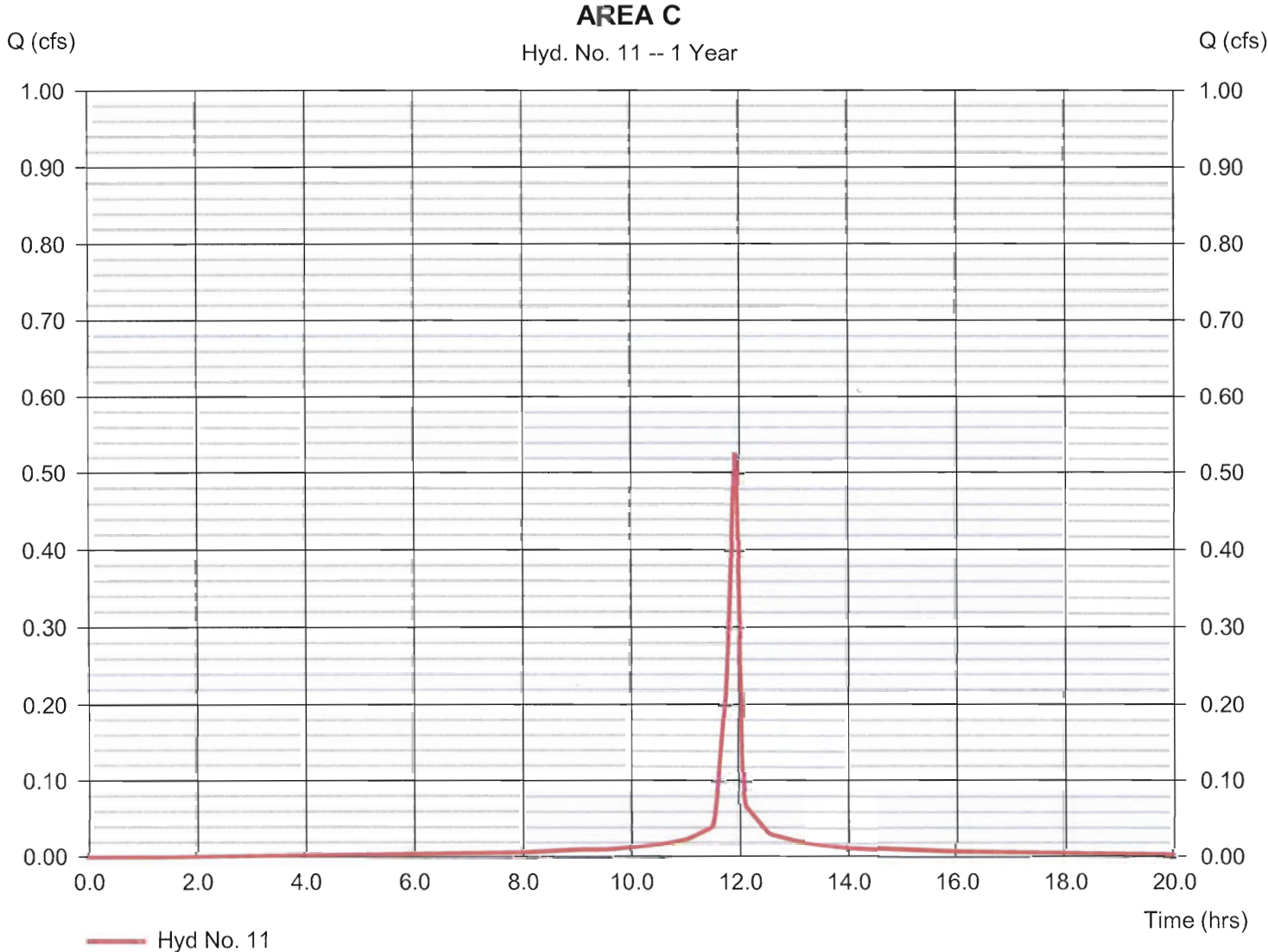


# Hydrograph Report

## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.527 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.028 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

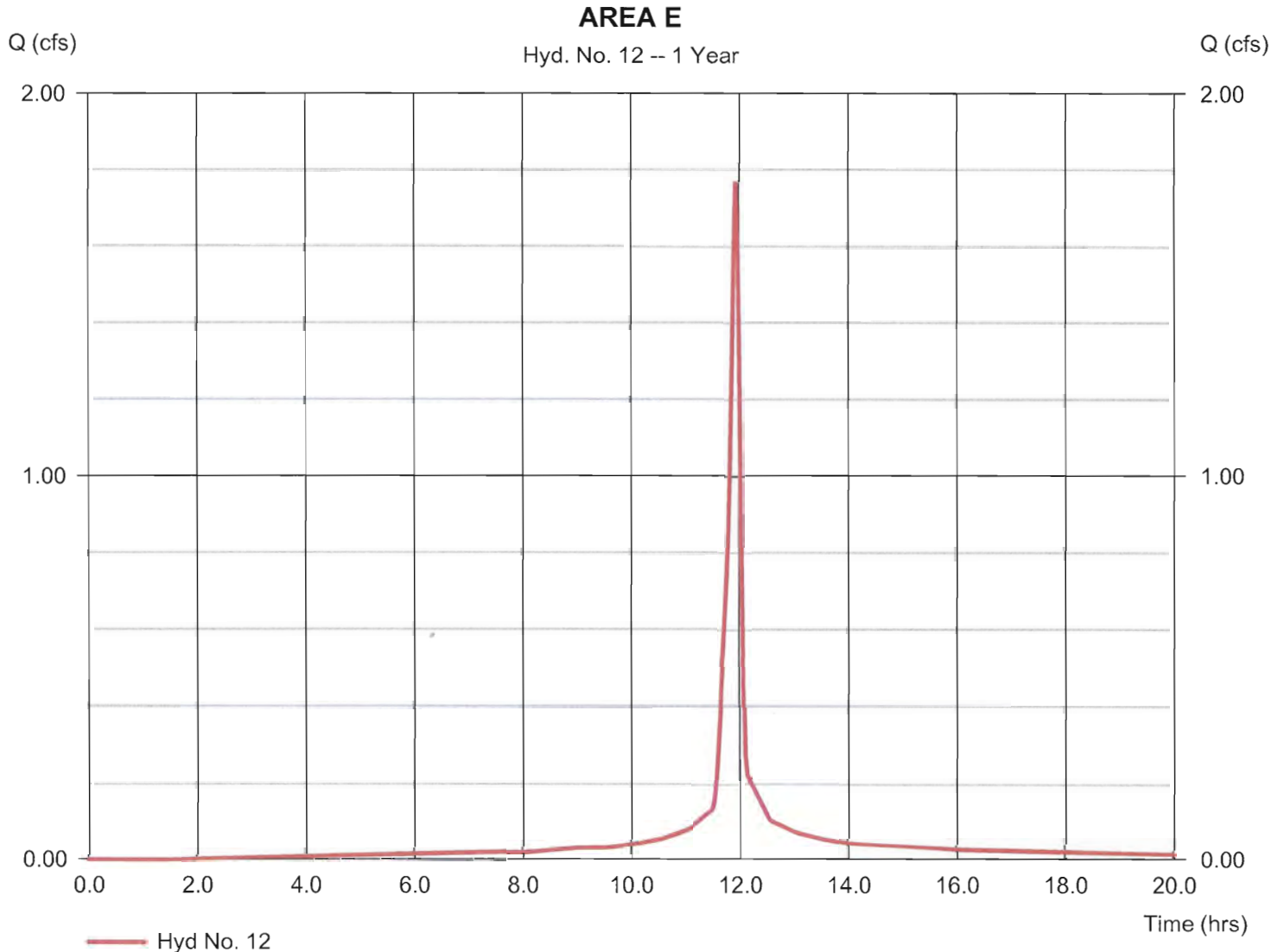
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 1.770 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.094 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

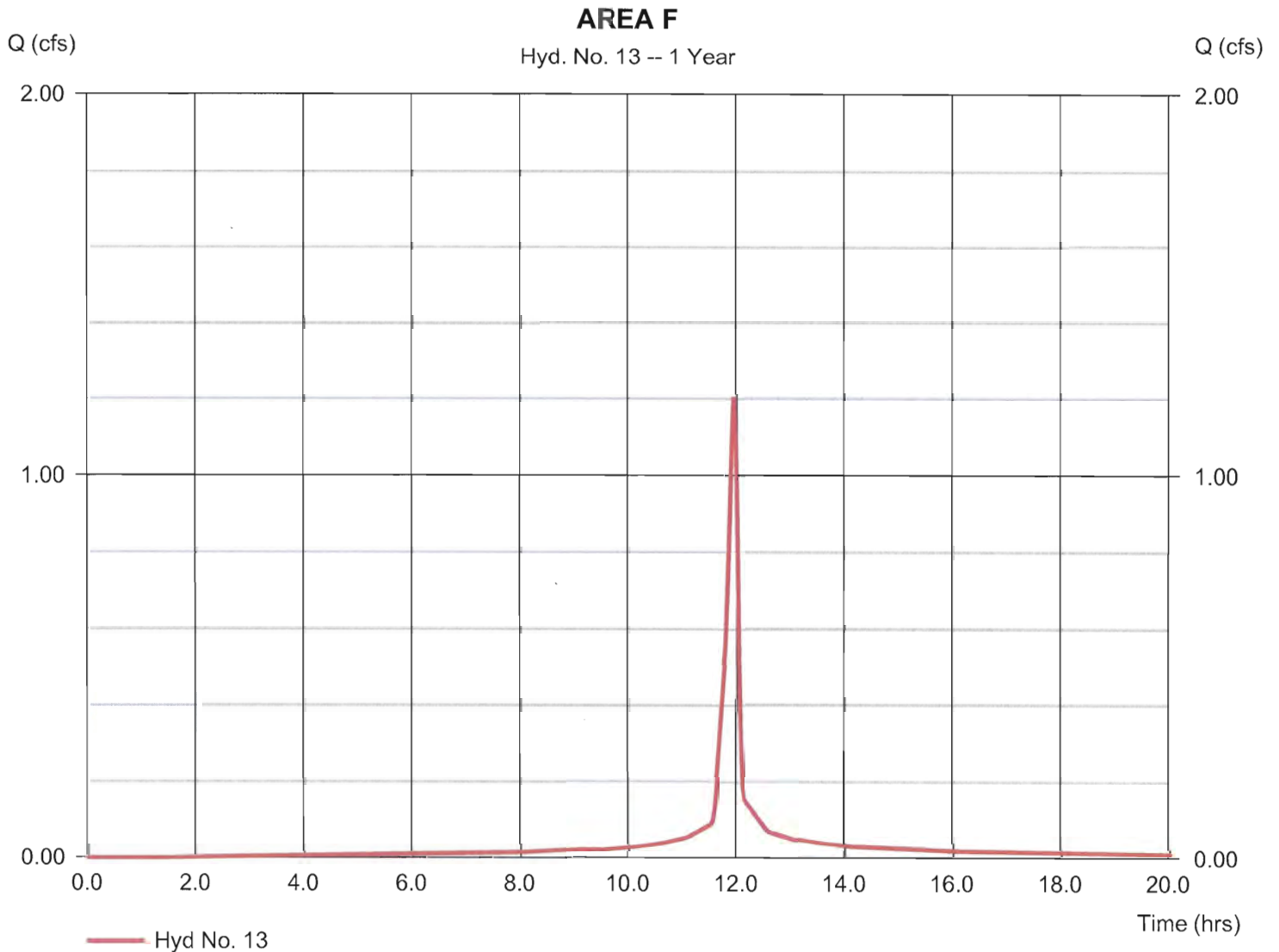


# Hydrograph Report

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 1.205 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.064 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

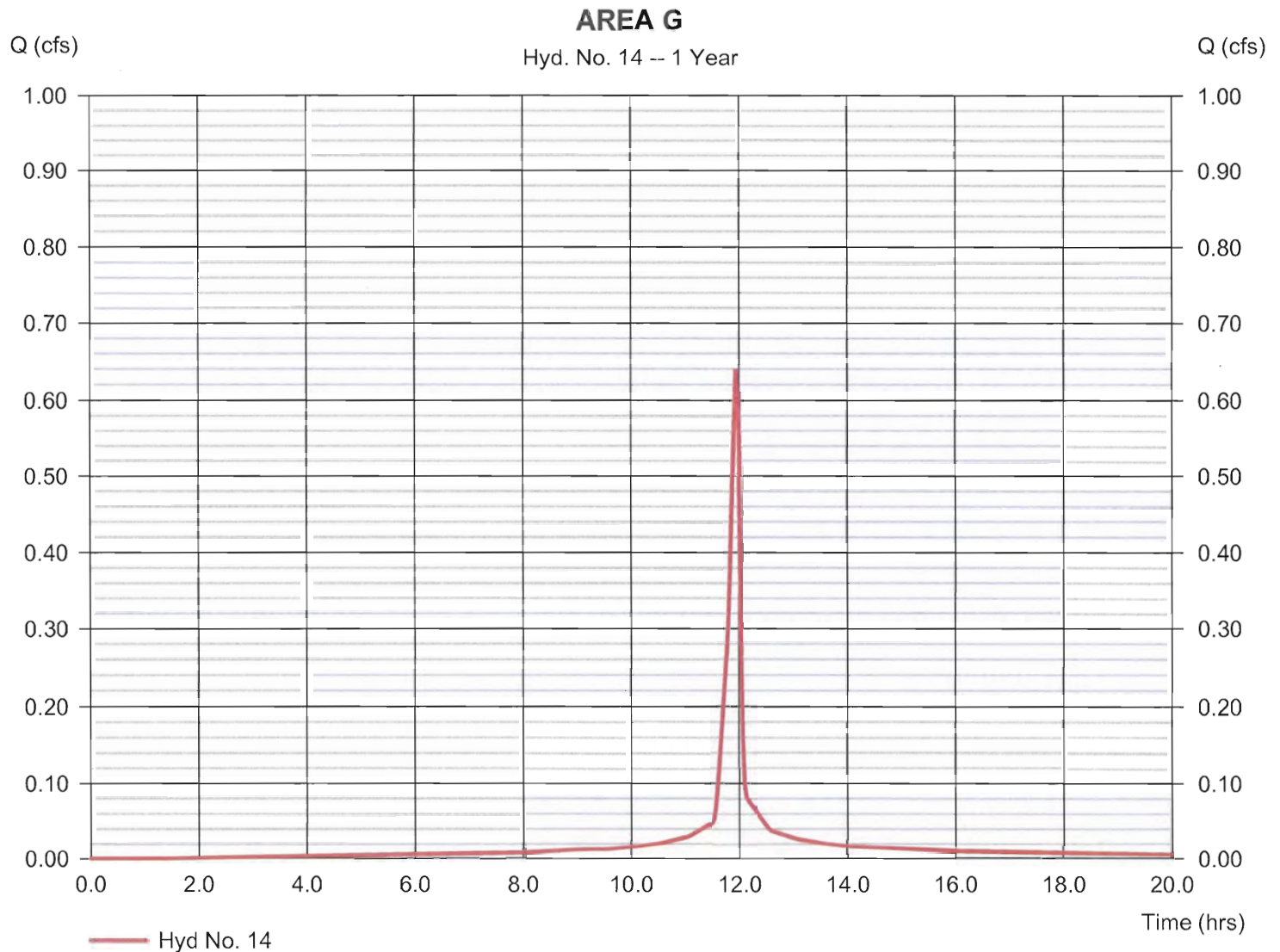


# Hydrograph Report

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 0.640 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.034 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

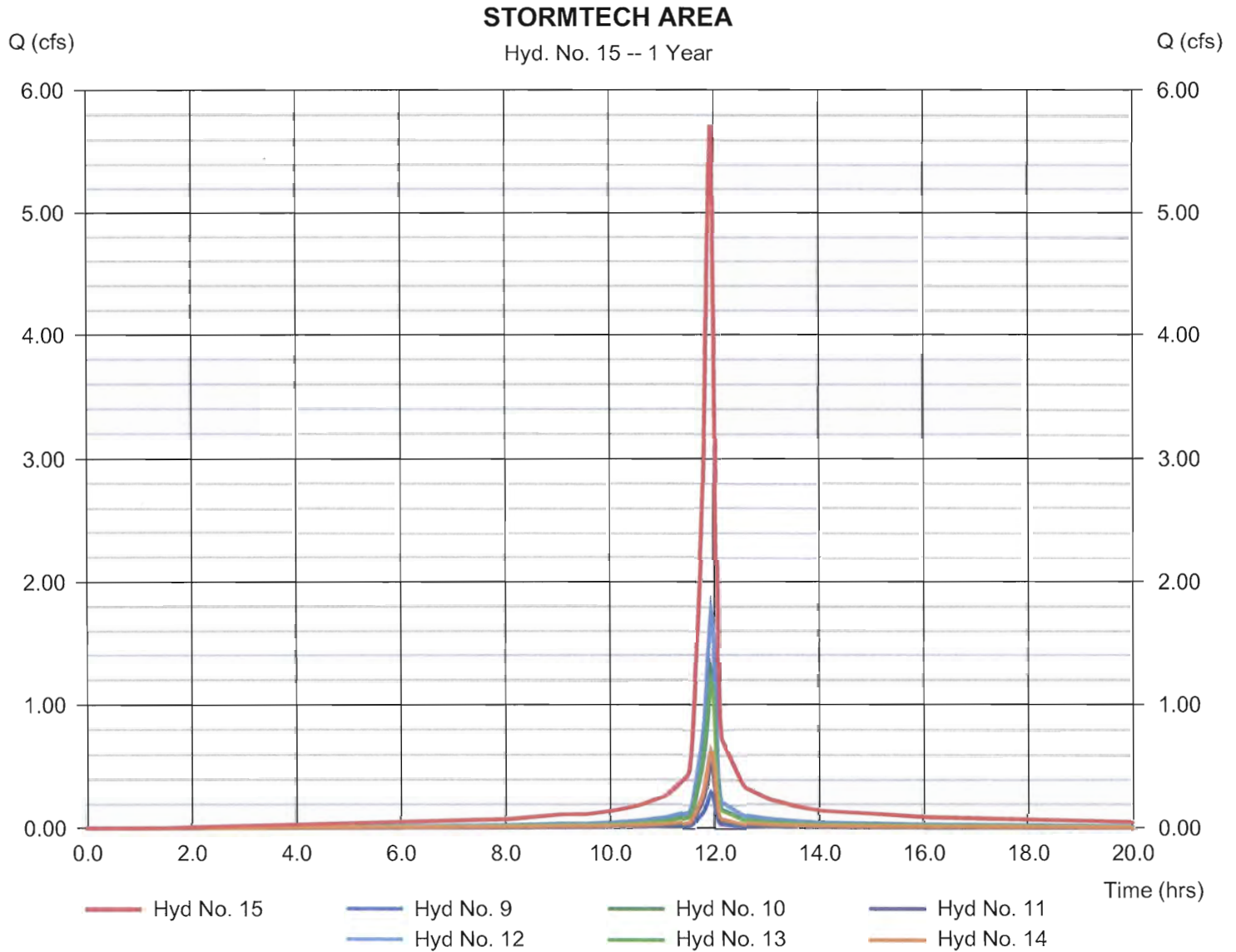
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 5.724 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.305 acft
Inflow hyds.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac

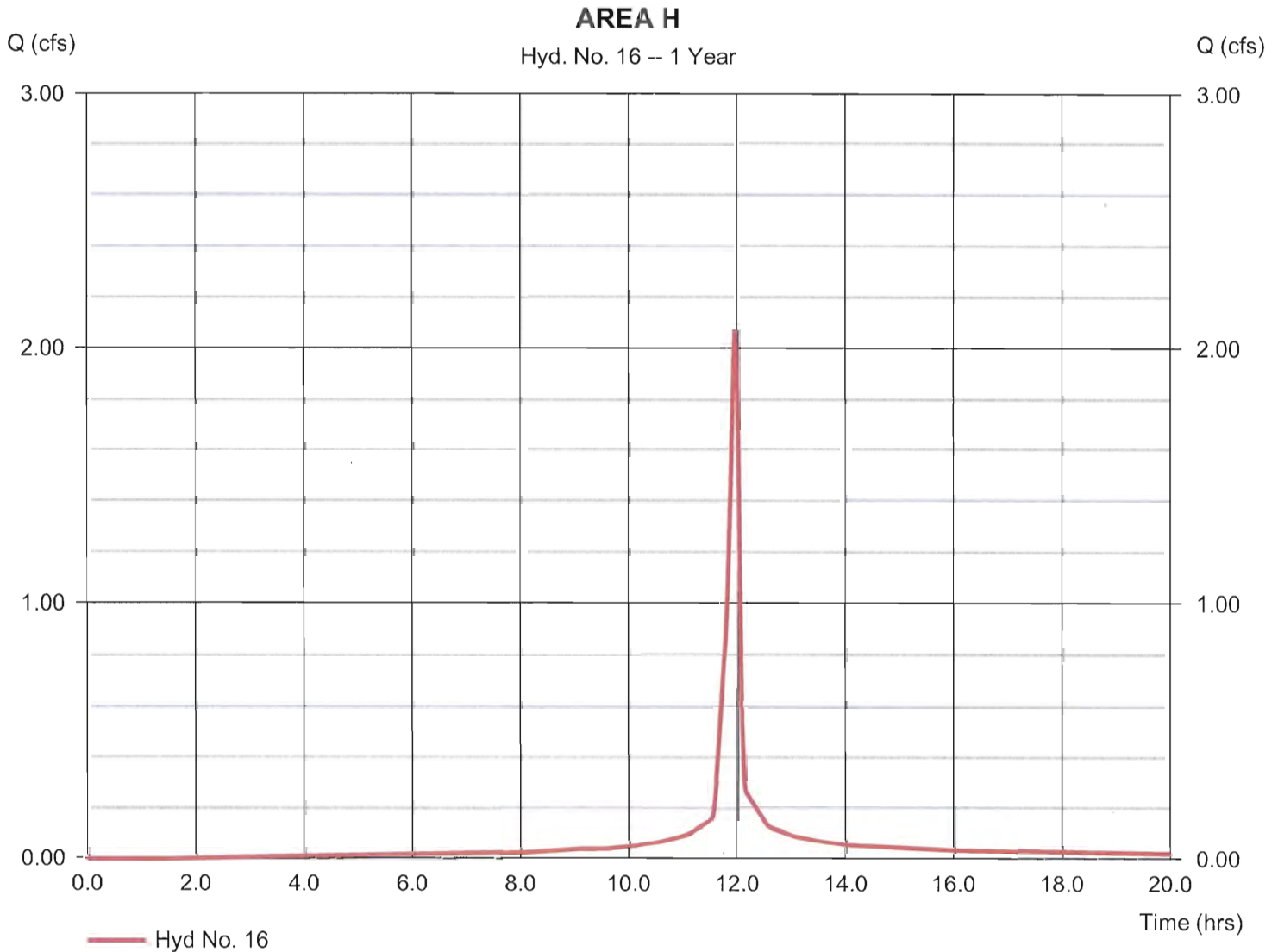


# Hydrograph Report

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 2.071 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.110 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

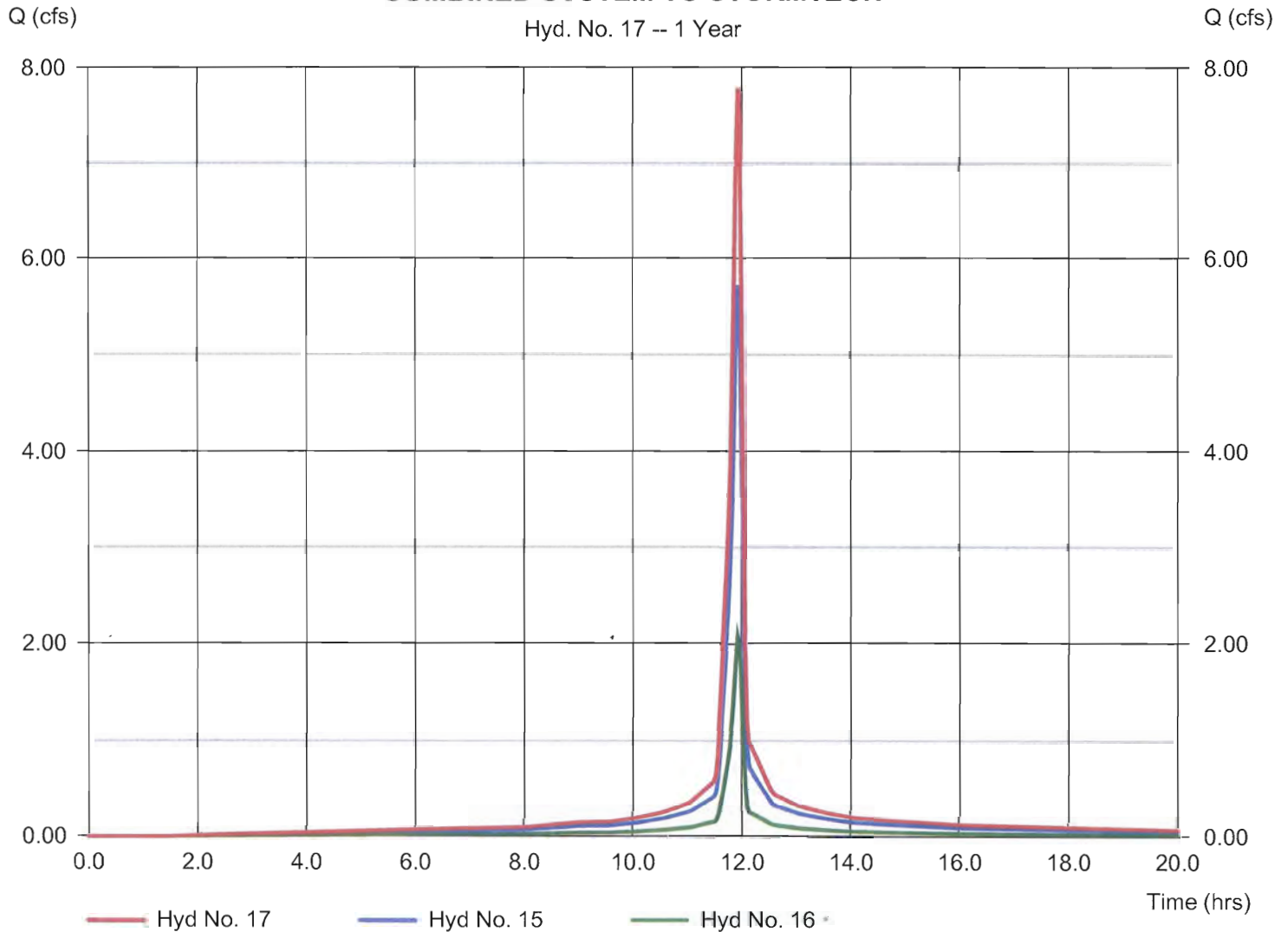
## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 7.796 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.415 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac

### COMBINED SYSTEM TO STORMTECH

Hyd. No. 17 -- 1 Year



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

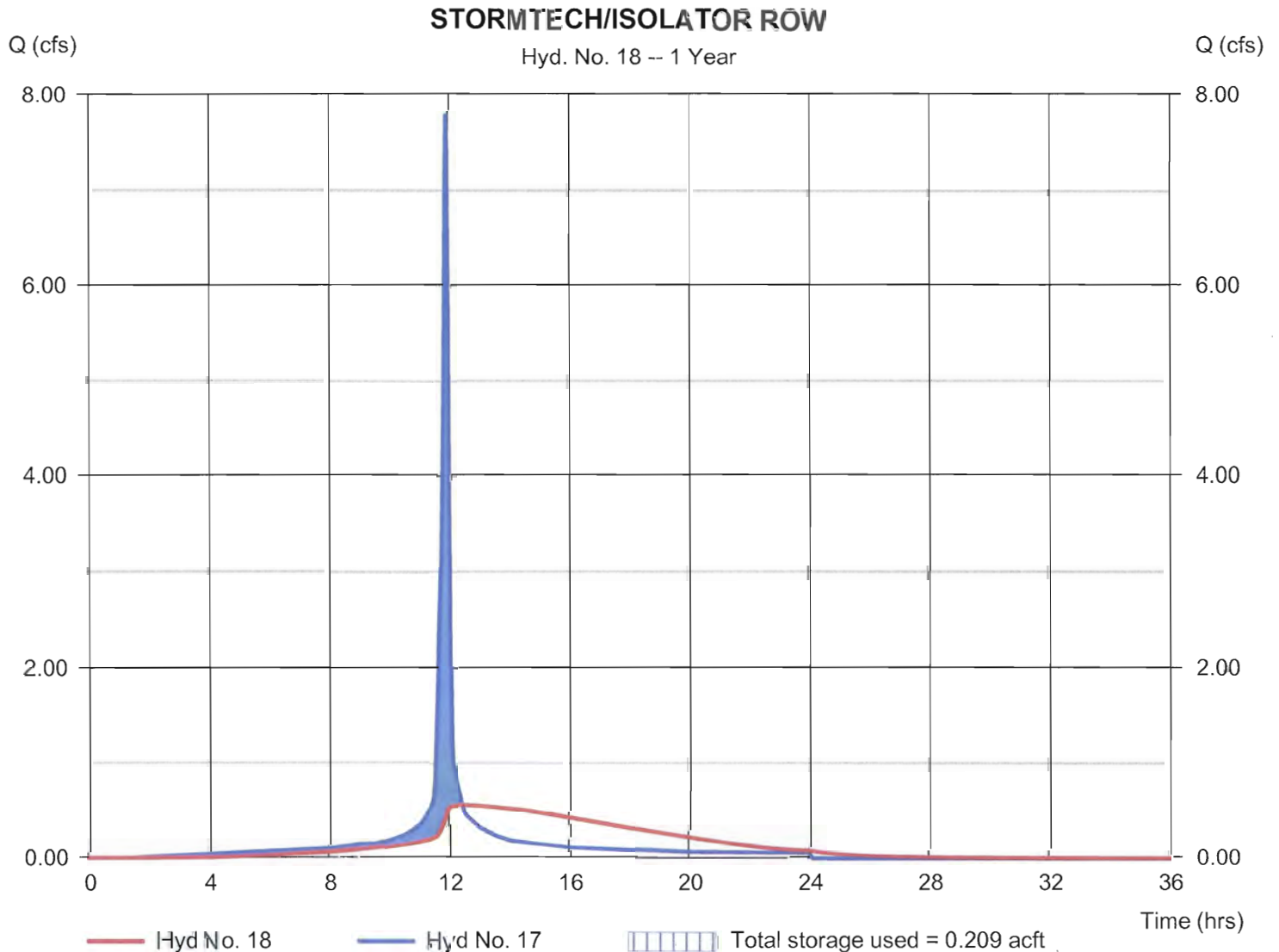
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.571 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 0.415 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. Storage	= 1342.01 ft
Reservoir name	= STORMTECH 3500		= 0.209 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

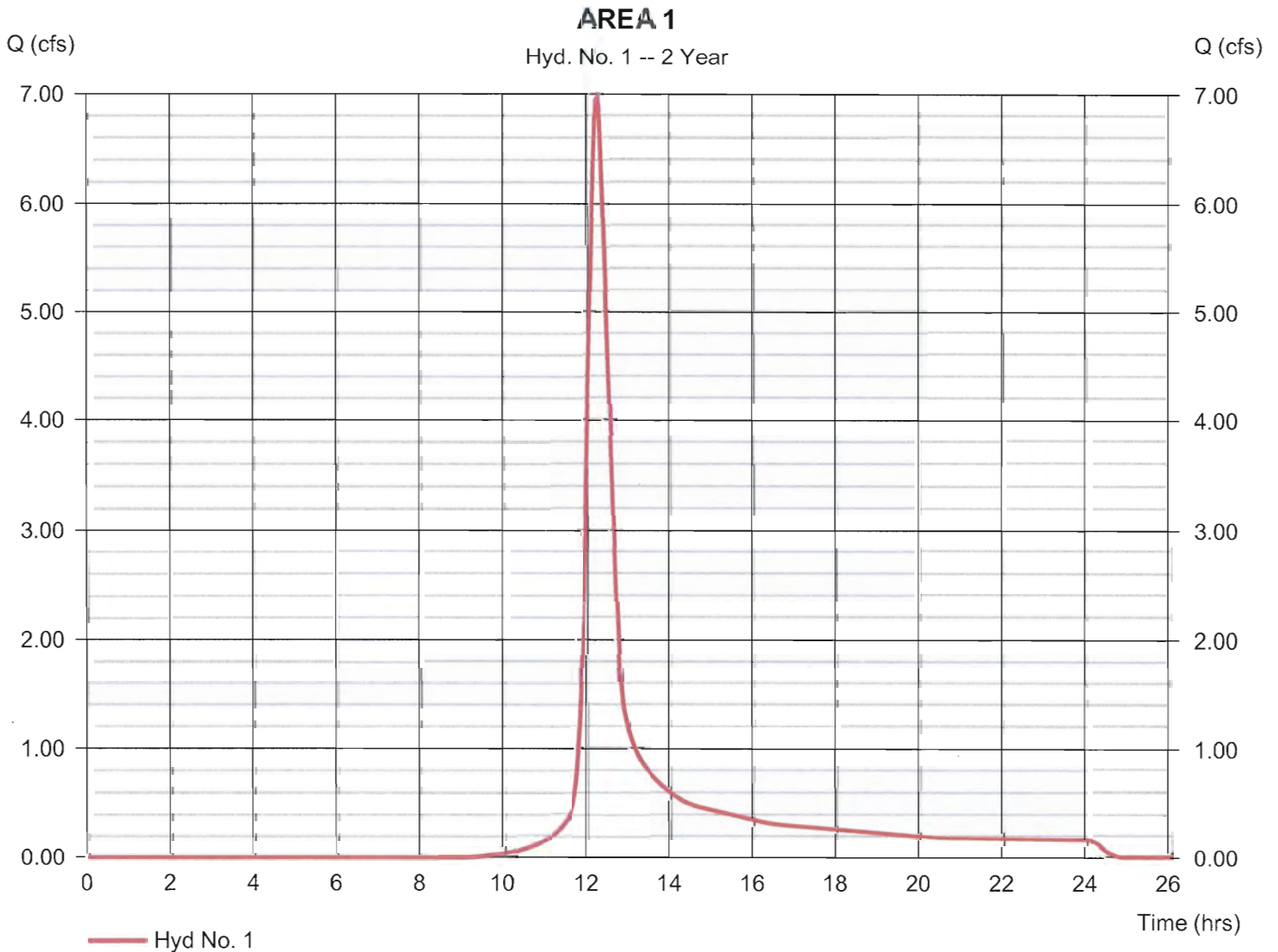
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	6.973	2	734	0.700	-----	-----	-----	AREA 1	
2	SCS Runoff	0.630	2	728	0.054	-----	-----	-----	AREA 2	
3	SCS Runoff	0.528	2	724	0.038	-----	-----	-----	AREA 3	
4	SCS Runoff	2.461	2	716	0.133	-----	-----	-----	AREA 4	
5	SCS Runoff	2.342	2	716	0.109	-----	-----	-----	AREA 5	
6	SCS Runoff	1.171	2	716	0.054	-----	-----	-----	AREA 6	
7	SCS Runoff	0.768	2	736	0.081	-----	-----	-----	AREA 7	
8	SCS Runoff	0.000	2	n/a	0.000	-----	-----	-----	AREA A	
9	SCS Runoff	0.379	2	716	0.020	-----	-----	-----	AREA B	
10	SCS Runoff	1.609	2	716	0.087	-----	-----	-----	AREA D	
11	SCS Runoff	0.663	2	716	0.036	-----	-----	-----	AREA C	
12	SCS Runoff	2.224	2	716	0.120	-----	-----	-----	AREA E	
13	SCS Runoff	1.514	2	716	0.082	-----	-----	-----	AREA F	
14	SCS Runoff	0.805	2	716	0.043	-----	-----	-----	AREA G	
15	Combine	7.193	2	716	0.388	9, 10, 11, 12, 13, 14	-----	-----	STORMTECH AREA	
16	SCS Runoff	2.603	2	716	0.140	-----	-----	-----	AREA H	
17	Combine	9.796	2	716	0.528	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE	
18	Reservoir	0.625	2	752	0.528	17	1342.38	0.269	STORMTECH/ISOLATOR ROW	
13TH AND MAIZE 3.16.12.gpw					Return Period: 2 Year			Friday, 00 6, 2012		

# Hydrograph Report

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.973 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.700 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

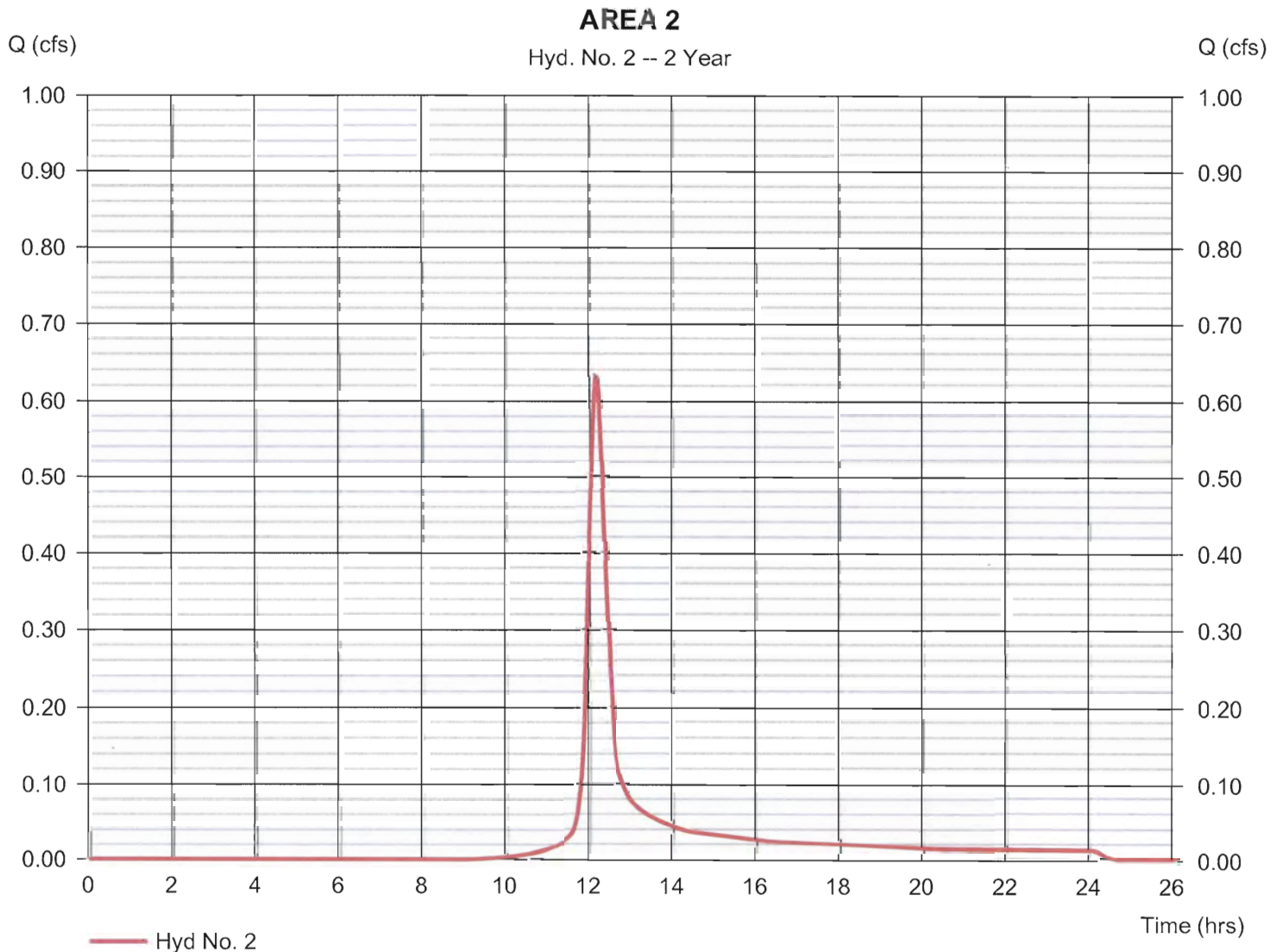
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.630 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.054 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

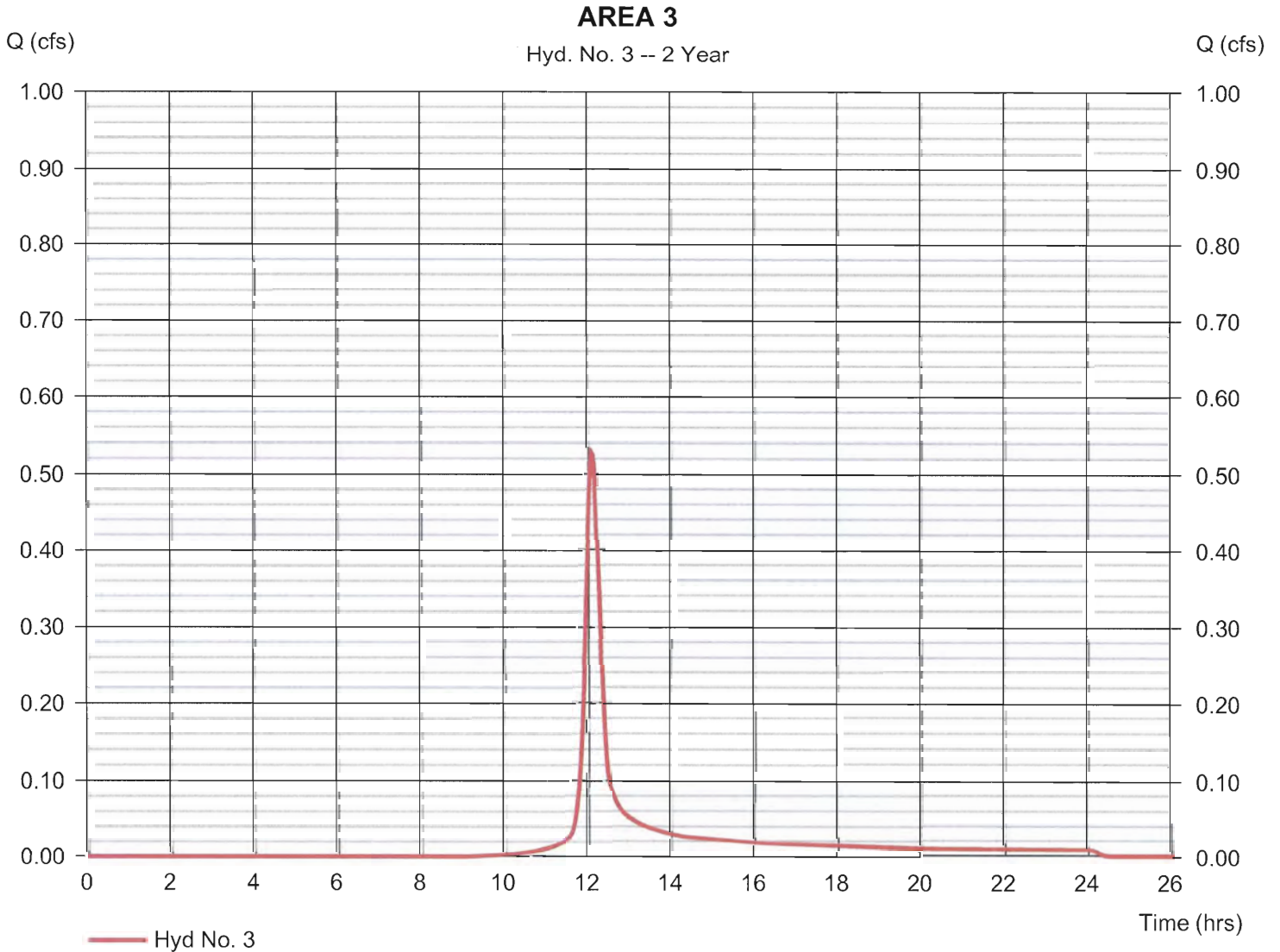
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.528 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.038 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

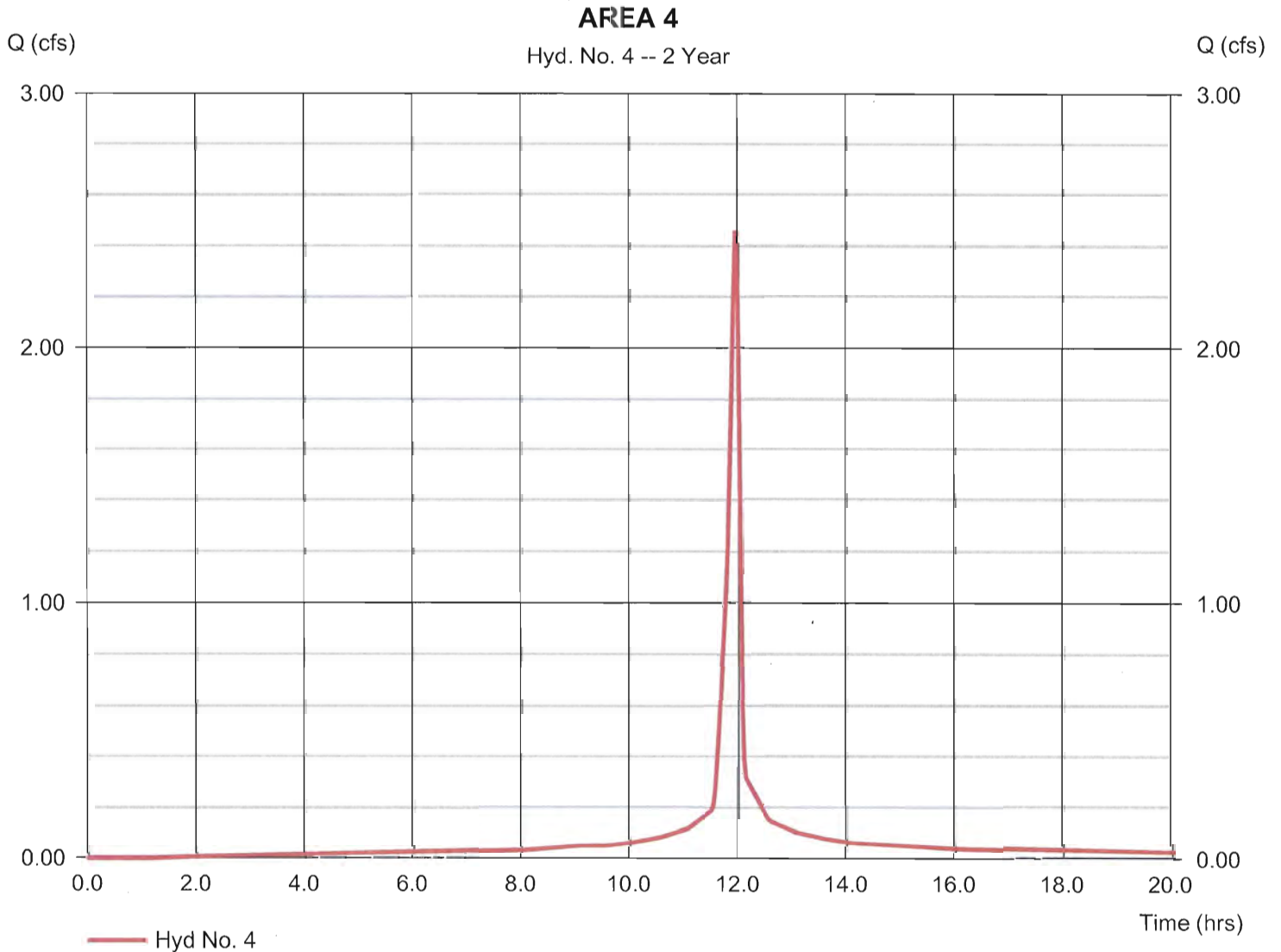


# Hydrograph Report

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 2.461 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.133 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

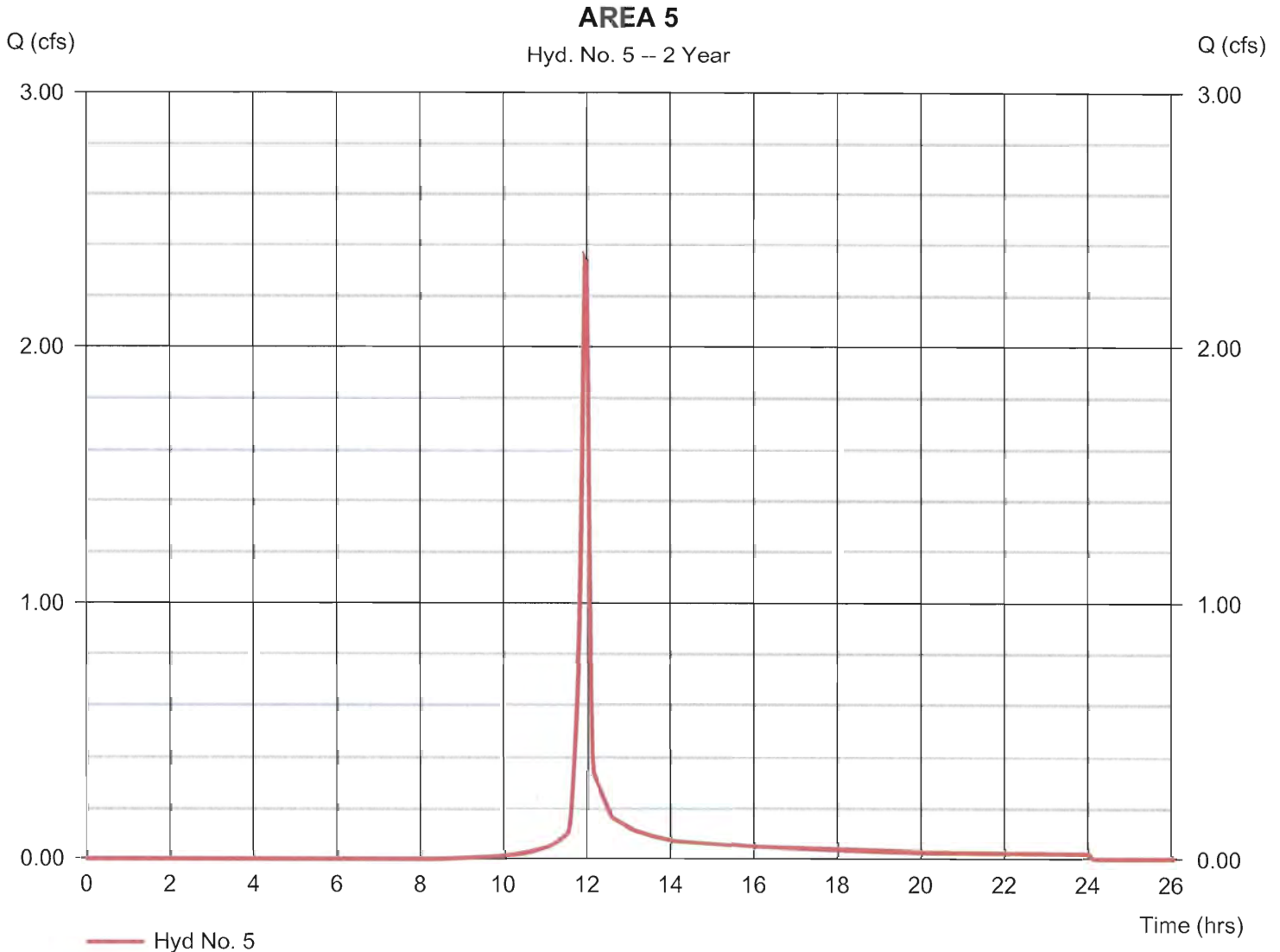
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 2.342 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.109 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

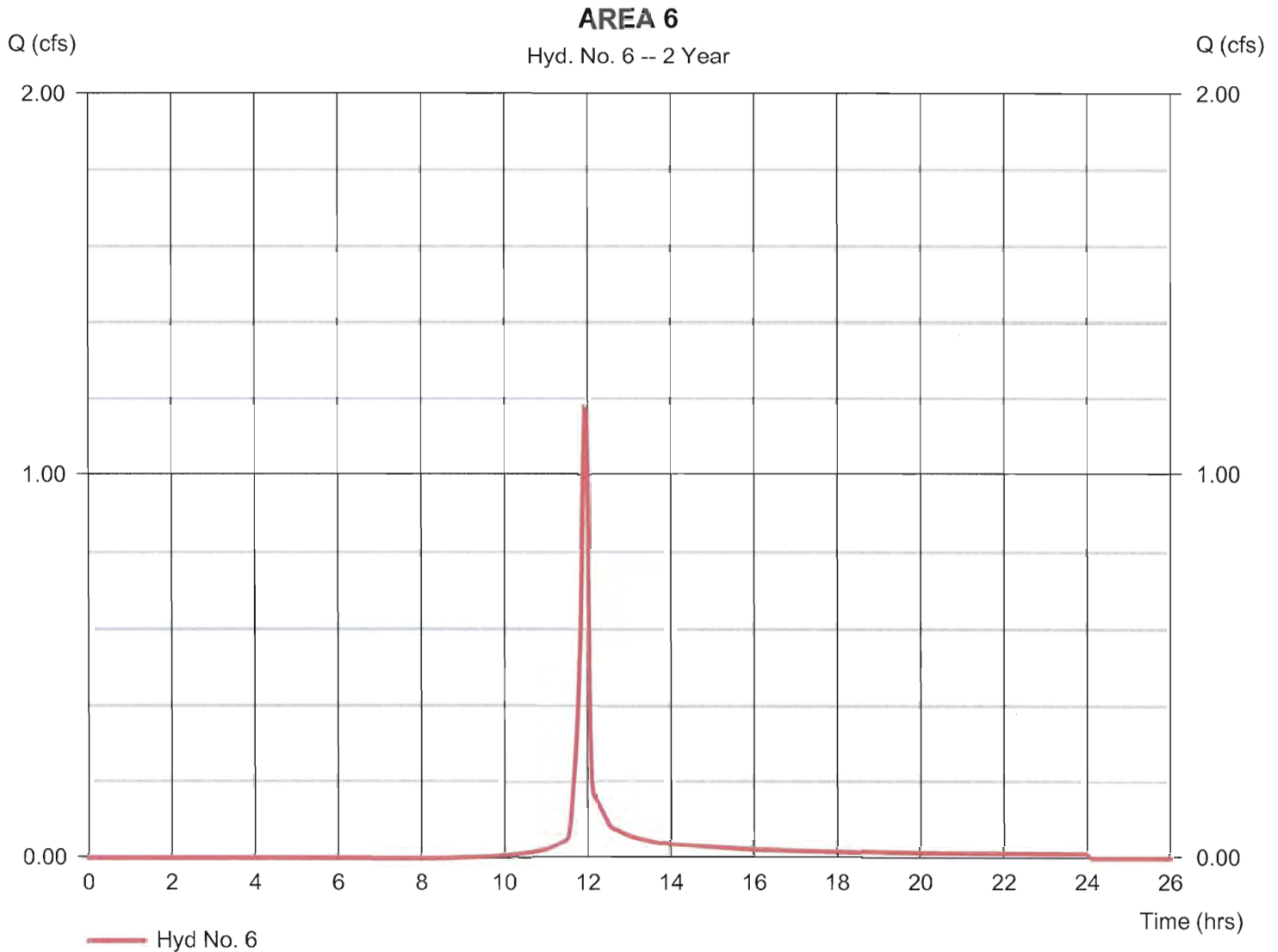


# Hydrograph Report

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 1.171 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.054 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

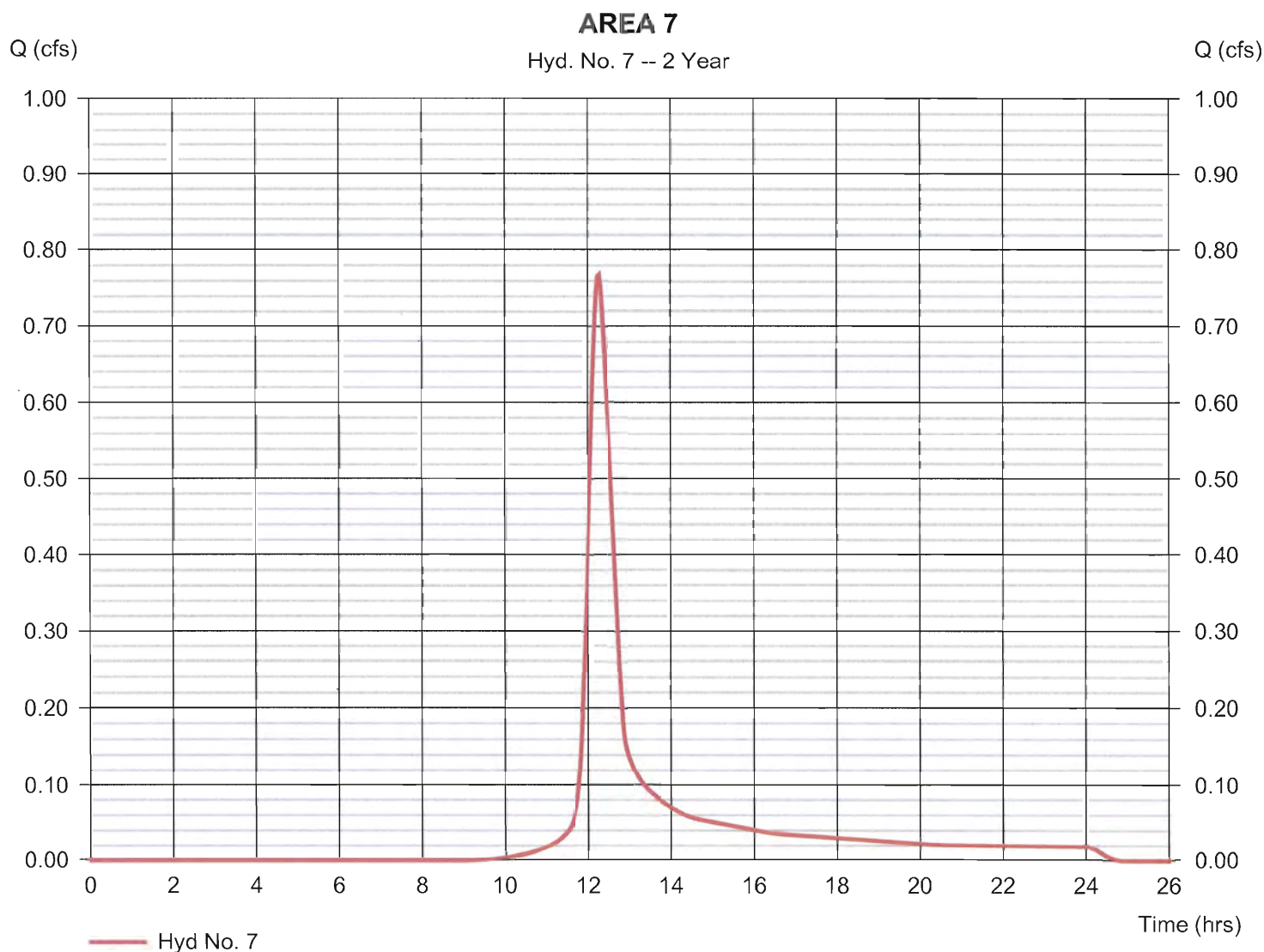


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 0.768 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 0.081 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

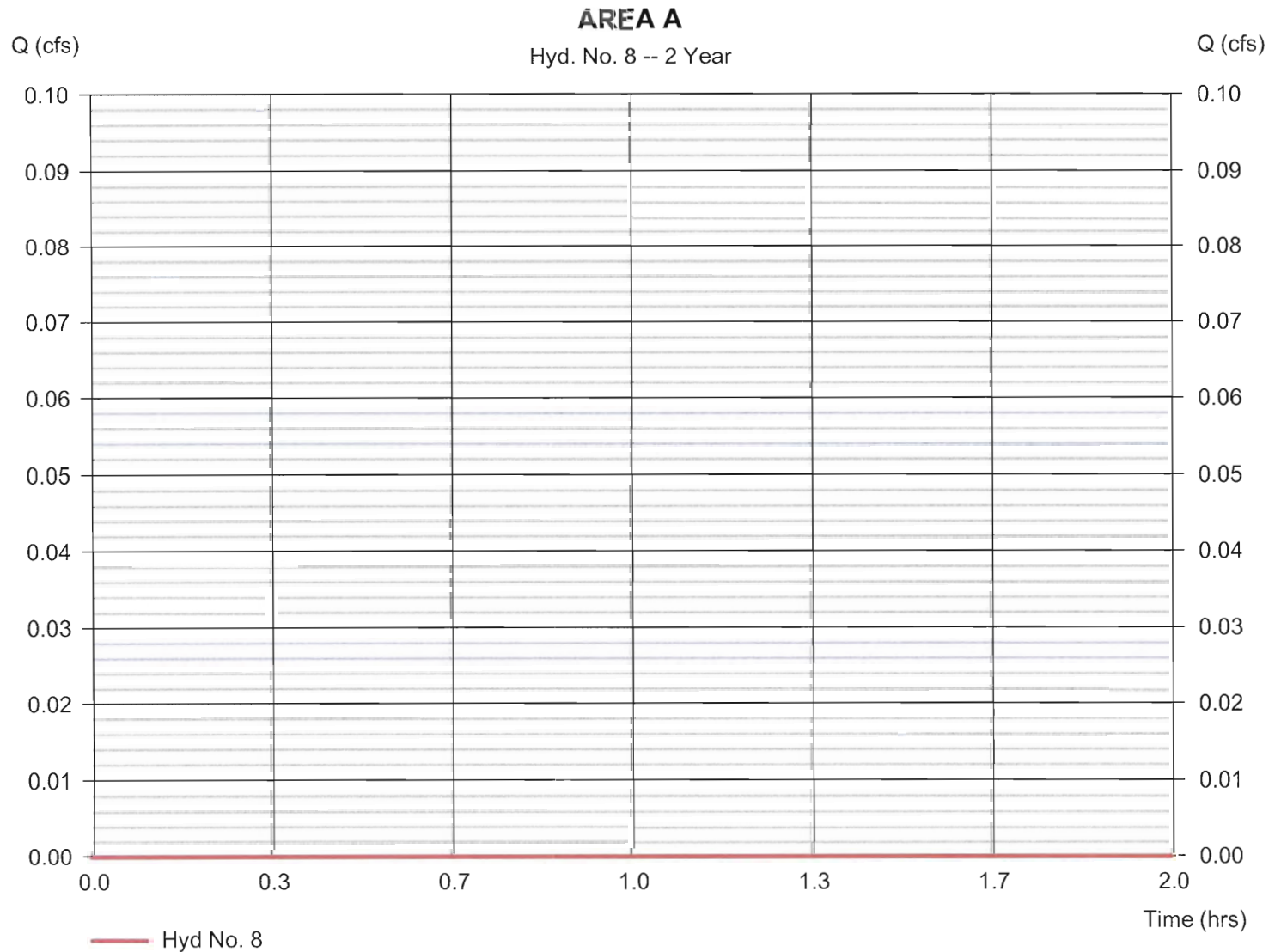


# Hydrograph Report

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0.000 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

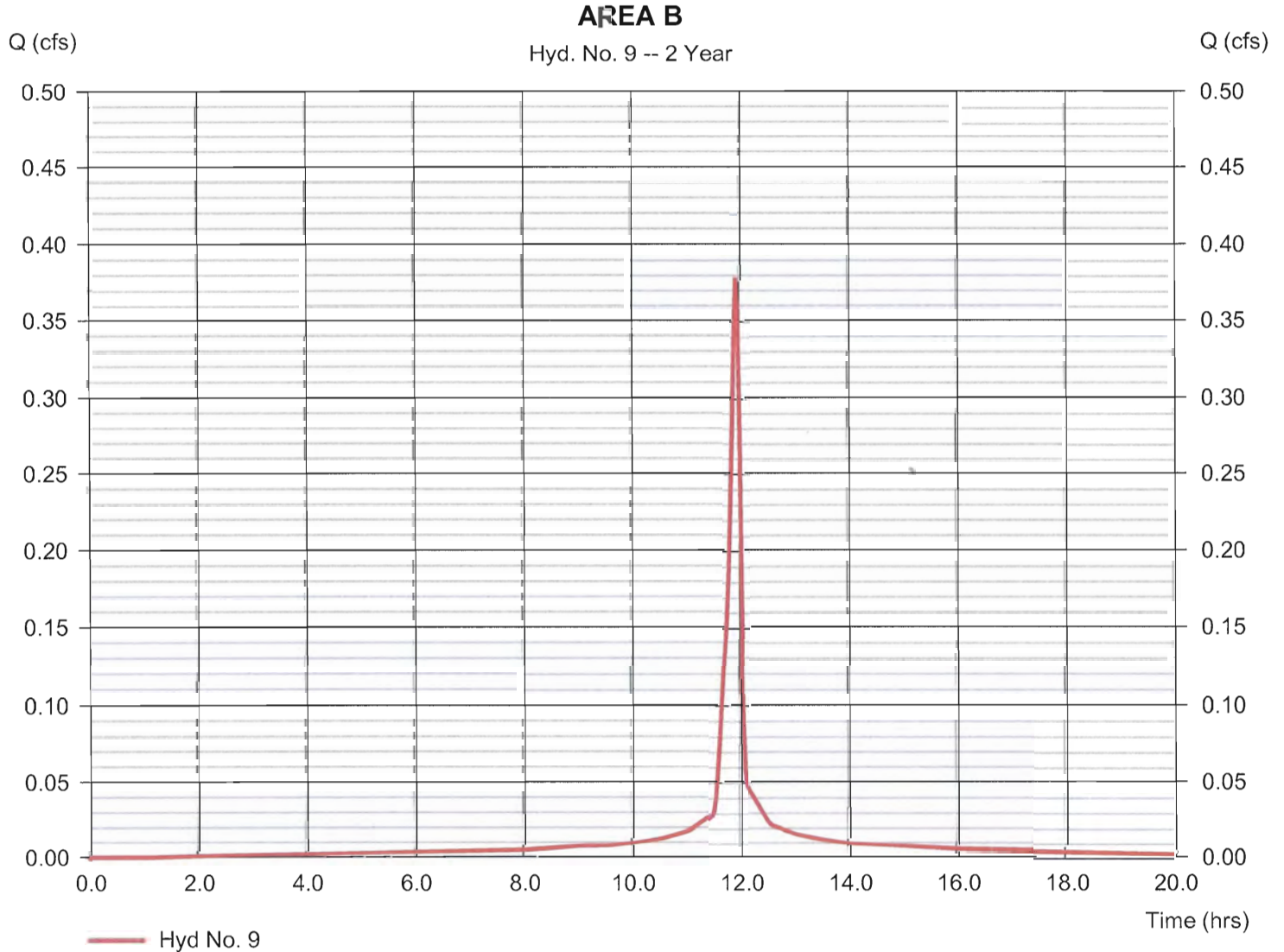
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Friday, 00 6, 2012

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.379 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.020 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

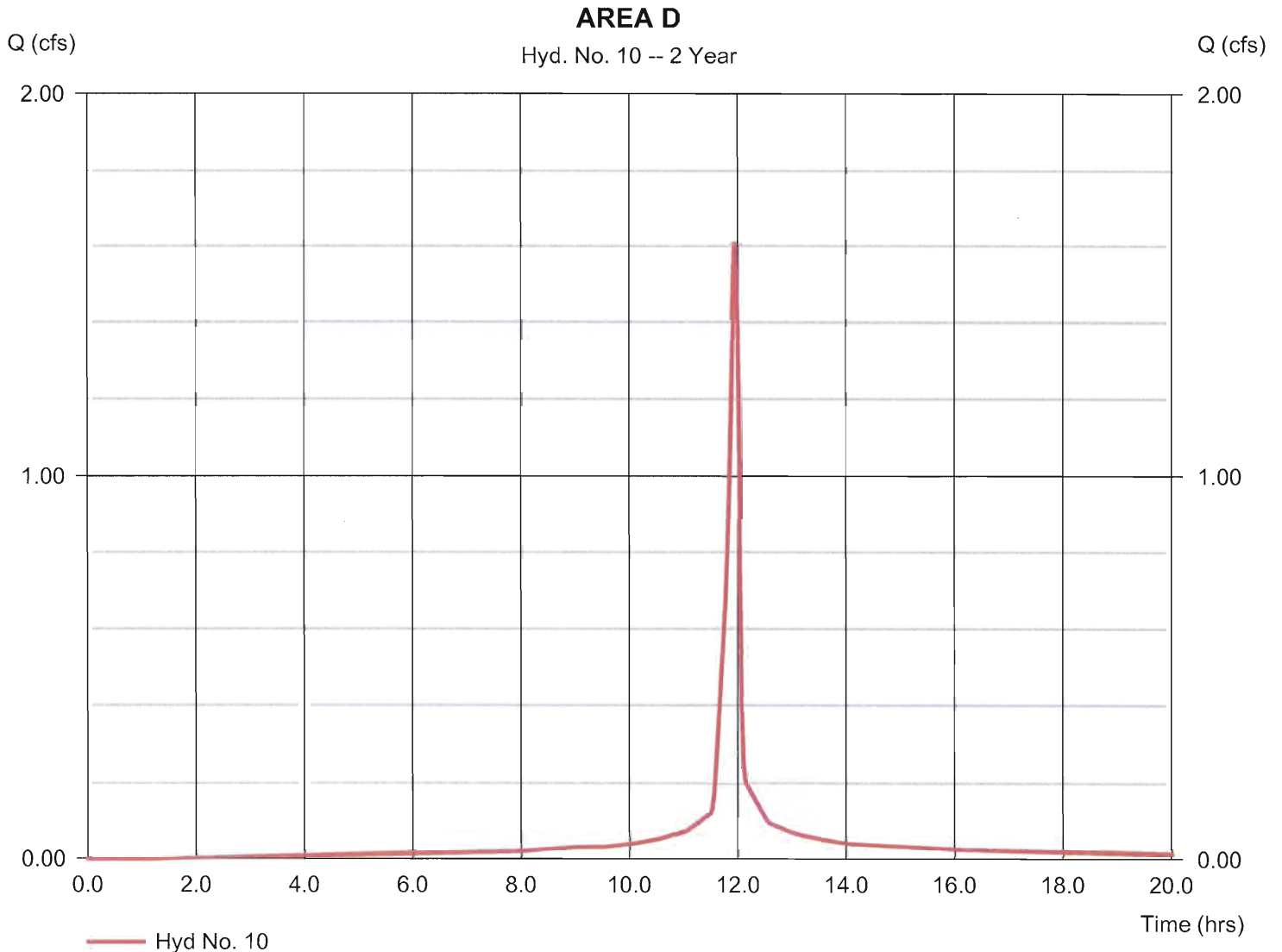


# Hydrograph Report

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.609 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.087 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

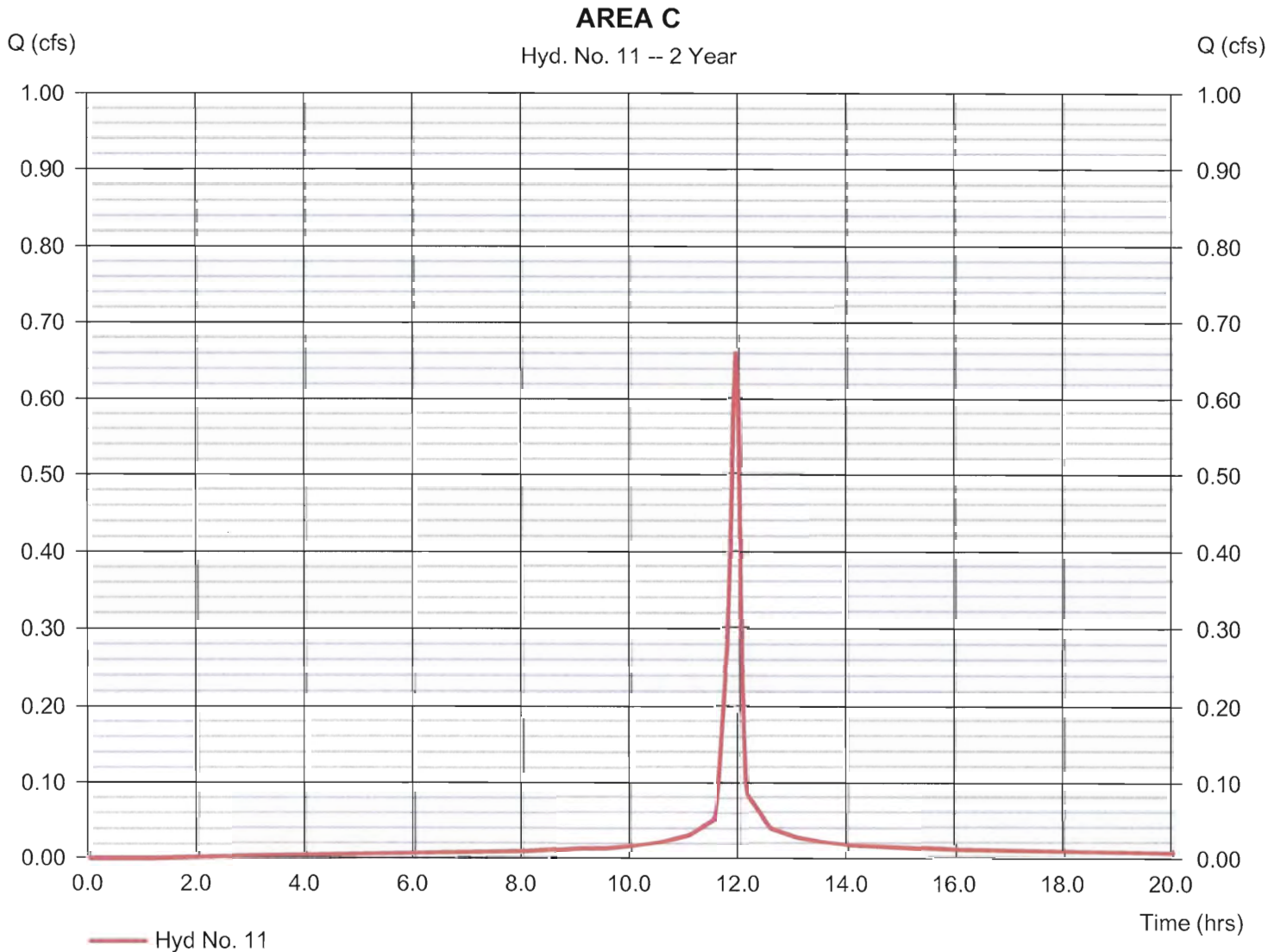
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.663 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.036 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

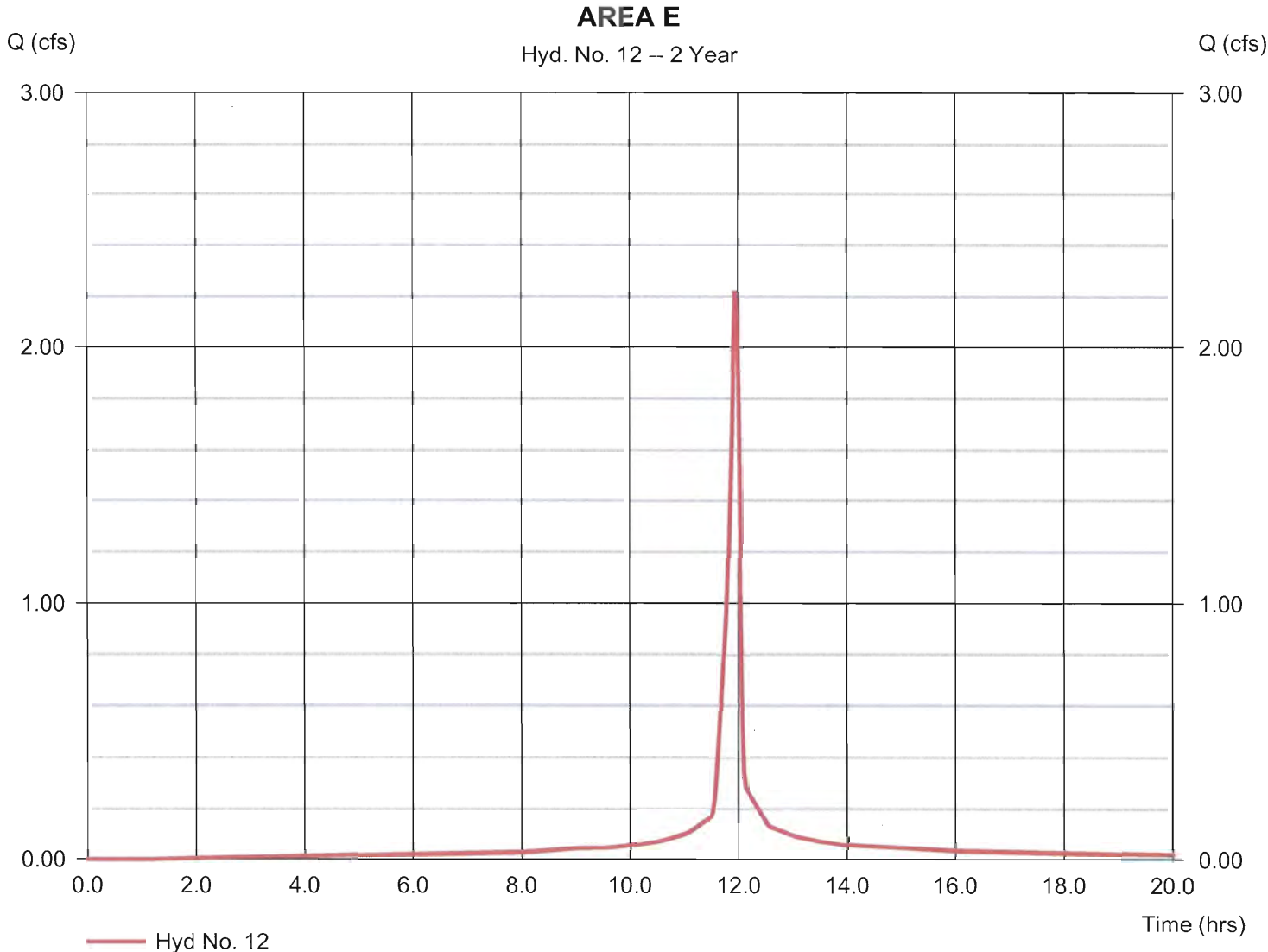
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## Hyd. No. 12

### AREA E

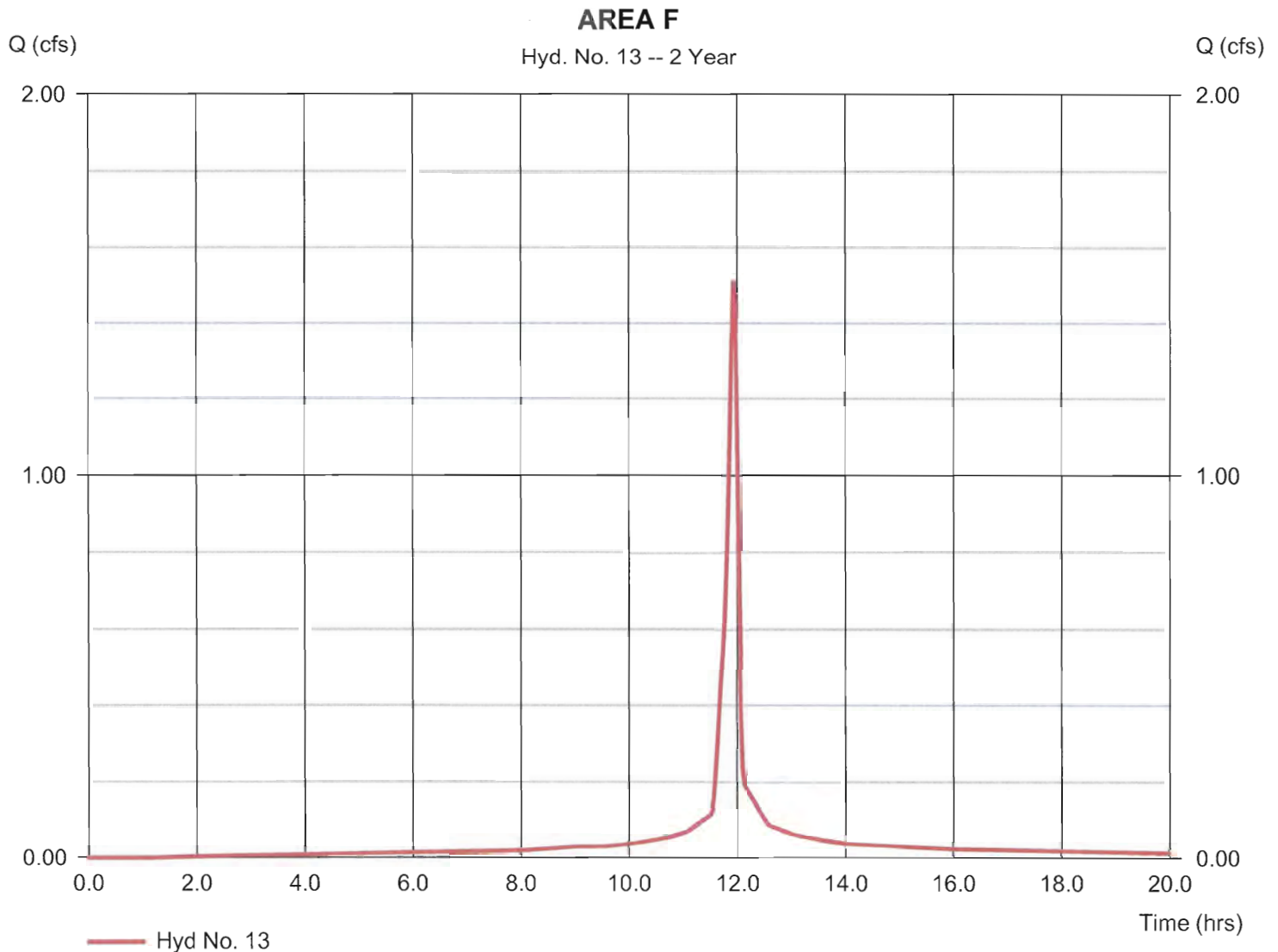
Hydrograph type	= SCS Runoff	Peak discharge	= 2.224 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.120 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 1.514 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.082 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

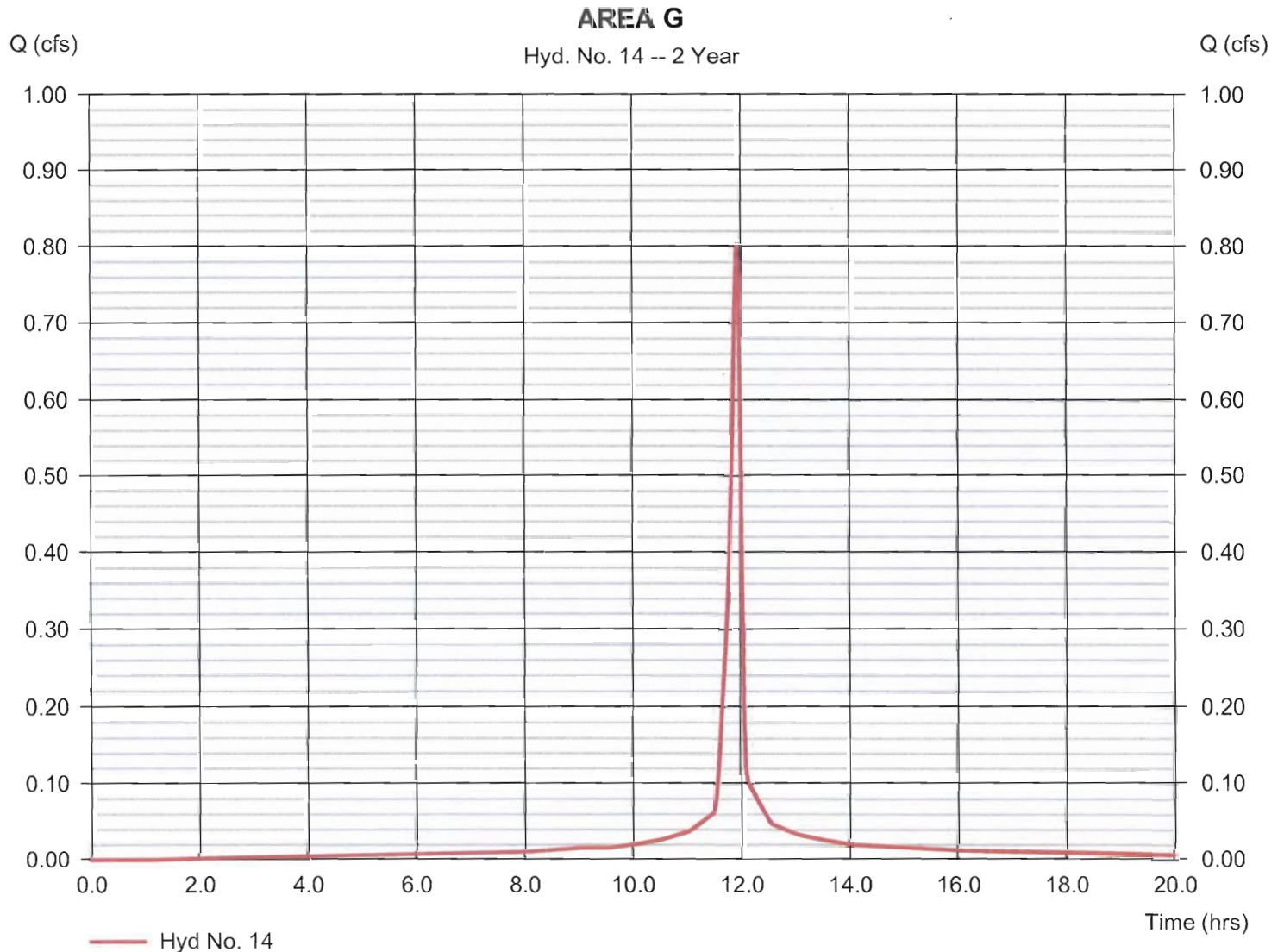
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 0.805 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.043 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



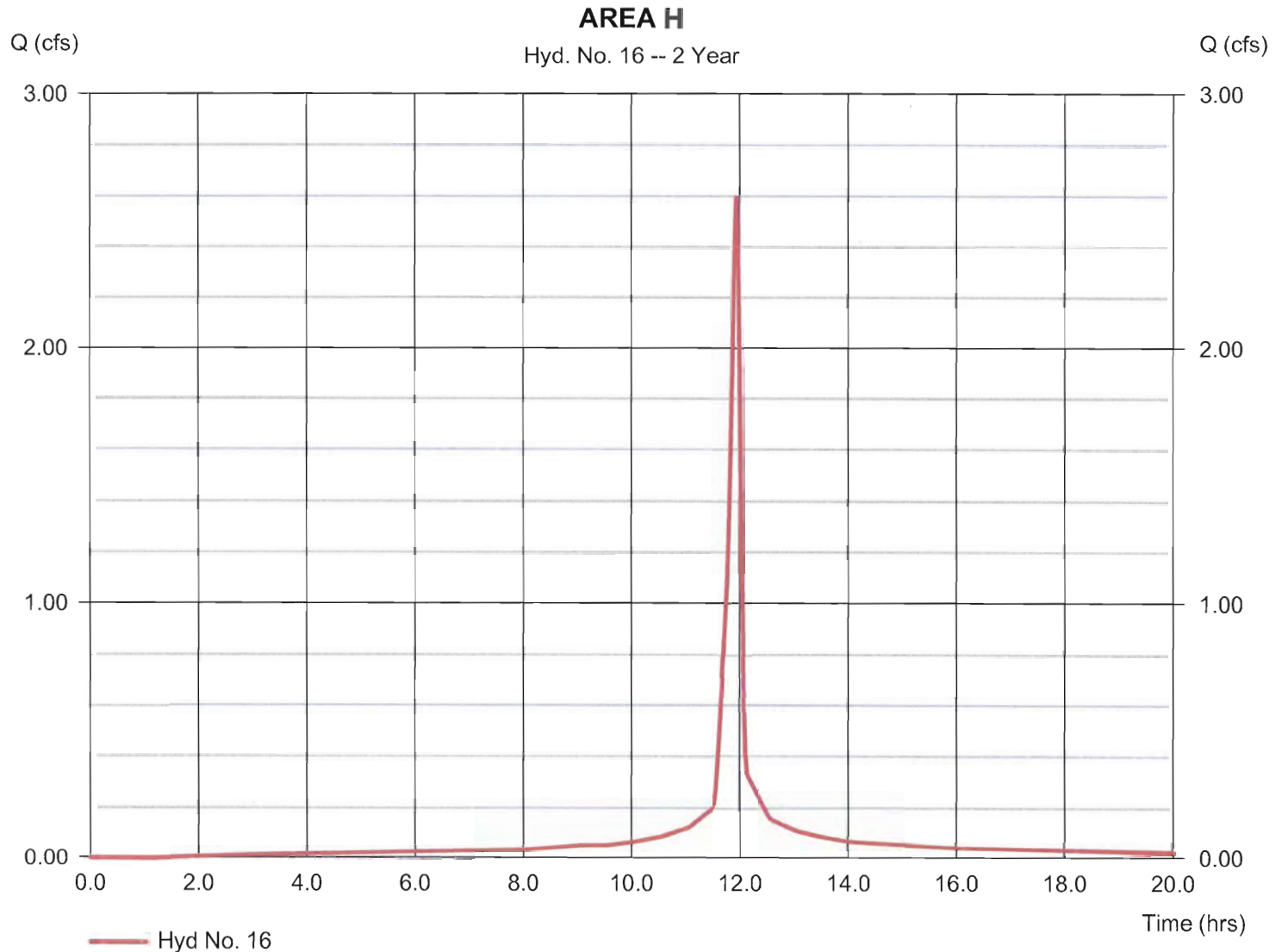


# Hydrograph Report

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 2.603 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.140 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

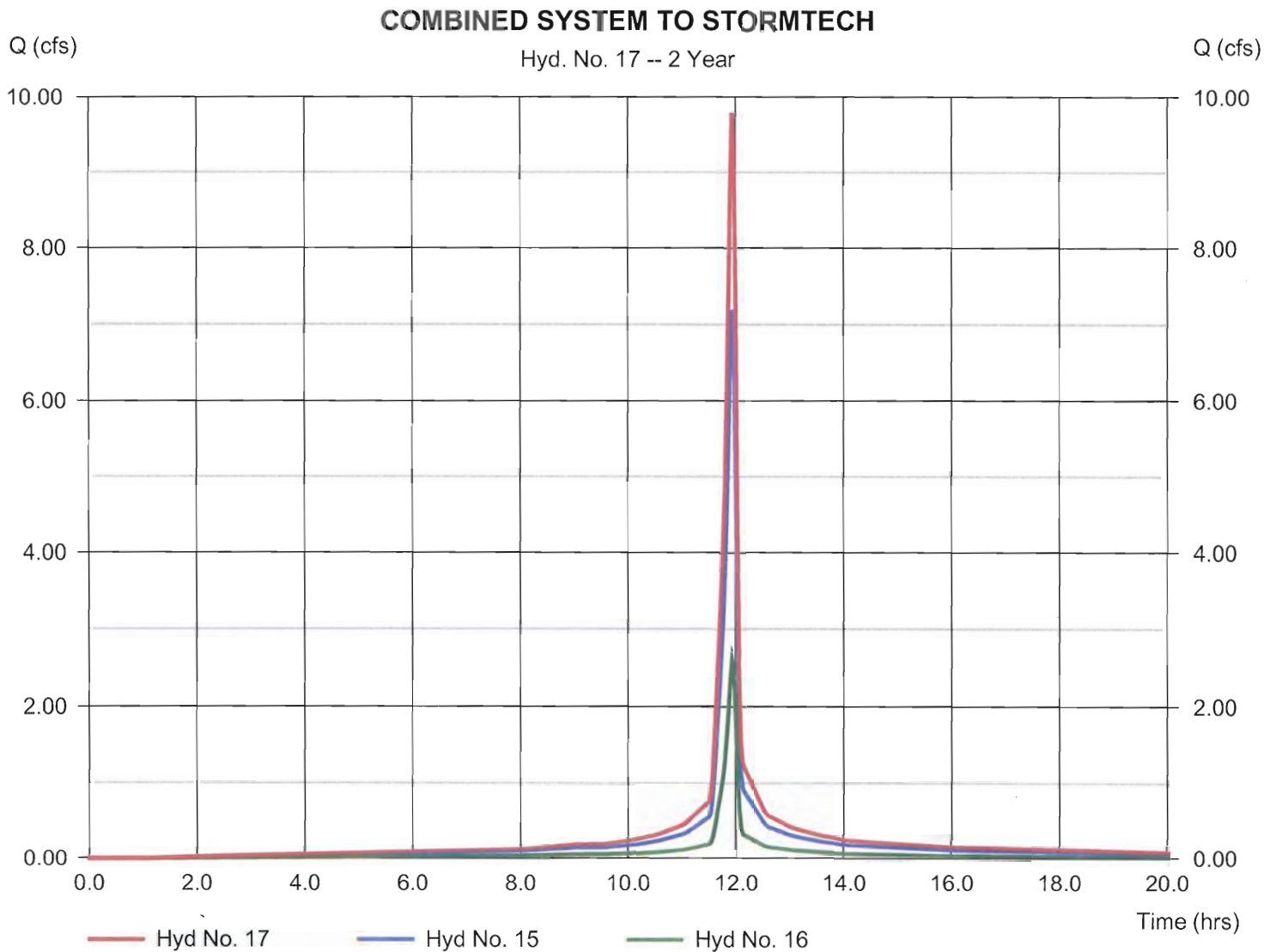
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## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 9.796 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.528 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



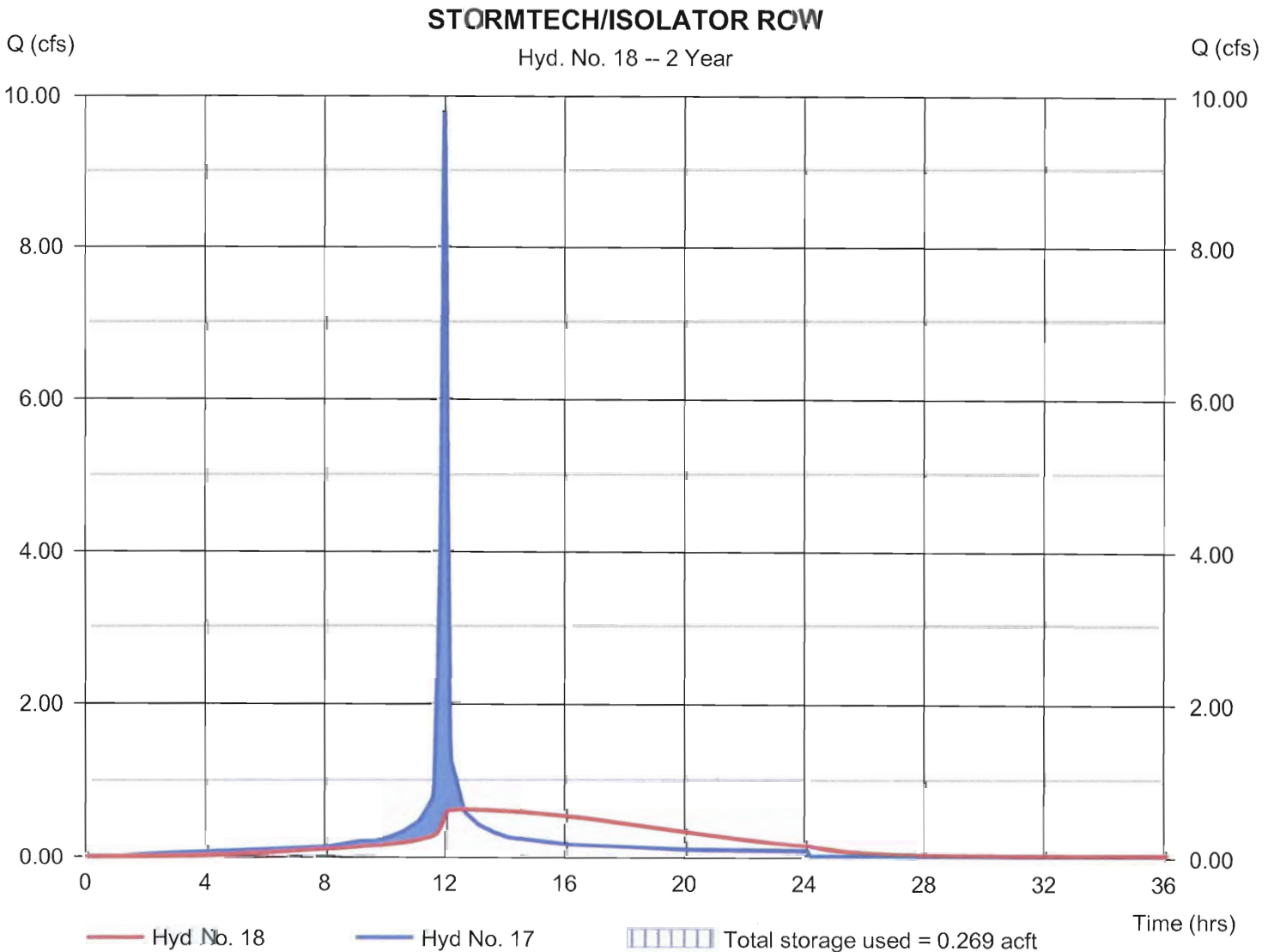
# Hydrograph Report

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.625 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 0.528 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. Storage	= 1342.38 ft
Reservoir name	= STORMTECH 3500		= 0.269 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	10.59	2	732	1.053	-----	-----	-----	AREA 1
2	SCS Runoff	0.958	2	728	0.081	-----	-----	-----	AREA 2
3	SCS Runoff	0.800	2	724	0.057	-----	-----	-----	AREA 3
4	SCS Runoff	3.176	2	716	0.173	-----	-----	-----	AREA 4
5	SCS Runoff	3.436	2	716	0.161	-----	-----	-----	AREA 5
6	SCS Runoff	1.718	2	716	0.080	-----	-----	-----	AREA 6
7	SCS Runoff	1.167	2	734	0.122	-----	-----	-----	AREA 7
8	SCS Runoff	0.015	2	1440	0.010	-----	-----	-----	AREA A
9	SCS Runoff	0.489	2	716	0.027	-----	-----	-----	AREA B
10	SCS Runoff	2.077	2	716	0.113	-----	-----	-----	AREA D
11	SCS Runoff	0.855	2	716	0.047	-----	-----	-----	AREA C
12	SCS Runoff	2.871	2	716	0.157	-----	-----	-----	AREA E
13	SCS Runoff	1.955	2	716	0.107	-----	-----	-----	AREA F
14	SCS Runoff	1.038	2	716	0.057	-----	-----	-----	AREA G
15	Combine	9.285	2	716	0.506	9, 10, 11, 12, 13, 14 -----	-----	-----	STORMTECH AREA
16	SCS Runoff	3.360	2	716	0.183	-----	-----	-----	AREA H
17	Combine	12.64	2	716	0.690	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE
18	Reservoir	0.687	2	764	0.689	17	1342.84	0.358	STORMTECH/ISOLATOR ROW
13TH AND MAIZE 3.16.12.gpw					Return Period: 5 Year			Friday, 00 6, 2012	

# Hydrograph Report

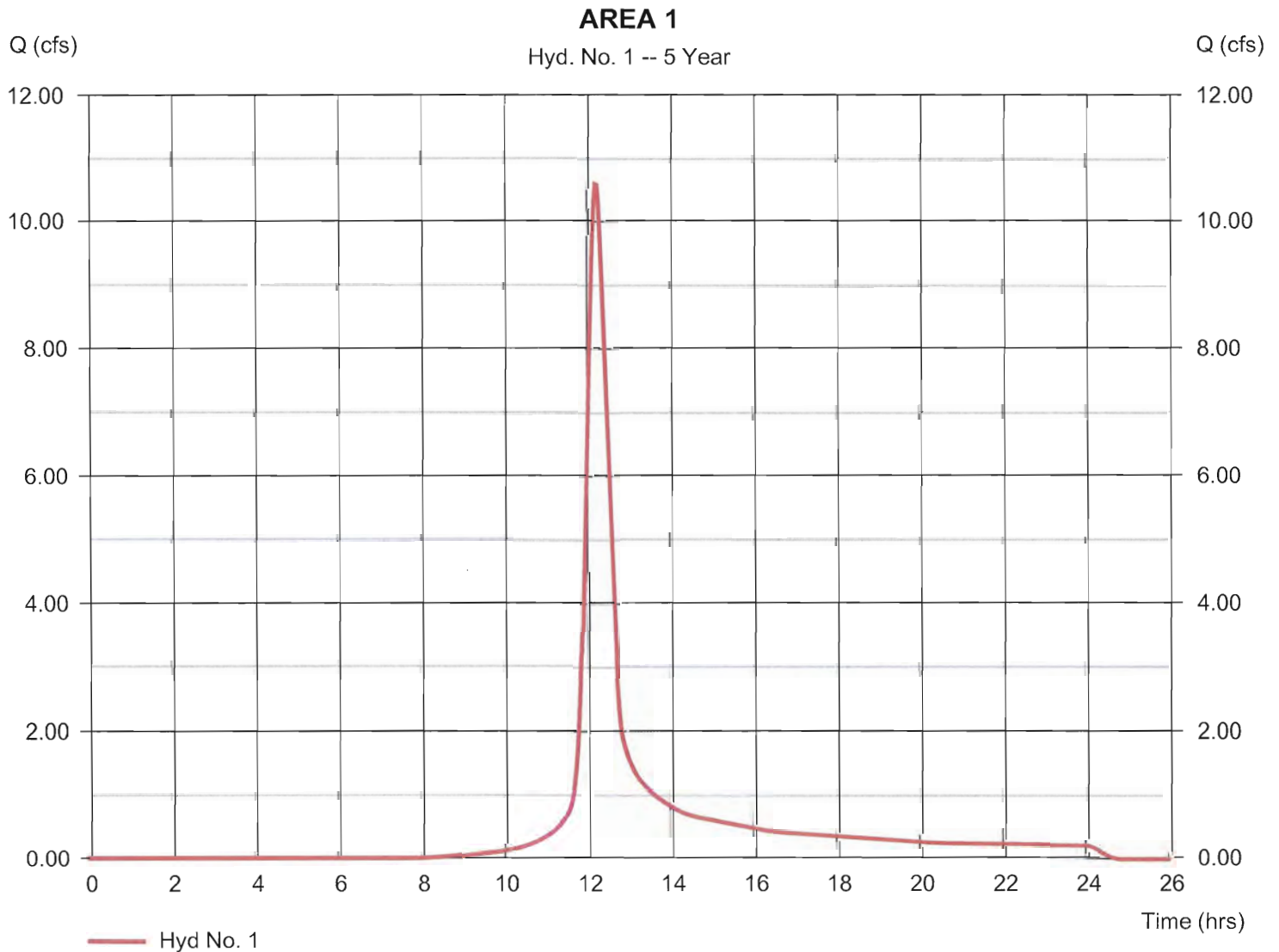
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 1

### AREA 1

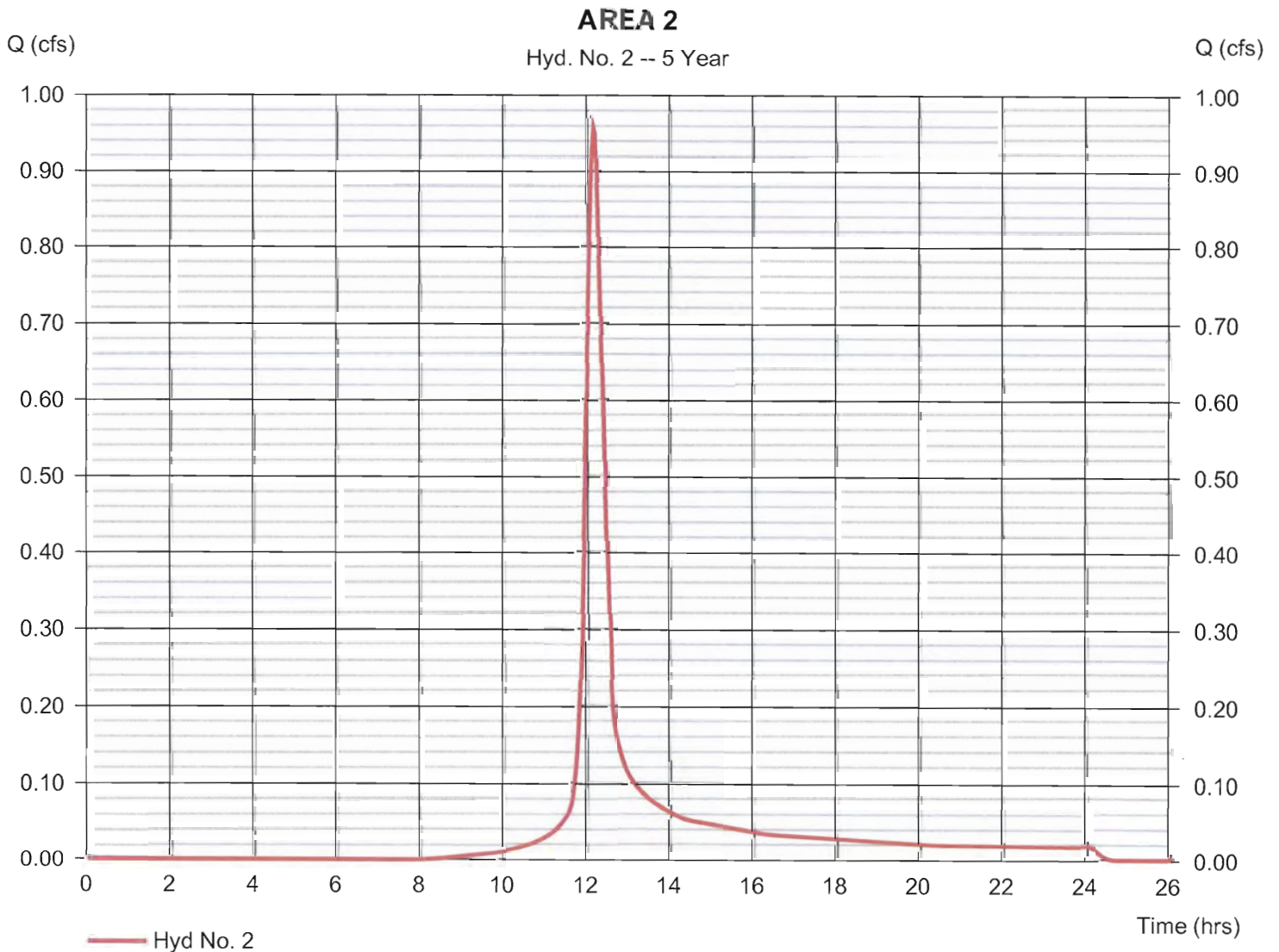
Hydrograph type	= SCS Runoff	Peak discharge	= 10.59 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 1.053 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.958 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.081 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

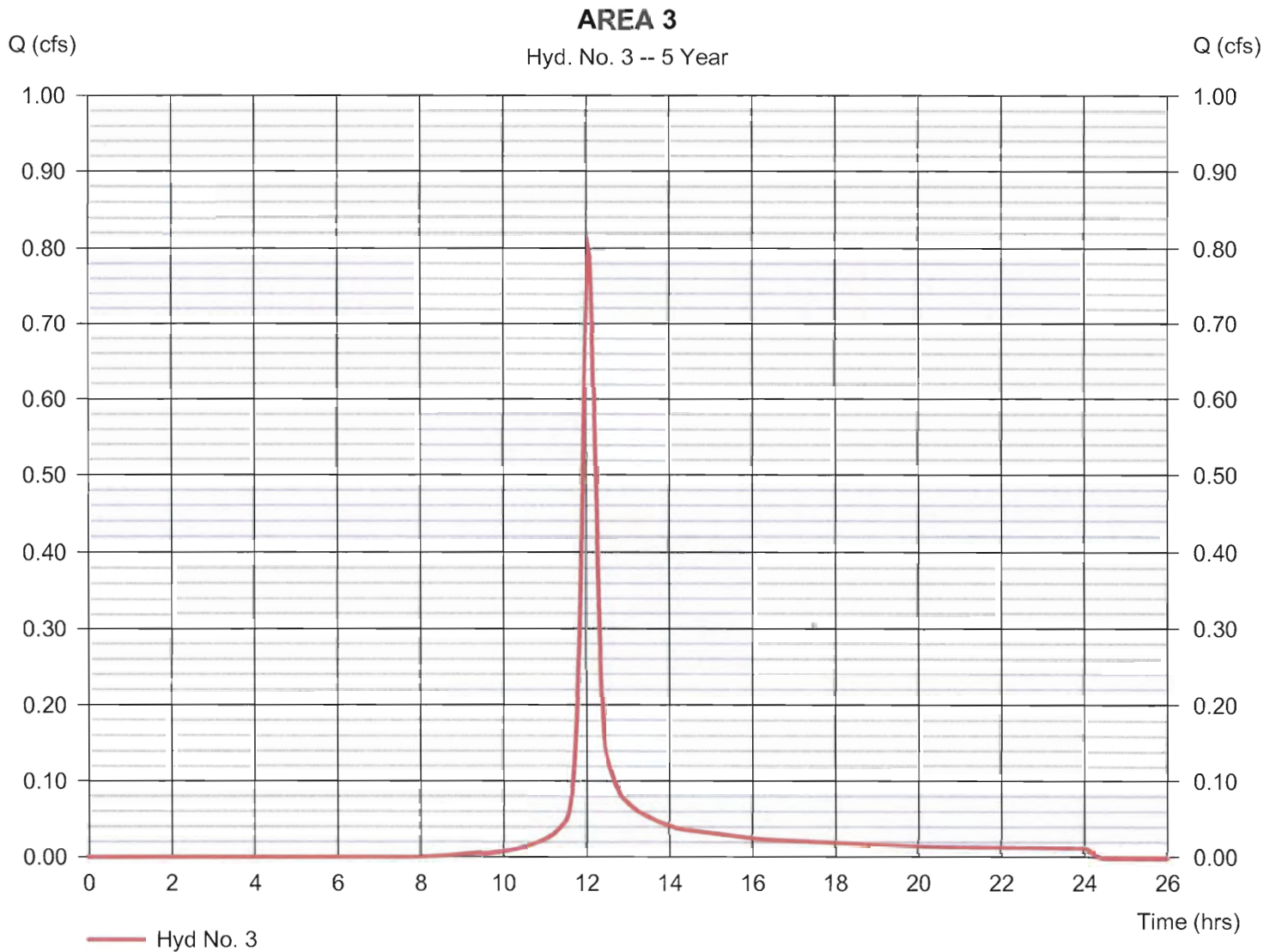


# Hydrograph Report

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.800 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.057 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

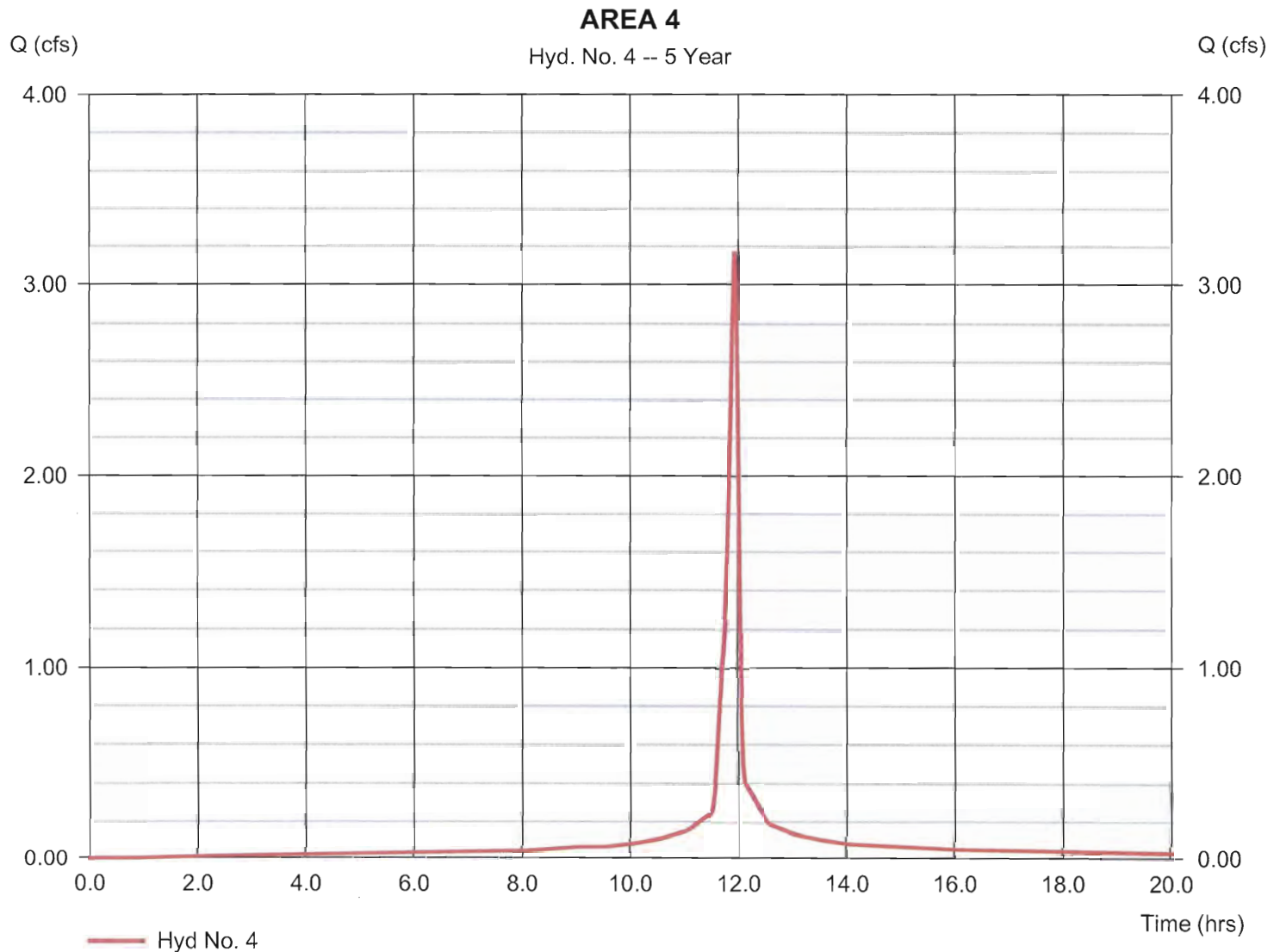
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## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 3.176 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.173 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

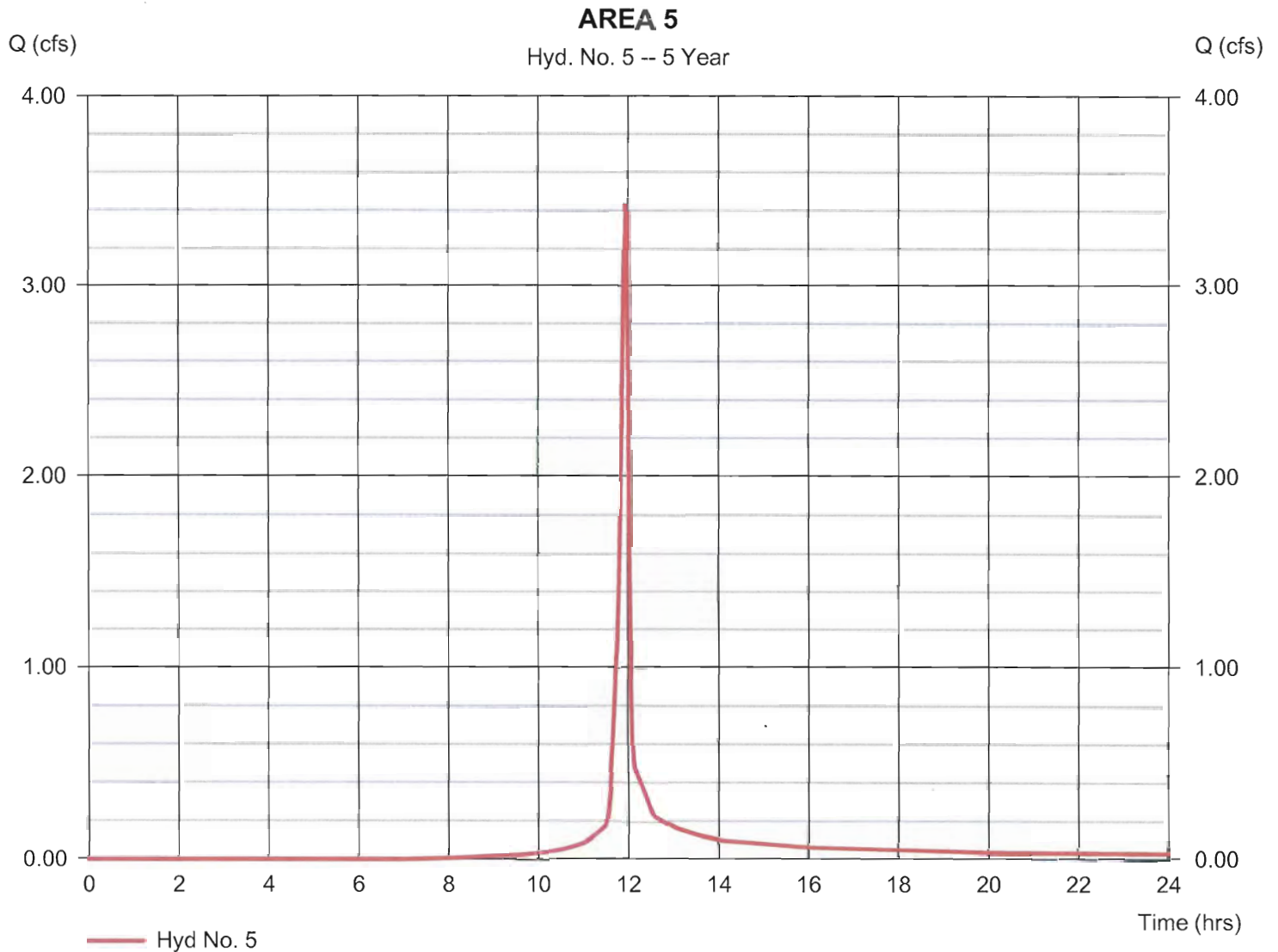


# Hydrograph Report

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 3.436 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.161 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

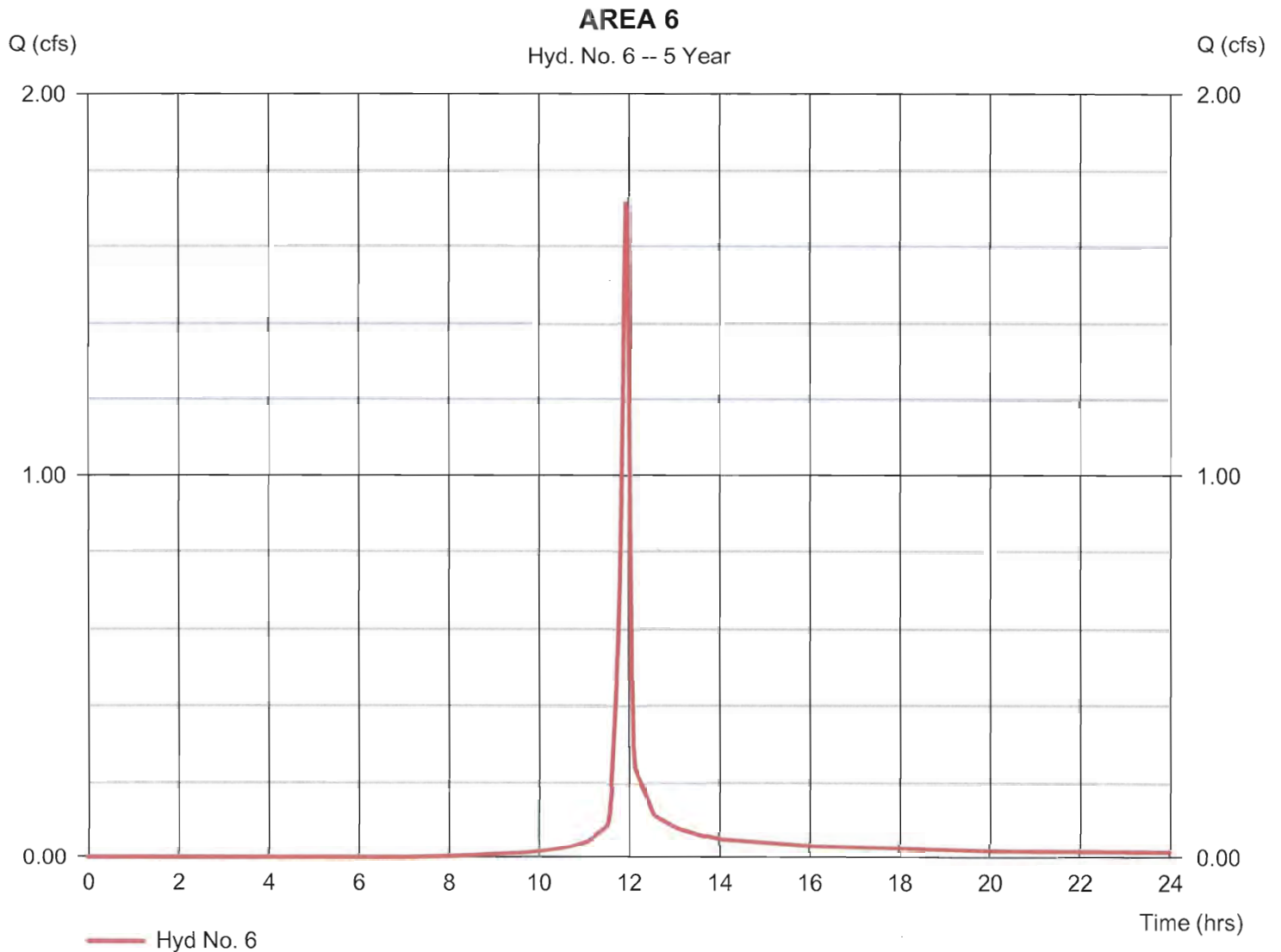


# Hydrograph Report

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 1.718 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.080 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

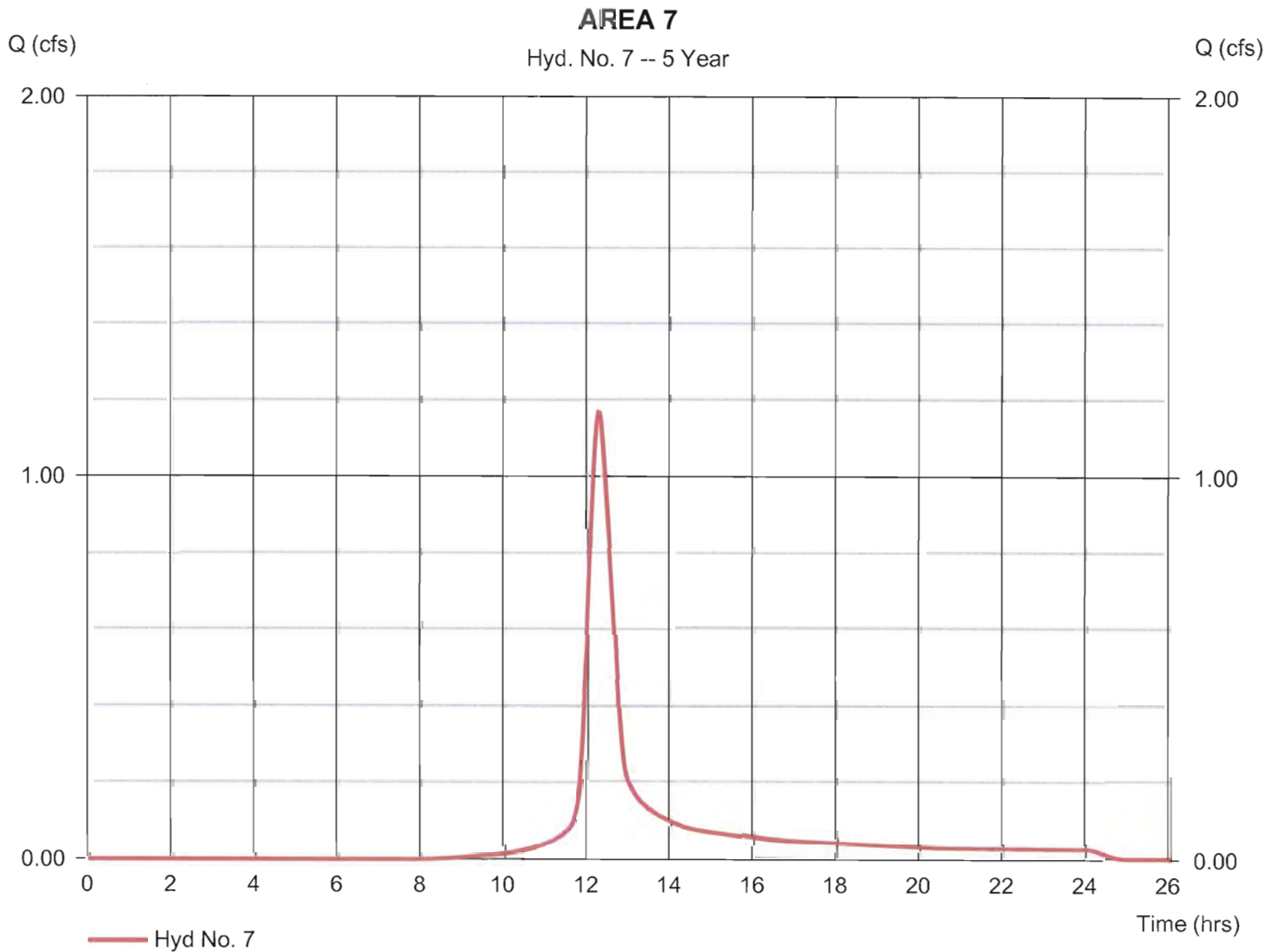


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 1.167 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.122 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

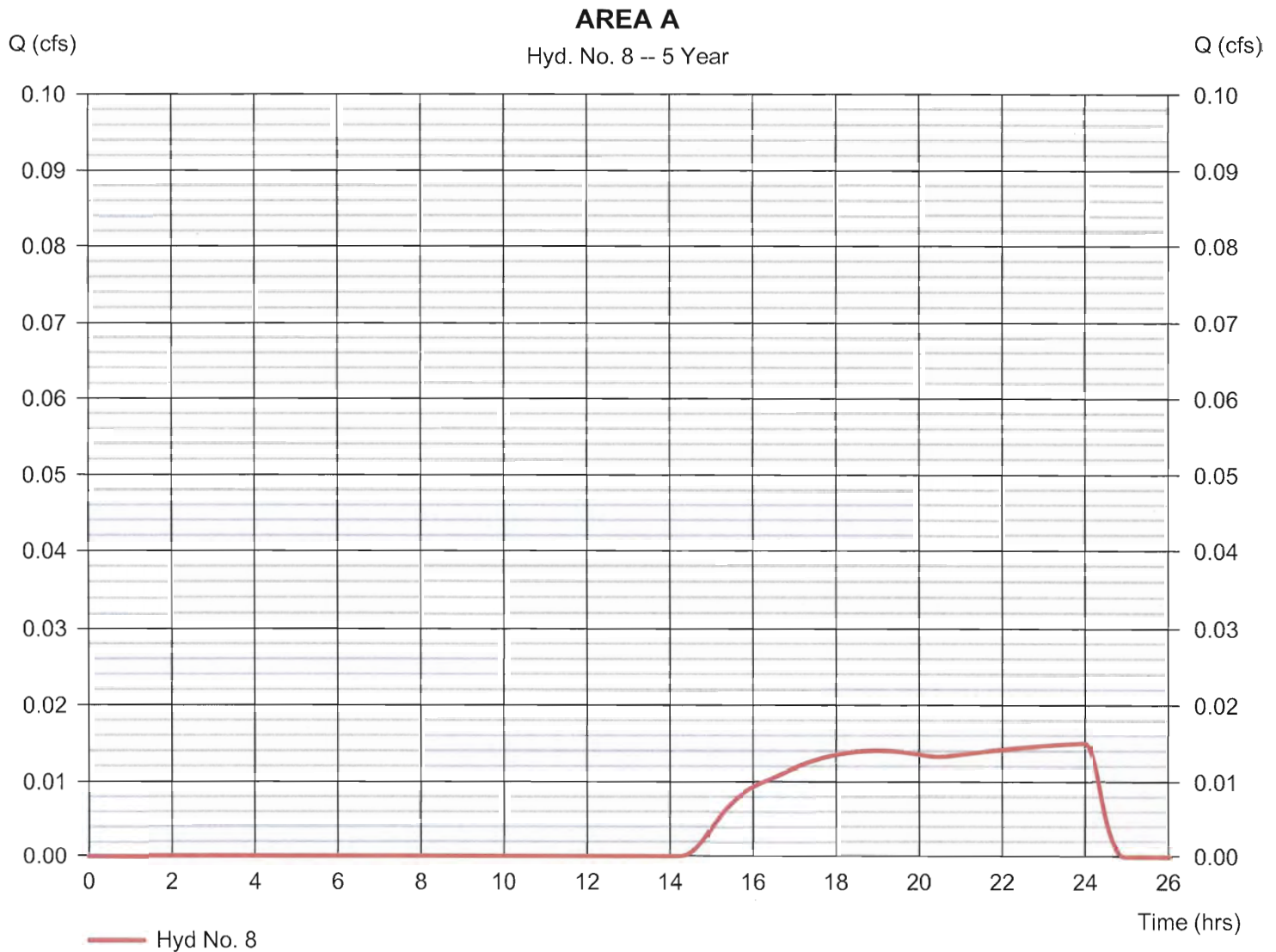
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## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.015 cfs
Storm frequency	= 5 yrs	Time to peak	= 24.00 hrs
Time interval	= 2 min	Hyd. volume	= 0.010 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

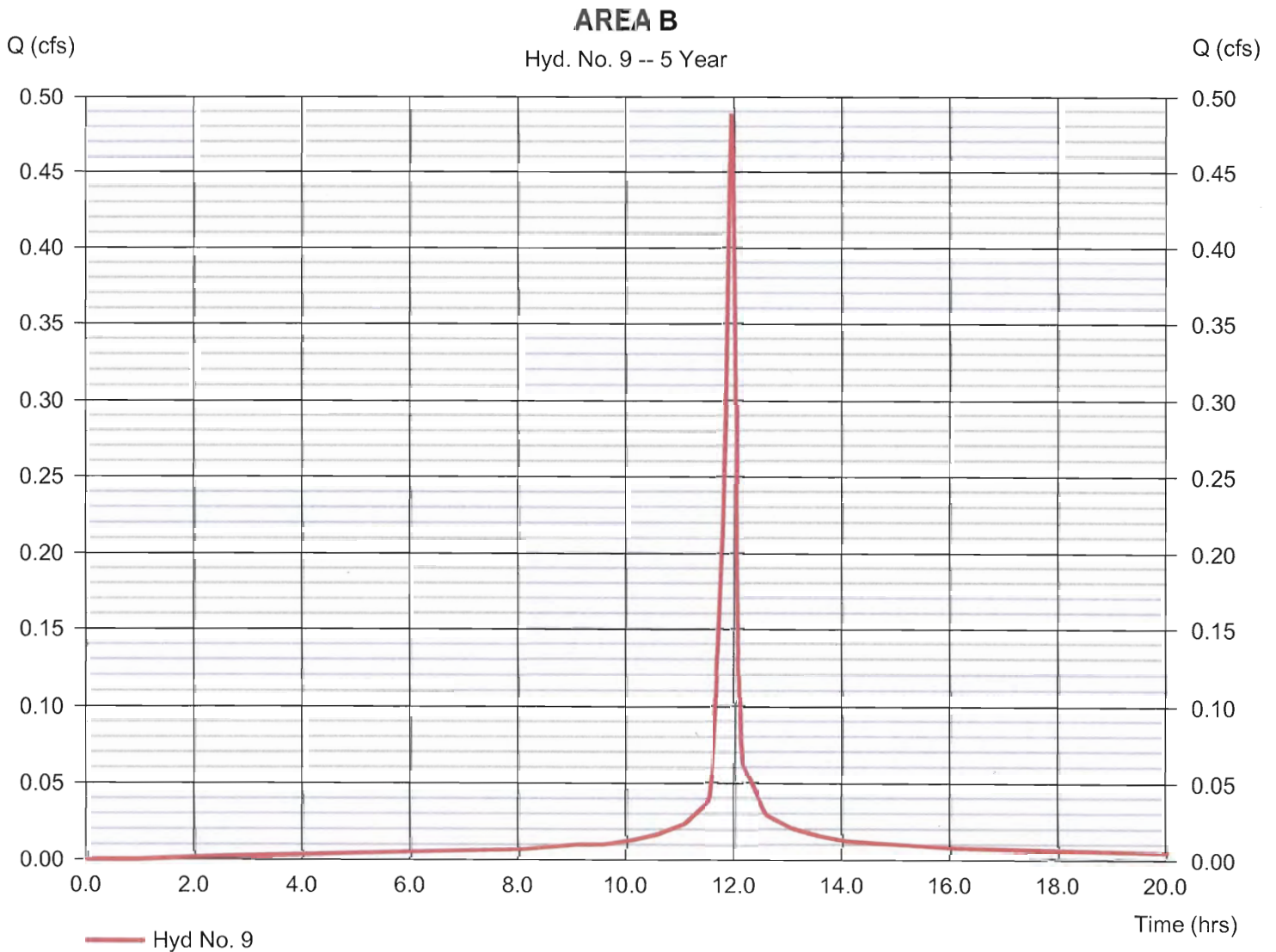


# Hydrograph Report

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.489 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.027 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

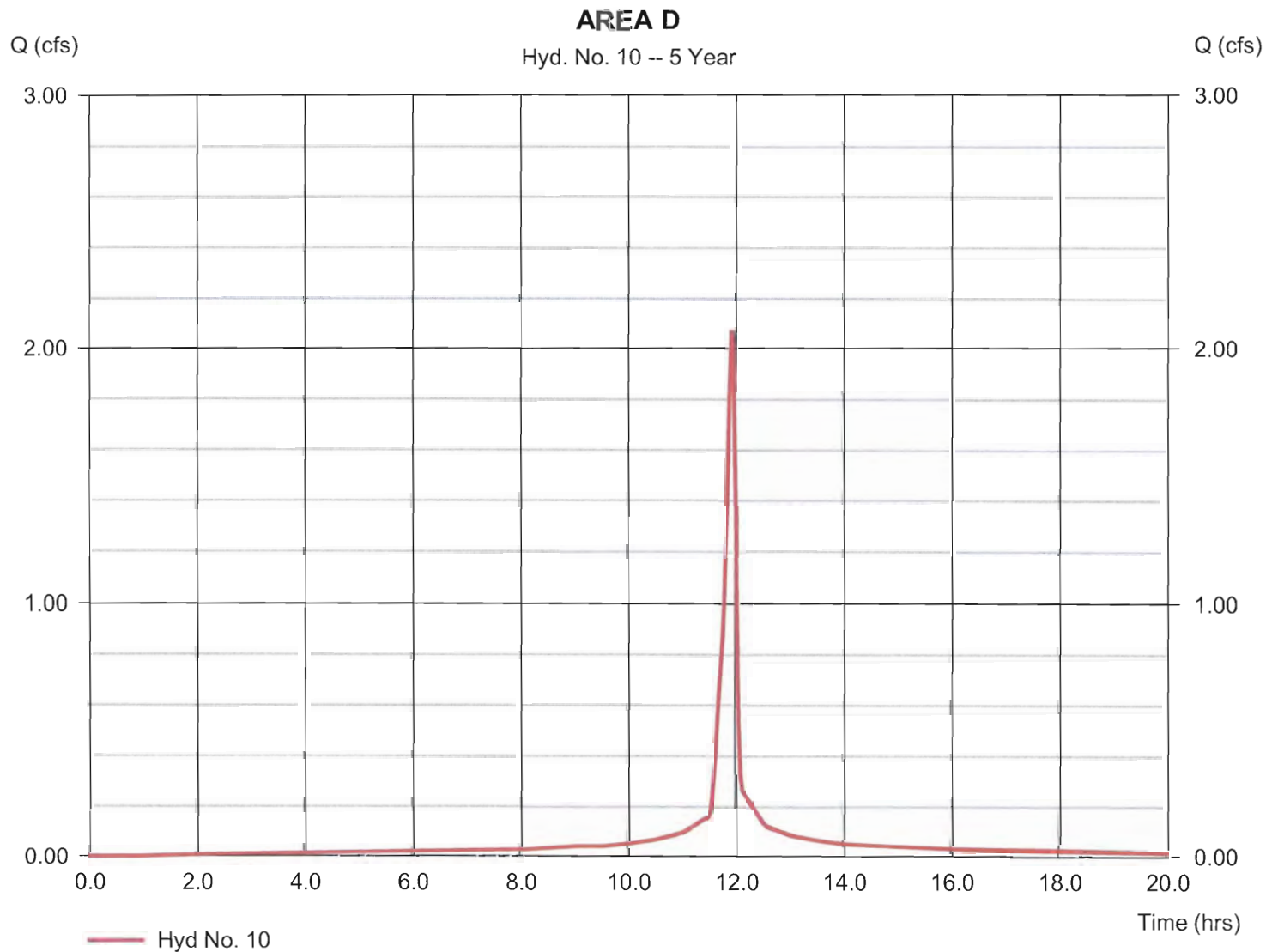
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## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 2.077 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.113 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

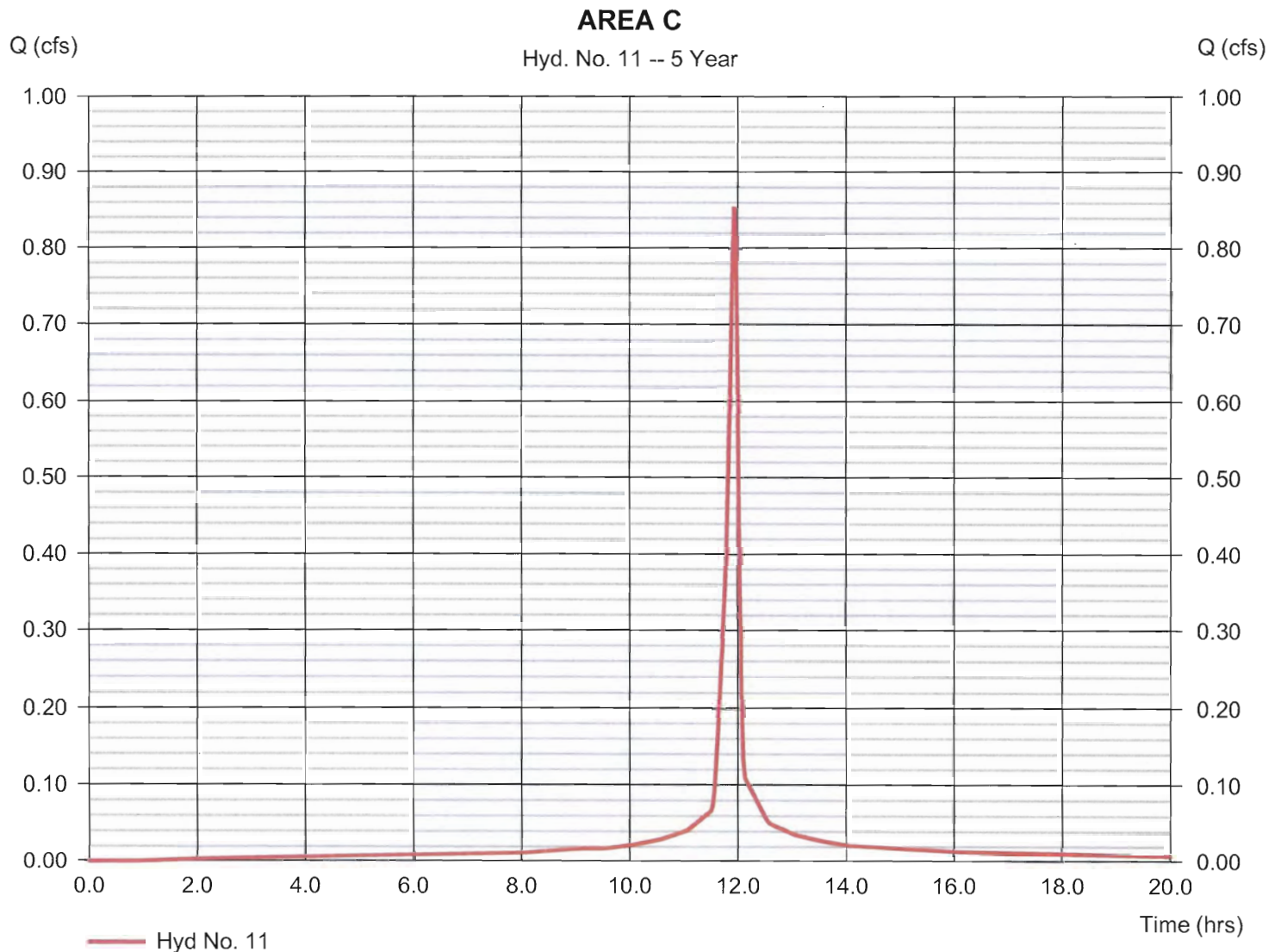
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## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.855 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.047 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

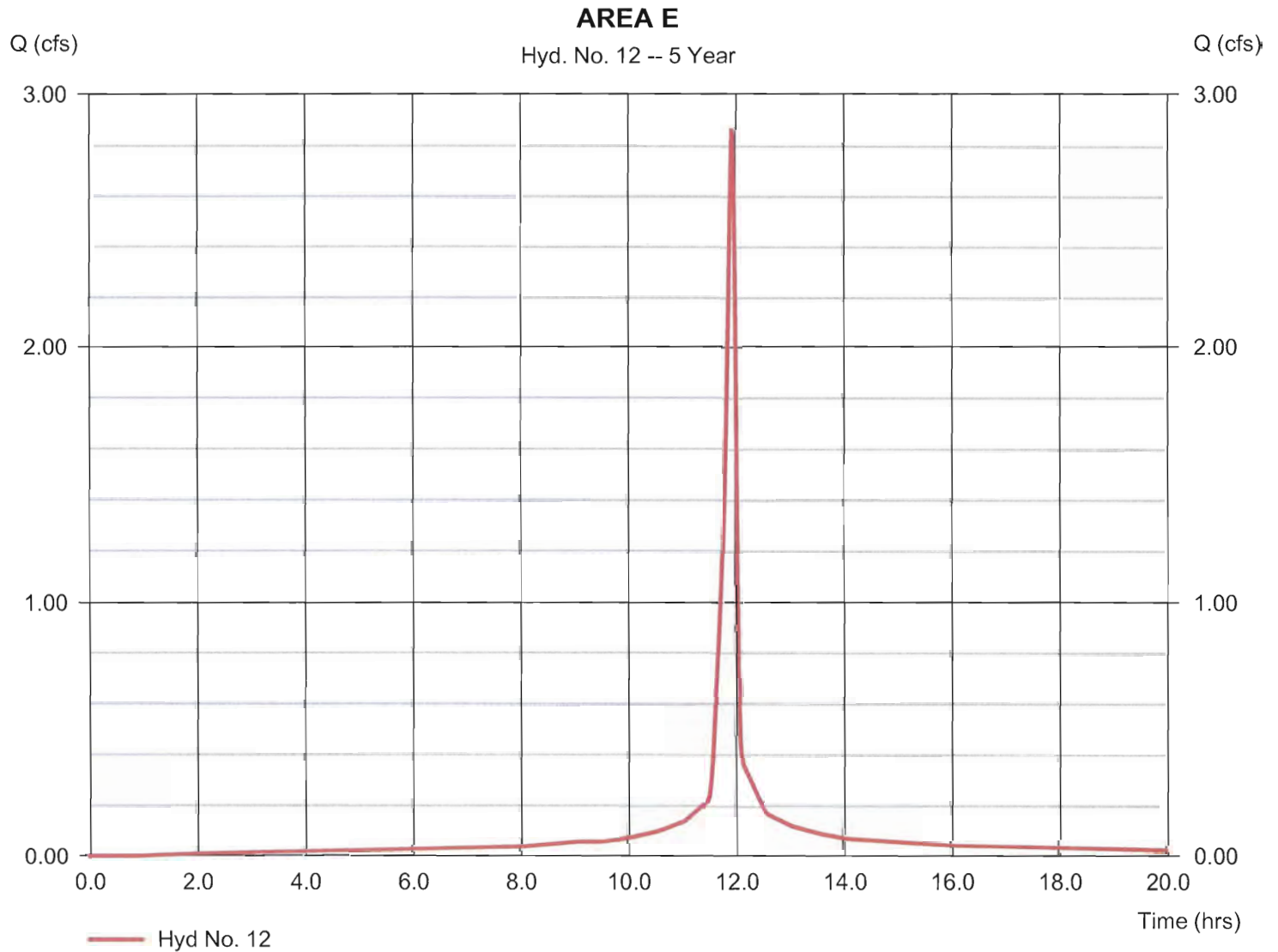


# Hydrograph Report

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 2.871 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.157 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

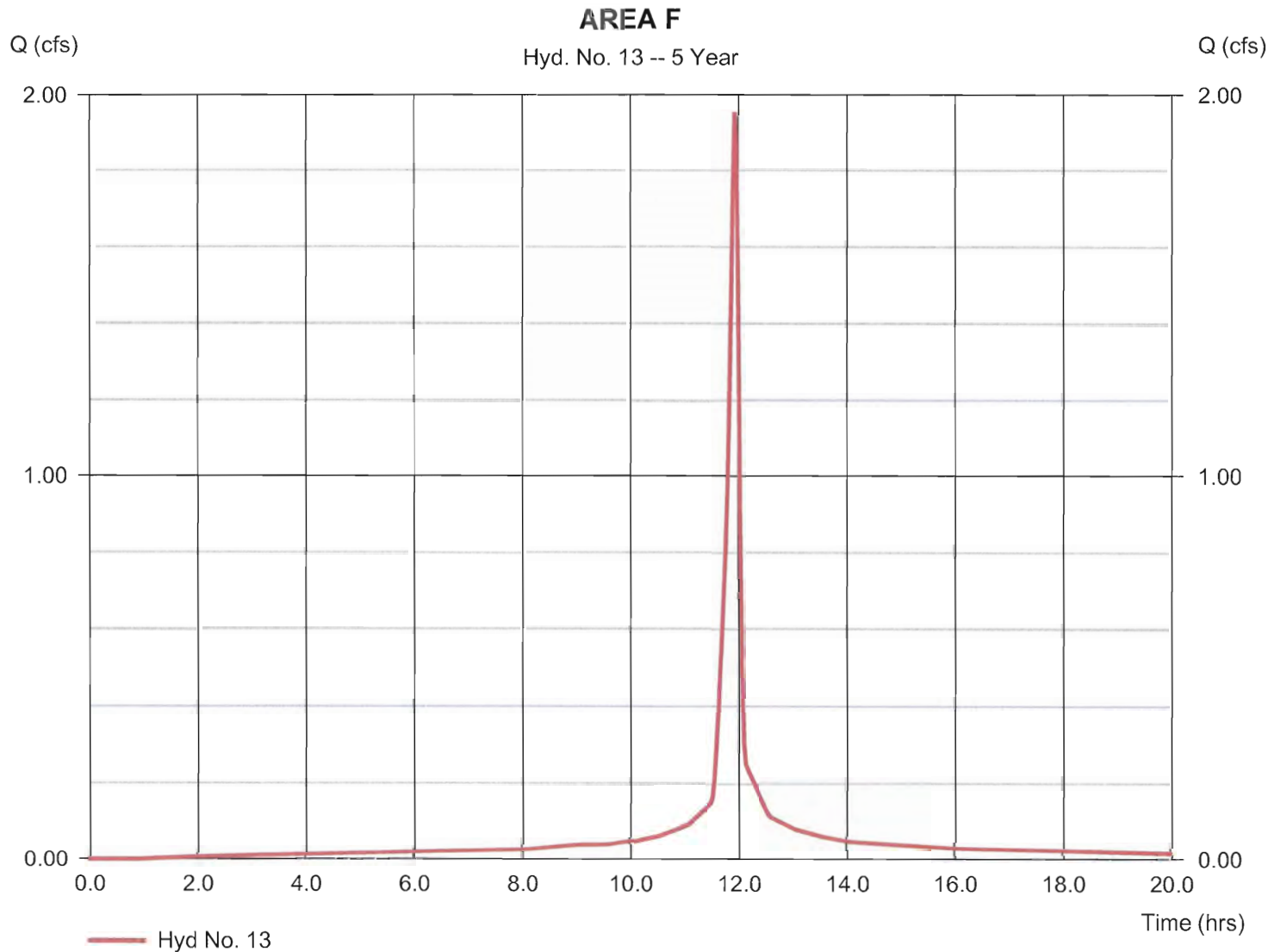


# Hydrograph Report

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 1.955 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.107 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

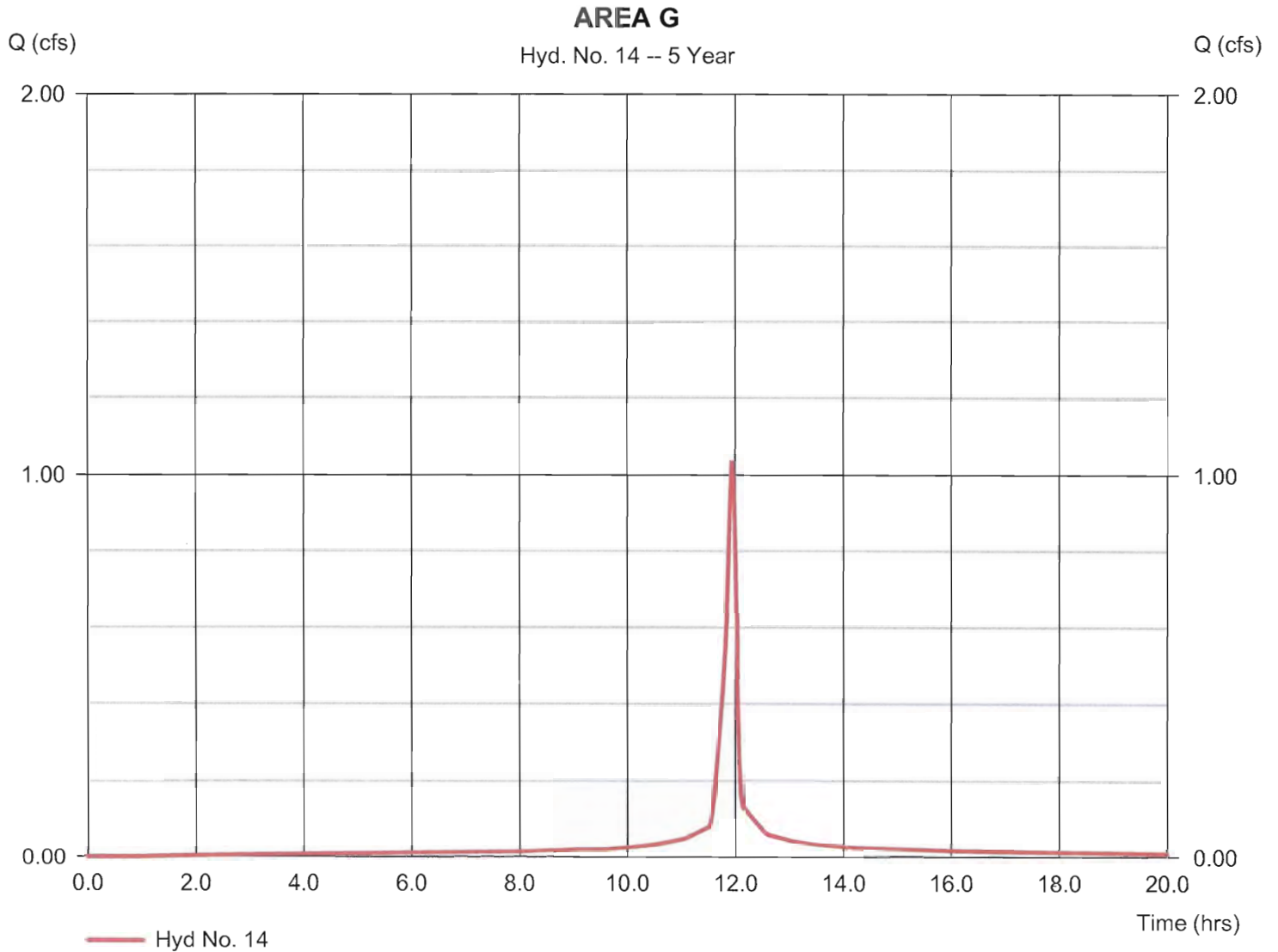


# Hydrograph Report

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 1.038 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.057 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

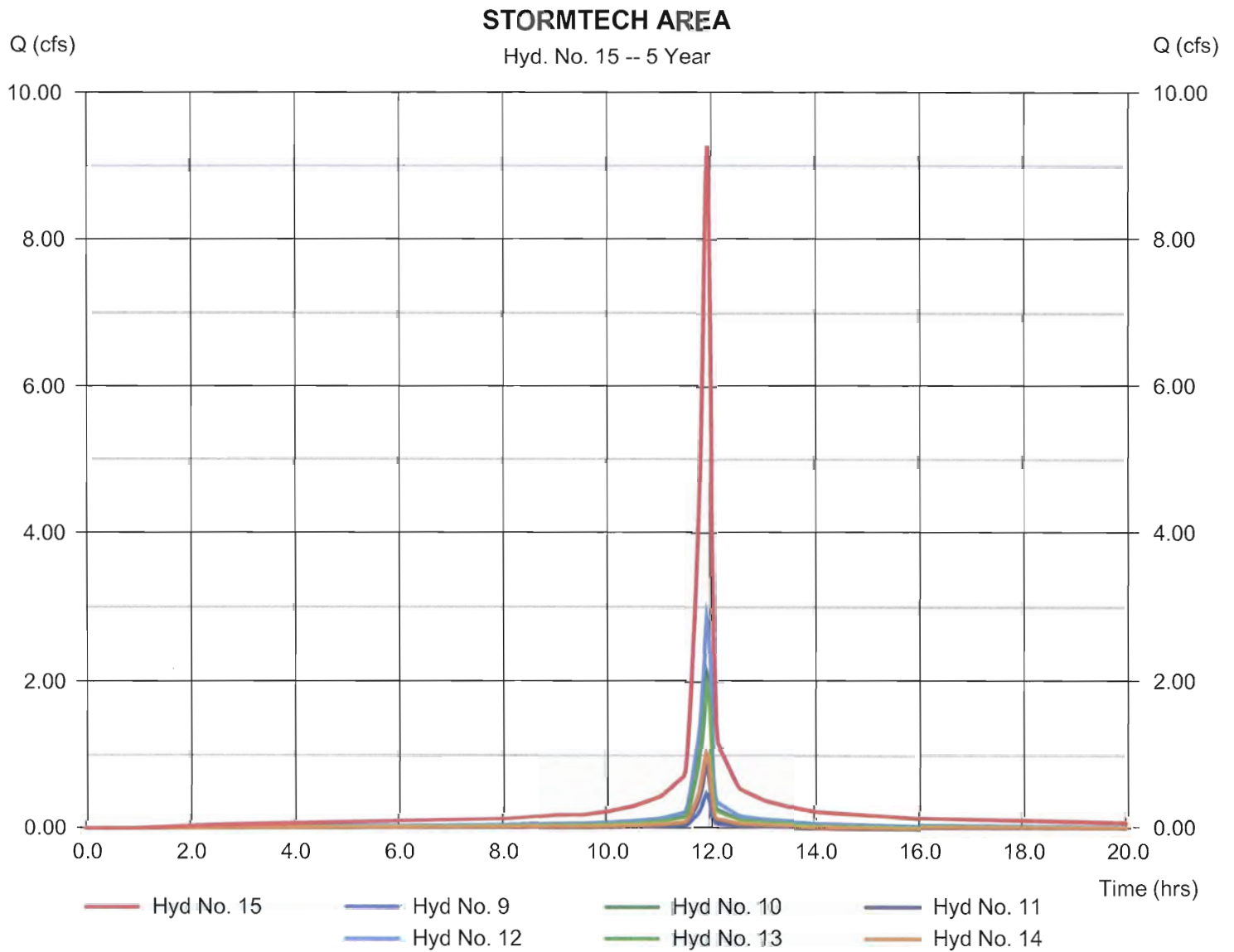


# Hydrograph Report

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 9.285 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.506 acft
Inflow hyds.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac



# Hydrograph Report

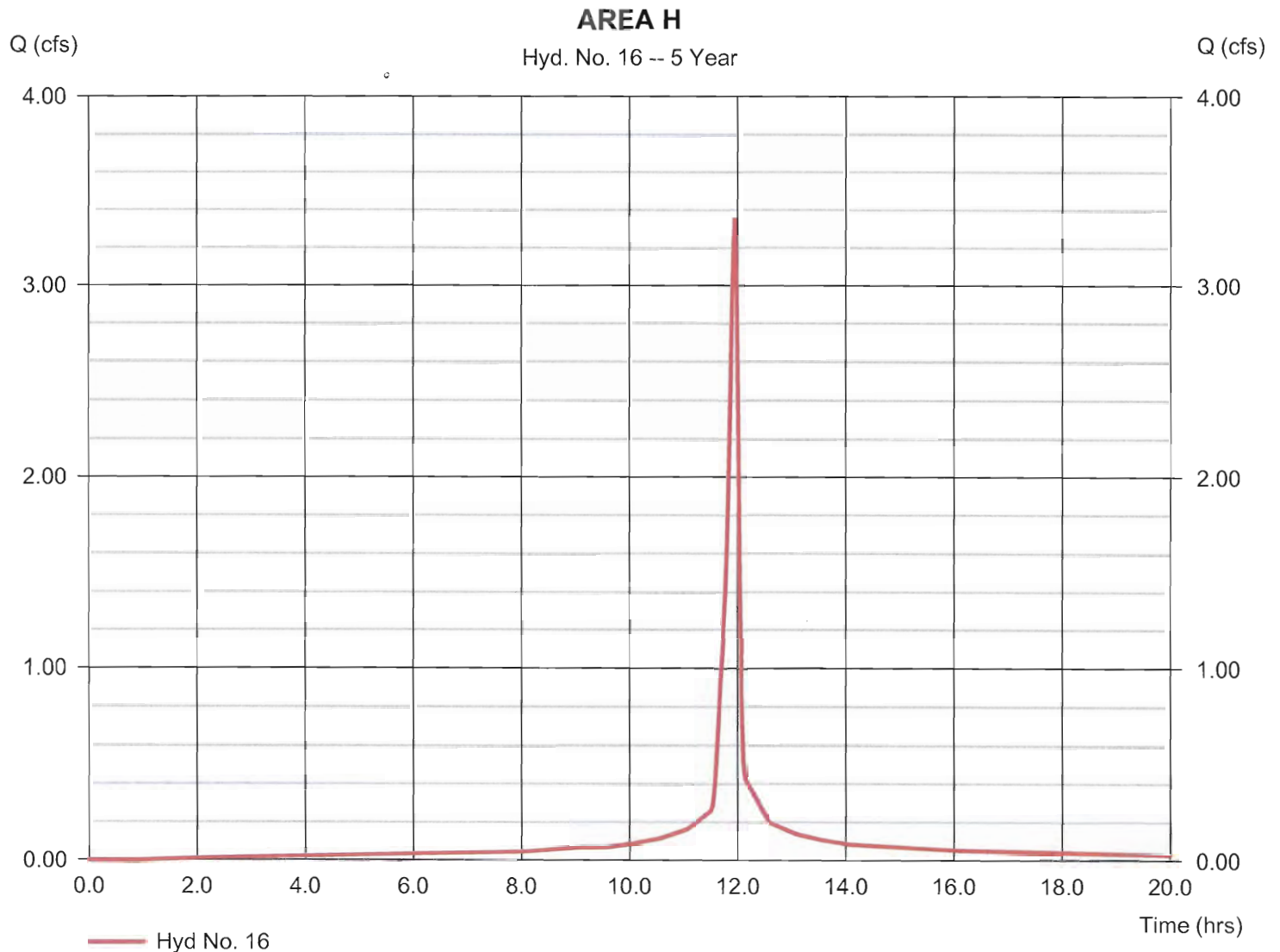
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 3.360 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.183 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

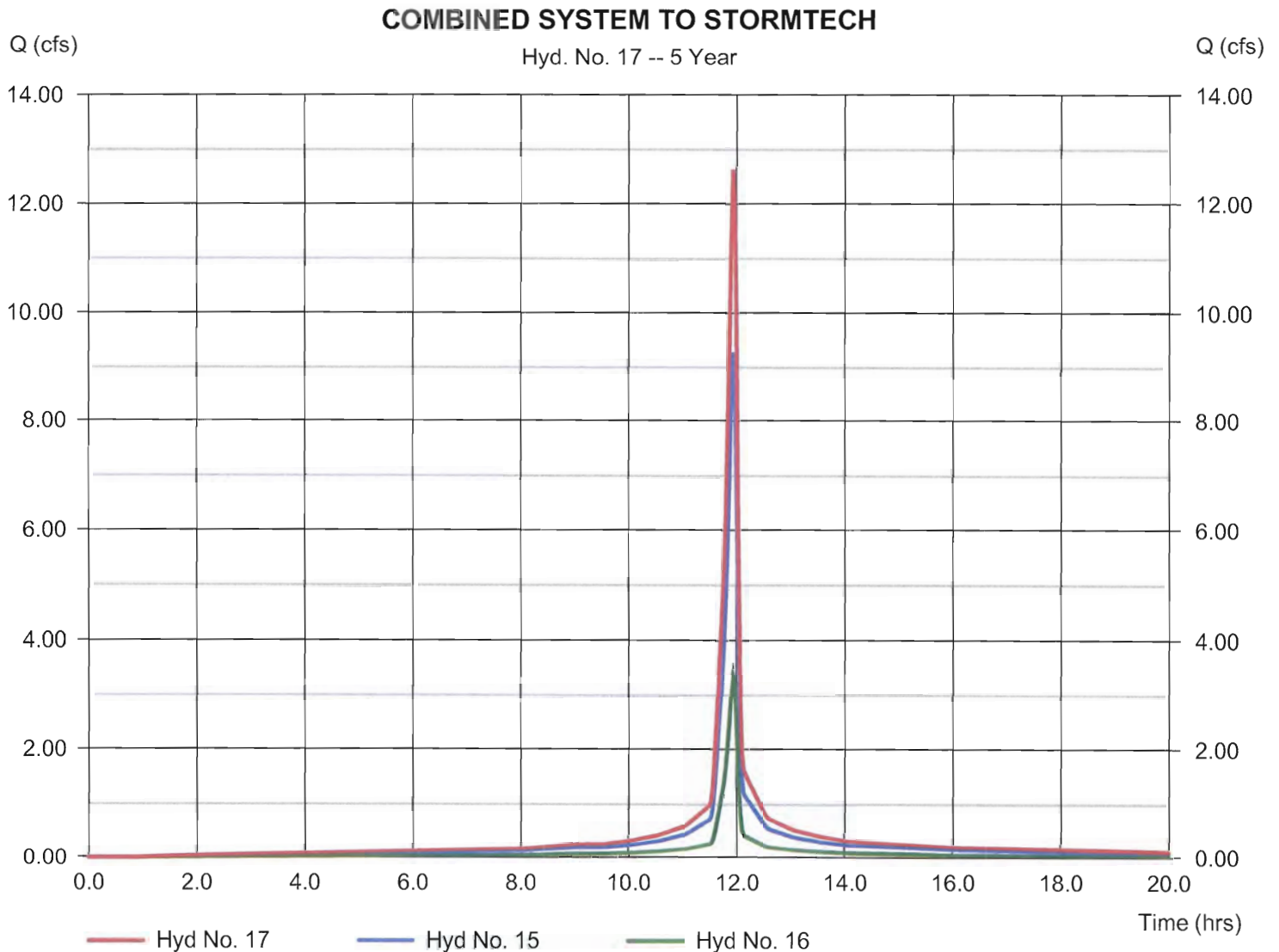
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 12.64 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.690 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

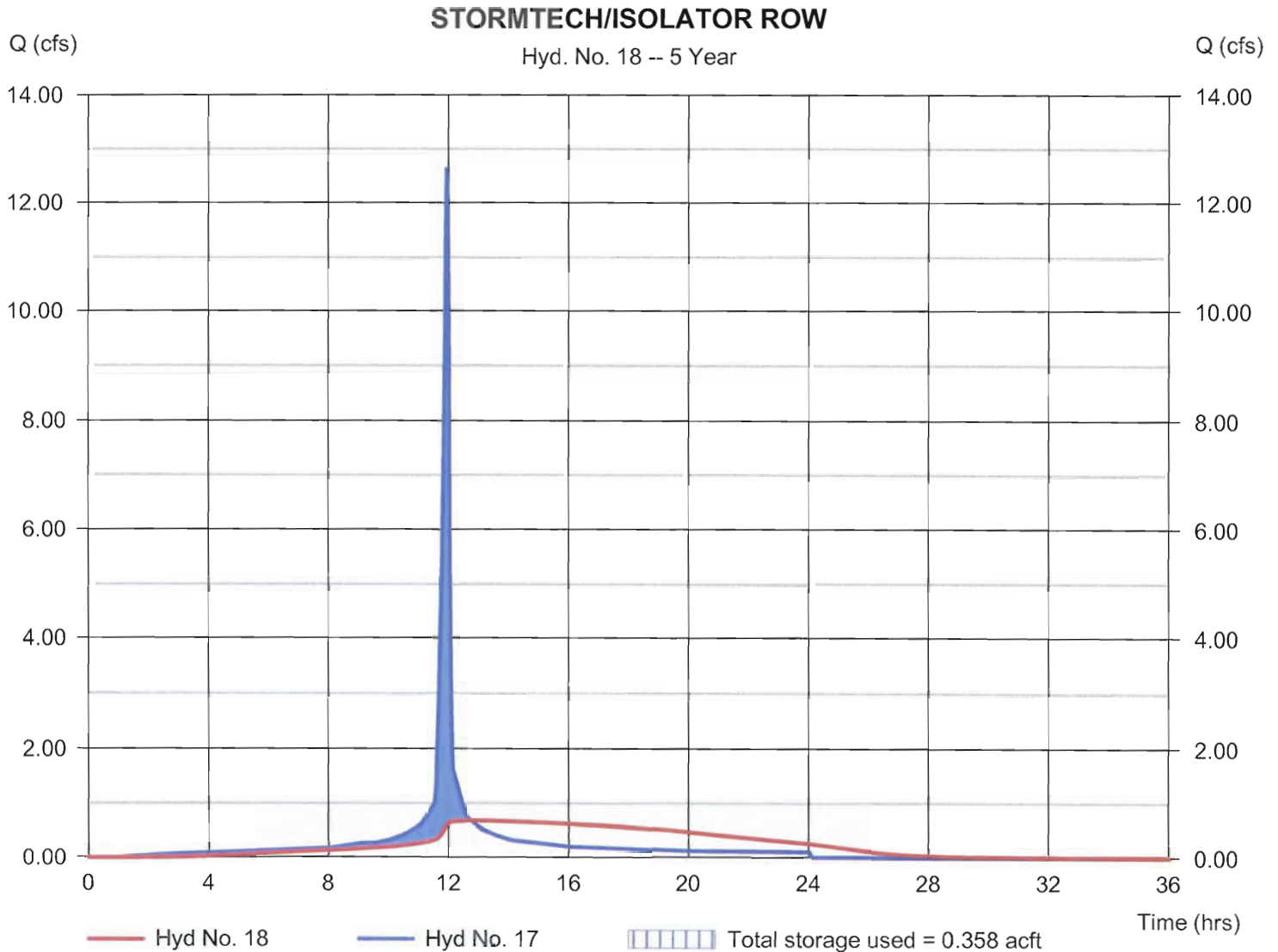
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.687 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.73 hrs
Time interval	= 2 min	Hyd. volume	= 0.689 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Storage Indication	= 1342.84 ft
Reservoir name	= STORMTECH 3500	Max. Storage	= 0.358 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

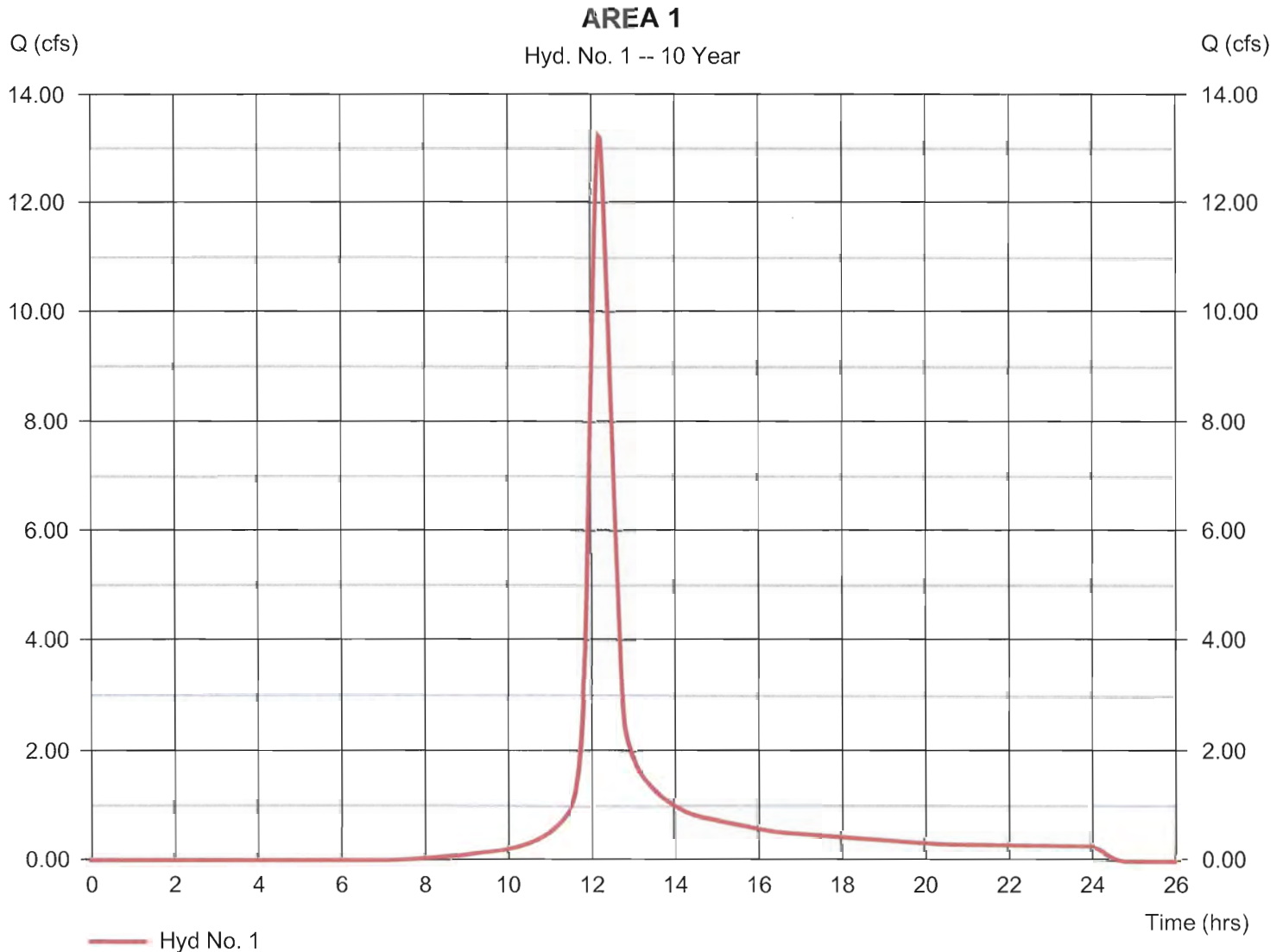
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	13.23	2	732	1.312	-----	-----	-----	AREA 1	
2	SCS Runoff	1.195	2	728	0.101	-----	-----	-----	AREA 2	
3	SCS Runoff	0.997	2	724	0.072	-----	-----	-----	AREA 3	
4	SCS Runoff	3.676	2	716	0.202	-----	-----	-----	AREA 4	
5	SCS Runoff	4.217	2	716	0.199	-----	-----	-----	AREA 5	
6	SCS Runoff	2.109	2	716	0.099	-----	-----	-----	AREA 6	
7	SCS Runoff	1.459	2	734	0.152	-----	-----	-----	AREA 7	
8	SCS Runoff	0.044	2	914	0.035	-----	-----	-----	AREA A	
9	SCS Runoff	0.566	2	716	0.031	-----	-----	-----	AREA B	
10	SCS Runoff	2.404	2	716	0.132	-----	-----	-----	AREA D	
11	SCS Runoff	0.990	2	716	0.054	-----	-----	-----	AREA C	
12	SCS Runoff	3.323	2	716	0.182	-----	-----	-----	AREA E	
13	SCS Runoff	2.262	2	716	0.124	-----	-----	-----	AREA F	
14	SCS Runoff	1.202	2	716	0.066	-----	-----	-----	AREA G	
15	Combine	10.75	2	716	0.589	9, 10, 11, 12, 13, 14	-----	-----	STORMTECH AREA	
16	SCS Runoff	3.888	2	716	0.213	-----	-----	-----	AREA H	
17	Combine	14.63	2	716	0.803	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE	
18	Reservoir	0.729	2	772	0.802	17	1343.18	0.422	STORMTECH/ISOLATOR ROW	
13TH AND MAIZE 3.16.12.gpw					Return Period: 10 Year			Friday, 00 6, 2012		

# Hydrograph Report

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 13.23 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 1.312 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

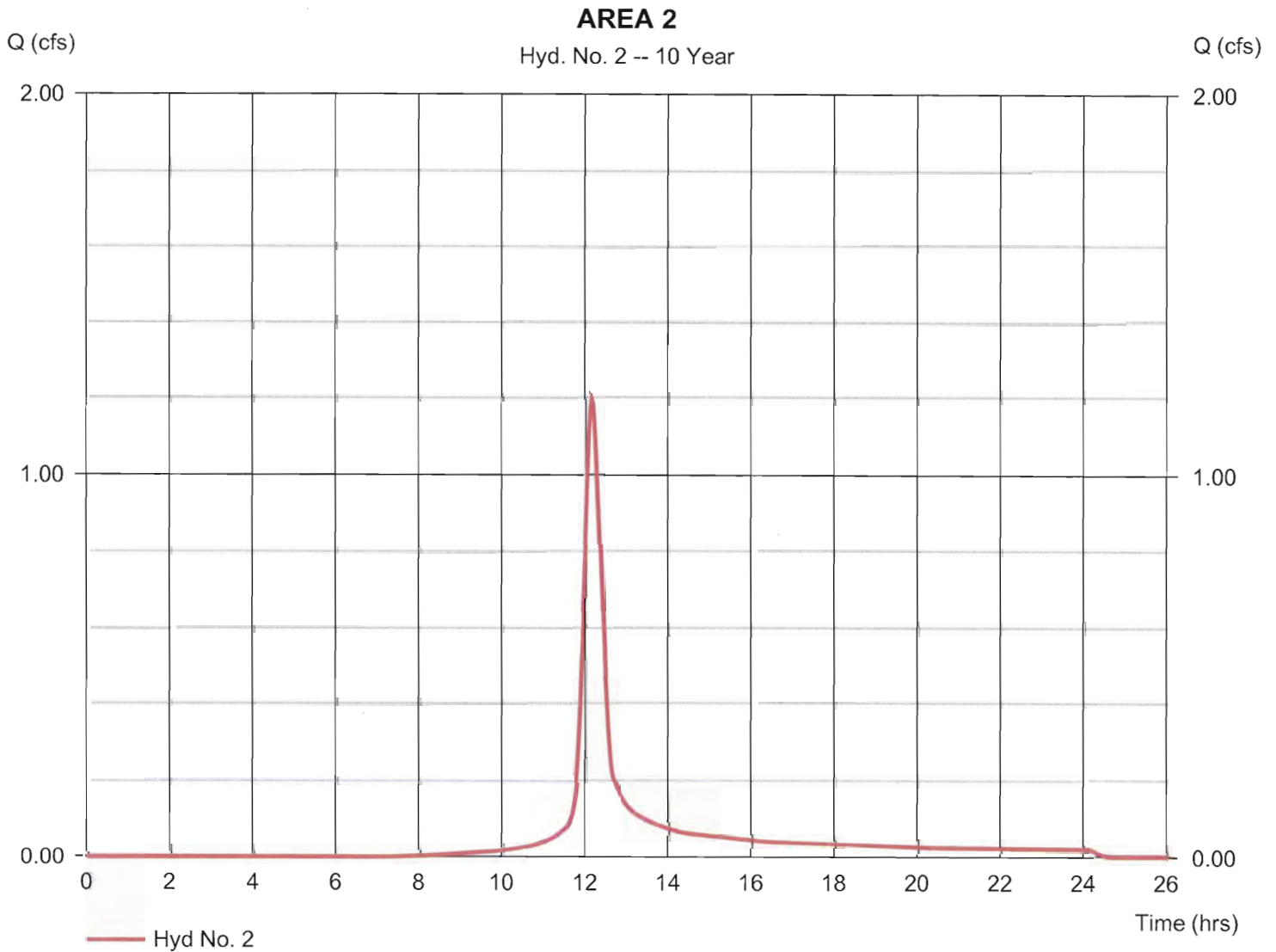


# Hydrograph Report

## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.195 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.101 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

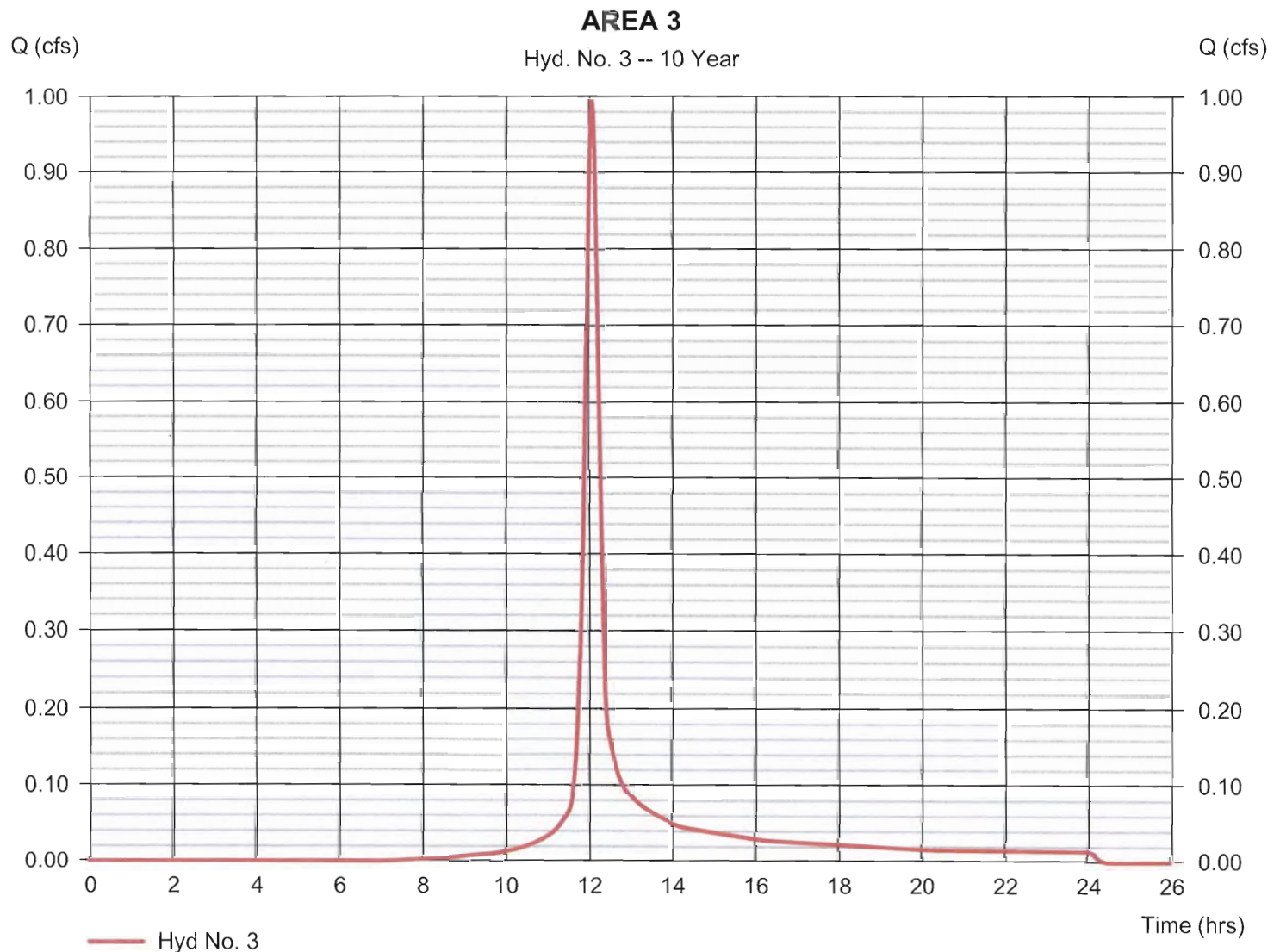
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Friday, 00 6, 2012

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.997 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.072 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

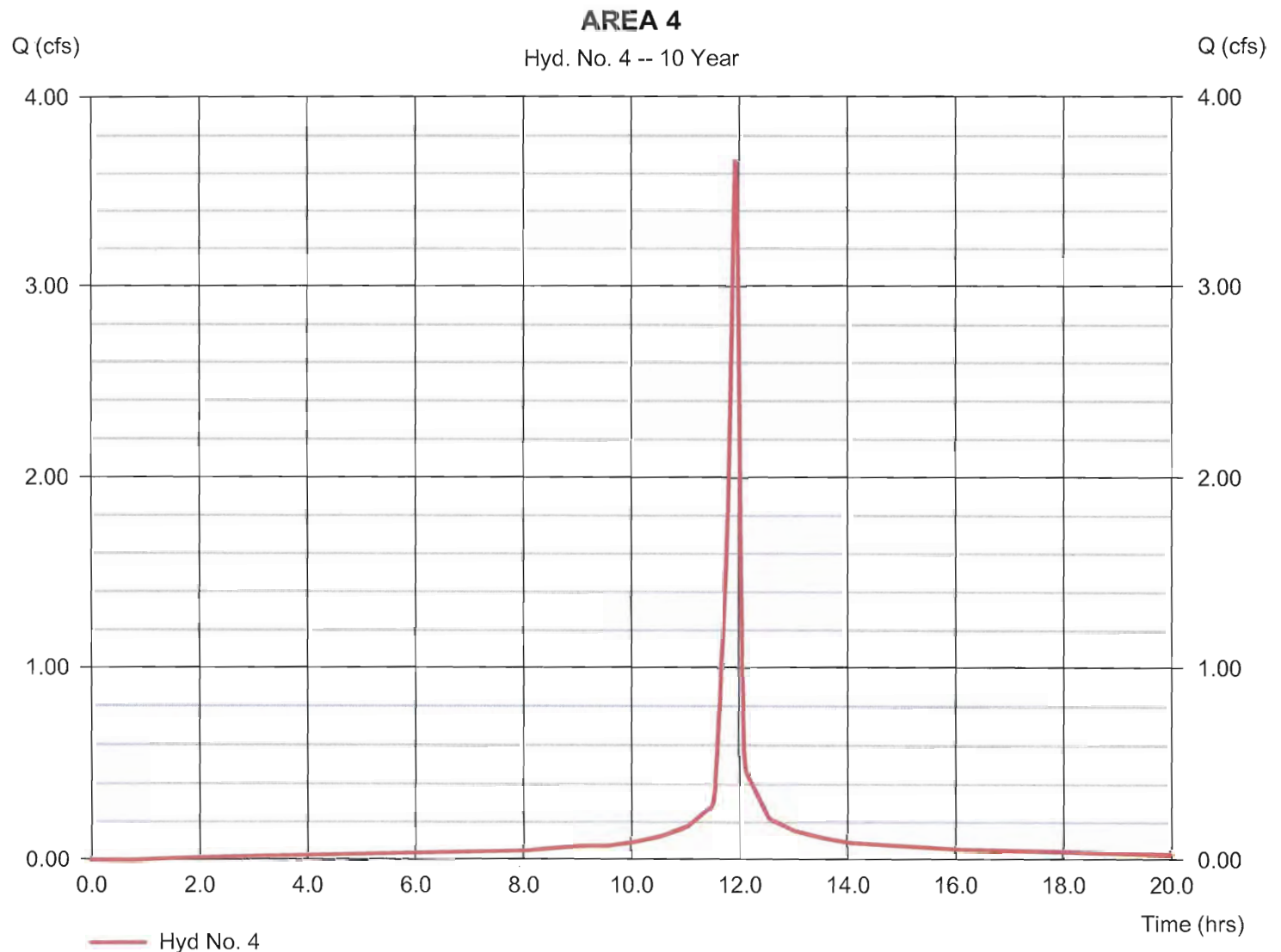
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 3.676 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.202 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

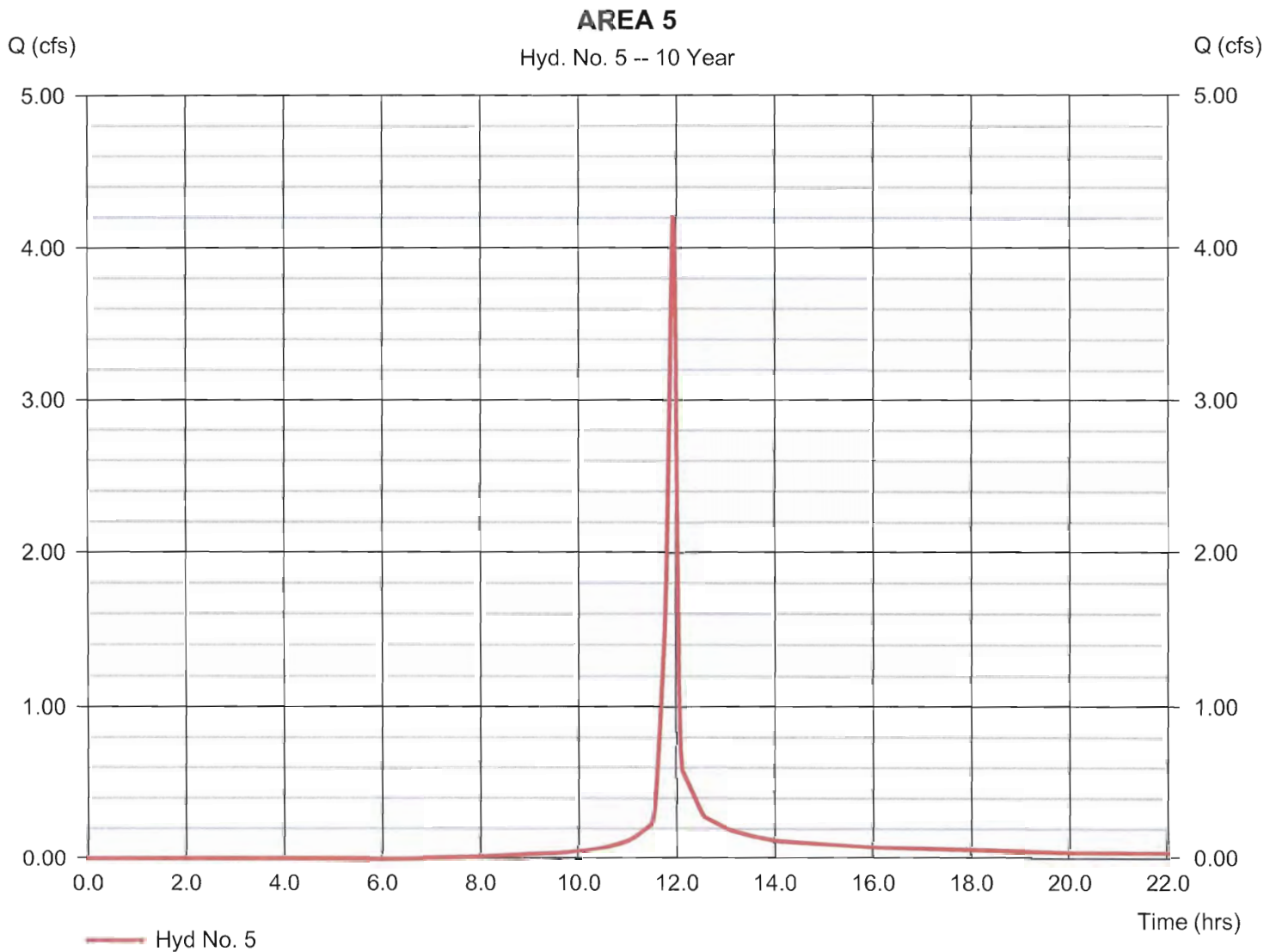
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 4.217 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.199 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

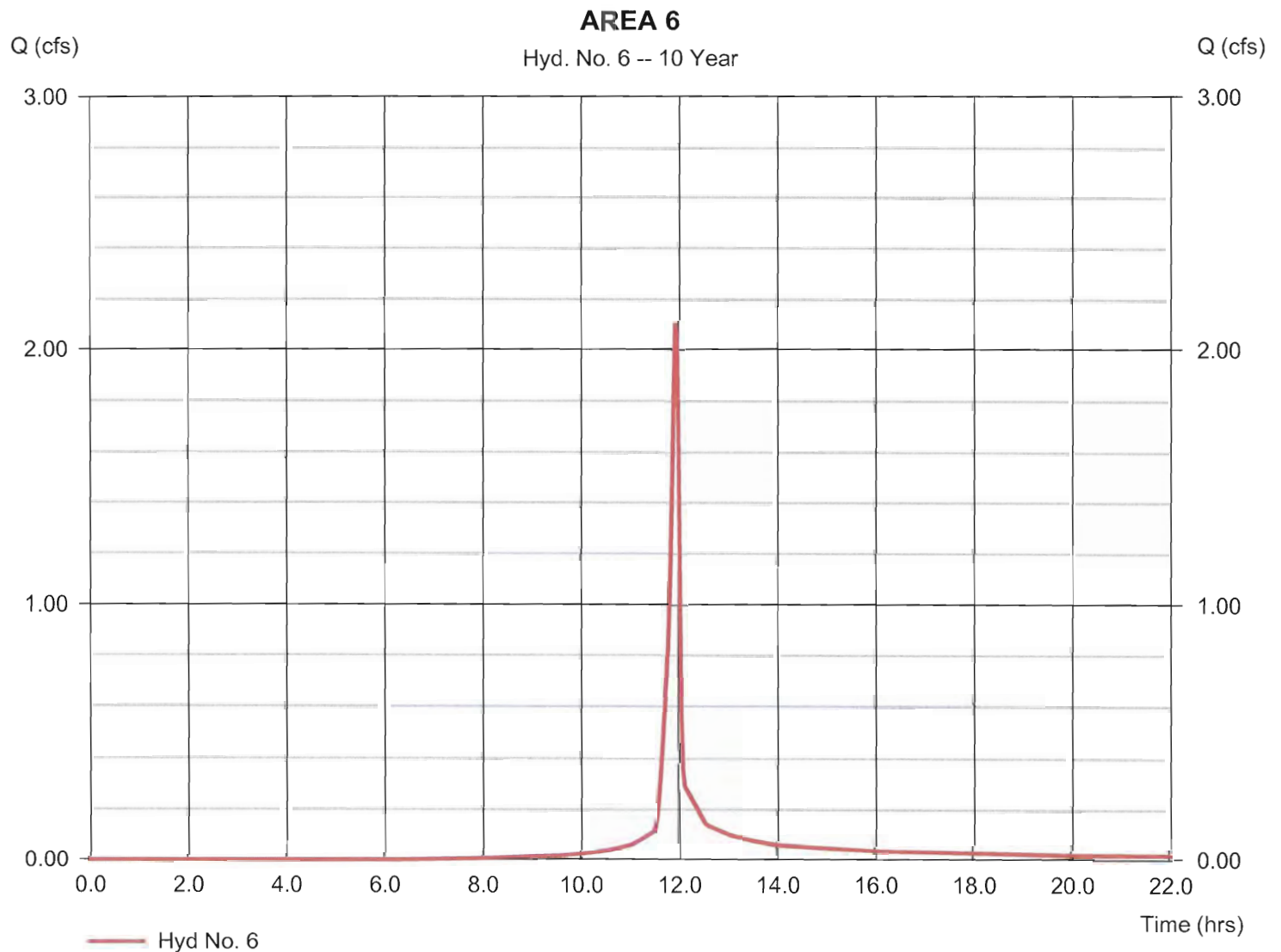
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 2.109 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.099 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

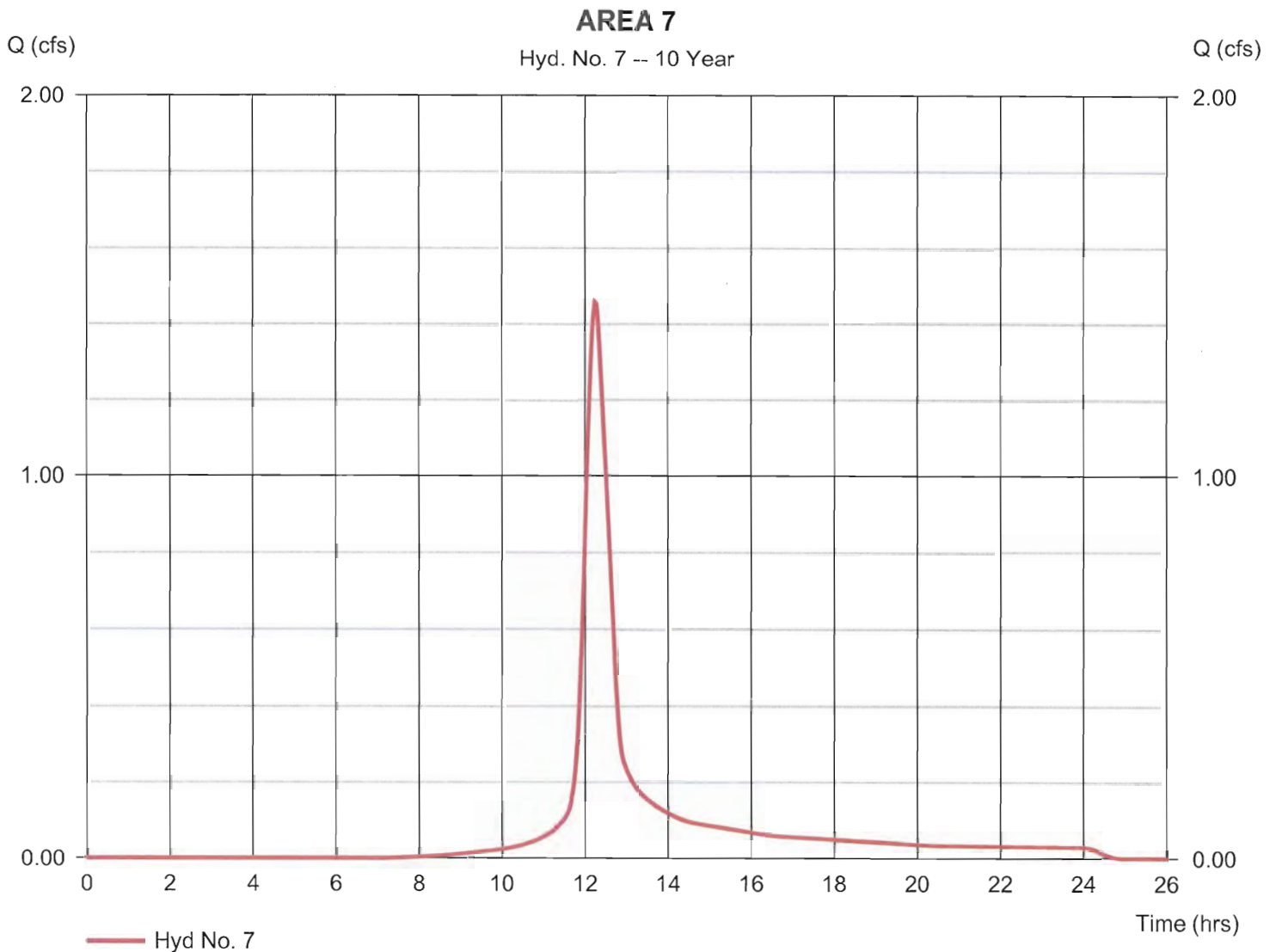


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 1.459 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.152 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

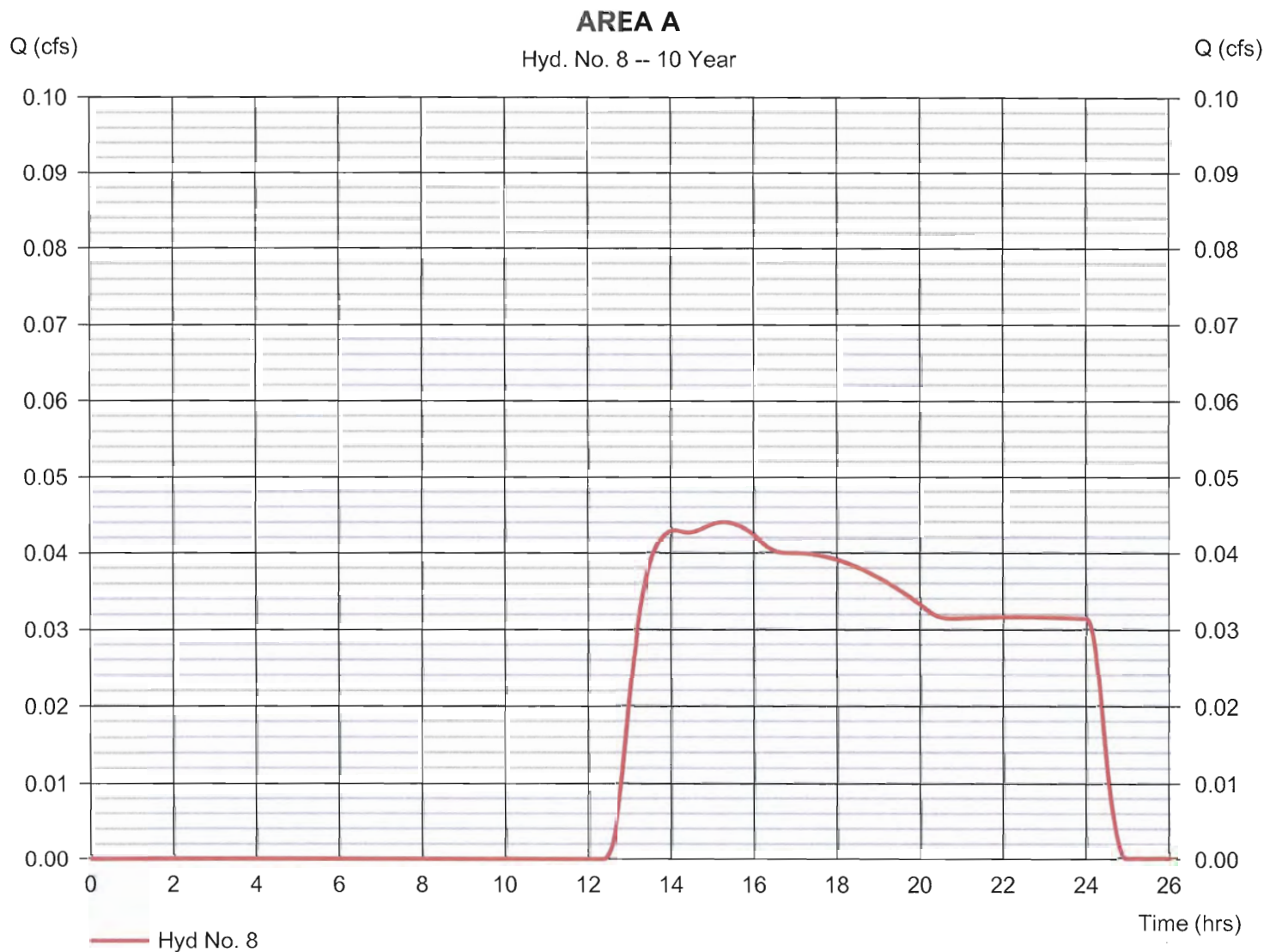


# Hydrograph Report

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.044 cfs
Storm frequency	= 10 yrs	Time to peak	= 15.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.035 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

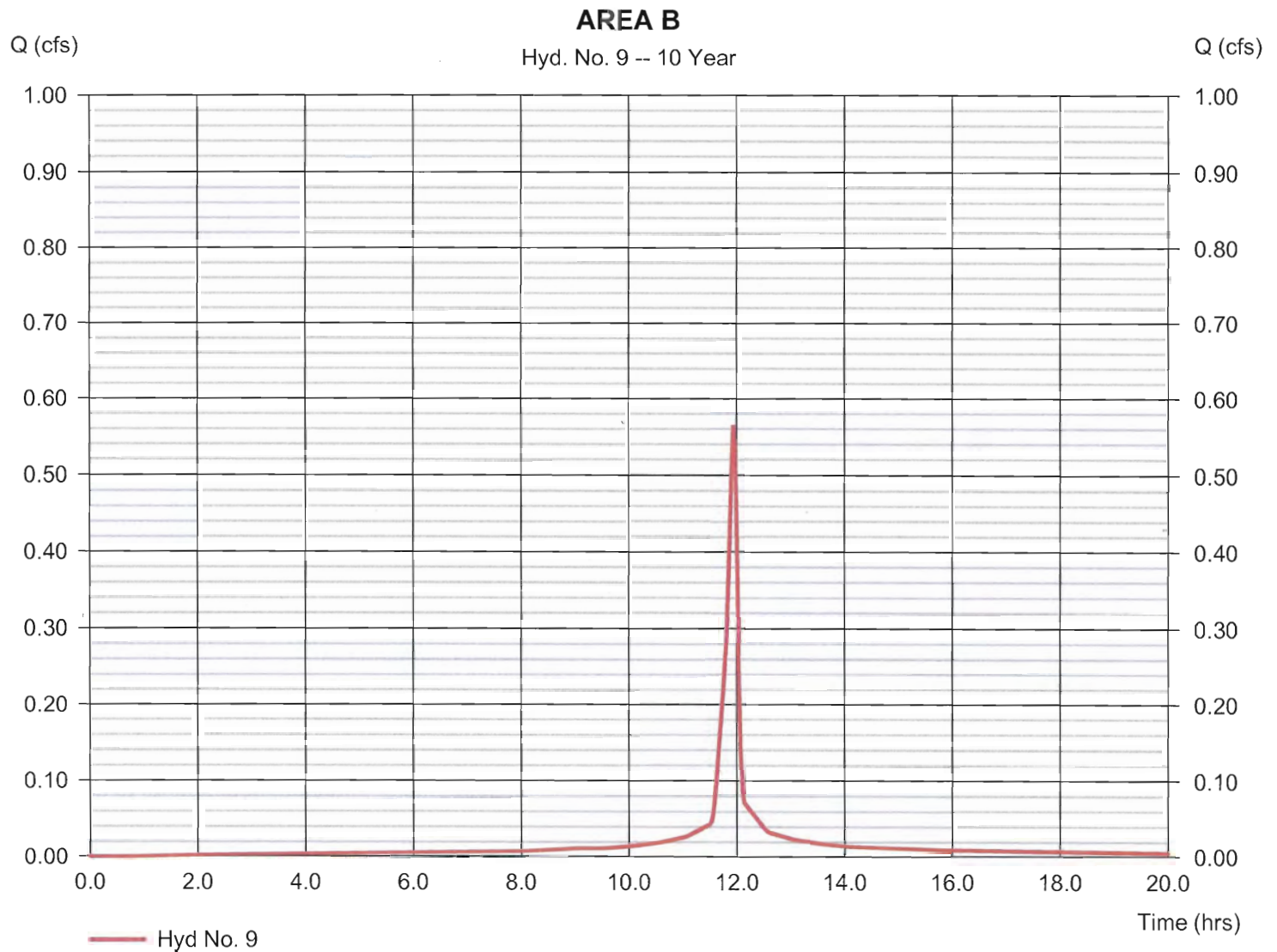
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.566 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.031 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

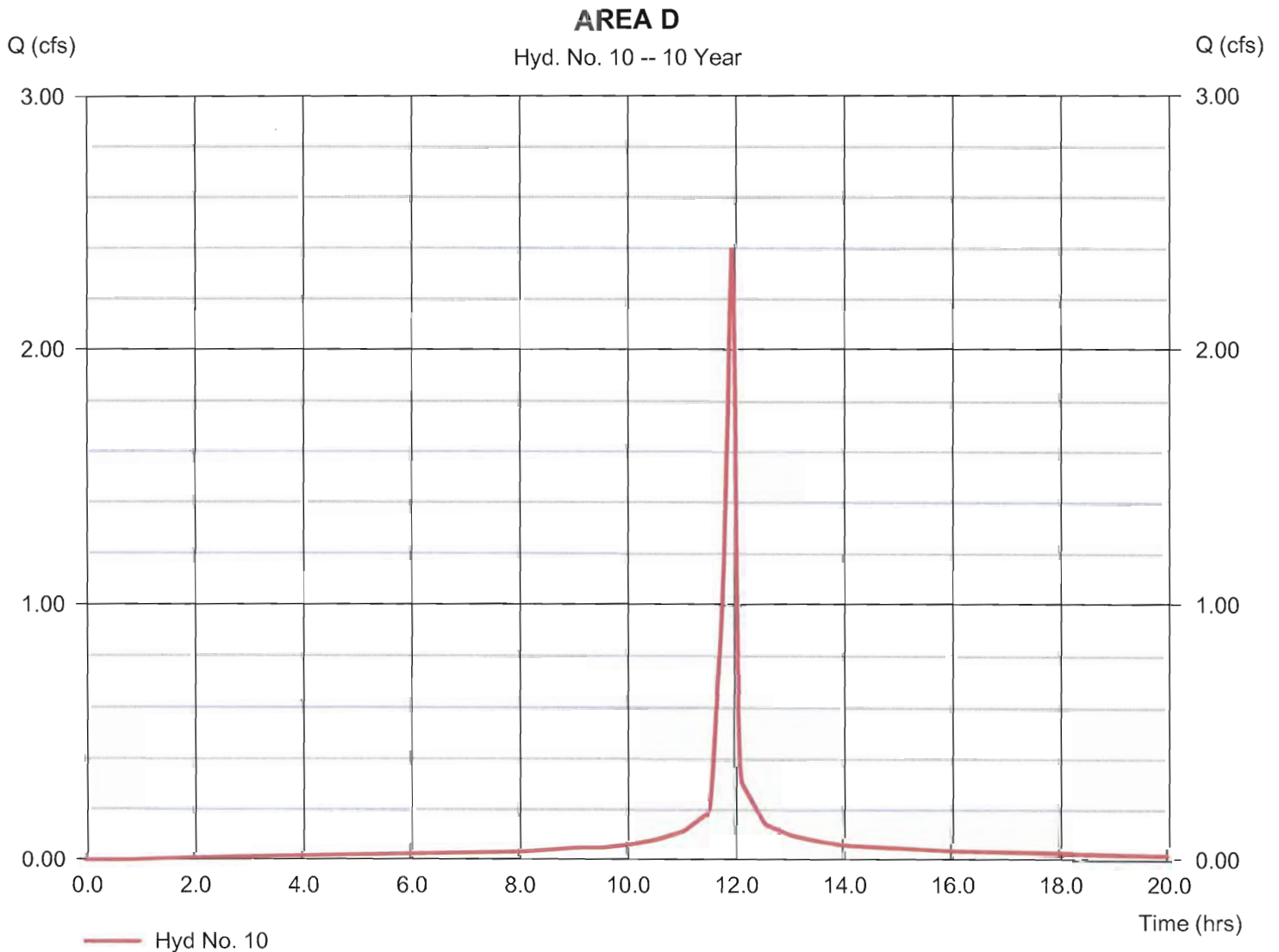
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 2.404 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.132 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

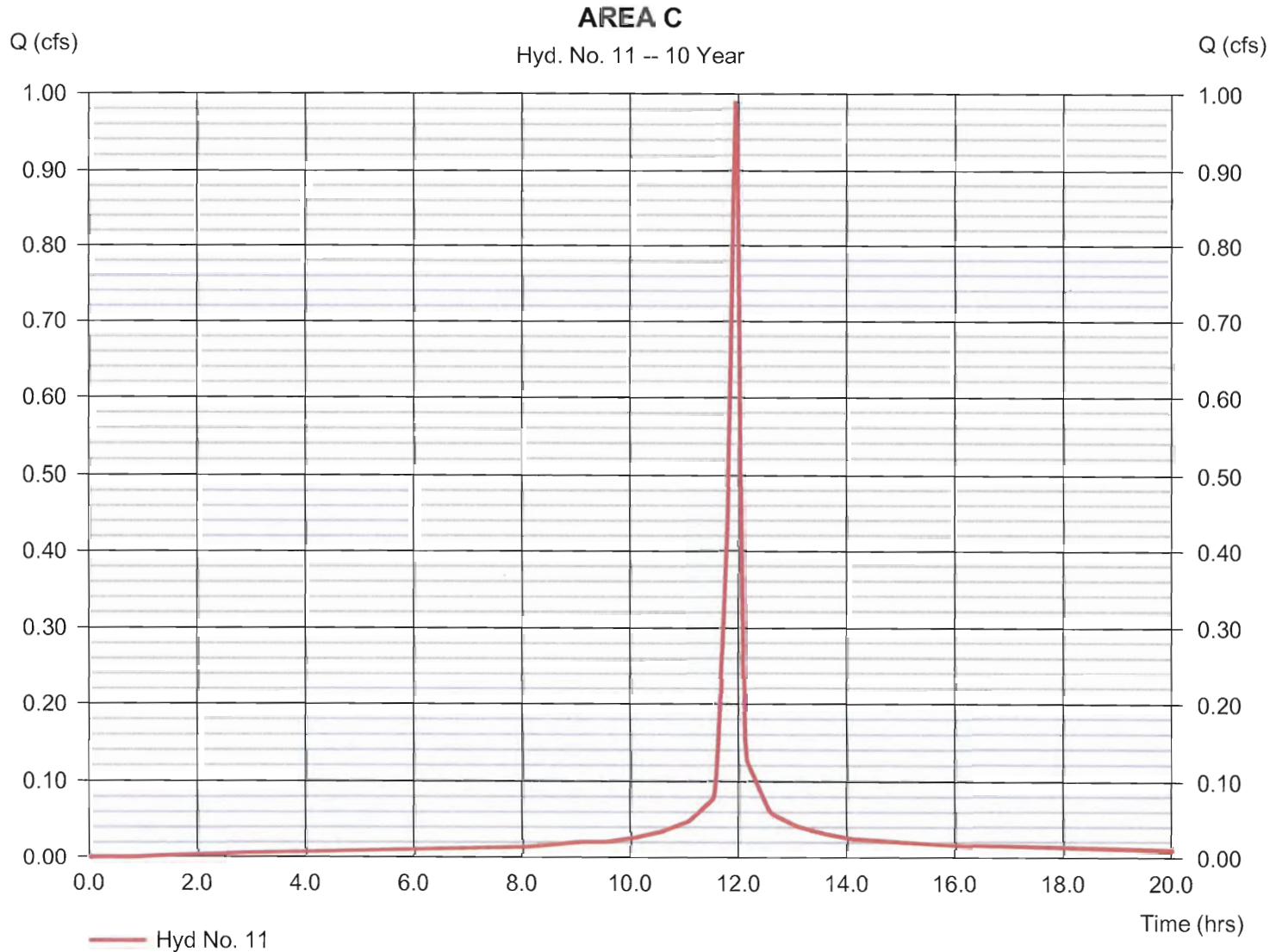


# Hydrograph Report

## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.990 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.054 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

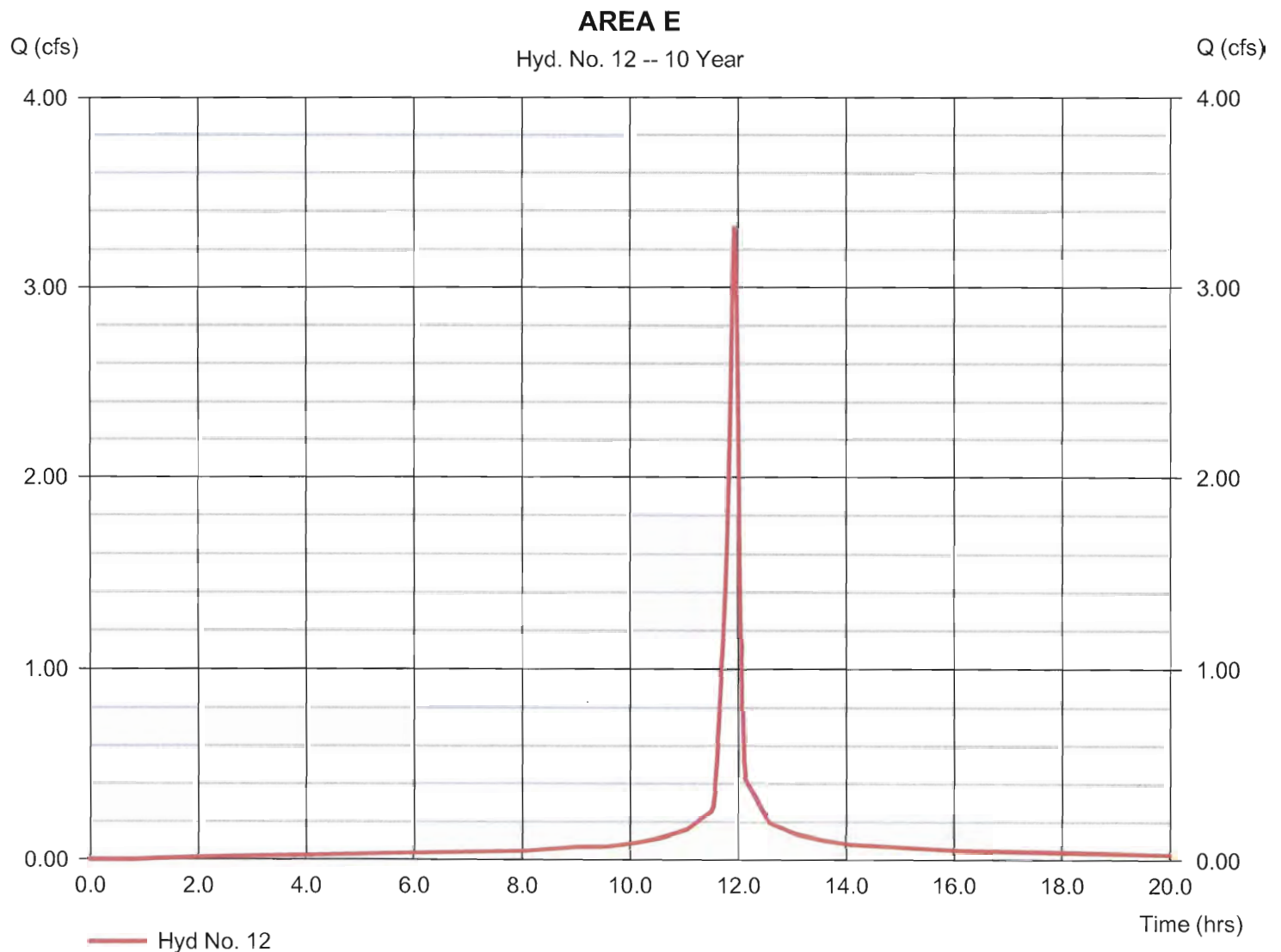
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 3.323 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.182 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

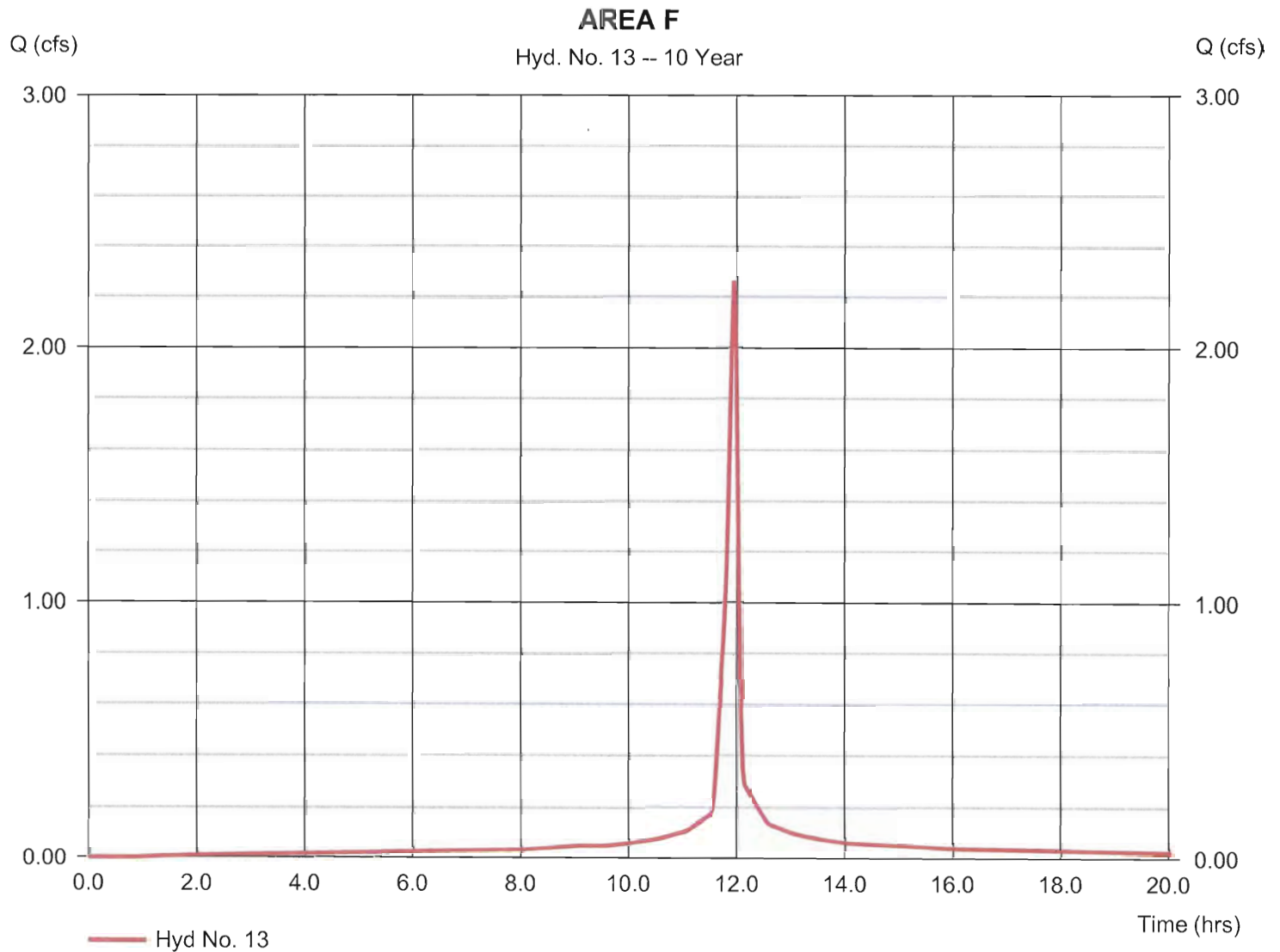


# Hydrograph Report

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 2.262 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.124 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

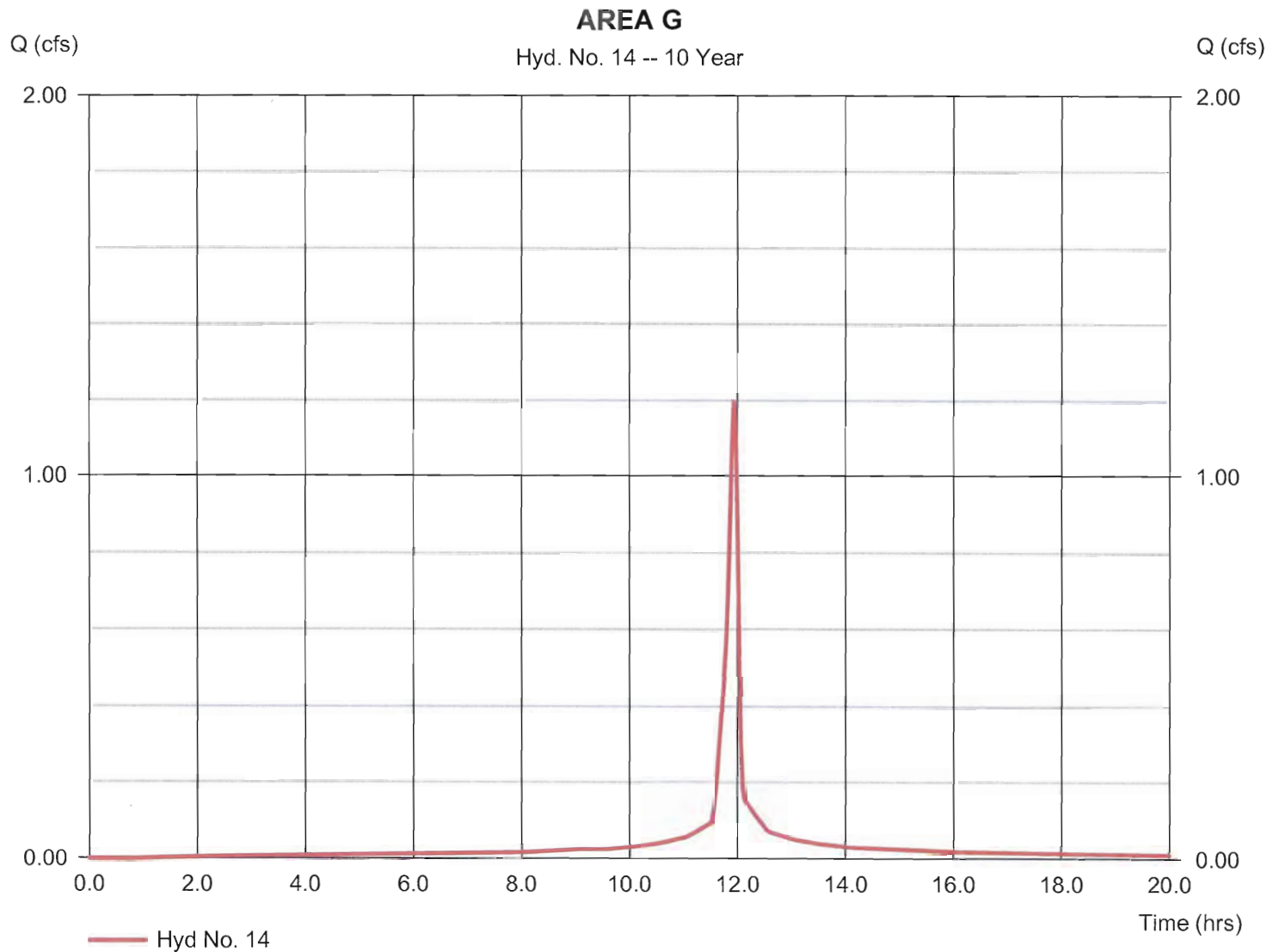
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 1.202 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.066 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

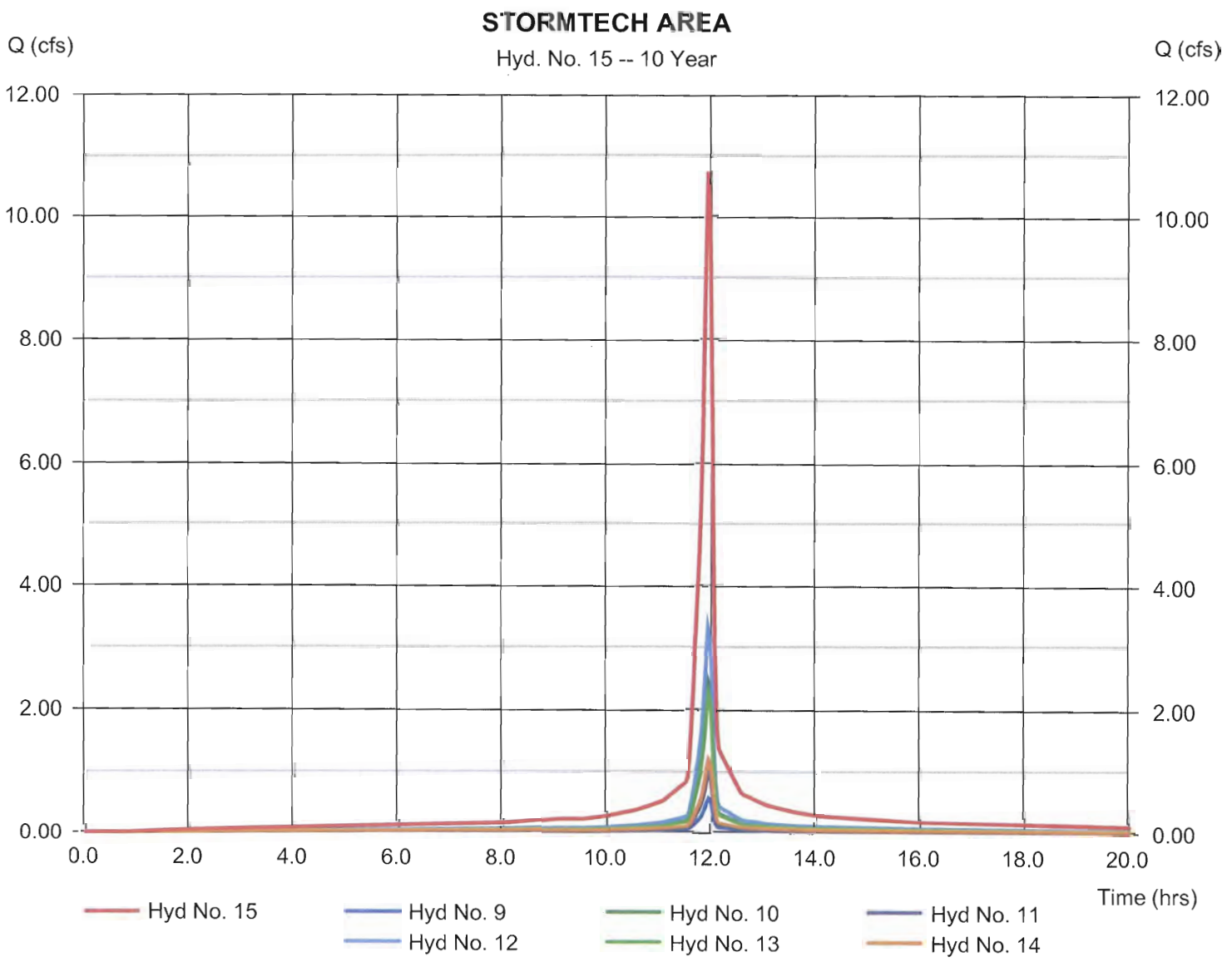
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Friday, 00 6, 2012

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 10.75 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.589 acft
Inflow hyds.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac

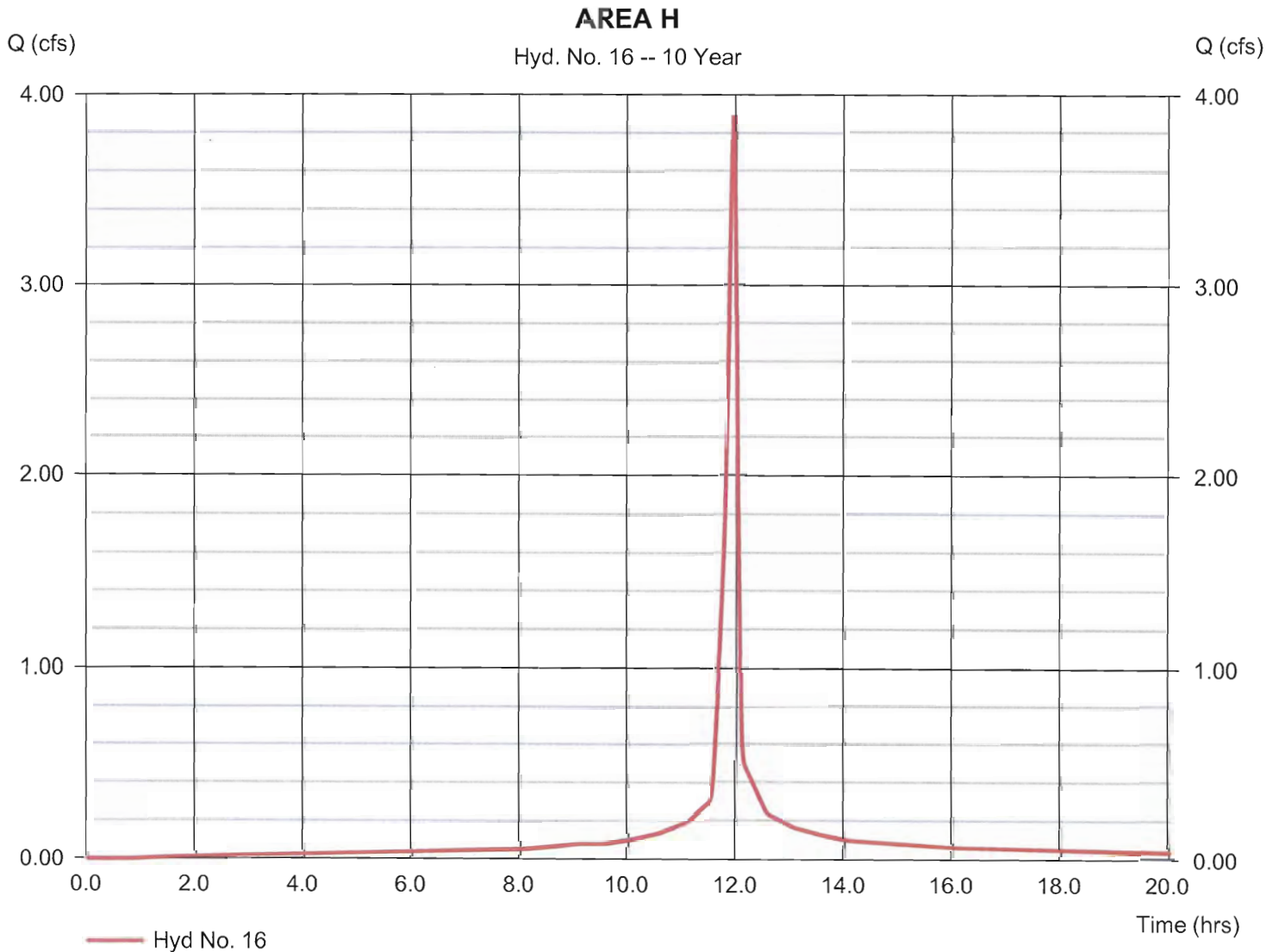


# Hydrograph Report

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 3.888 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.213 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

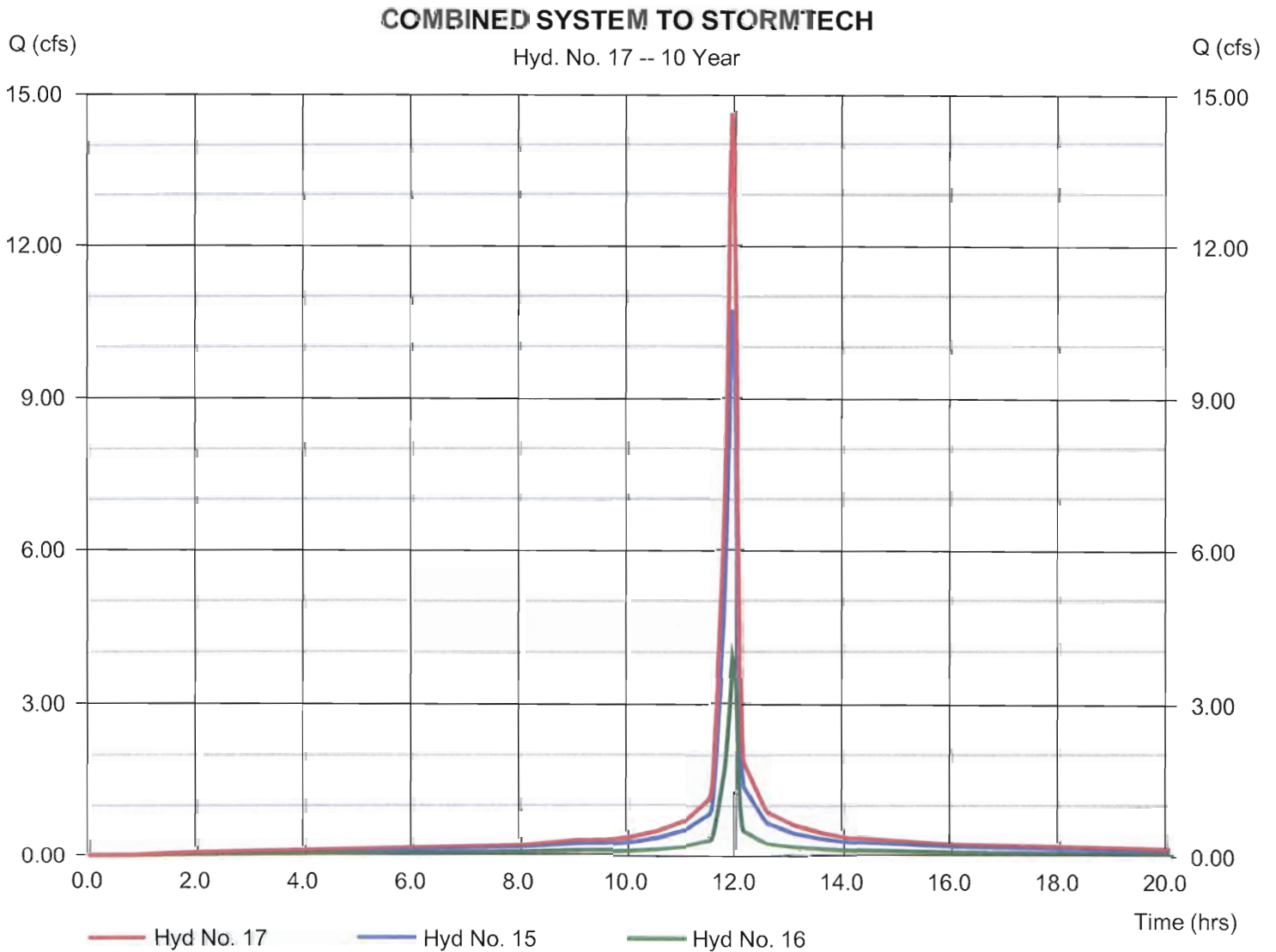


# Hydrograph Report

## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 14.63 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.803 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

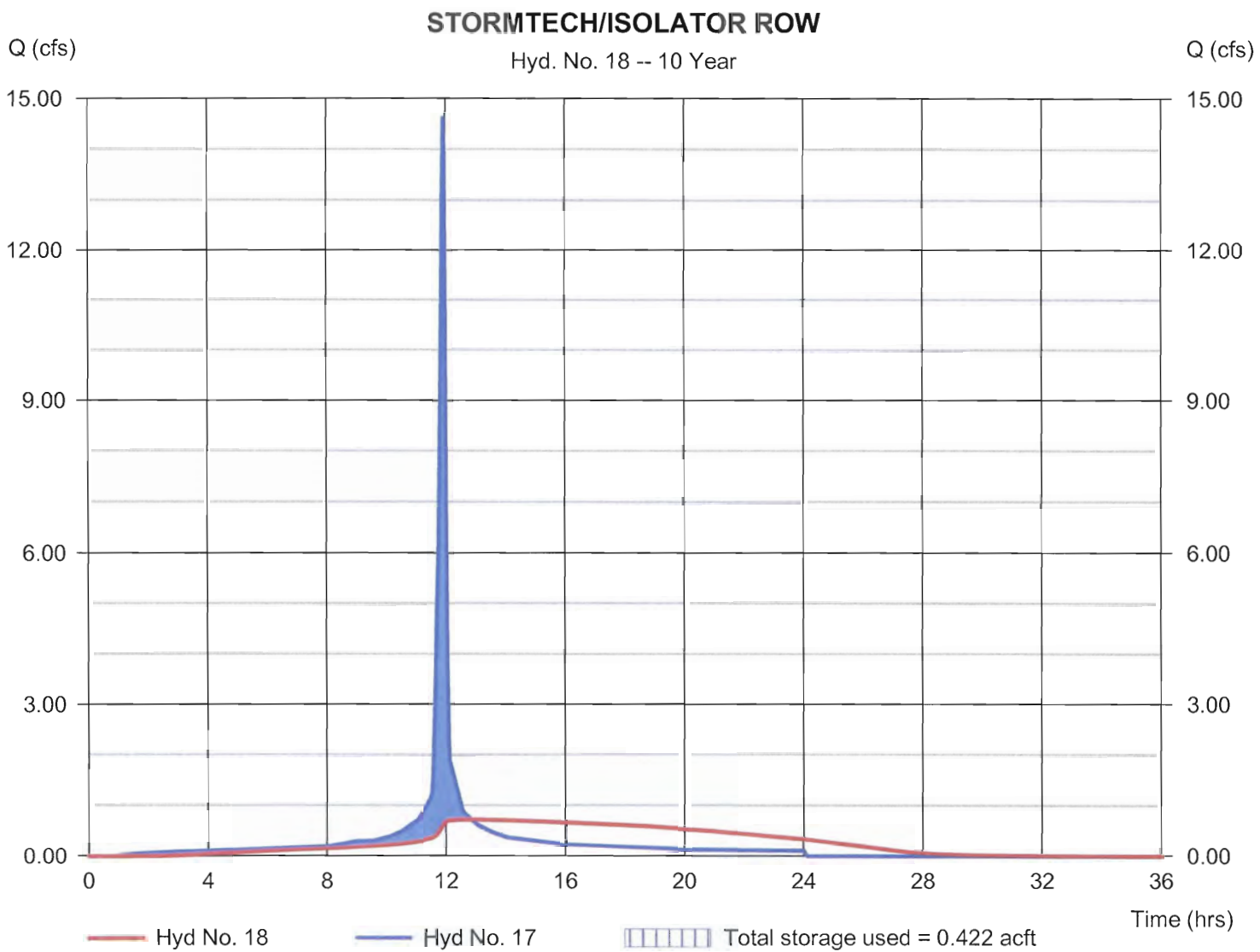
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.729 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.87 hrs
Time interval	= 2 min	Hyd. volume	= 0.802 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. elevation	= 1343.18 ft
Reservoir name	= STORMTECH 3500	Max. Storage	= 0.422 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	16.69	2	732	1.656	----	----	----	AREA 1	
2	SCS Runoff	1.506	2	728	0.127	----	----	----	AREA 2	
3	SCS Runoff	1.254	2	724	0.090	----	----	----	AREA 3	
4	SCS Runoff	4.318	2	716	0.238	----	----	----	AREA 4	
5	SCS Runoff	5.229	2	716	0.249	----	----	----	AREA 5	
6	SCS Runoff	2.614	2	716	0.124	----	----	----	AREA 6	
7	SCS Runoff	1.840	2	734	0.191	----	----	----	AREA 7	
8	SCS Runoff	0.184	2	764	0.086	----	----	----	AREA A	
9	SCS Runoff	0.664	2	716	0.037	----	----	----	AREA B	
10	SCS Runoff	2.823	2	716	0.156	----	----	----	AREA D	
11	SCS Runoff	1.163	2	716	0.064	----	----	----	AREA C	
12	SCS Runoff	3.903	2	716	0.215	----	----	----	AREA E	
13	SCS Runoff	2.657	2	716	0.147	----	----	----	AREA F	
14	SCS Runoff	1.412	2	716	0.078	----	----	----	AREA G	
15	Combine	12.62	2	716	0.696	9, 10, 11, 12, 13, 14	----	----	STORMTECH AREA	
16	SCS Runoff	4.567	2	716	0.252	----	----	----	AREA H	
17	Combine	17.19	2	716	0.948	15, 16	----	----	COMBINED SYSTEM TO STORMTE	
18	Reservoir	0.782	2	778	0.947	17	1343.63	0.507	STORMTECH/ISOLATOR ROW	
13TH AND MAIZE 3.16.12.gpw					Return Period: 25 Year			Friday, 00 6, 2012		

# Hydrograph Report

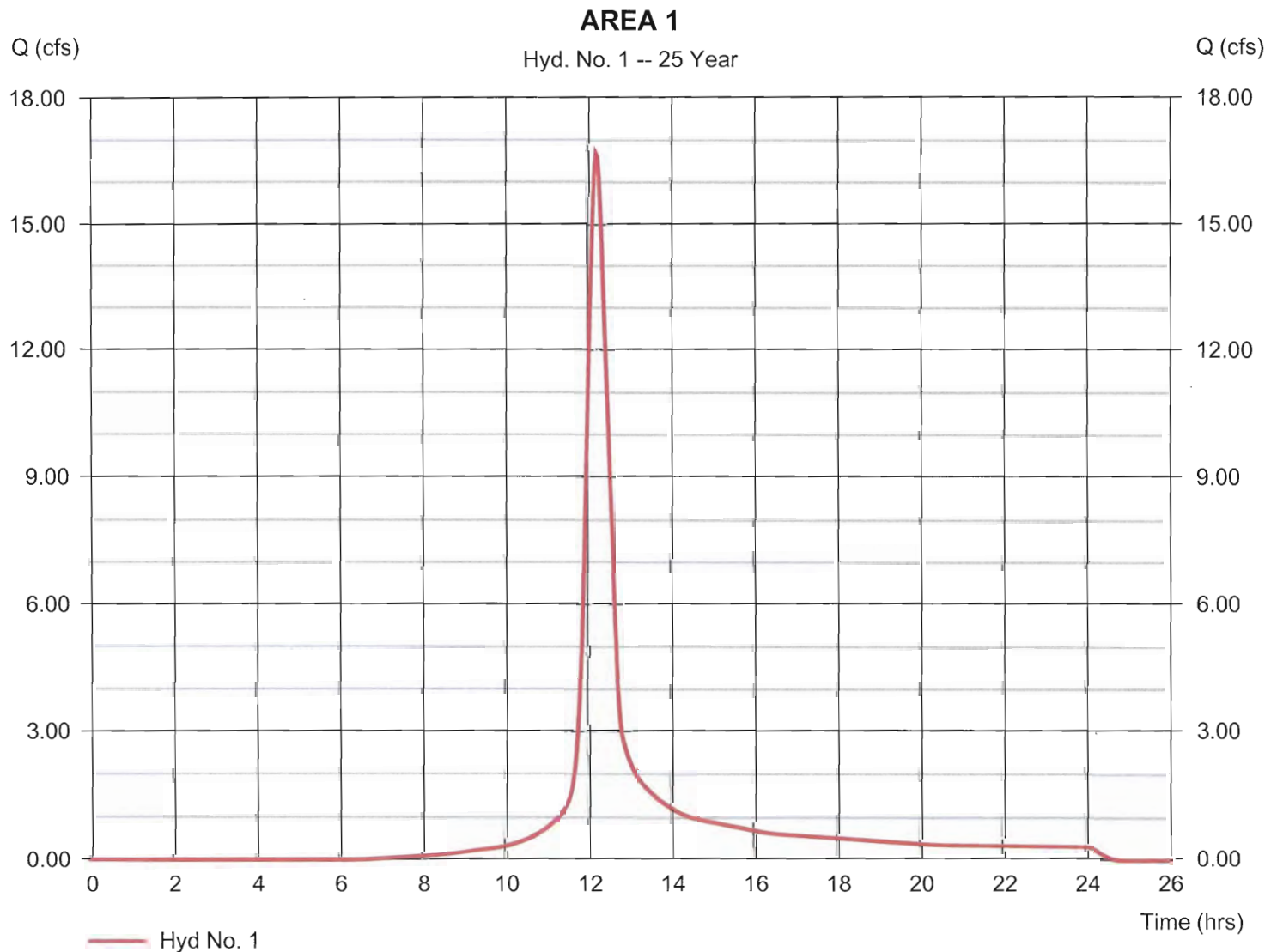
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Friday, 00 6, 2012

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 16.69 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 1.656 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

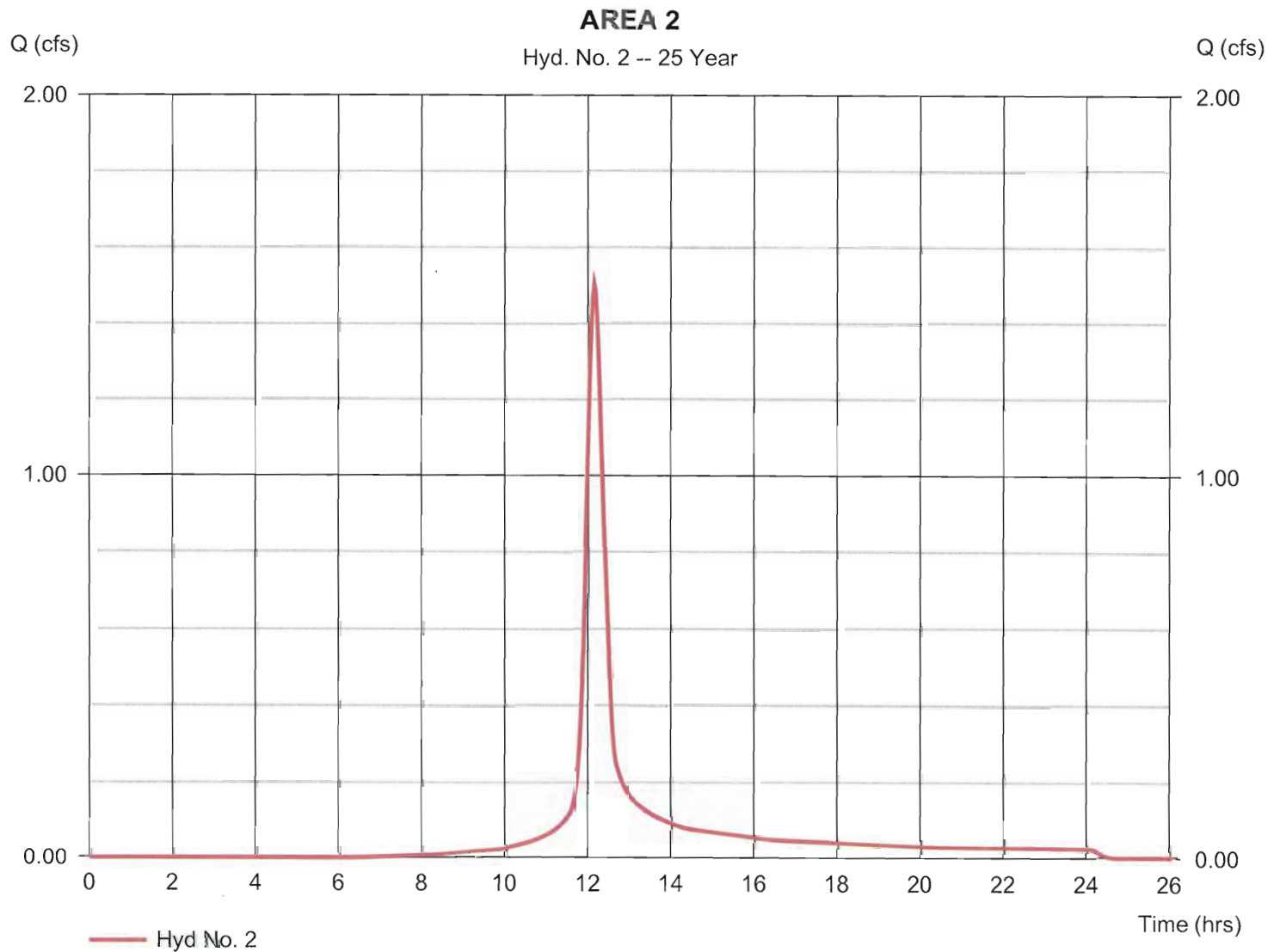


# Hydrograph Report

## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.506 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.127 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

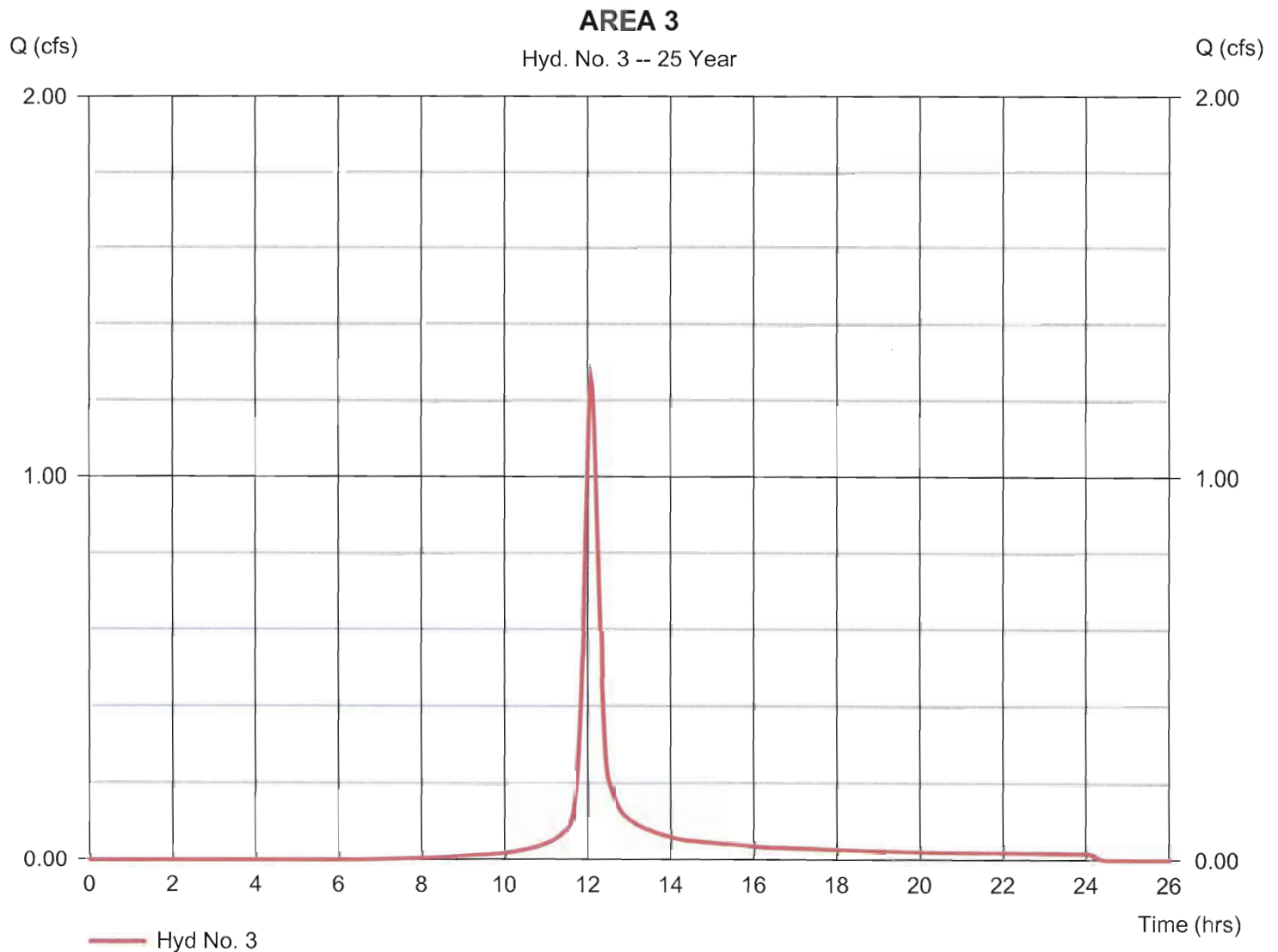
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Friday, 00 6, 2012

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.254 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.090 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

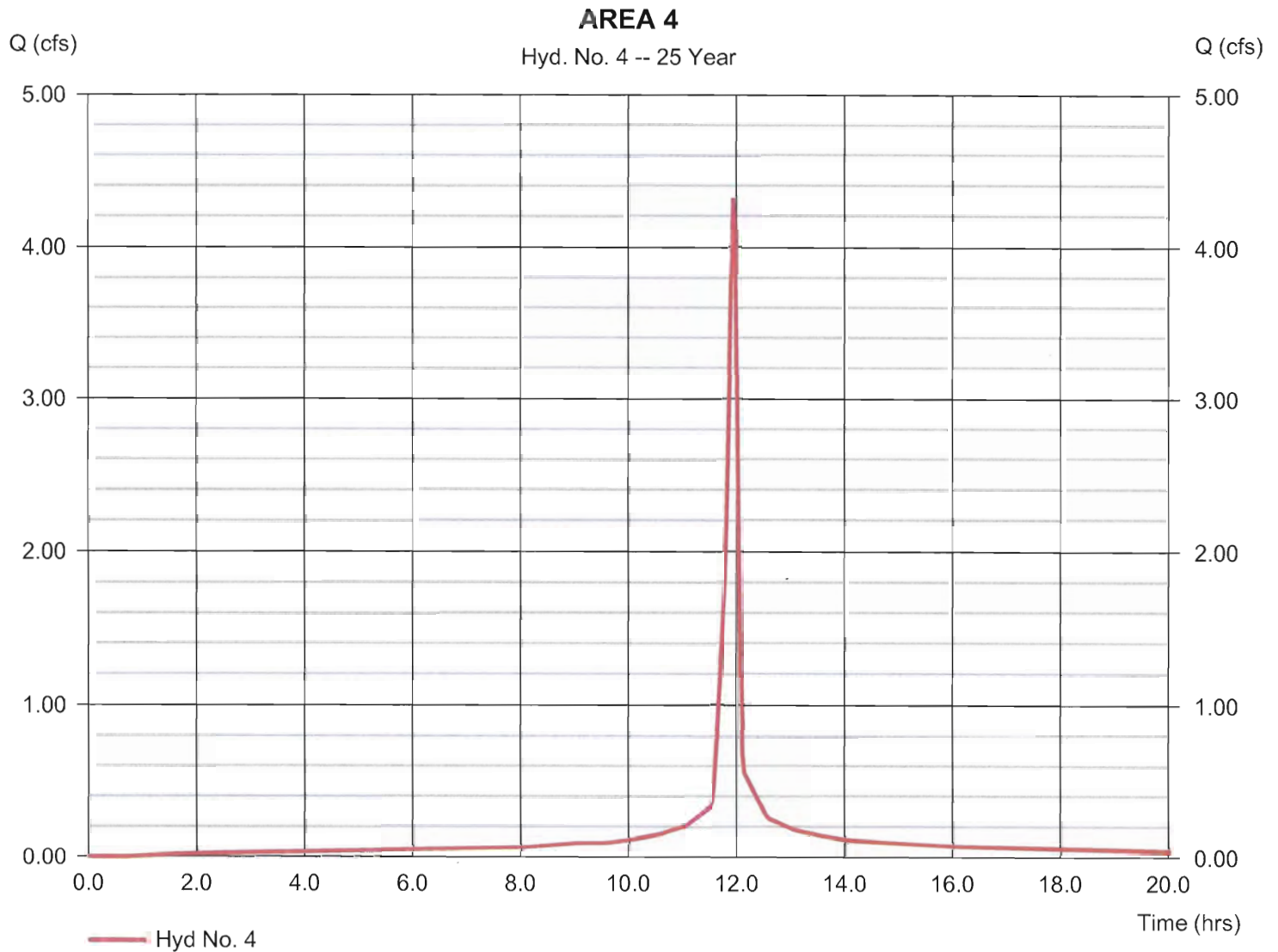


# Hydrograph Report

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.318 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.238 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

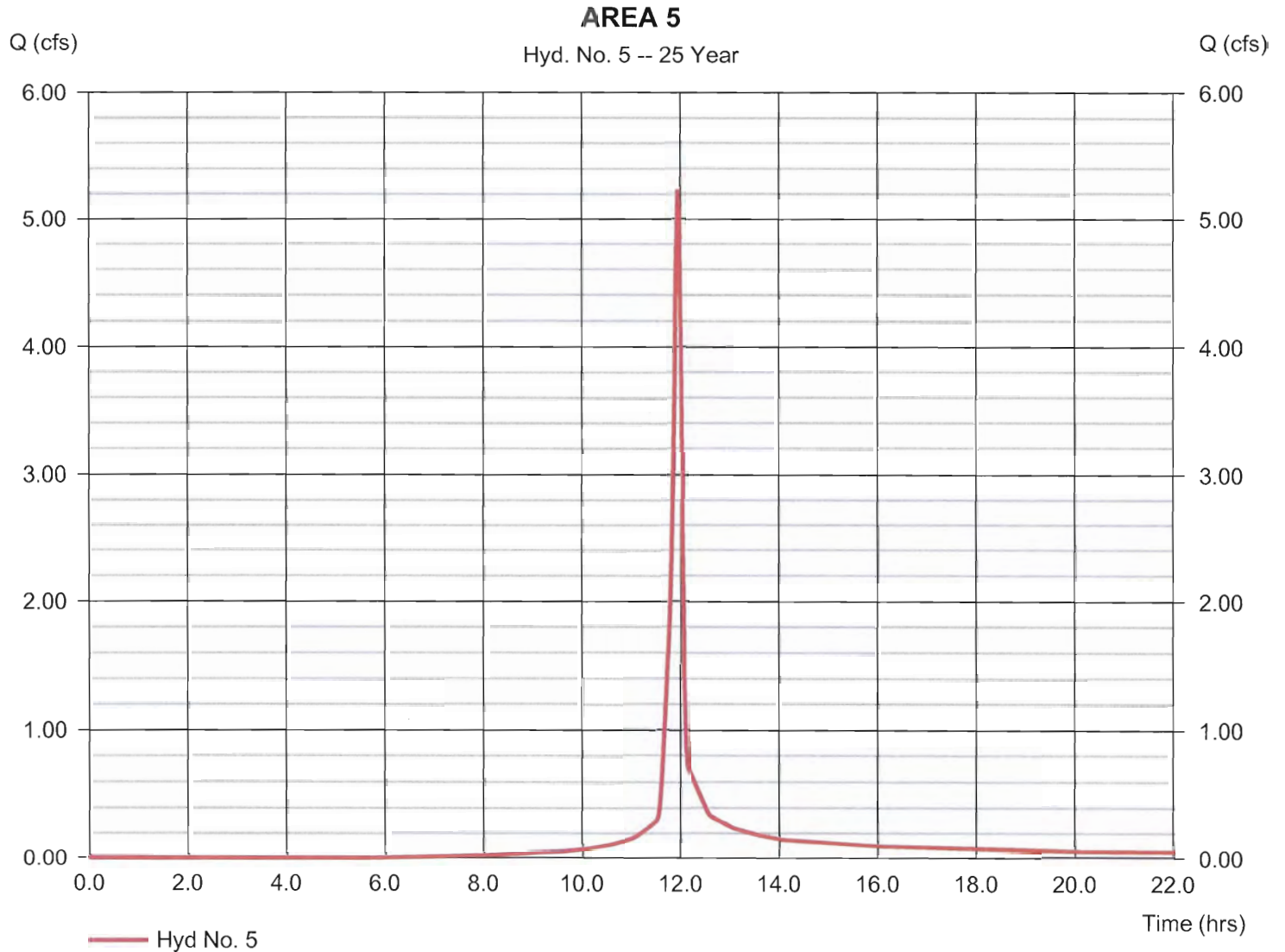


# Hydrograph Report

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 5.229 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.249 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

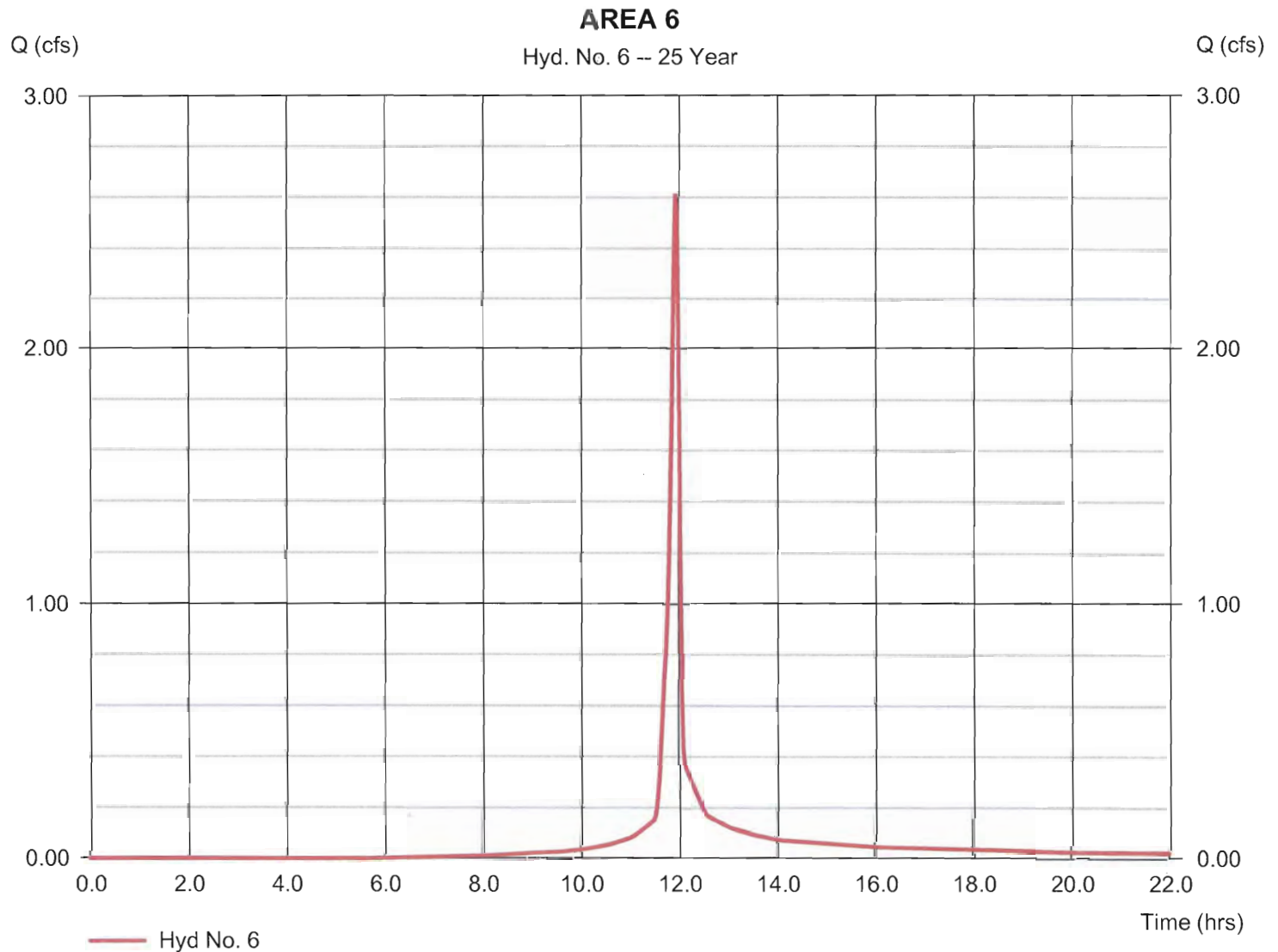
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 2.614 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.124 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

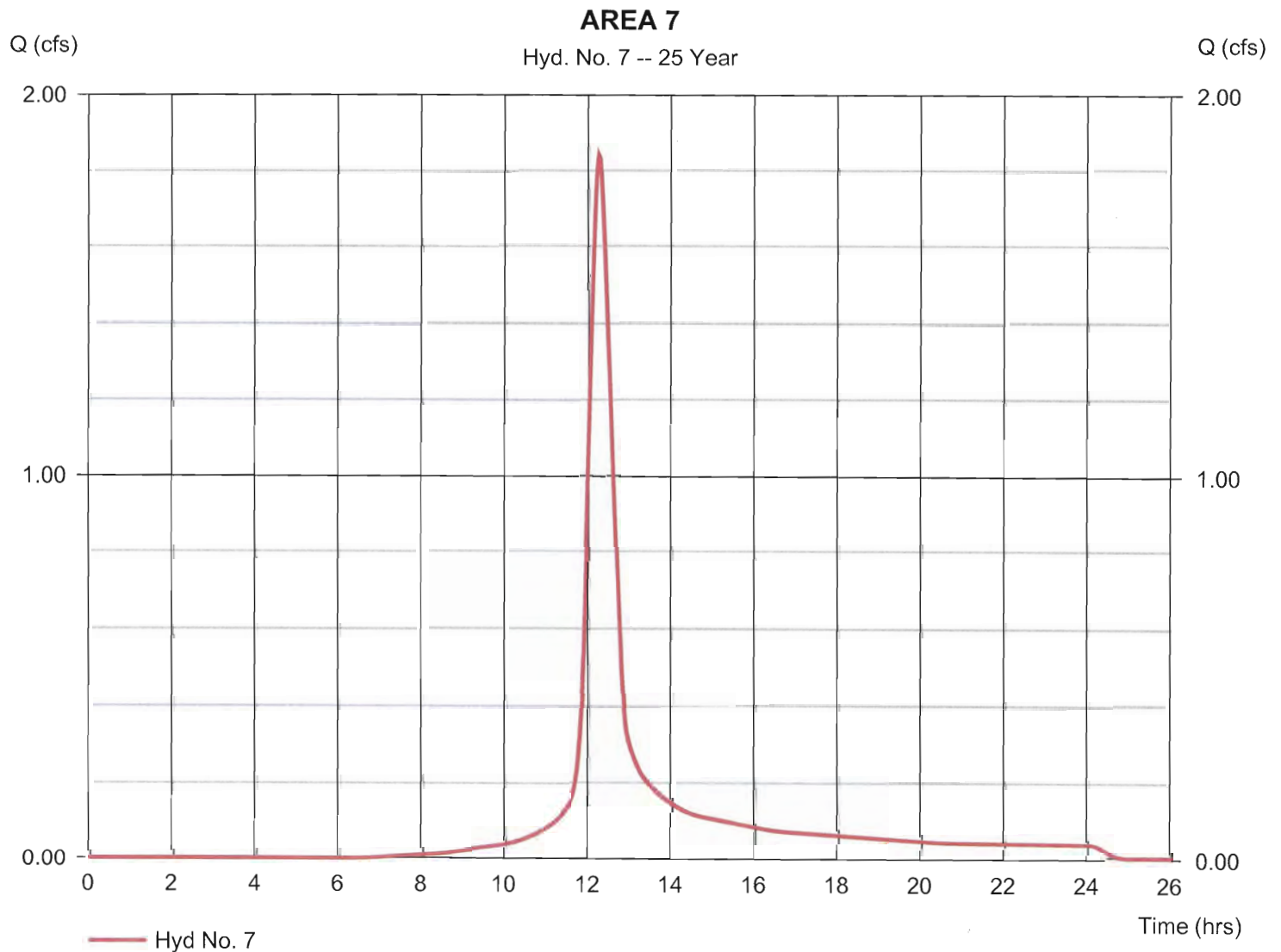
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## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 1.840 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.191 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

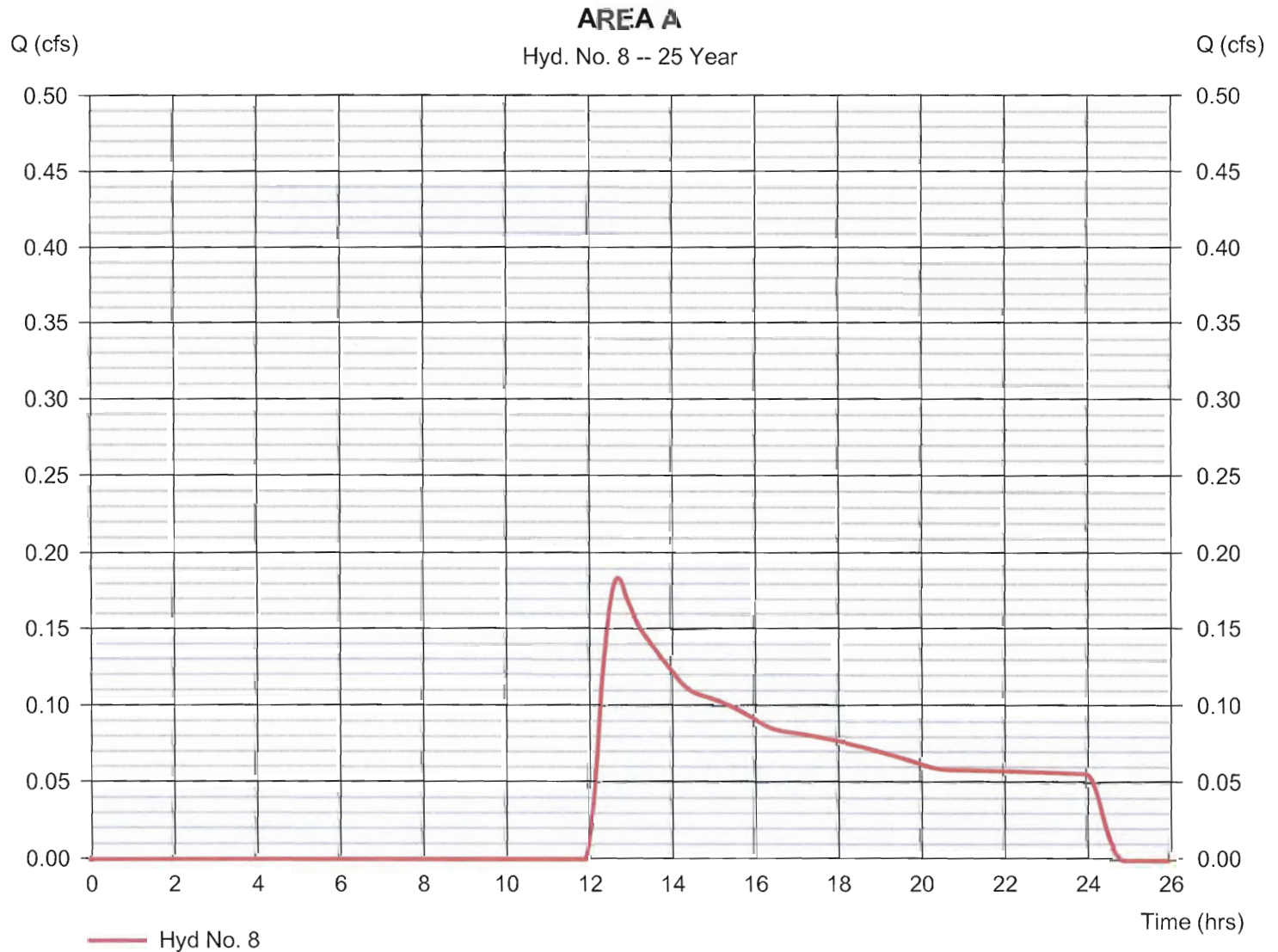
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Friday, 00 6, 2012

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.184 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.73 hrs
Time interval	= 2 min	Hyd. volume	= 0.086 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

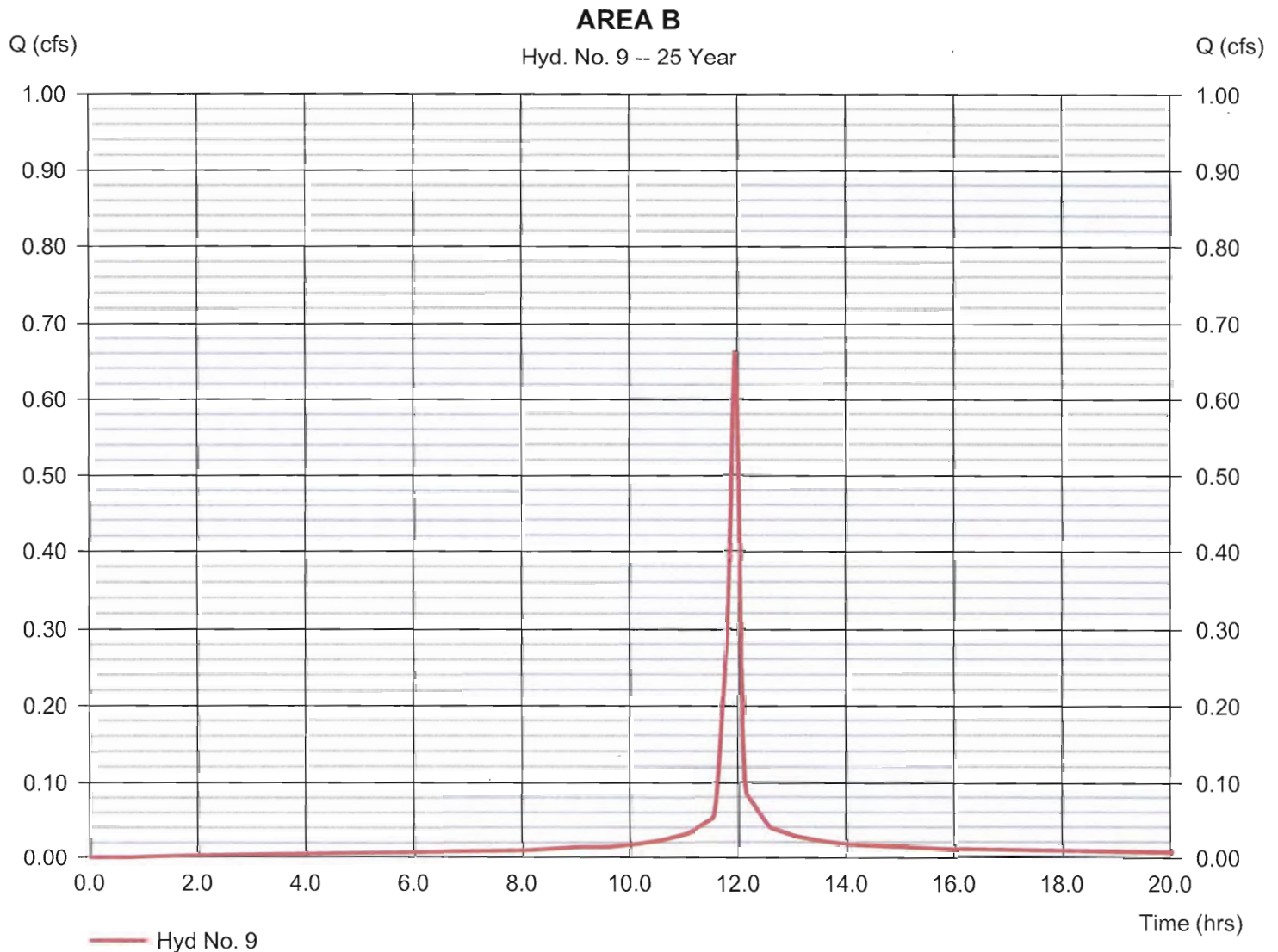


# Hydrograph Report

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.664 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.037 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

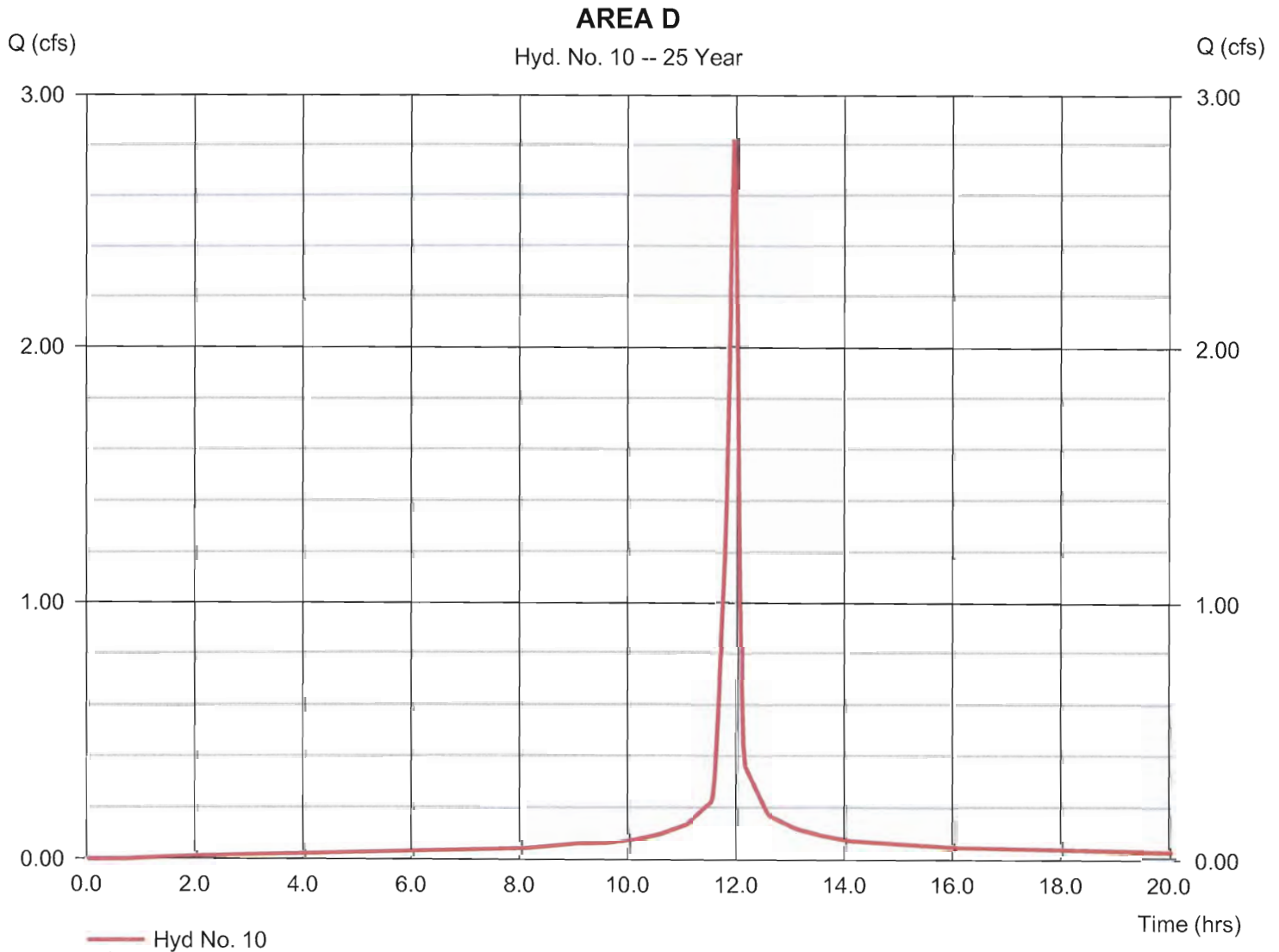


# Hydrograph Report

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 2.823 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.156 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

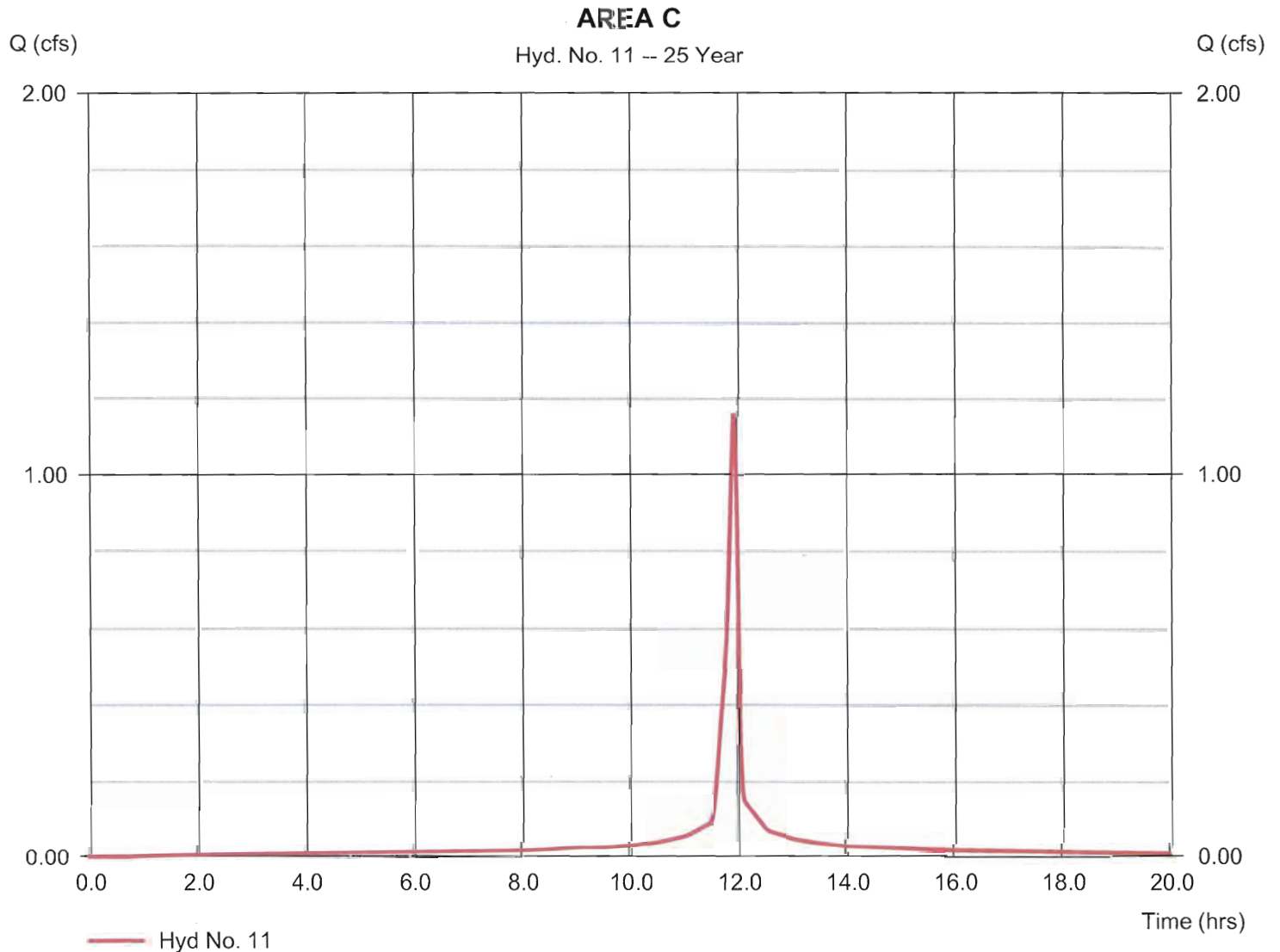
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Friday, 00 6, 2012

## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.163 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.064 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

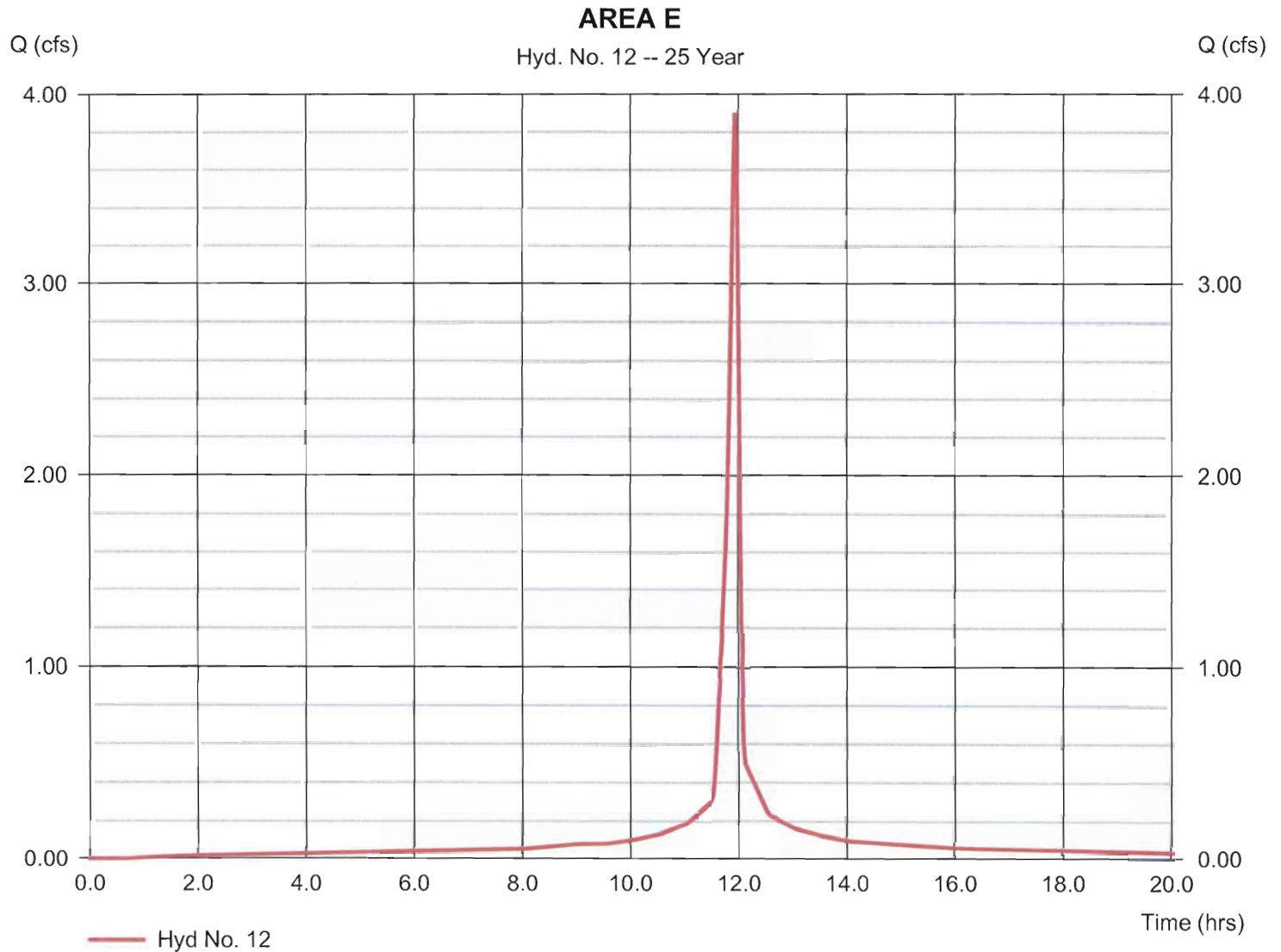
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Friday, 00 6, 2012

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 3.903 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.215 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

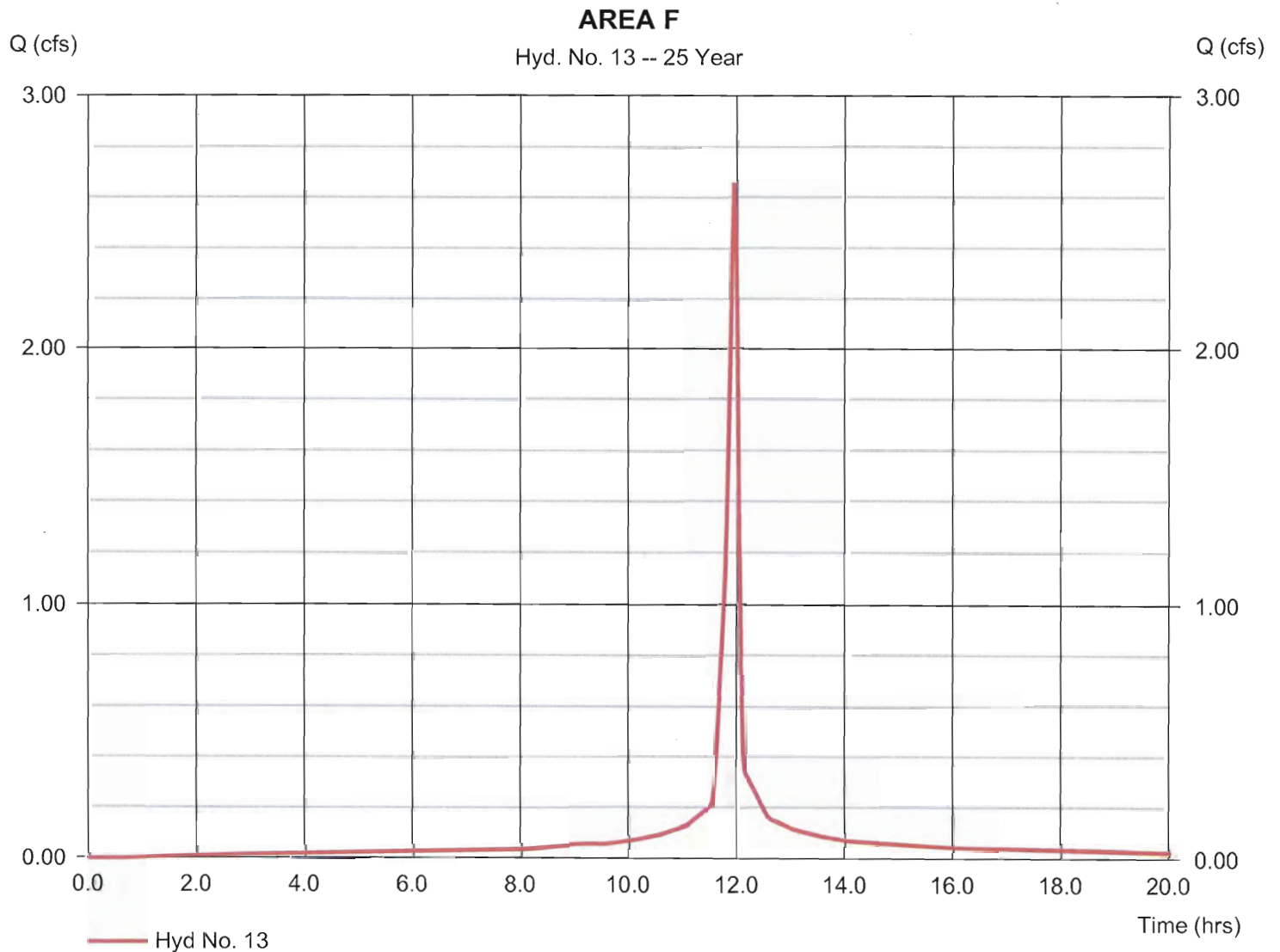
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Friday, 00 6, 2012

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 2.657 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.147 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

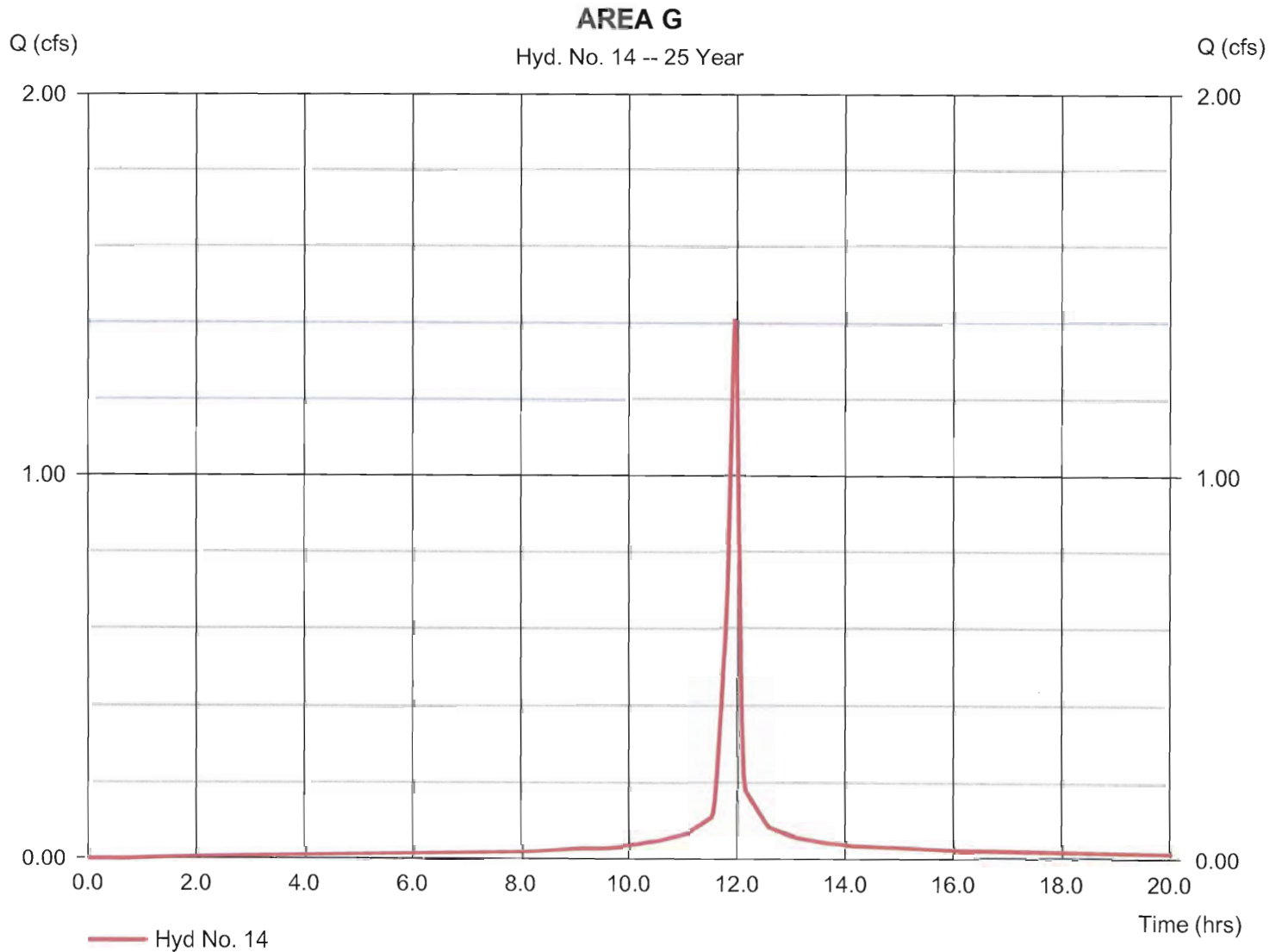


# Hydrograph Report

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 1.412 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.078 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

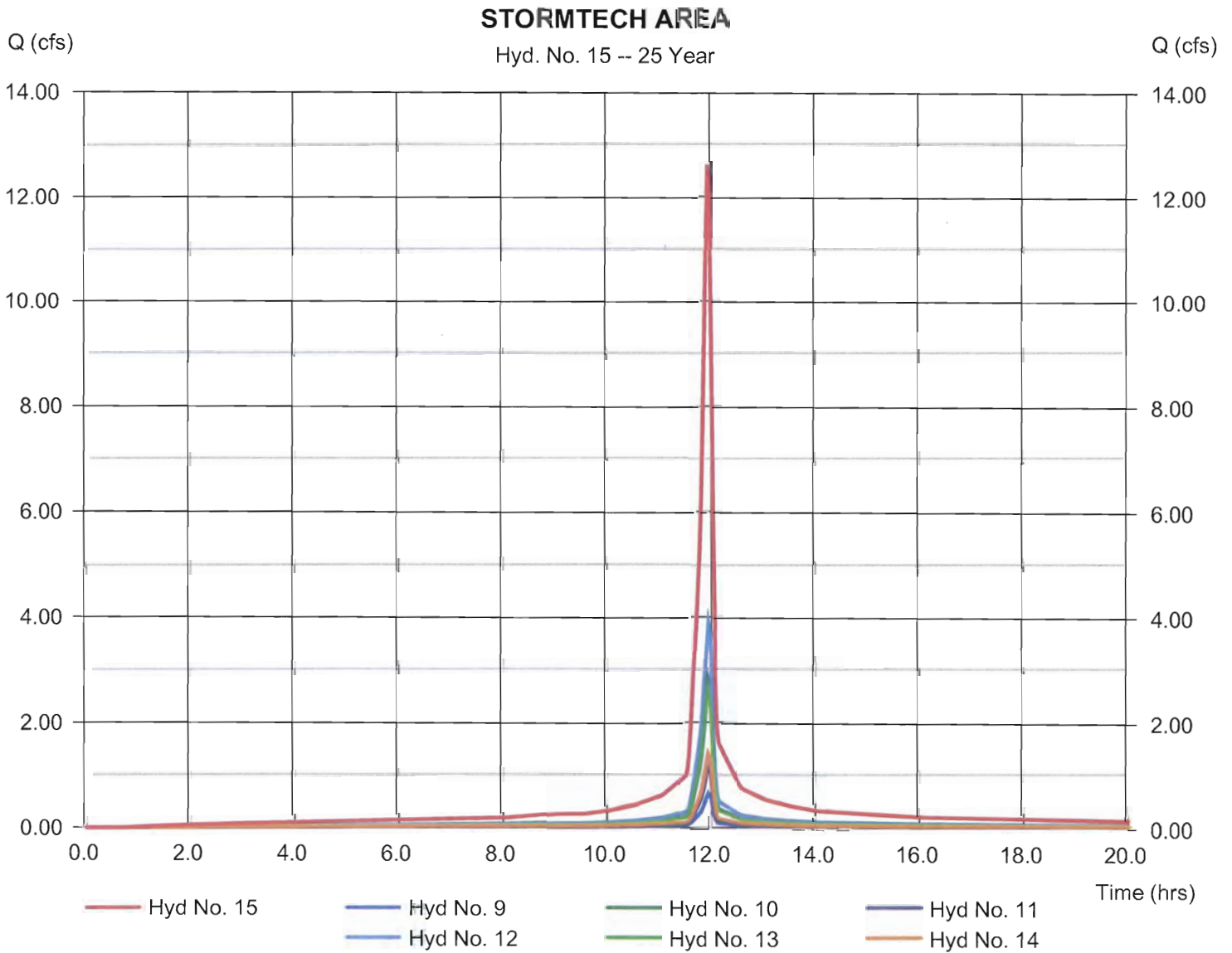


# Hydrograph Report

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 12.62 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.696 acft
Inflow hyd.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac

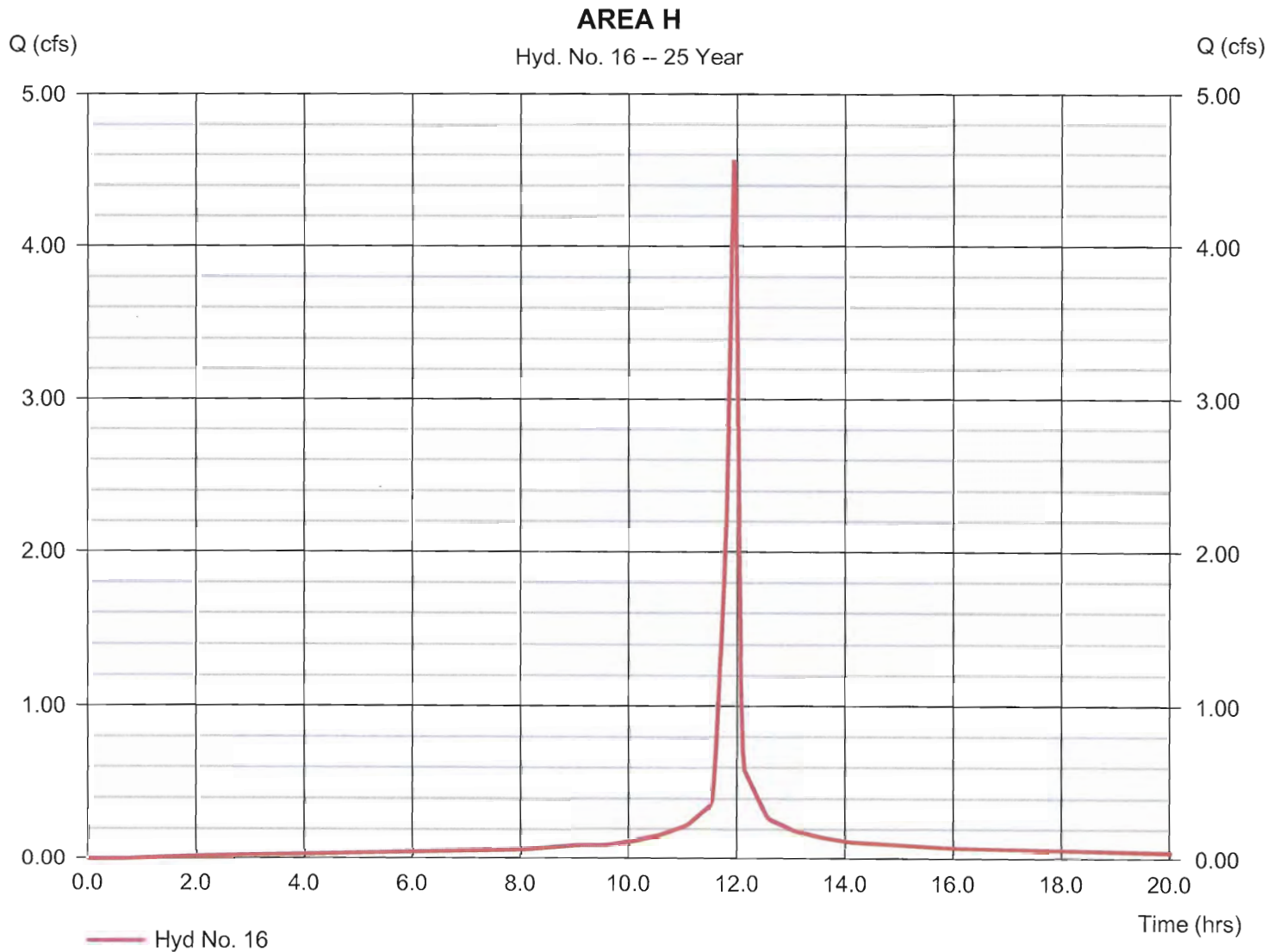


# Hydrograph Report

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 4.567 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.252 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

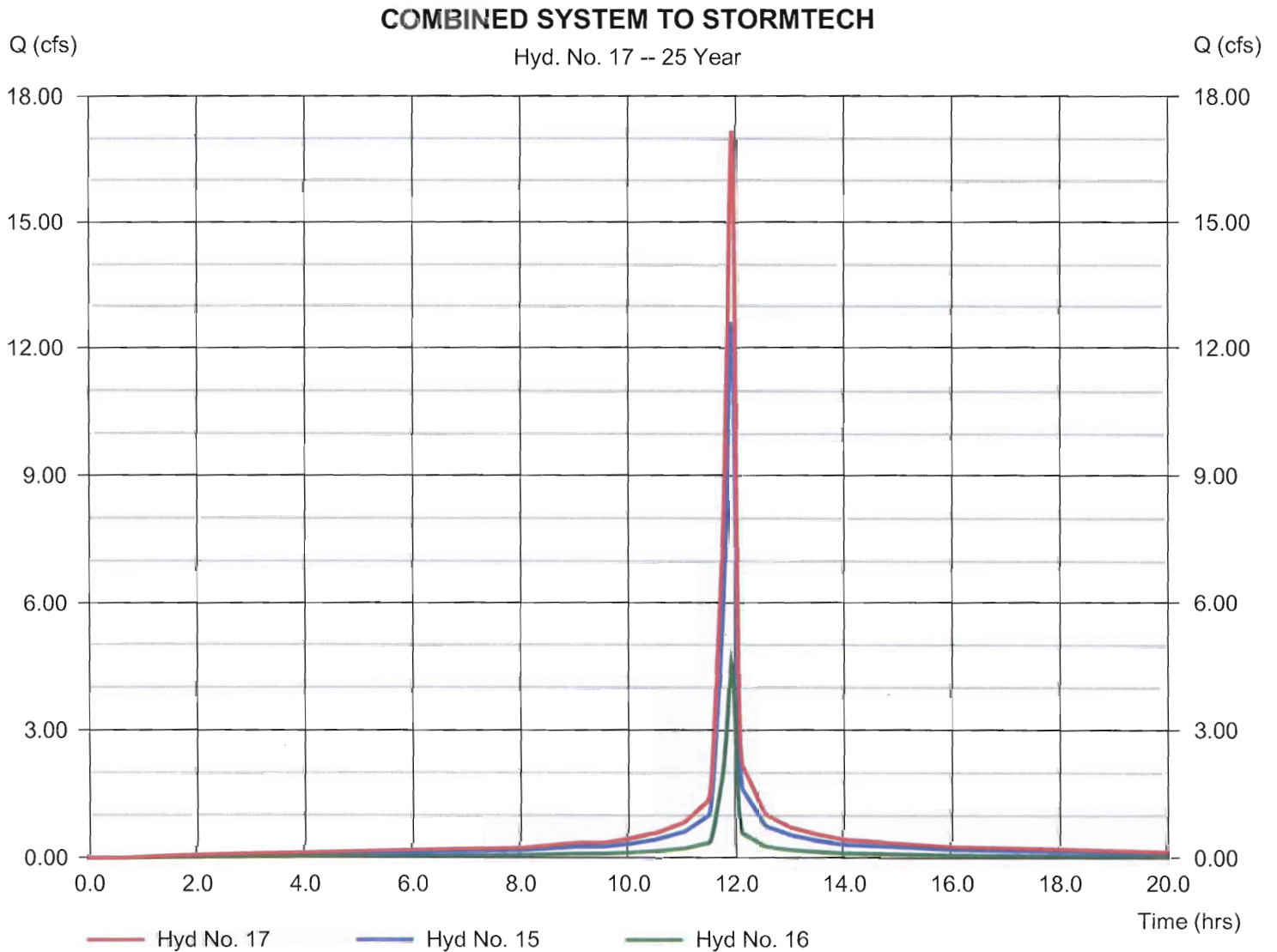


# Hydrograph Report

## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 17.19 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.948 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



# Hydrograph Report

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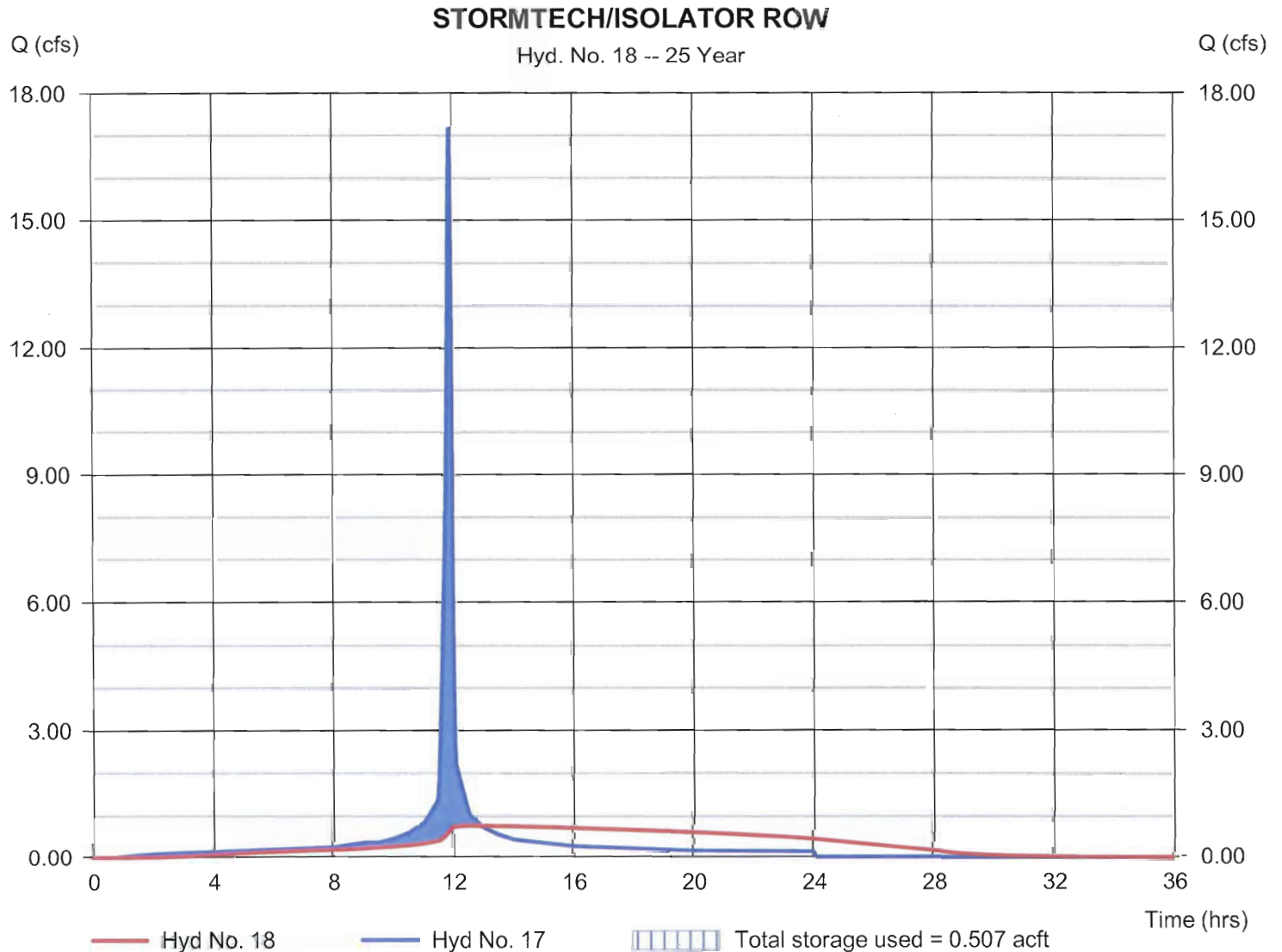
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.782 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.97 hrs
Time interval	= 2 min	Hyd. volume	= 0.947 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. Storage	= 1343.63 ft
Reservoir name	= STORMTECH 3500		= 0.507 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	19.79	2	732	1.969	-----	-----	-----	AREA 1	
2	SCS Runoff	1.784	2	728	0.151	-----	-----	-----	AREA 2	
3	SCS Runoff	1.485	2	724	0.107	-----	-----	-----	AREA 3	
4	SCS Runoff	4.888	2	716	0.271	-----	-----	-----	AREA 4	
5	SCS Runoff	6.130	2	716	0.294	-----	-----	-----	AREA 5	
6	SCS Runoff	3.065	2	716	0.147	-----	-----	-----	AREA 6	
7	SCS Runoff	2.182	2	734	0.227	-----	-----	-----	AREA 7	
8	SCS Runoff	0.479	2	752	0.148	-----	-----	-----	AREA A	
9	SCS Runoff	0.752	2	716	0.042	-----	-----	-----	AREA B	
10	SCS Runoff	3.196	2	716	0.177	-----	-----	-----	AREA D	
11	SCS Runoff	1.316	2	716	0.073	-----	-----	-----	AREA C	
12	SCS Runoff	4.418	2	716	0.245	-----	-----	-----	AREA E	
13	SCS Runoff	3.008	2	716	0.167	-----	-----	-----	AREA F	
14	SCS Runoff	1.598	2	716	0.088	-----	-----	-----	AREA G	
15	Combine	14.29	2	716	0.791	9, 10, 11, 12, 13, 14	-----	-----	STORMTECH AREA	
16	SCS Runoff	5.170	2	716	0.286	-----	-----	-----	AREA H	
17	Combine	19.46	2	716	1.077	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE	
18	Reservoir	0.830	2	784	1.077	17	1344.07	0.583	STORMTECH/ISOLATOR ROW	
13TH AND MAIZE 3.16.12.gpw					Return Period: 50 Year			Friday, 00 6, 2012		

# Hydrograph Report

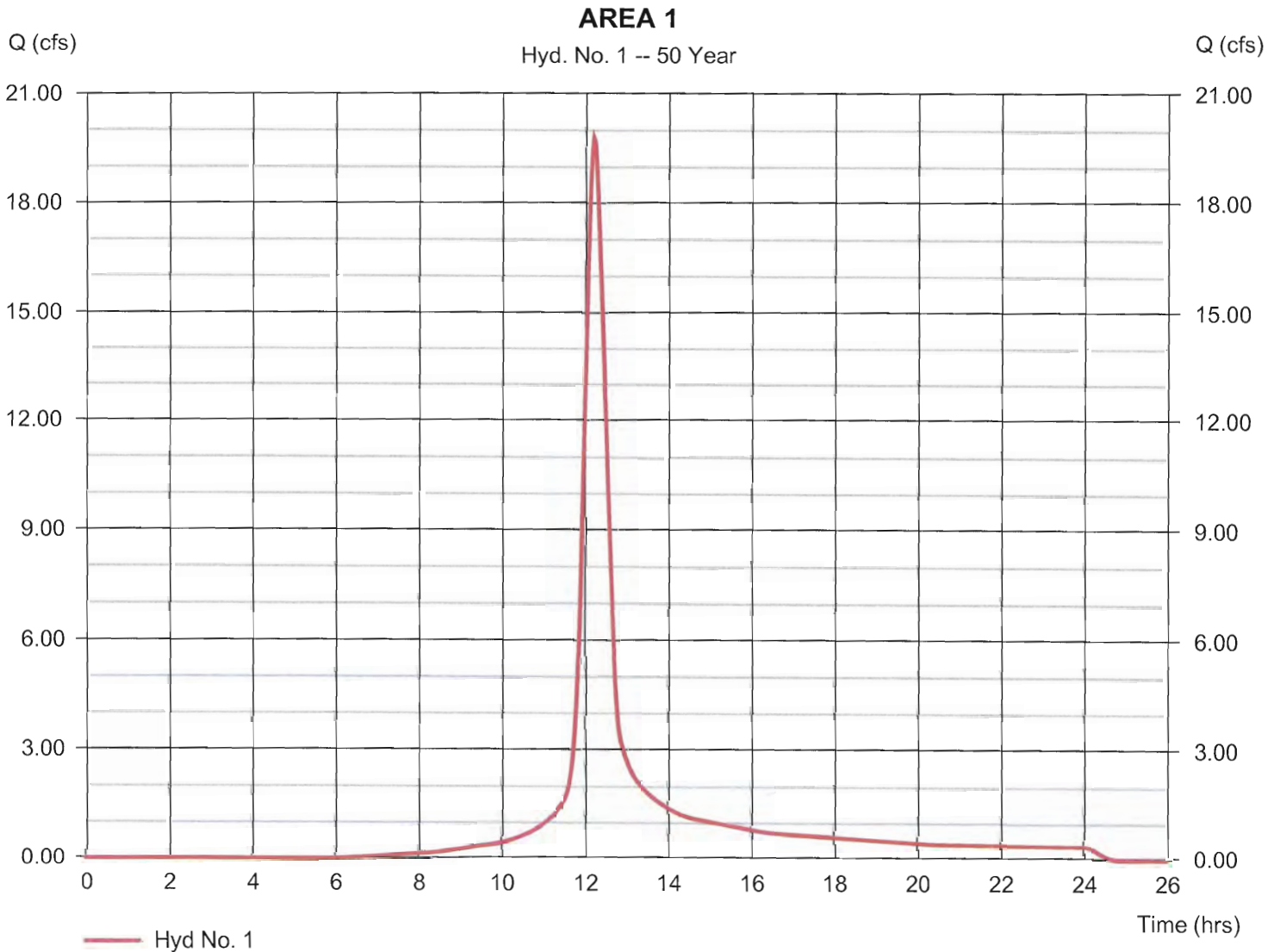
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Friday, 00 6, 2012

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 19.79 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 1.969 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

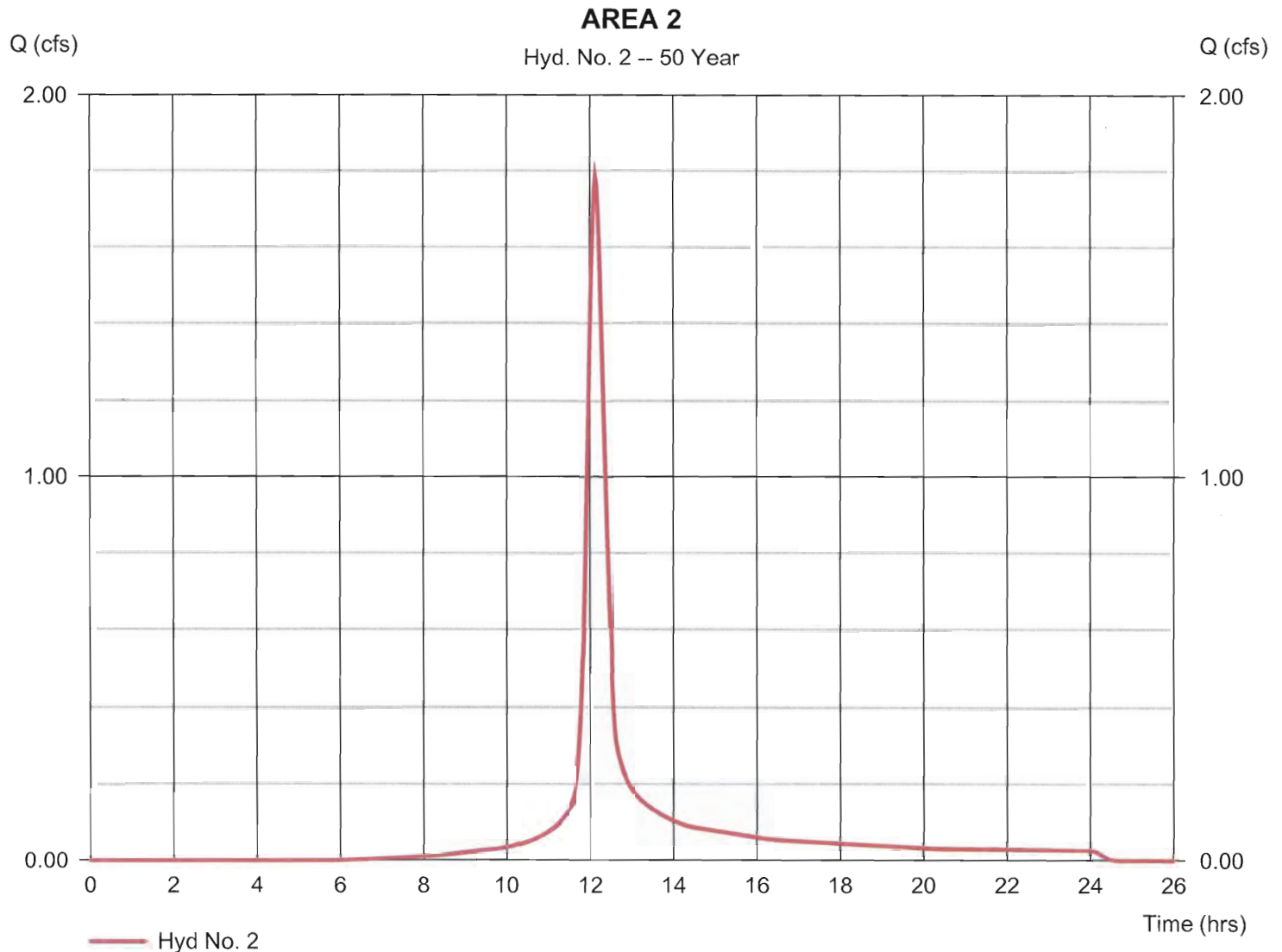


# Hydrograph Report

## Hyd. No. 2

### AREA 2

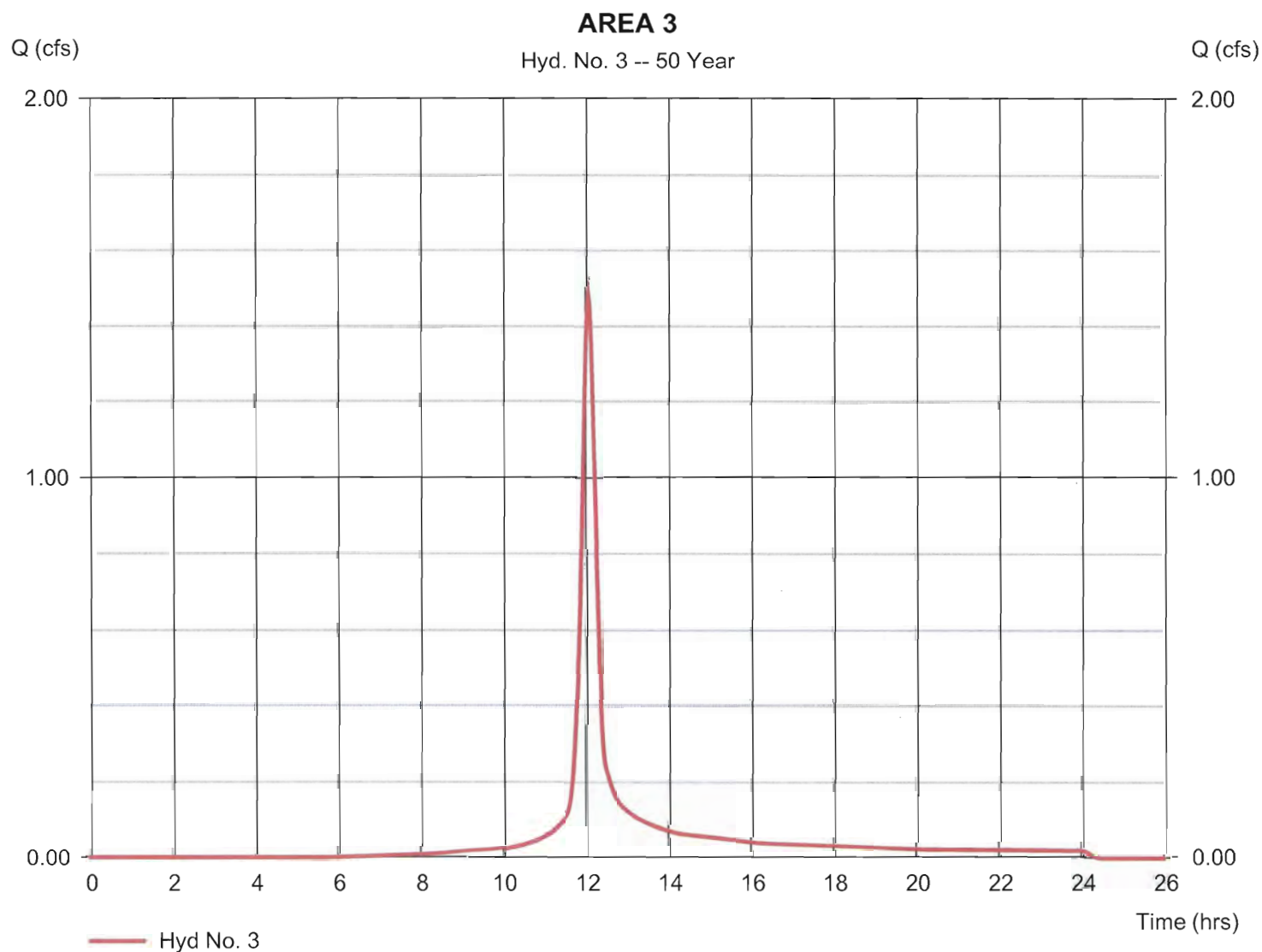
Hydrograph type	= SCS Runoff	Peak discharge	= 1.784 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.151 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.485 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.107 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

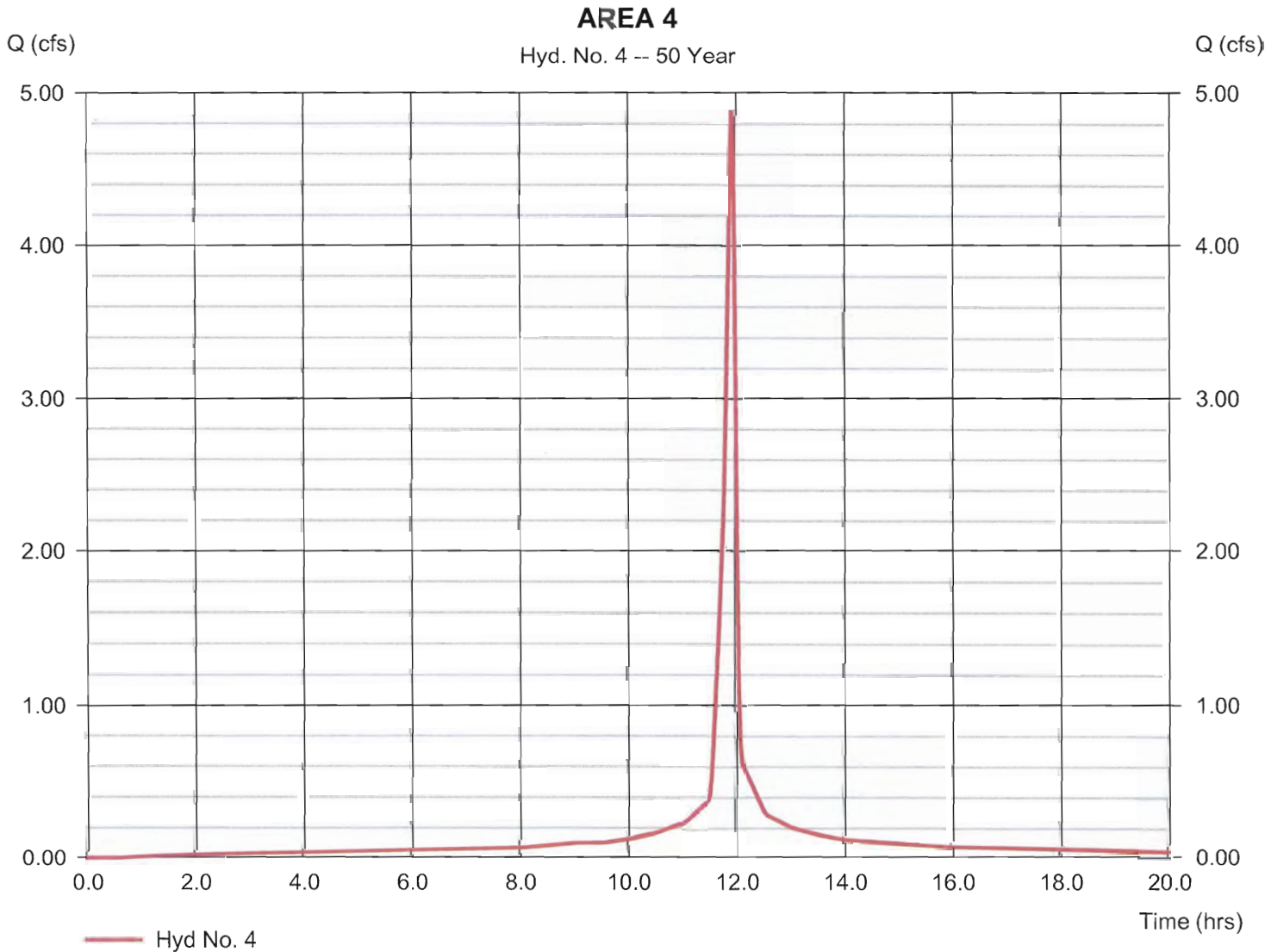
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Friday, 00 6, 2012

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.888 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.271 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

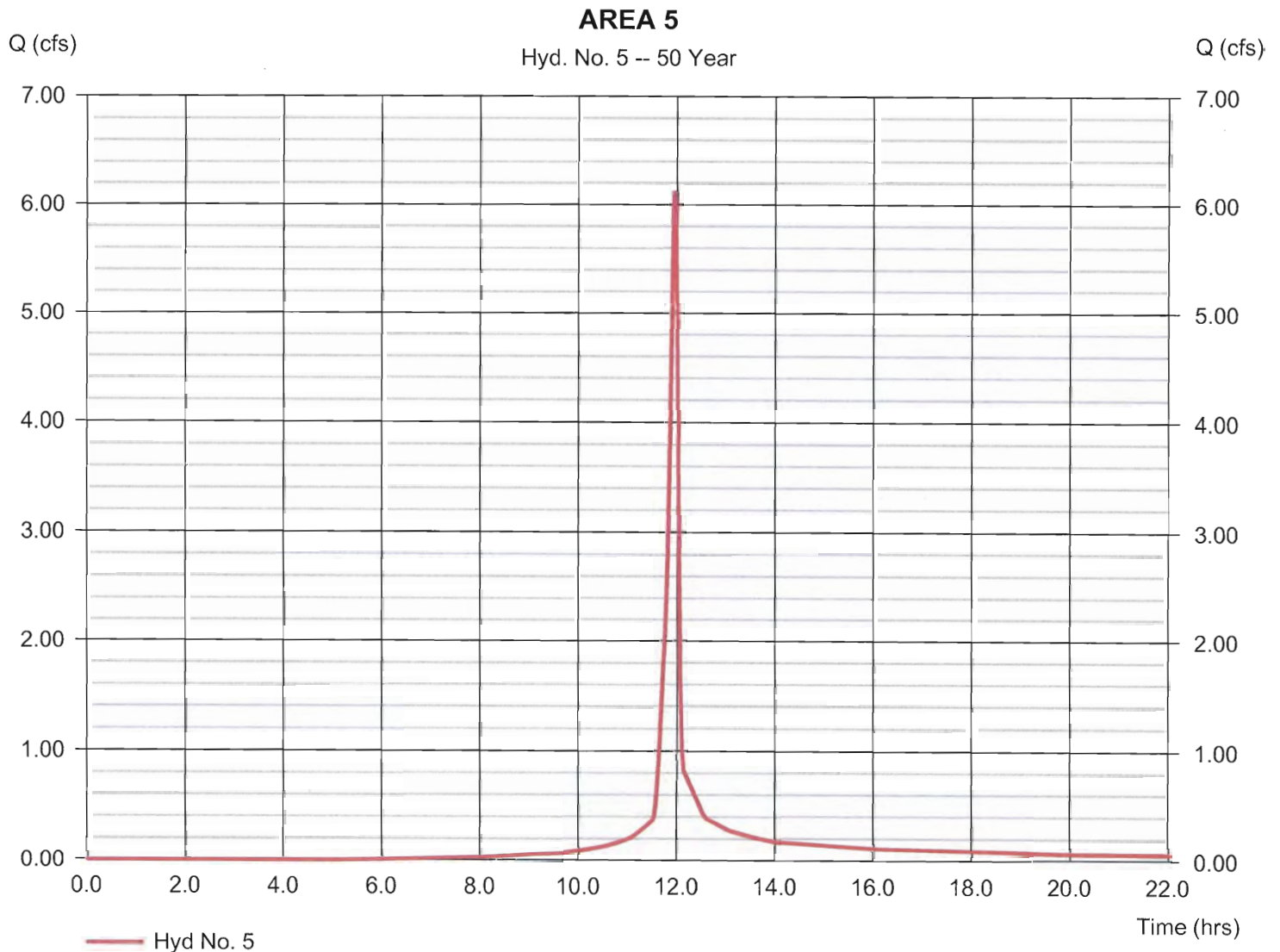


# Hydrograph Report

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 6.130 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.294 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

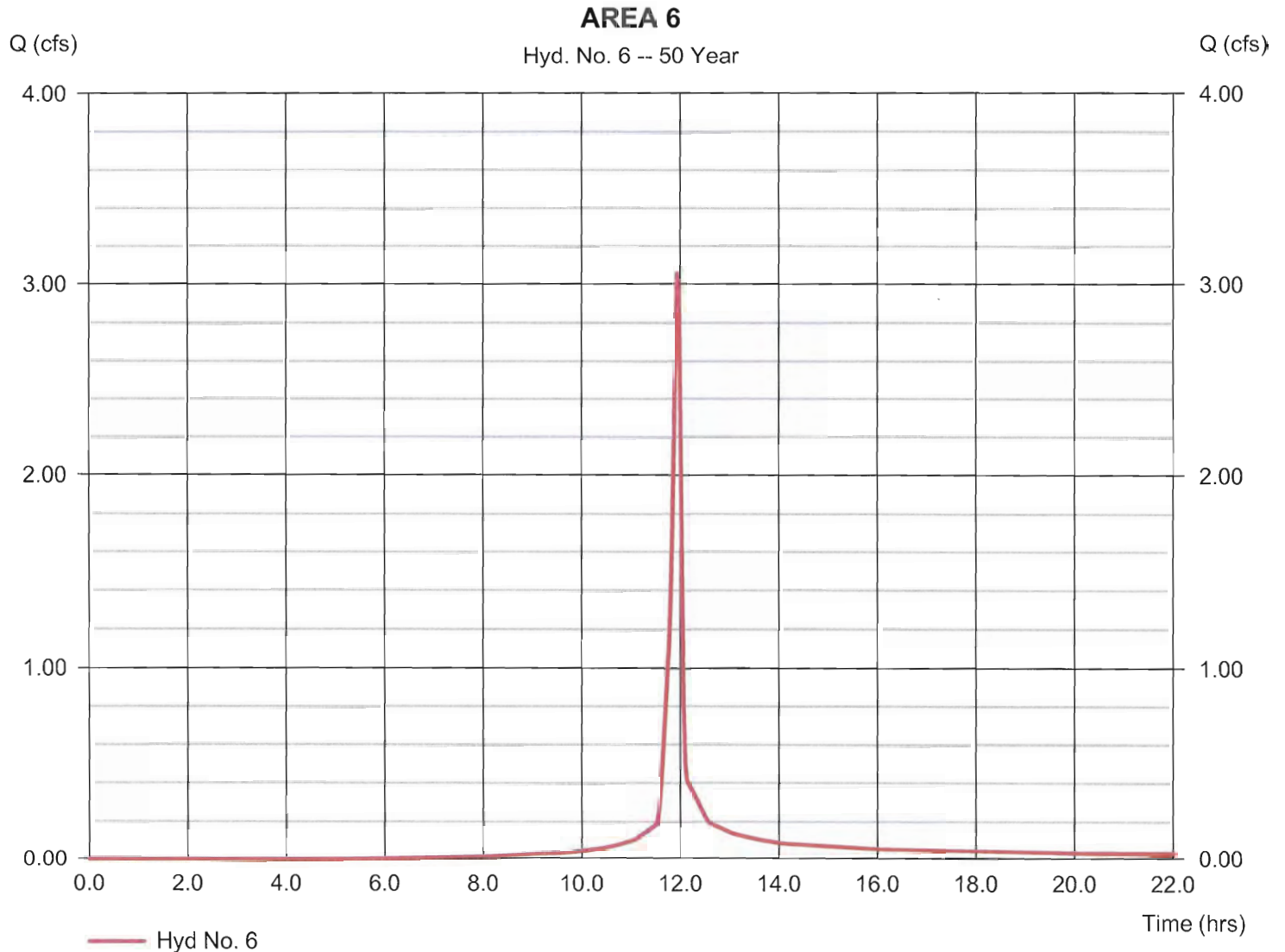


# Hydrograph Report

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 3.065 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.147 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

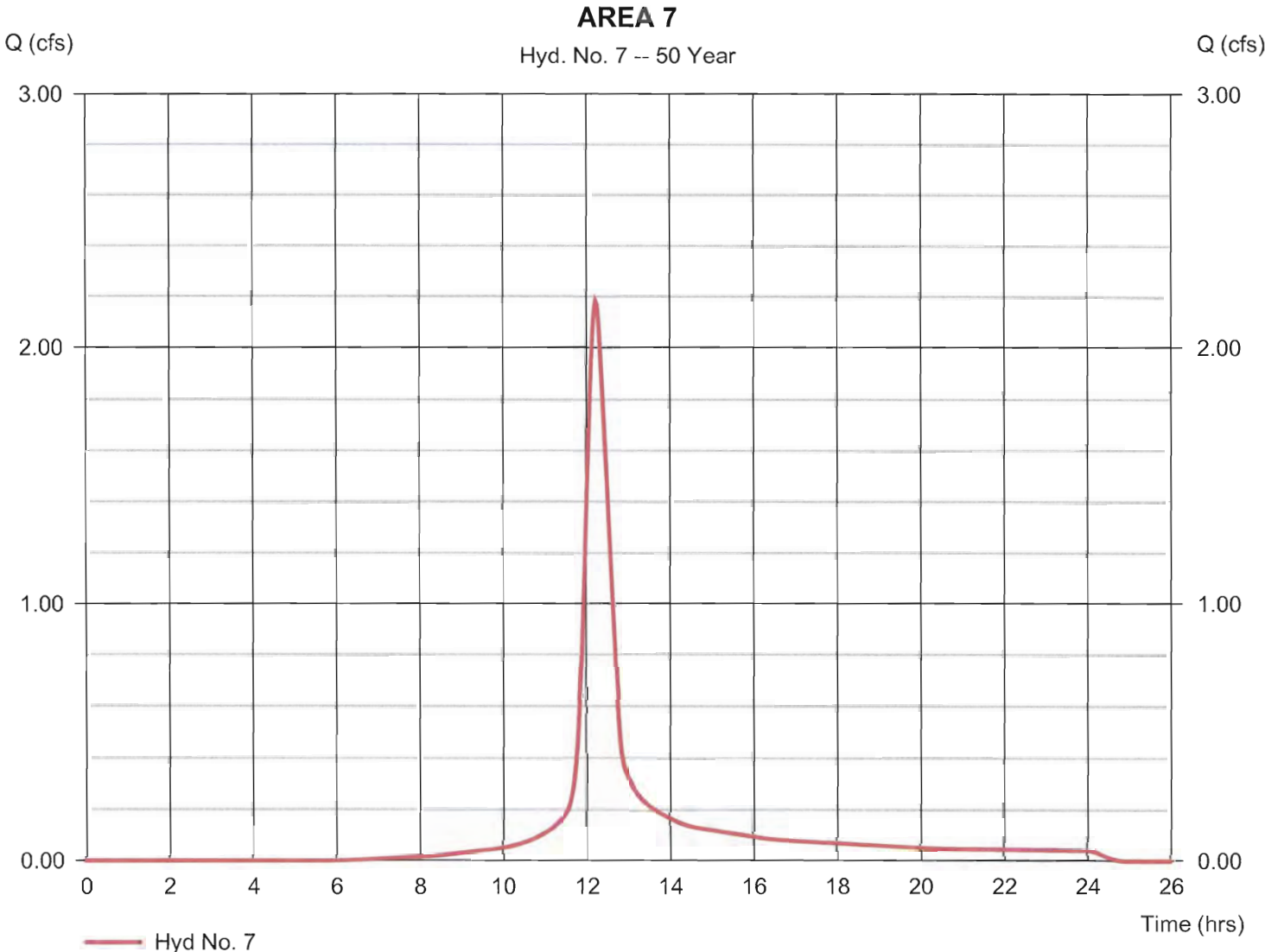


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 2.182 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.227 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

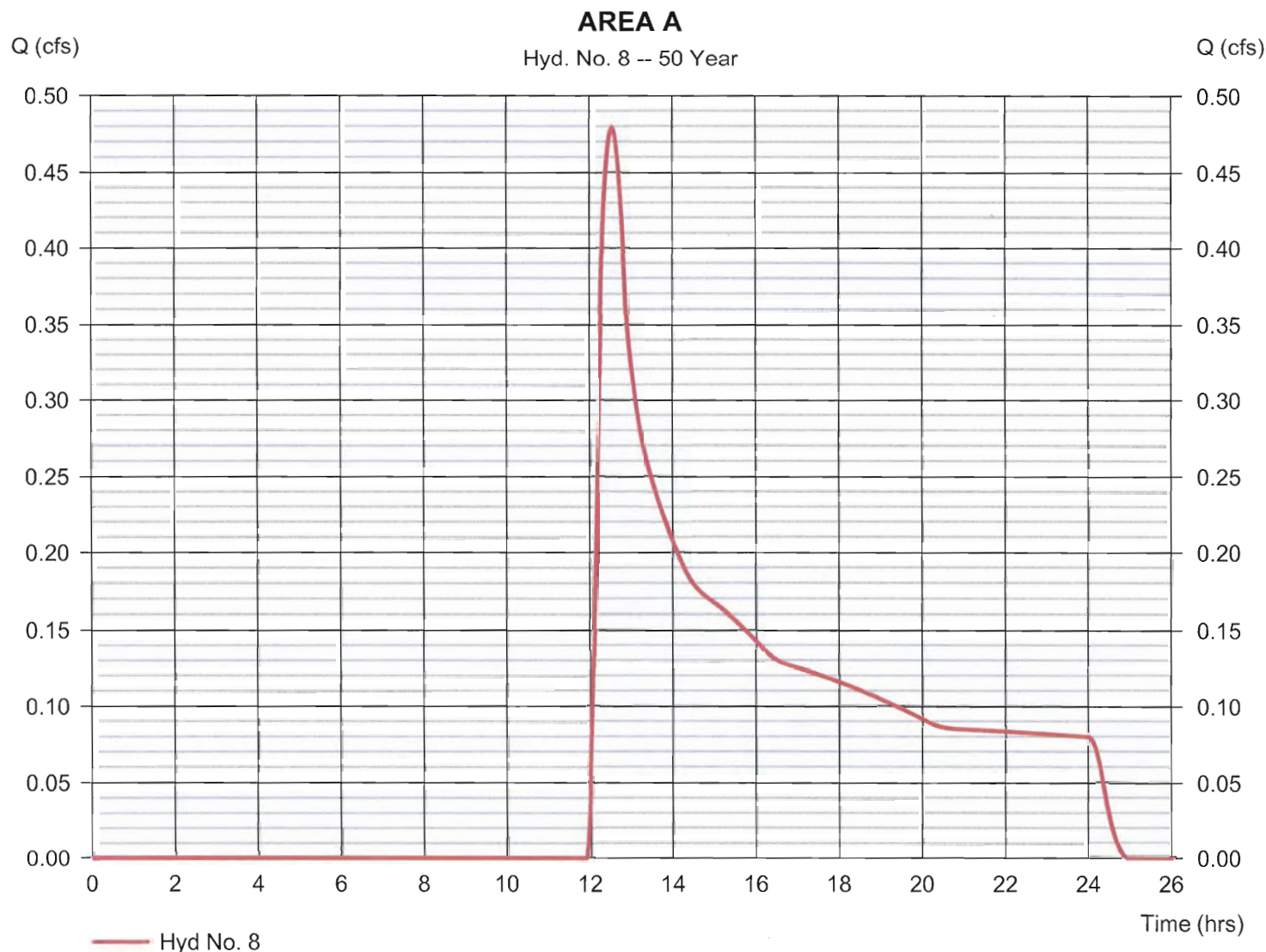


# Hydrograph Report

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.479 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.53 hrs
Time interval	= 2 min	Hyd. volume	= 0.148 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

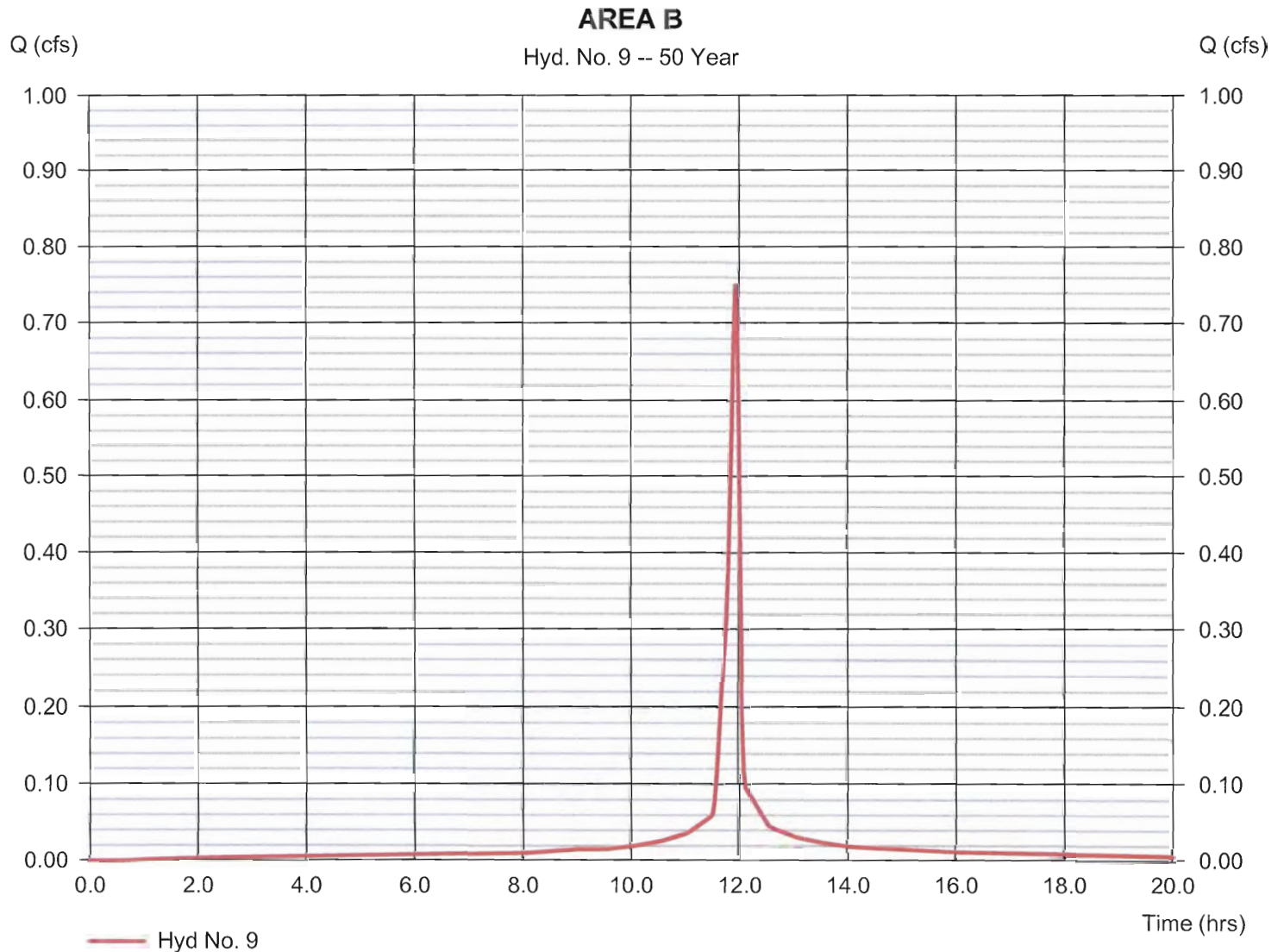


# Hydrograph Report

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.752 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.042 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

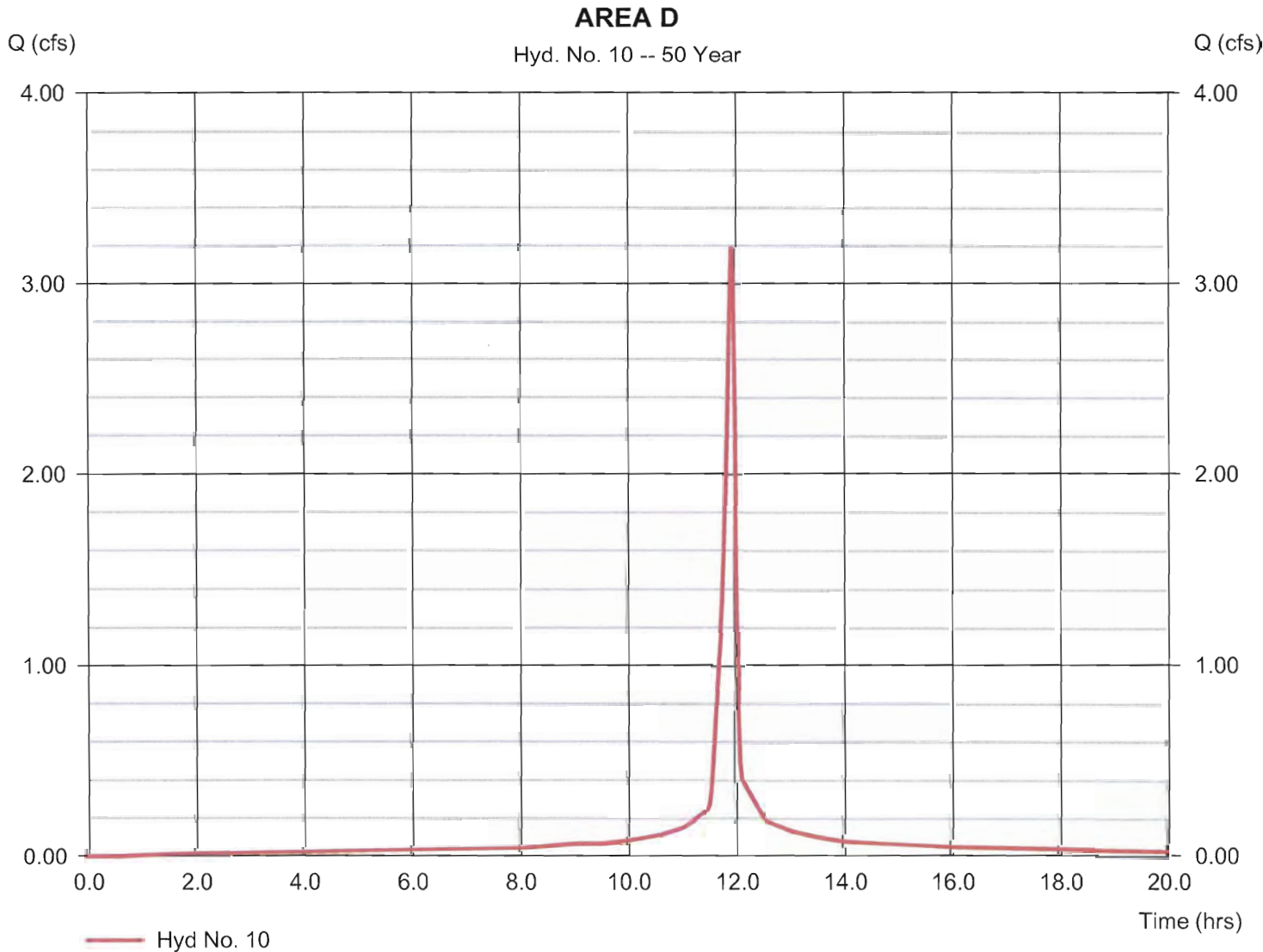


# Hydrograph Report

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 3.196 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.177 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

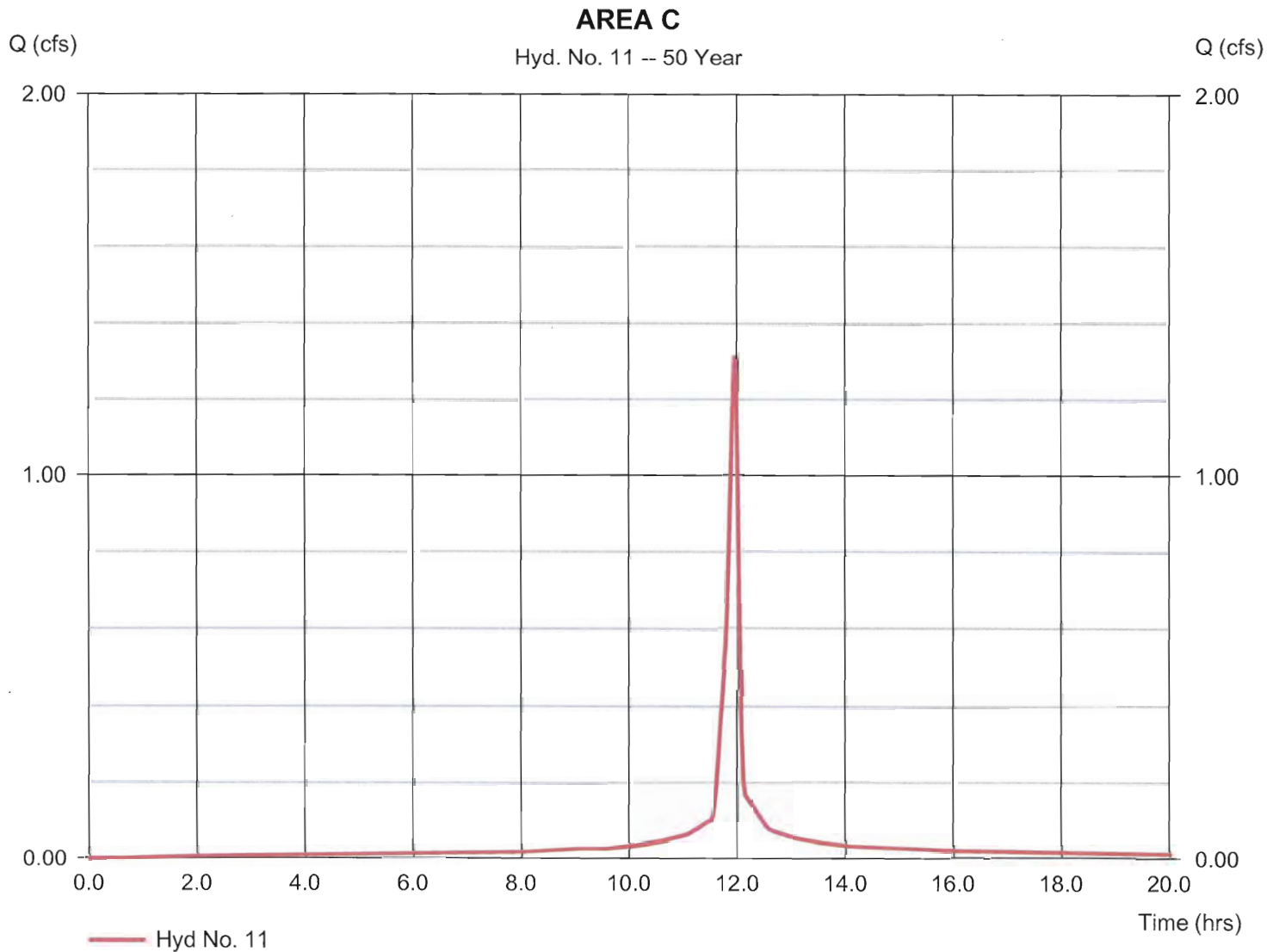


# Hydrograph Report

## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.316 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.073 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

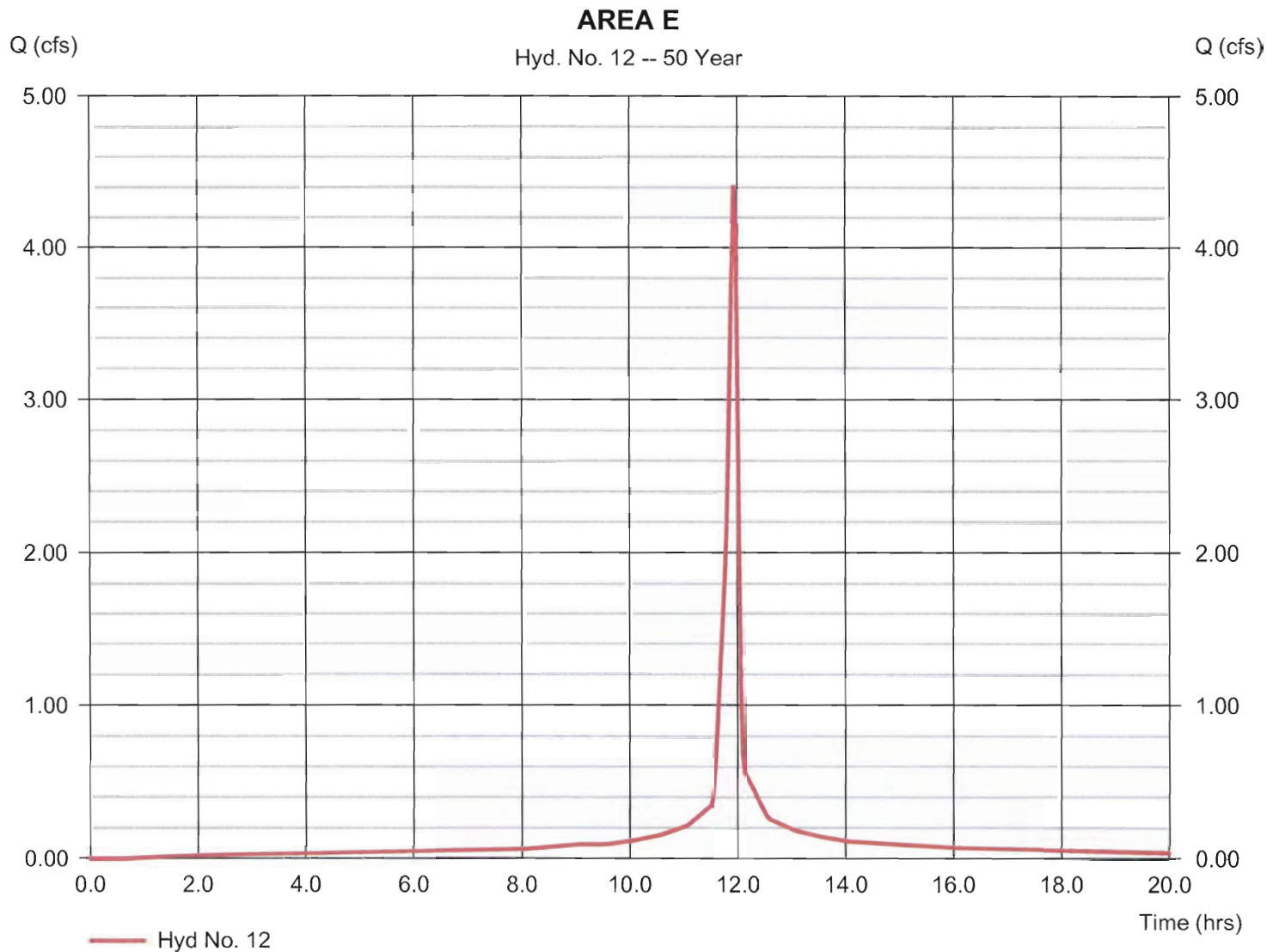


# Hydrograph Report

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 4.418 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.245 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

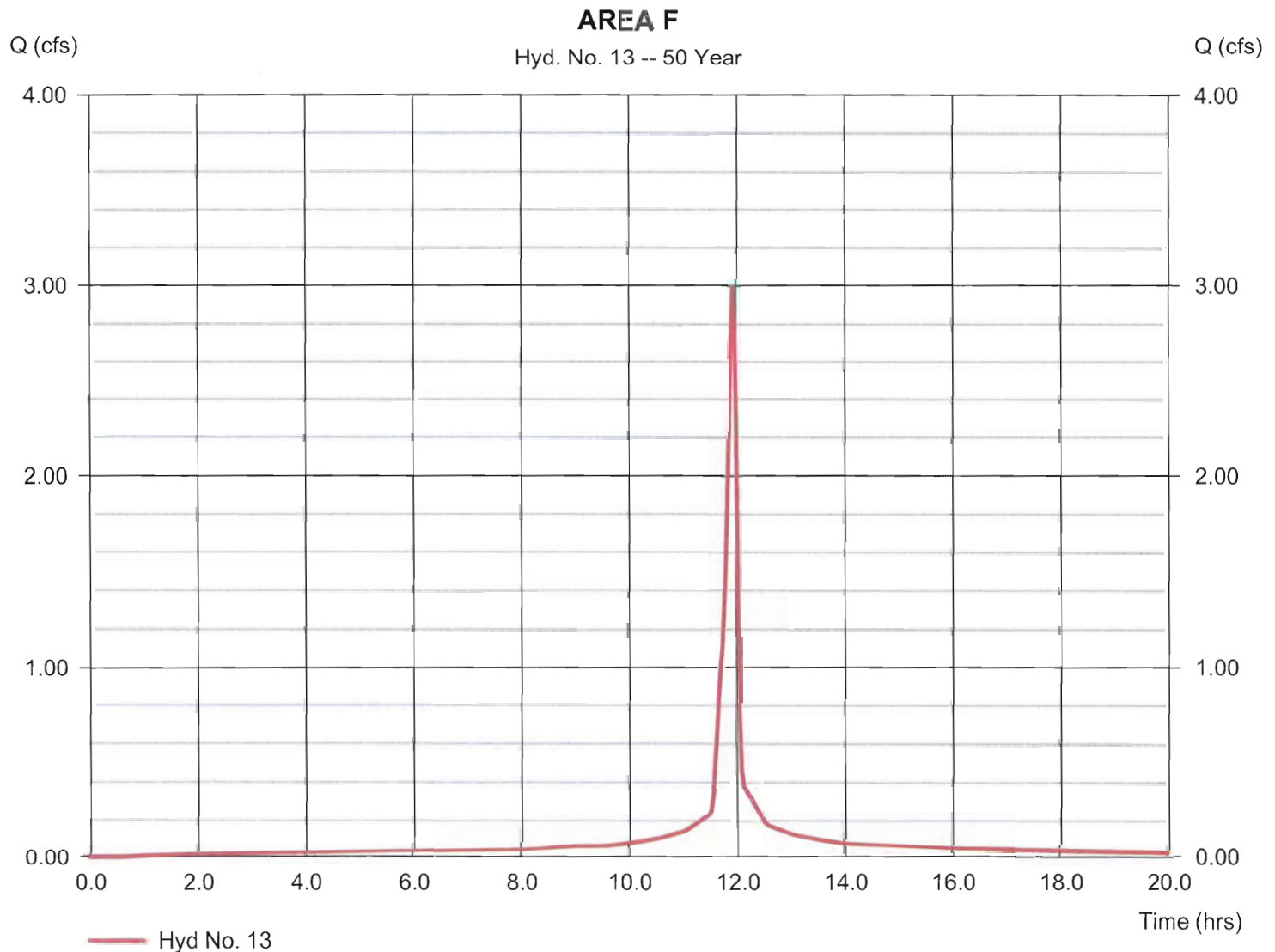


# Hydrograph Report

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 3.008 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.167 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

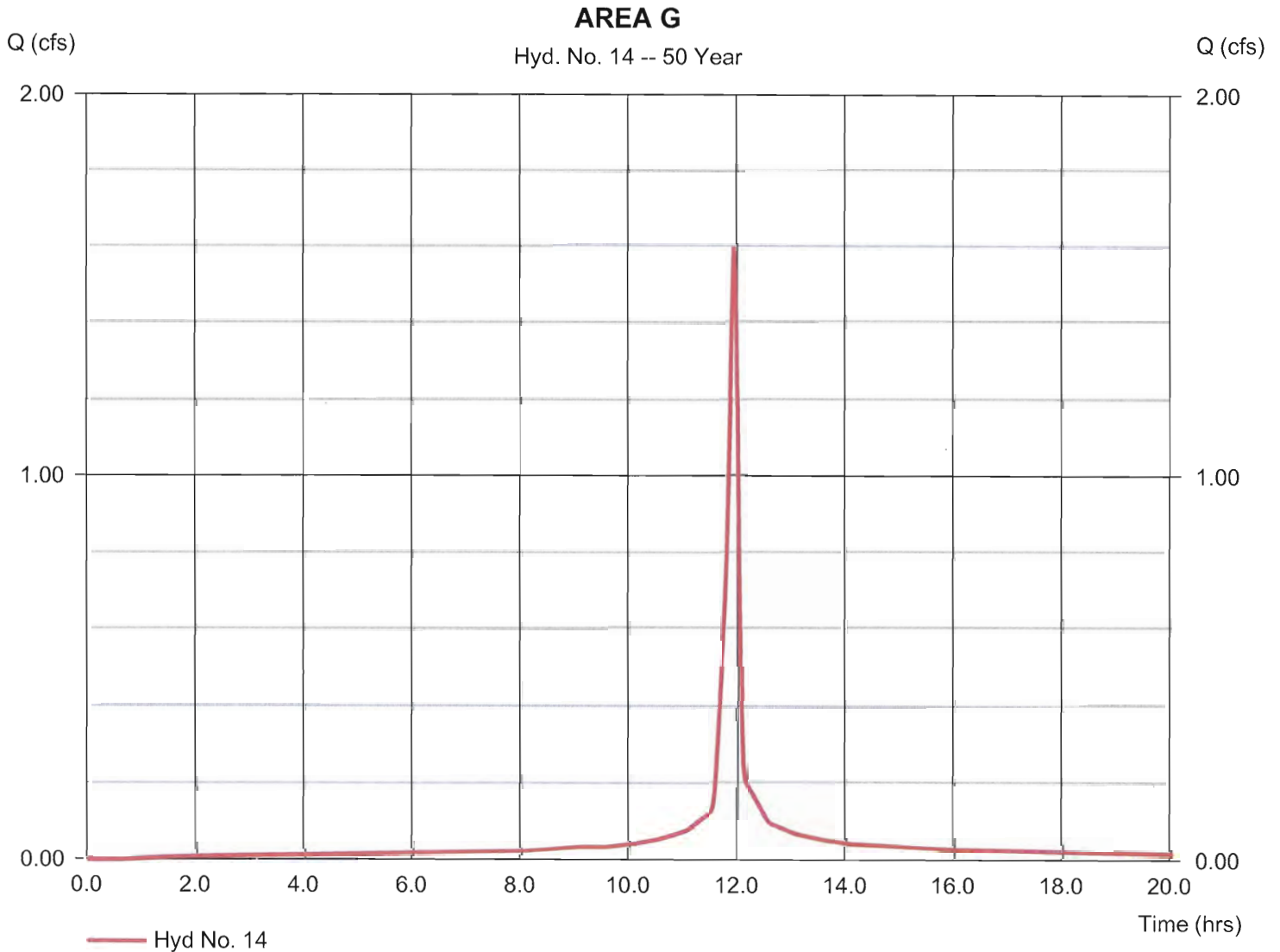


# Hydrograph Report

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 1.598 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.088 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

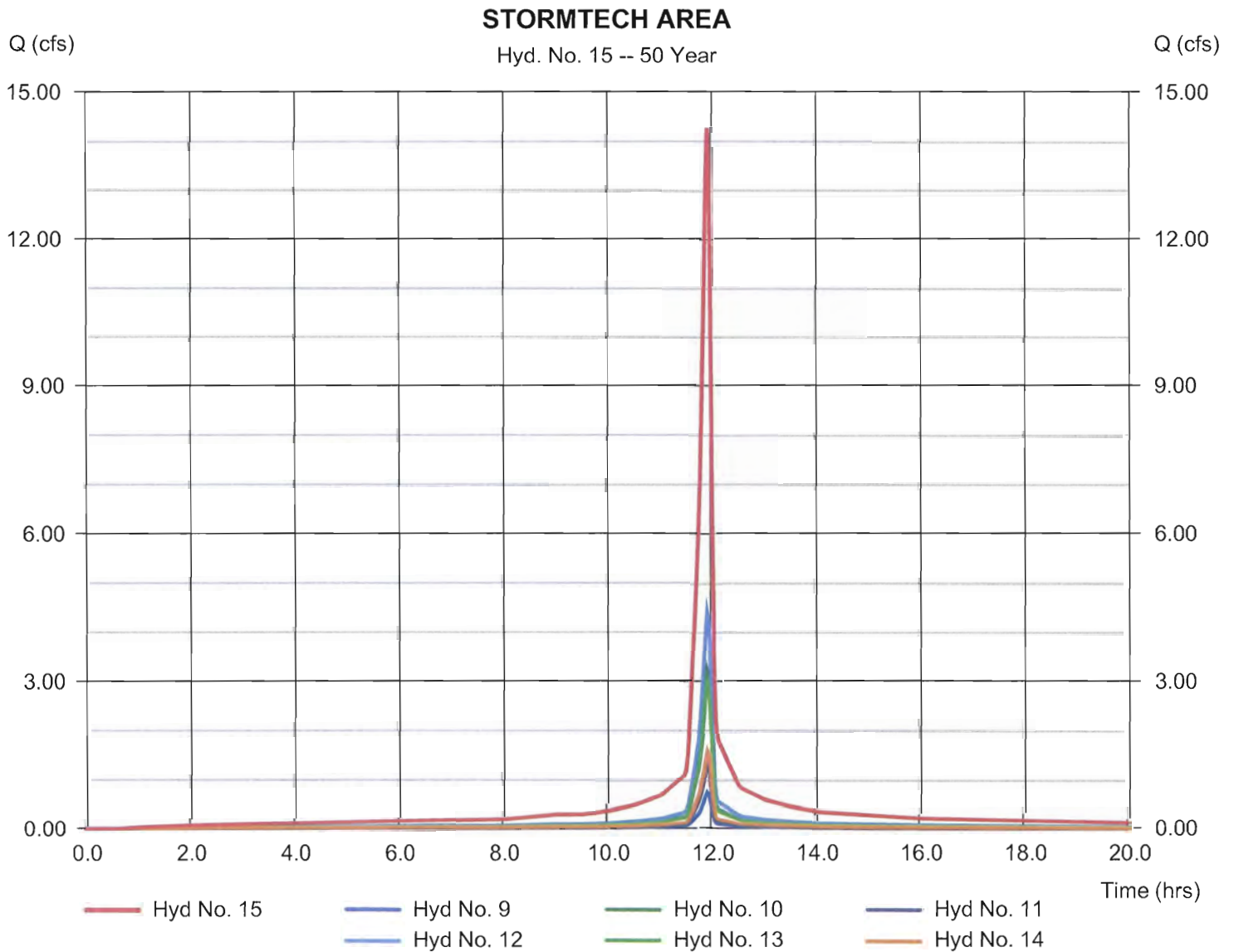


# Hydrograph Report

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 14.29 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.791 acft
Inflow hyds.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac



# Hydrograph Report

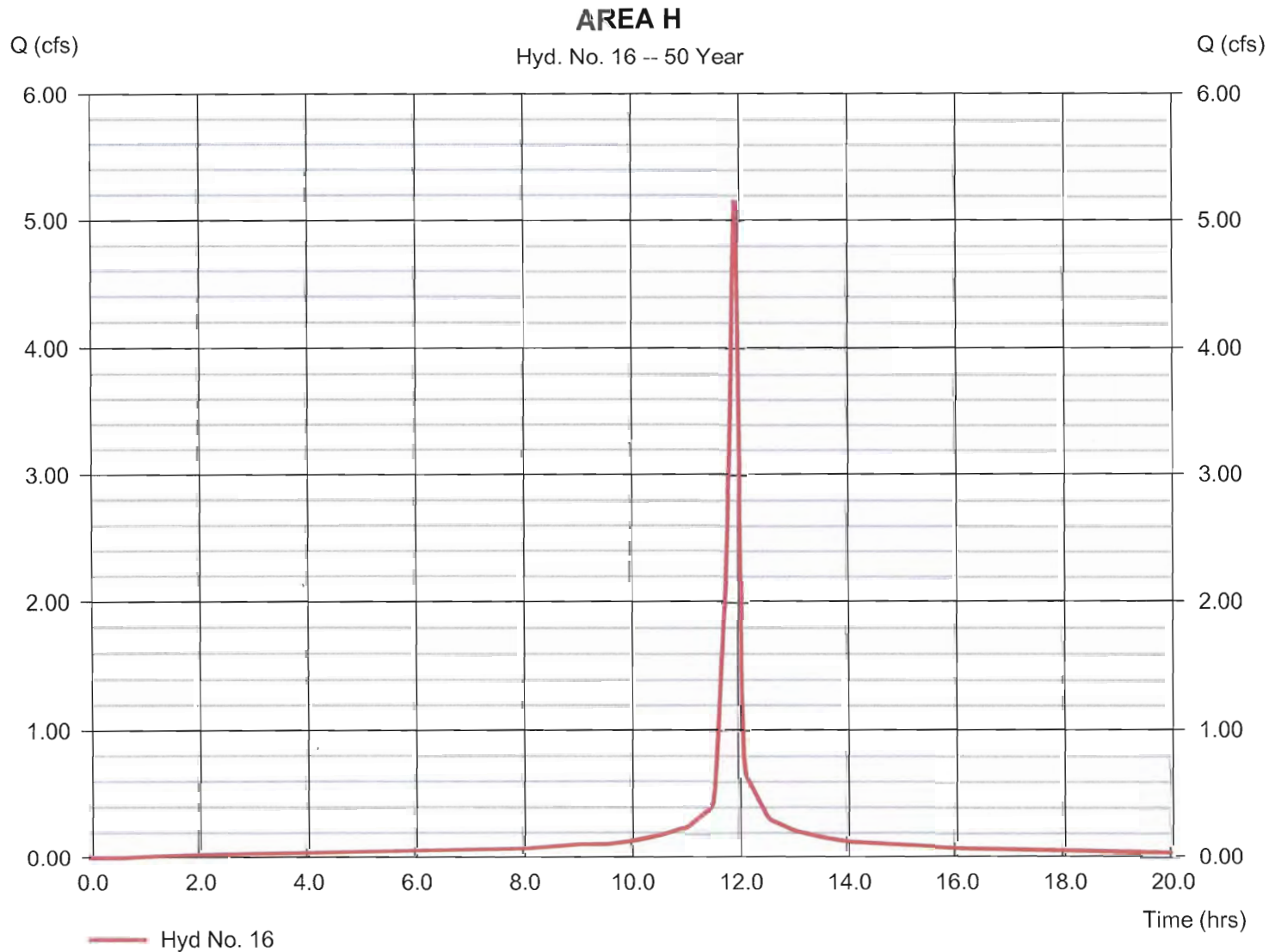
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Friday, 00 6, 2012

## Hyd. No. 16

### AREA H

Hydrograph type	= SCS Runoff	Peak discharge	= 5.170 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.286 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

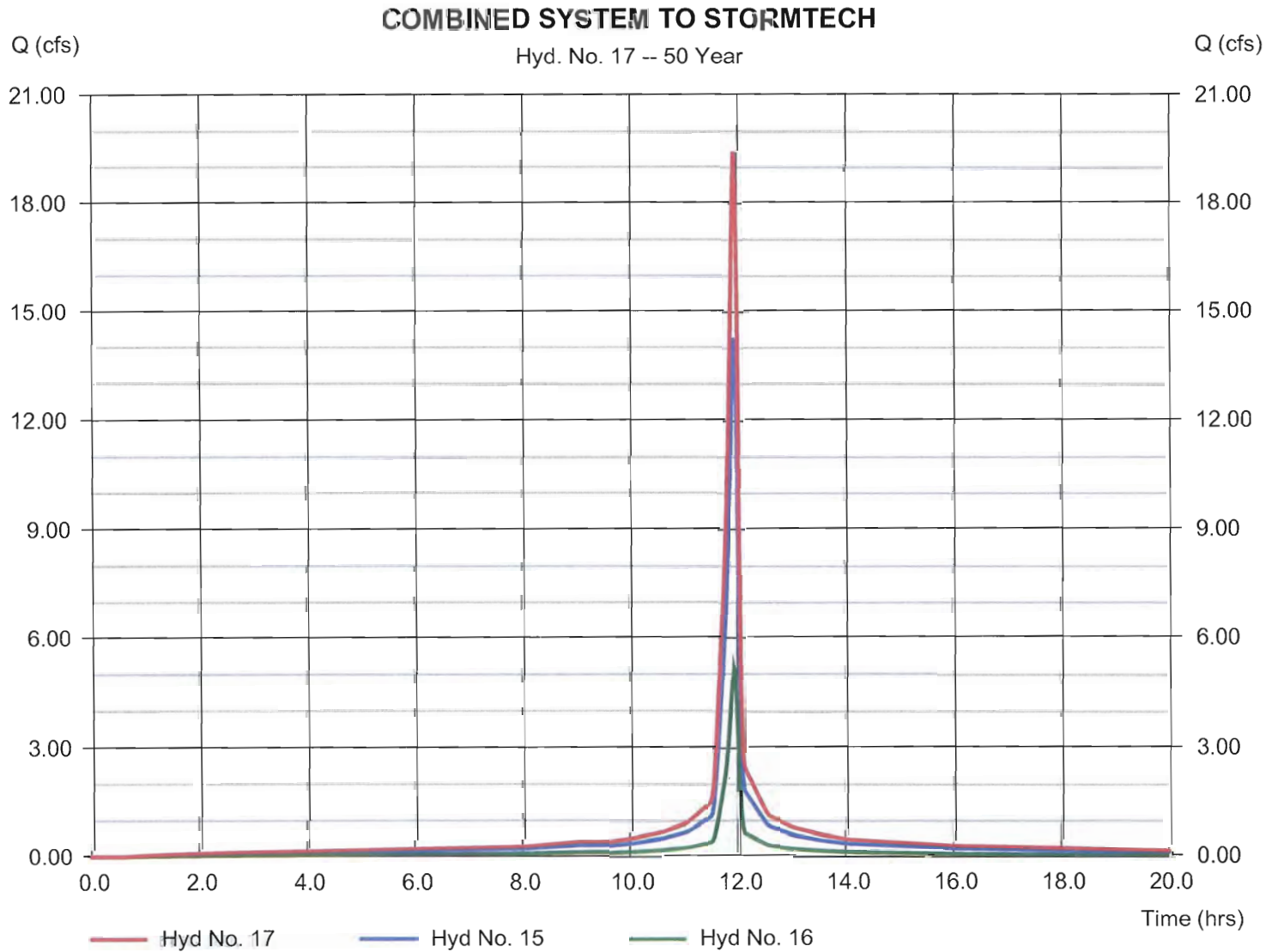


# Hydrograph Report

## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 19.46 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1.077 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



# Hydrograph Report

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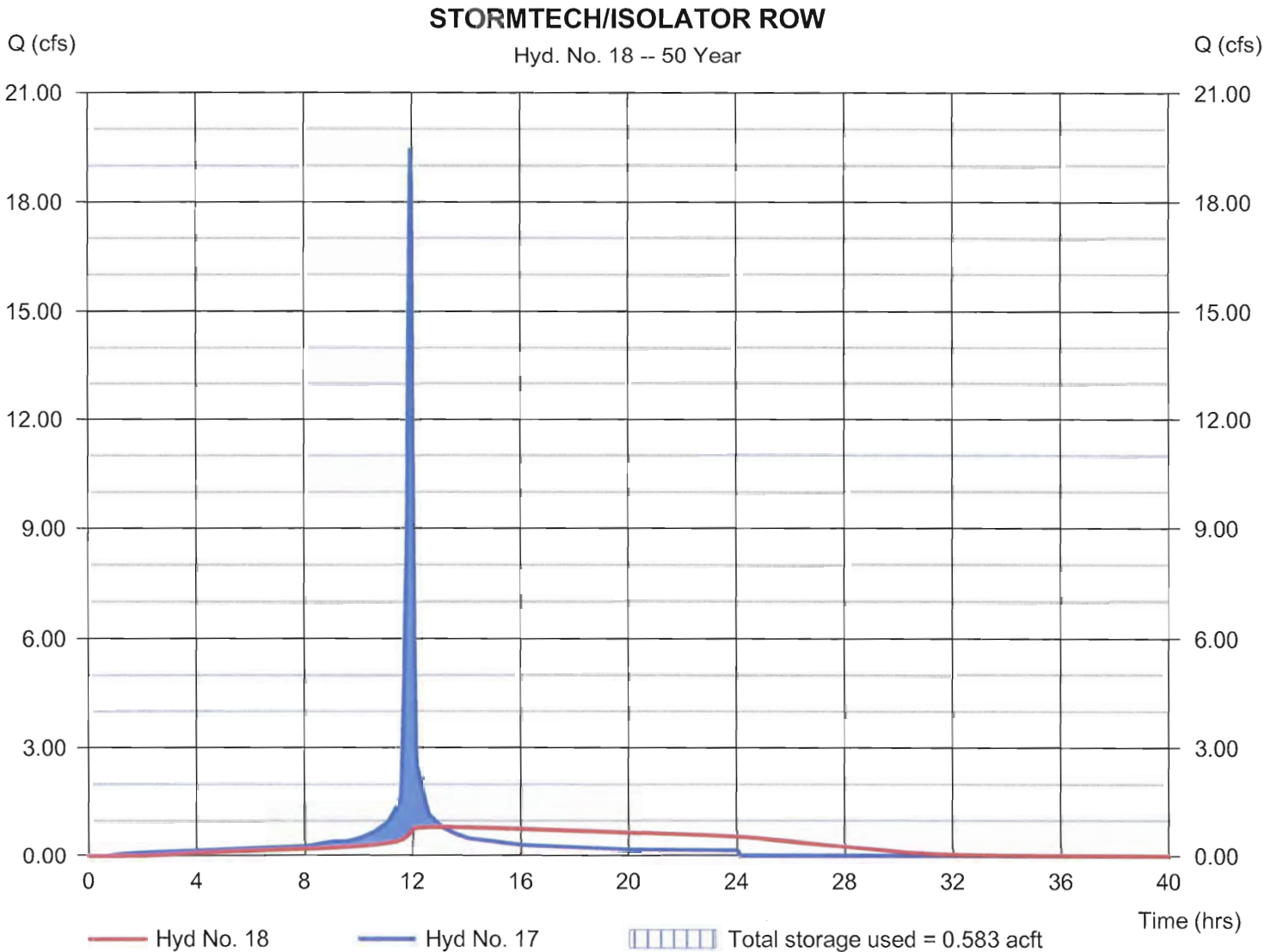
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.830 cfs
Storm frequency	= 50 yrs	Time to peak	= 13.07 hrs
Time interval	= 2 min	Hyd. volume	= 1.077 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. Storage	= 1344.07 ft
Reservoir name	= STORMTECH 3500		= 0.583 acft

Storage Indication method used.



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

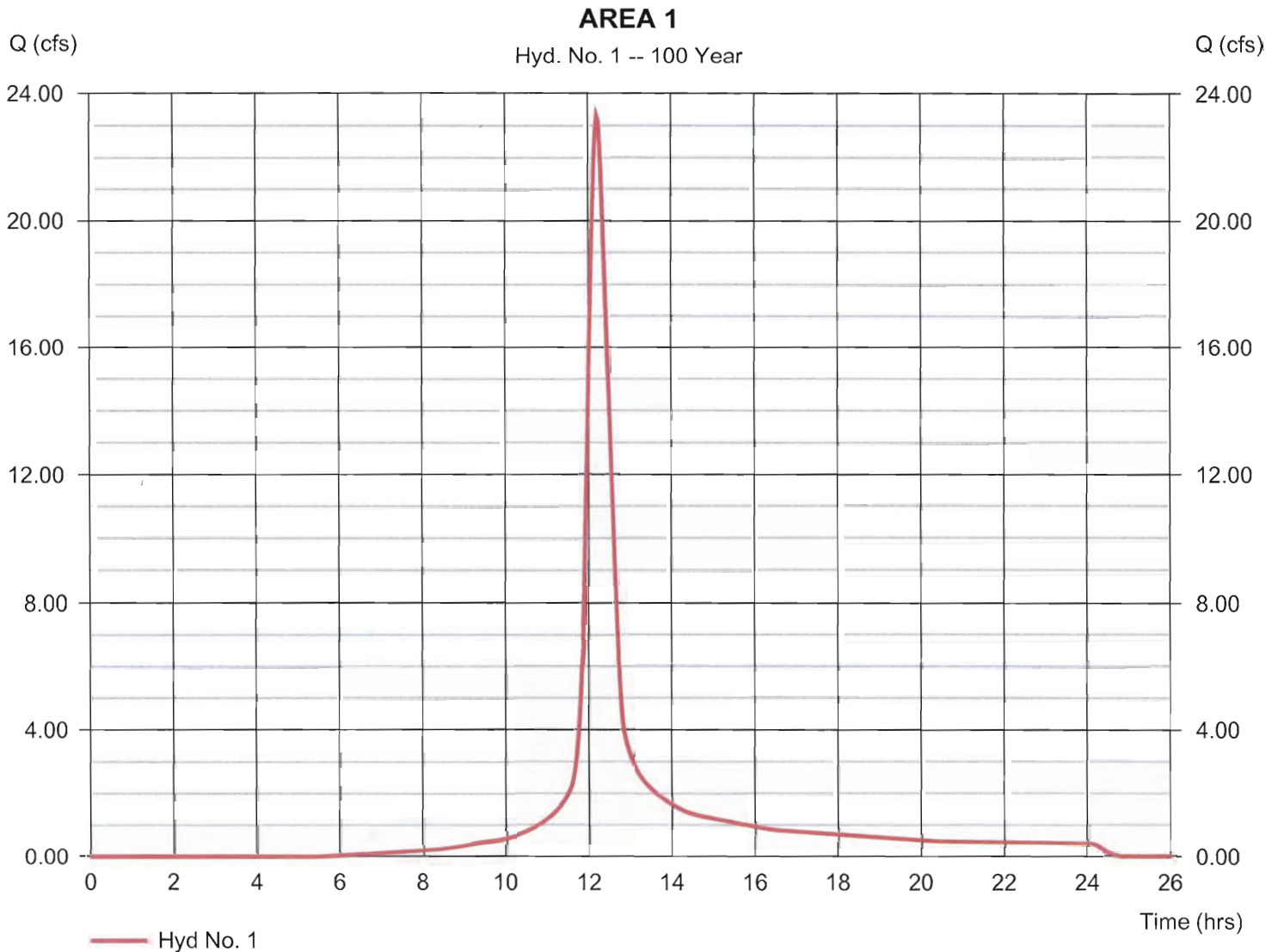
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	23.31	2	732	2.326	-----	-----	-----	AREA 1	
2	SCS Runoff	2.099	2	728	0.178	-----	-----	-----	AREA 2	
3	SCS Runoff	1.746	2	724	0.127	-----	-----	-----	AREA 3	
4	SCS Runoff	5.529	2	716	0.307	-----	-----	-----	AREA 4	
5	SCS Runoff	7.143	2	716	0.346	-----	-----	-----	AREA 5	
6	SCS Runoff	3.572	2	716	0.173	-----	-----	-----	AREA 6	
7	SCS Runoff	2.570	2	734	0.269	-----	-----	-----	AREA 7	
8	SCS Runoff	1.043	2	744	0.234	-----	-----	-----	AREA A	
9	SCS Runoff	0.851	2	716	0.047	-----	-----	-----	AREA B	
10	SCS Runoff	3.615	2	716	0.201	-----	-----	-----	AREA D	
11	SCS Runoff	1.489	2	716	0.083	-----	-----	-----	AREA C	
12	SCS Runoff	4.998	2	716	0.278	-----	-----	-----	AREA E	
13	SCS Runoff	3.403	2	716	0.189	-----	-----	-----	AREA F	
14	SCS Runoff	1.808	2	716	0.100	-----	-----	-----	AREA G	
15	Combine	16.16	2	716	0.898	9, 10, 11, 12, 13, 14	-----	-----	STORMTECH AREA	
16	SCS Runoff	5.848	2	716	0.325	-----	-----	-----	AREA H	
17	Combine	22.01	2	716	1.223	15, 16	-----	-----	COMBINED SYSTEM TO STORMTE	
18	Reservoir	0.888	2	790	1.222	17	1344.63	0.670	STORMTECH/ISOLATOR ROW	
13TH AND MAIZE 3.16.12.gpw					Return Period: 100 Year			Friday, 00 6, 2012		

# Hydrograph Report

## Hyd. No. 1

### AREA 1

Hydrograph type	= SCS Runoff	Peak discharge	= 23.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 2.326 acft
Drainage area	= 5.070 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

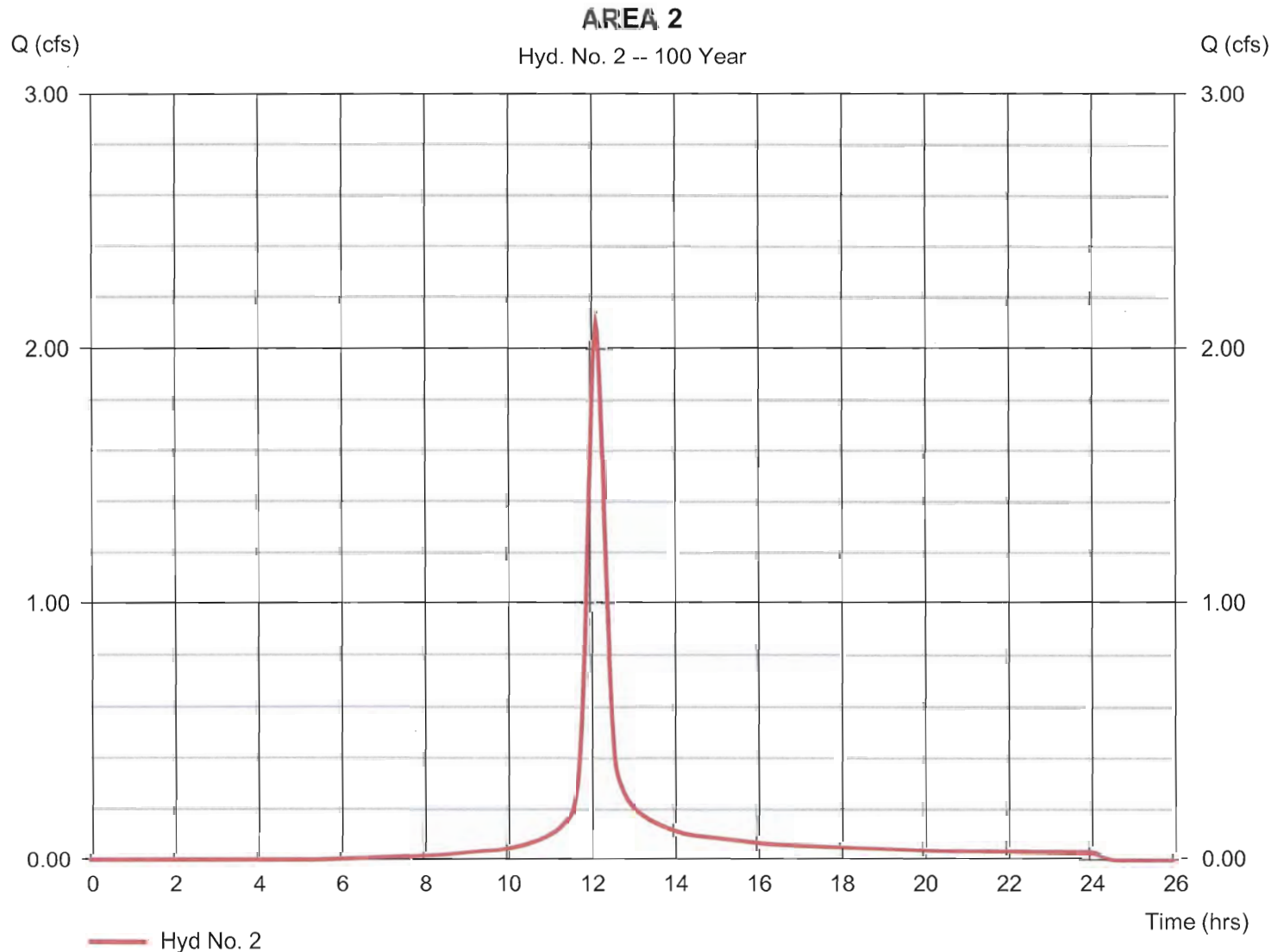


# Hydrograph Report

## Hyd. No. 2

### AREA 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.099 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 0.178 acft
Drainage area	= 0.400 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.30 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

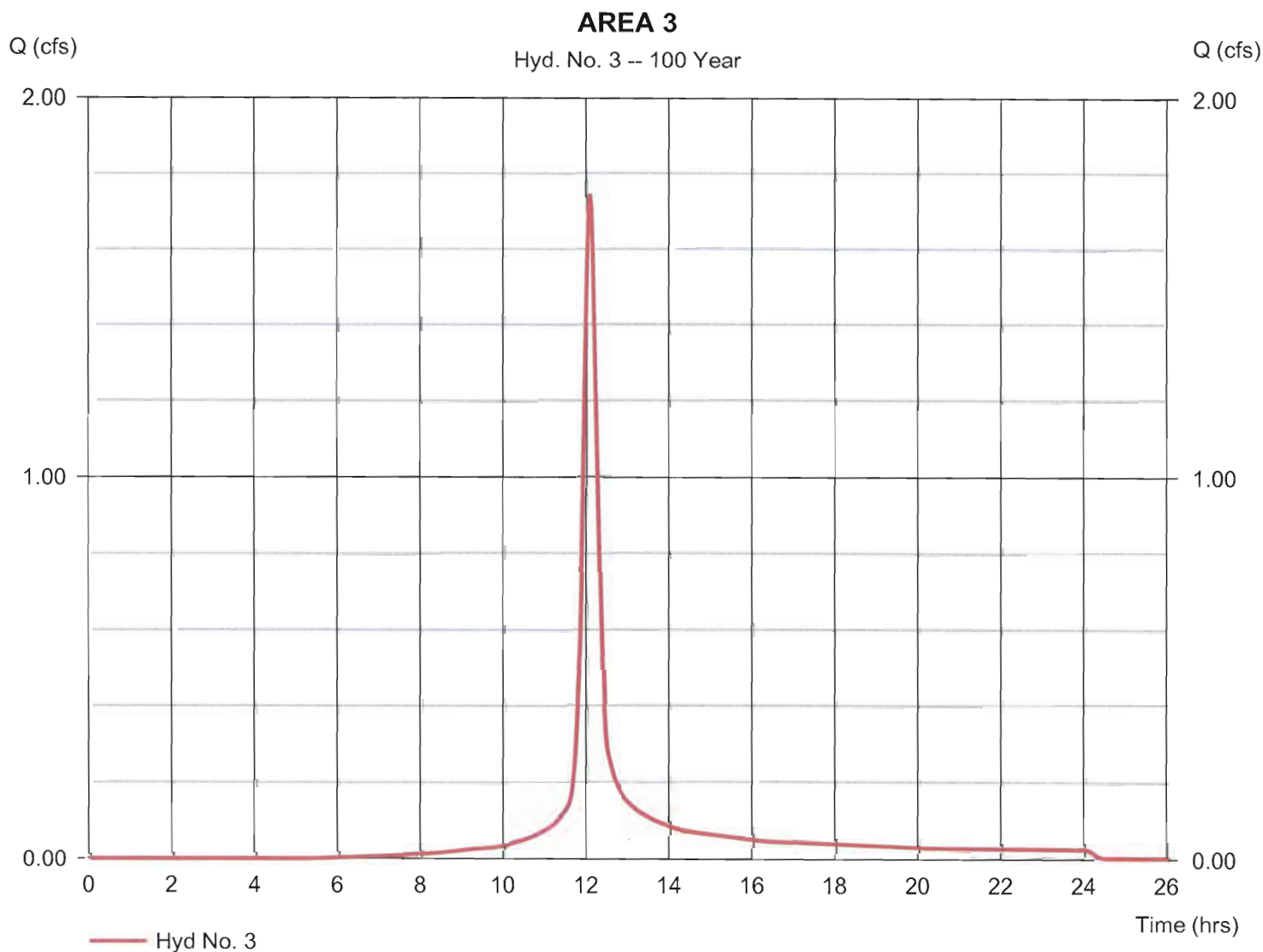


# Hydrograph Report

## Hyd. No. 3

### AREA 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.746 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0.127 acft
Drainage area	= 0.280 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.40 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

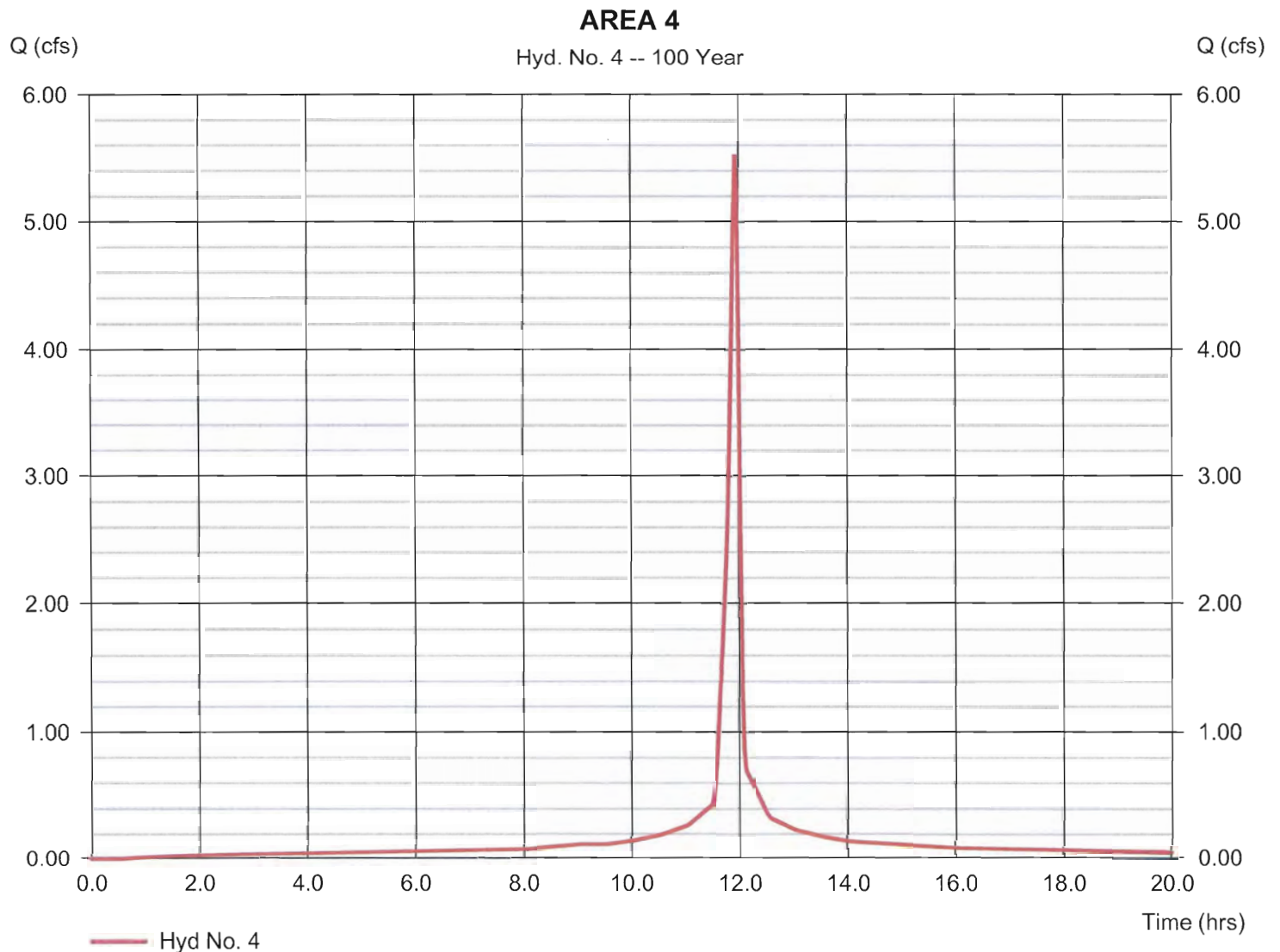


# Hydrograph Report

## Hyd. No. 4

### AREA 4

Hydrograph type	= SCS Runoff	Peak discharge	= 5.529 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.307 acft
Drainage area	= 0.520 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

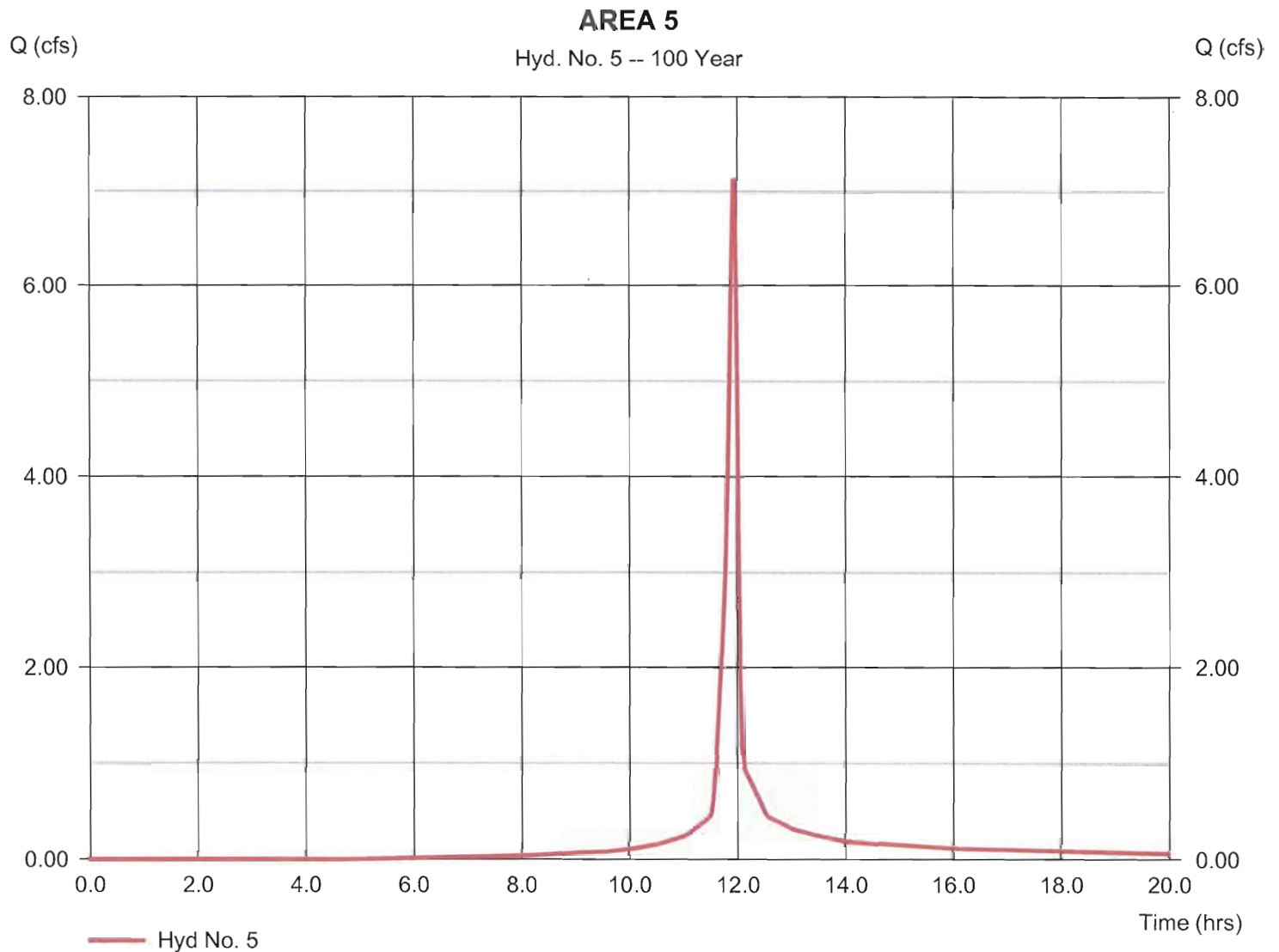


# Hydrograph Report

## Hyd. No. 5

### AREA 5

Hydrograph type	= SCS Runoff	Peak discharge	= 7.143 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.346 acft
Drainage area	= 0.780 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

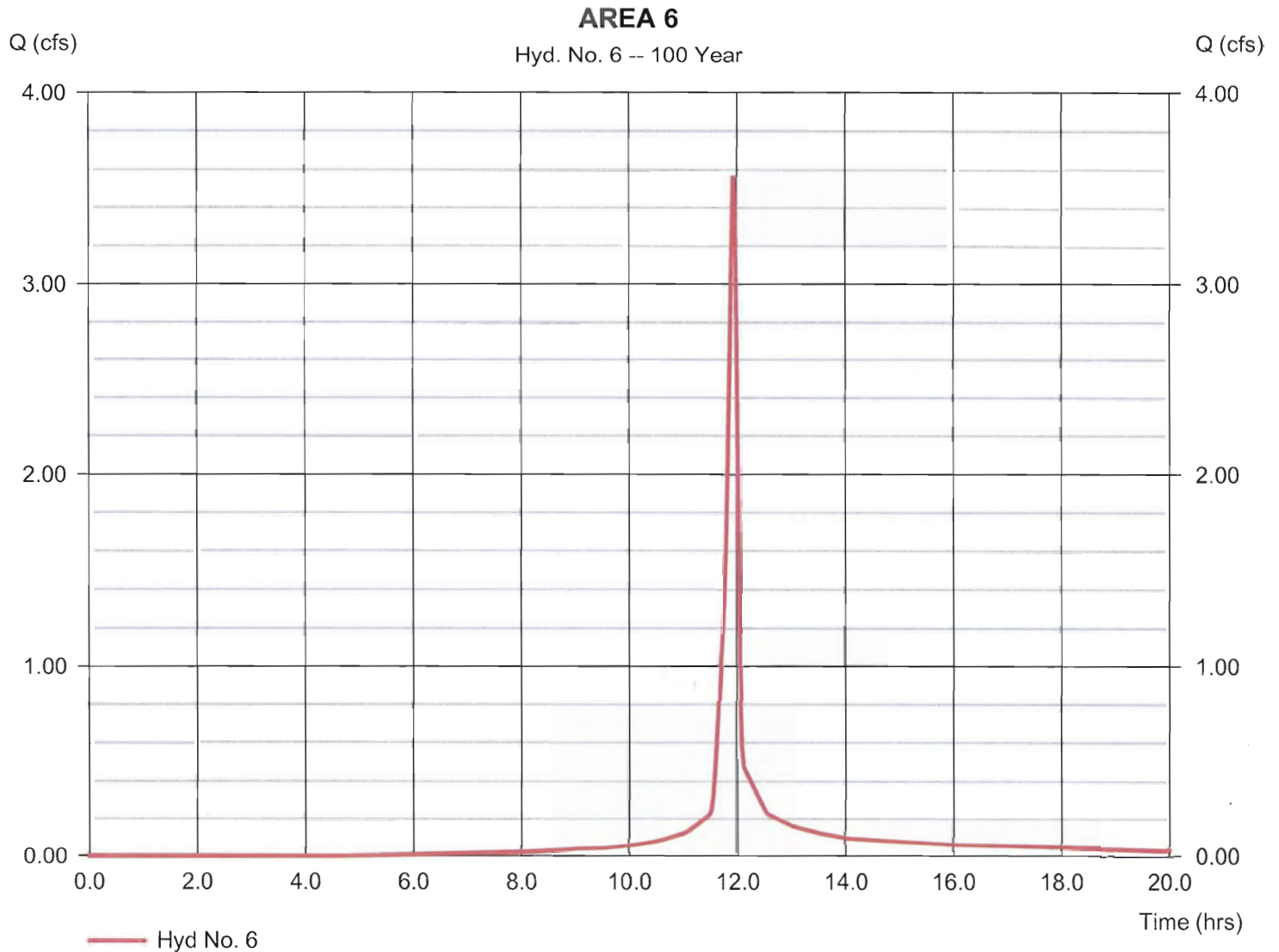


# Hydrograph Report

## Hyd. No. 6

### AREA 6

Hydrograph type	= SCS Runoff	Peak discharge	= 3.572 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.173 acft
Drainage area	= 0.390 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

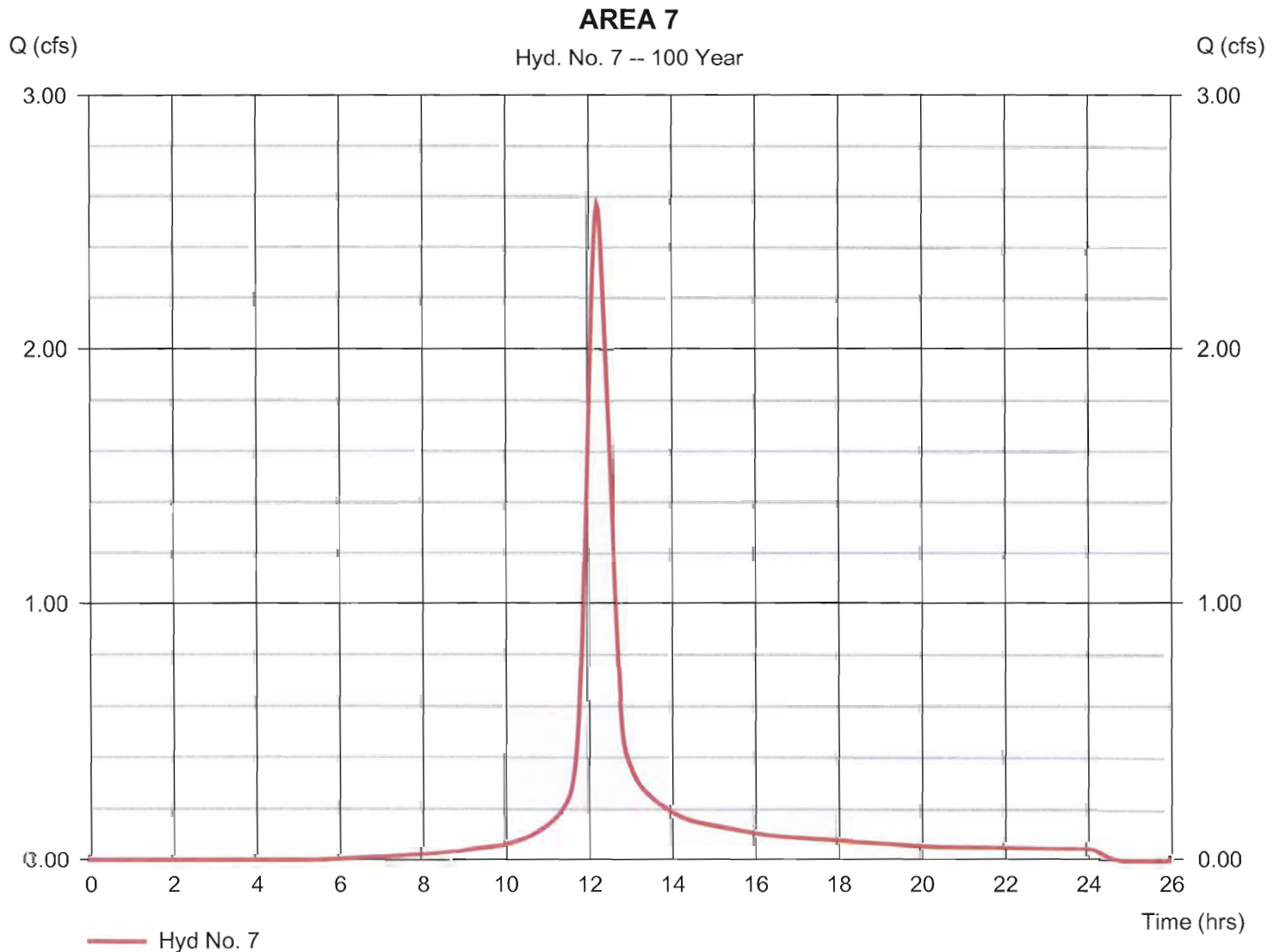


# Hydrograph Report

## Hyd. No. 7

### AREA 7

Hydrograph type	= SCS Runoff	Peak discharge	= 2.570 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 0.269 acft
Drainage area	= 0.600 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 35.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

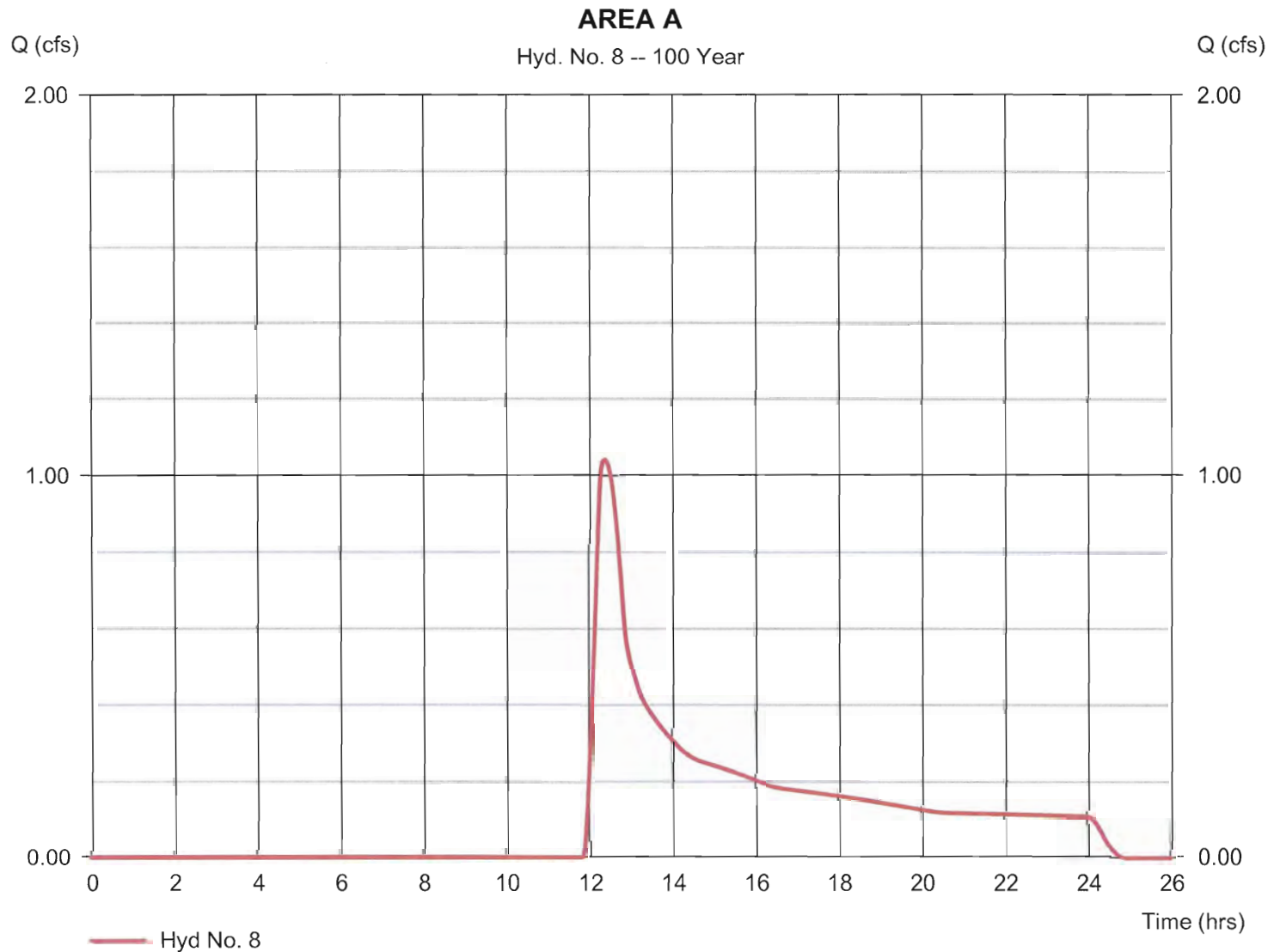


# Hydrograph Report

## Hyd. No. 8

### AREA A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.043 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.40 hrs
Time interval	= 2 min	Hyd. volume	= 0.234 acft
Drainage area	= 3.850 ac	Curve number	= 35
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 34.80 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

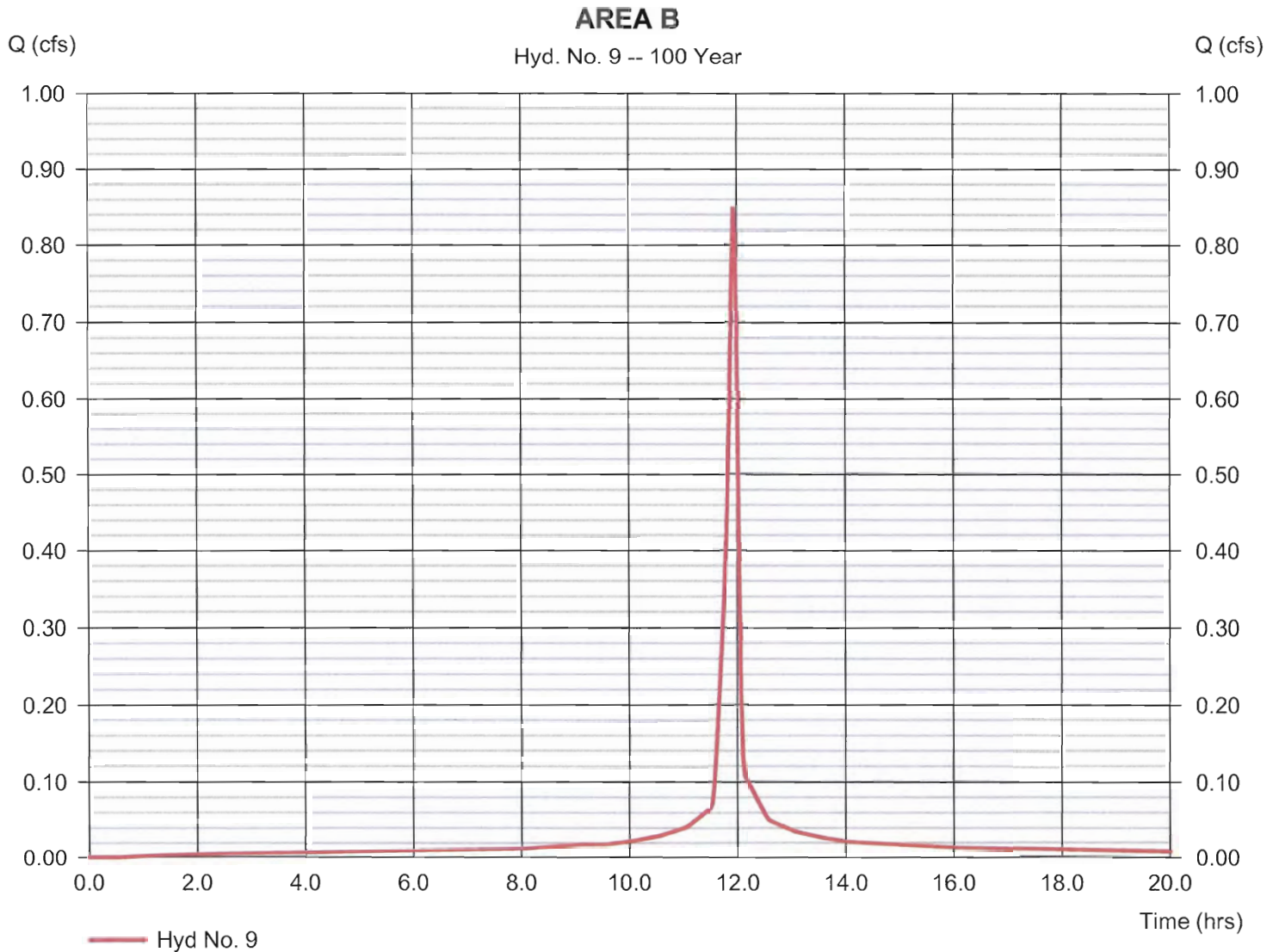


# Hydrograph Report

## Hyd. No. 9

### AREA B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.851 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.047 acft
Drainage area	= 0.080 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 4.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

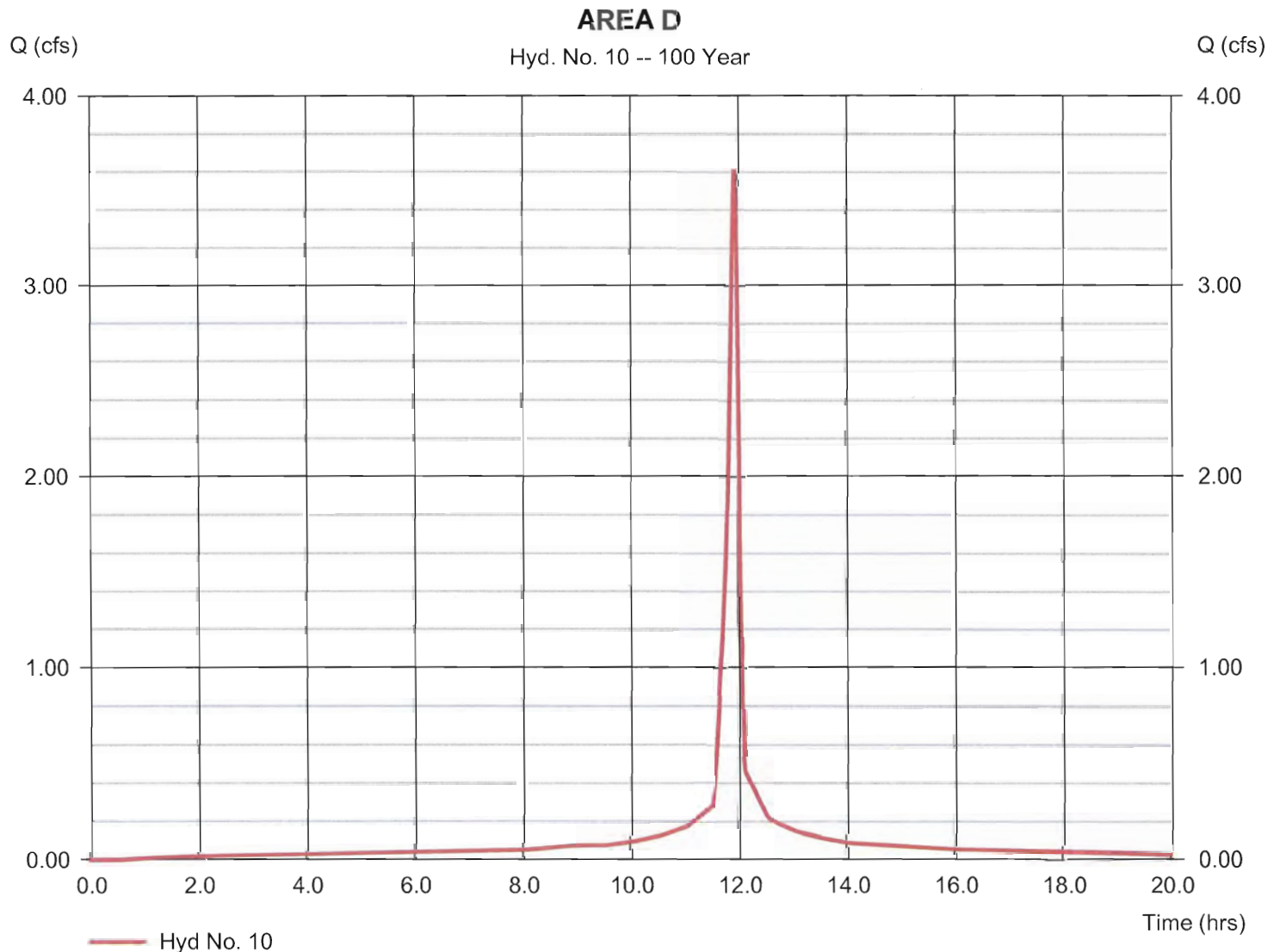


# Hydrograph Report

## Hyd. No. 10

### AREA D

Hydrograph type	= SCS Runoff	Peak discharge	= 3.615 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.201 acft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.20 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

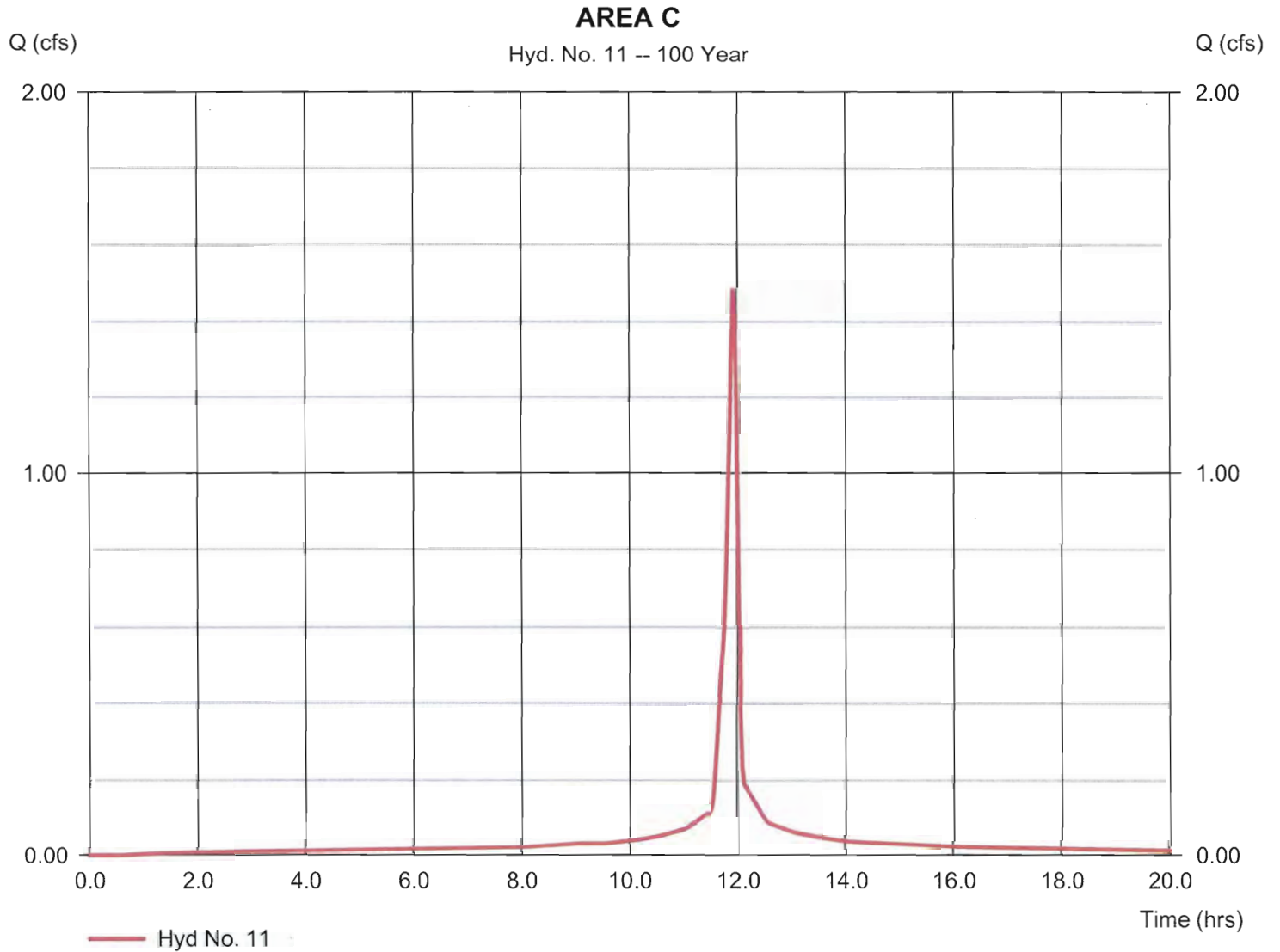


# Hydrograph Report

## Hyd. No. 11

### AREA C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.489 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.083 acft
Drainage area	= 0.140 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

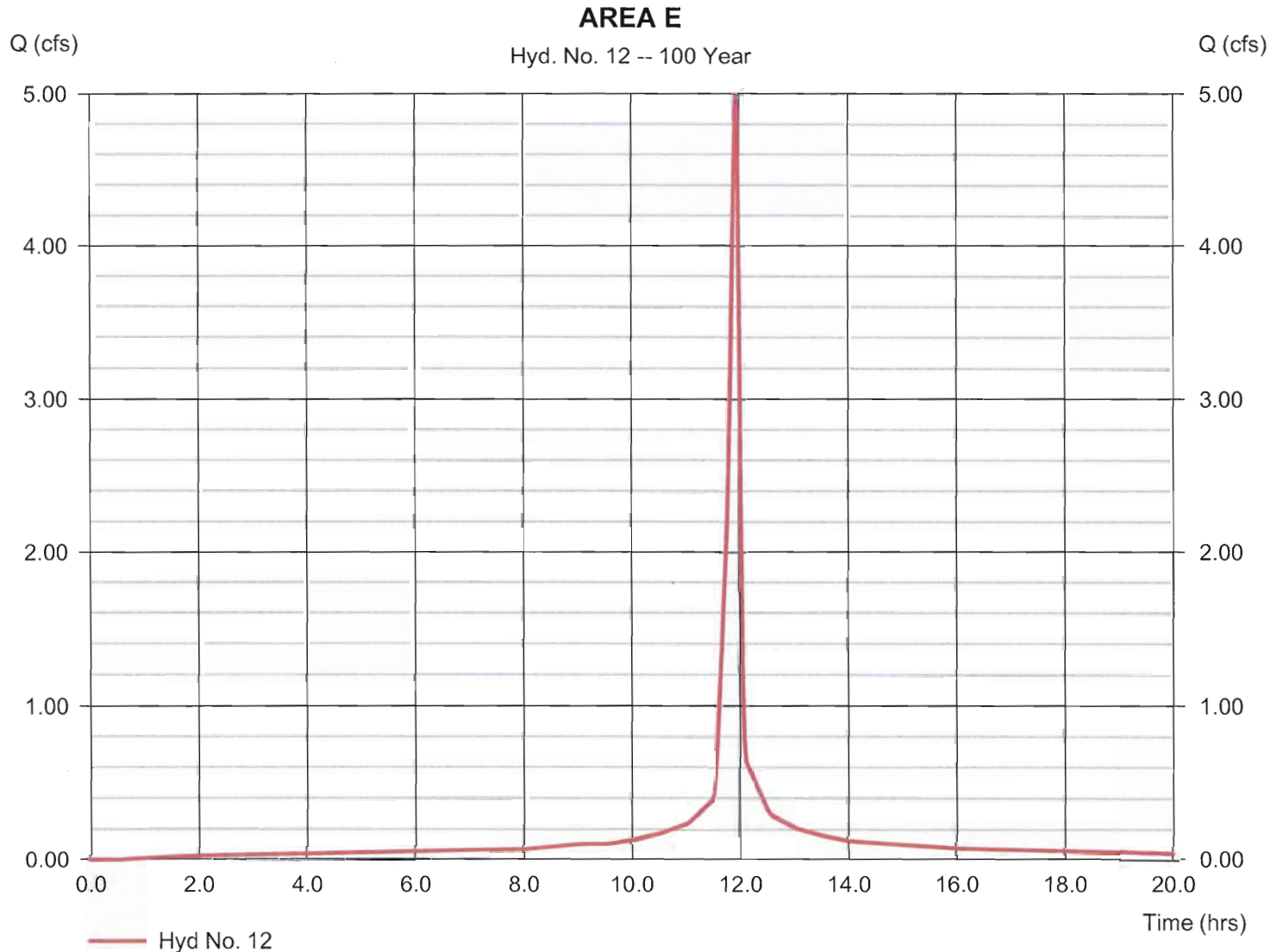
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Friday, 00 6, 2012

## Hyd. No. 12

### AREA E

Hydrograph type	= SCS Runoff	Peak discharge	= 4.998 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.278 acft
Drainage area	= 0.470 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

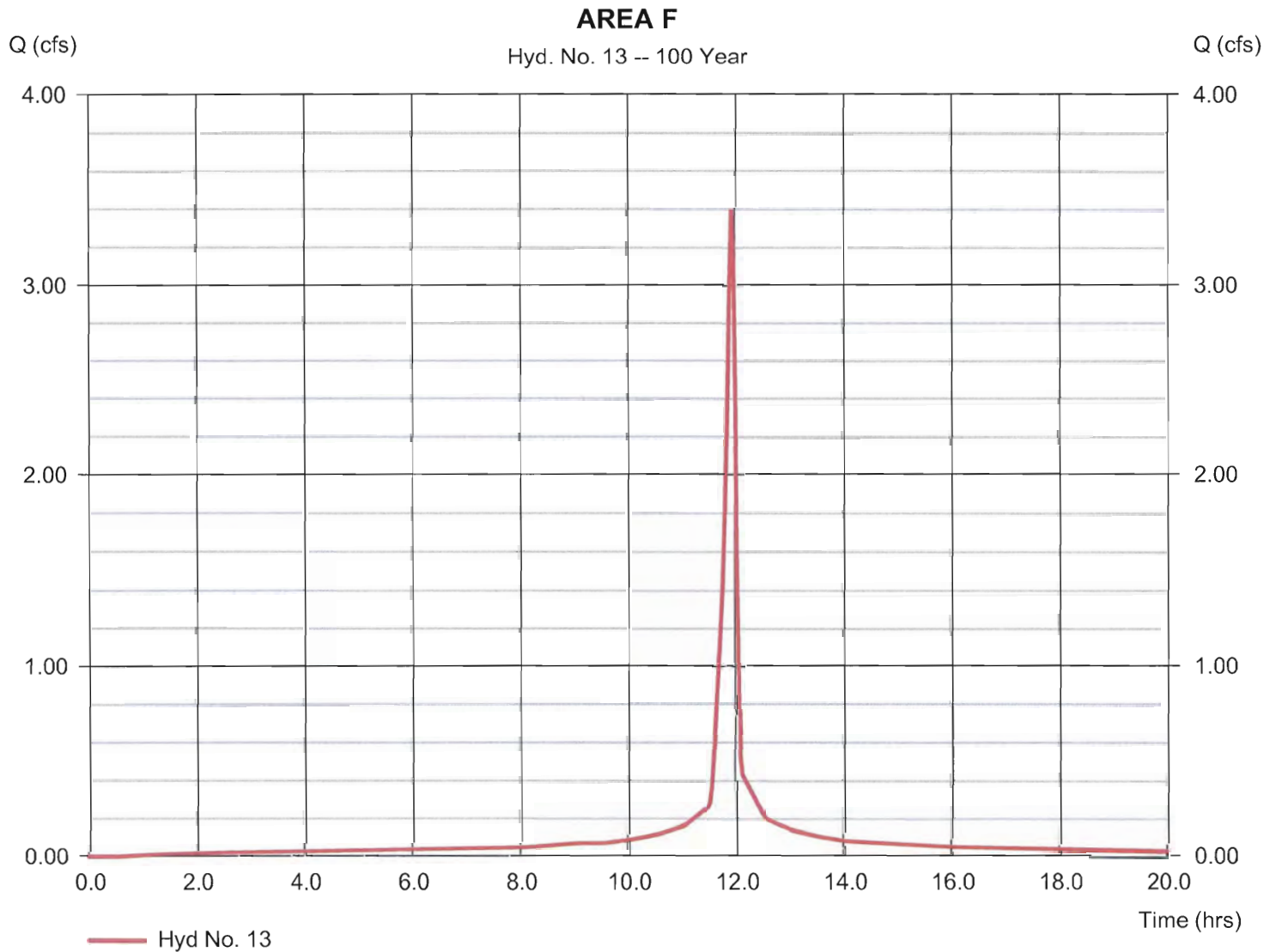


# Hydrograph Report

## Hyd. No. 13

### AREA F

Hydrograph type	= SCS Runoff	Peak discharge	= 3.403 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.189 acft
Drainage area	= 0.320 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

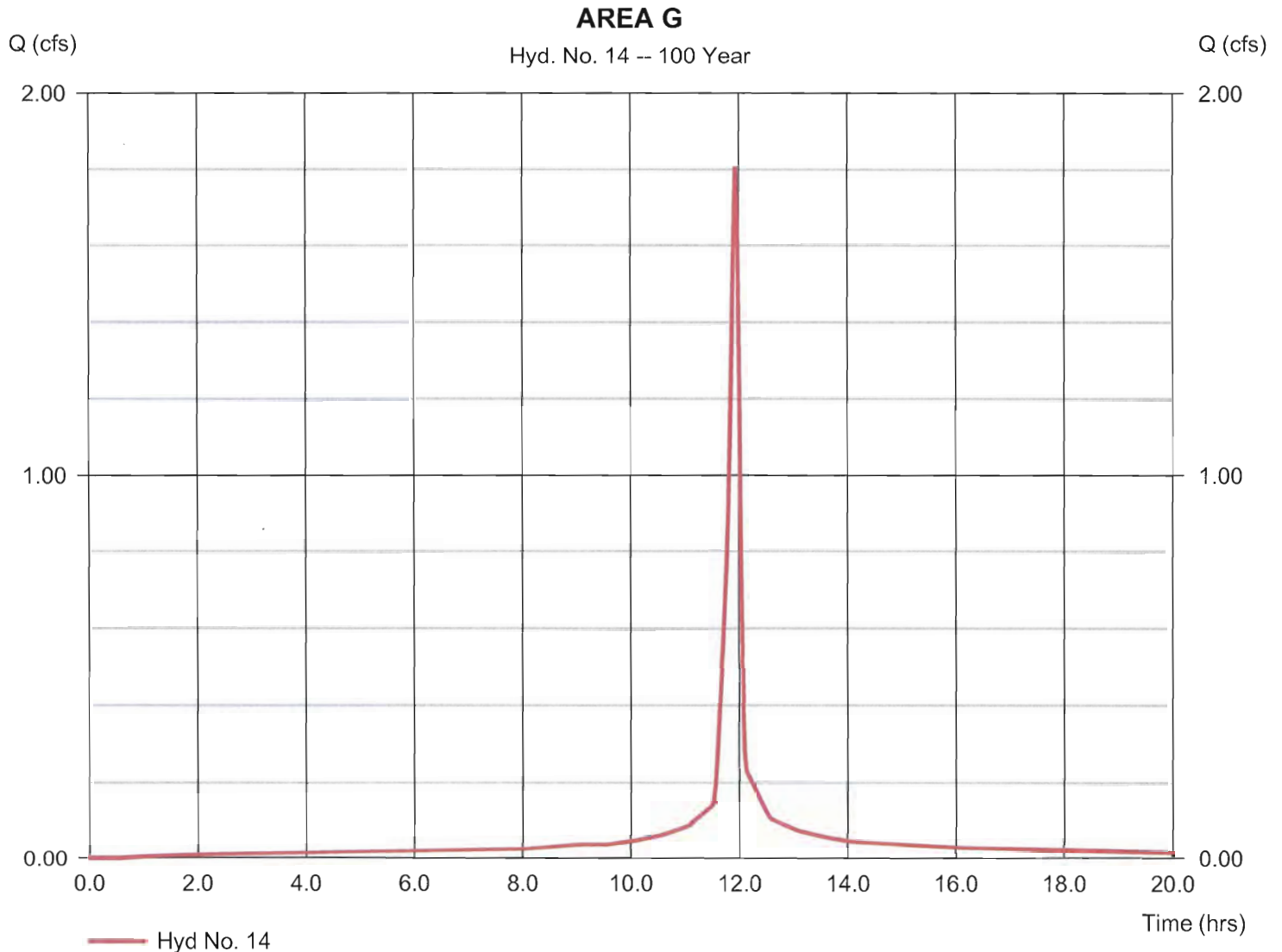


# Hydrograph Report

## Hyd. No. 14

### AREA G

Hydrograph type	= SCS Runoff	Peak discharge	= 1.808 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.100 acft
Drainage area	= 0.170 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.50 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

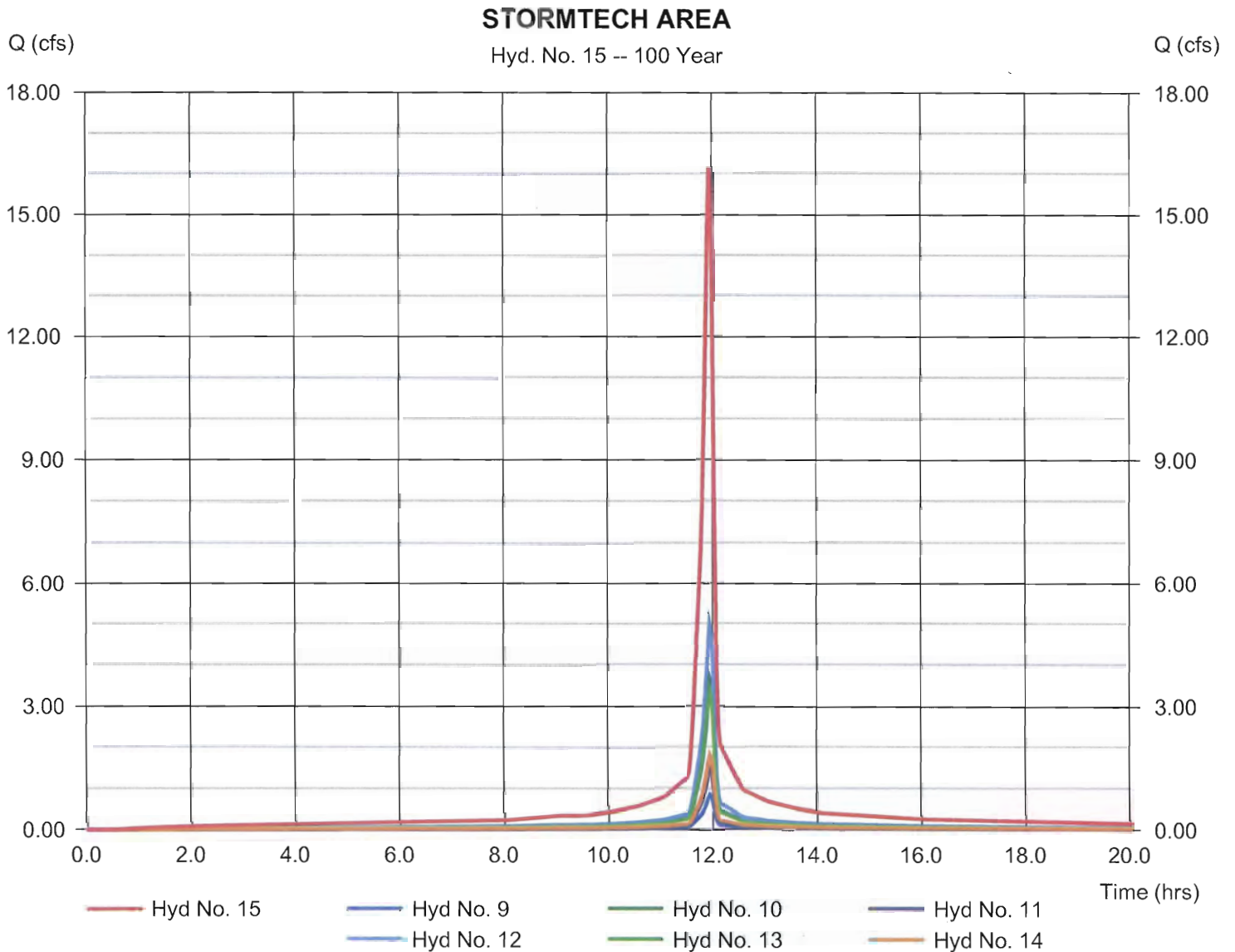


# Hydrograph Report

## Hyd. No. 15

### STORMTECH AREA

Hydrograph type	= Combine	Peak discharge	= 16.16 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.898 acft
Inflow hyds.	= 9, 10, 11, 12, 13, 14	Contrib. drain. area	= 1.520 ac

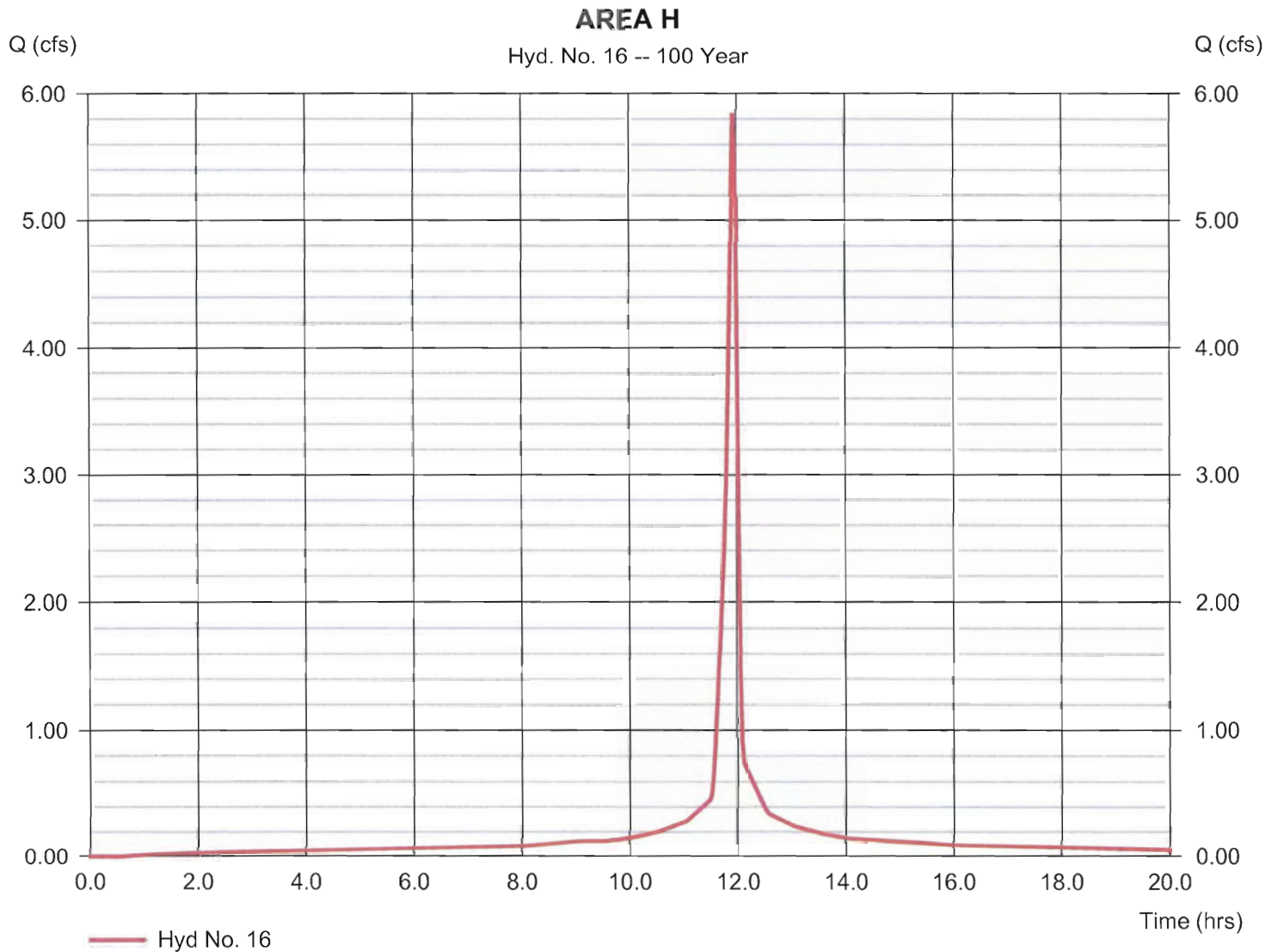


# Hydrograph Report

## Hyd. No. 16

### AREA H

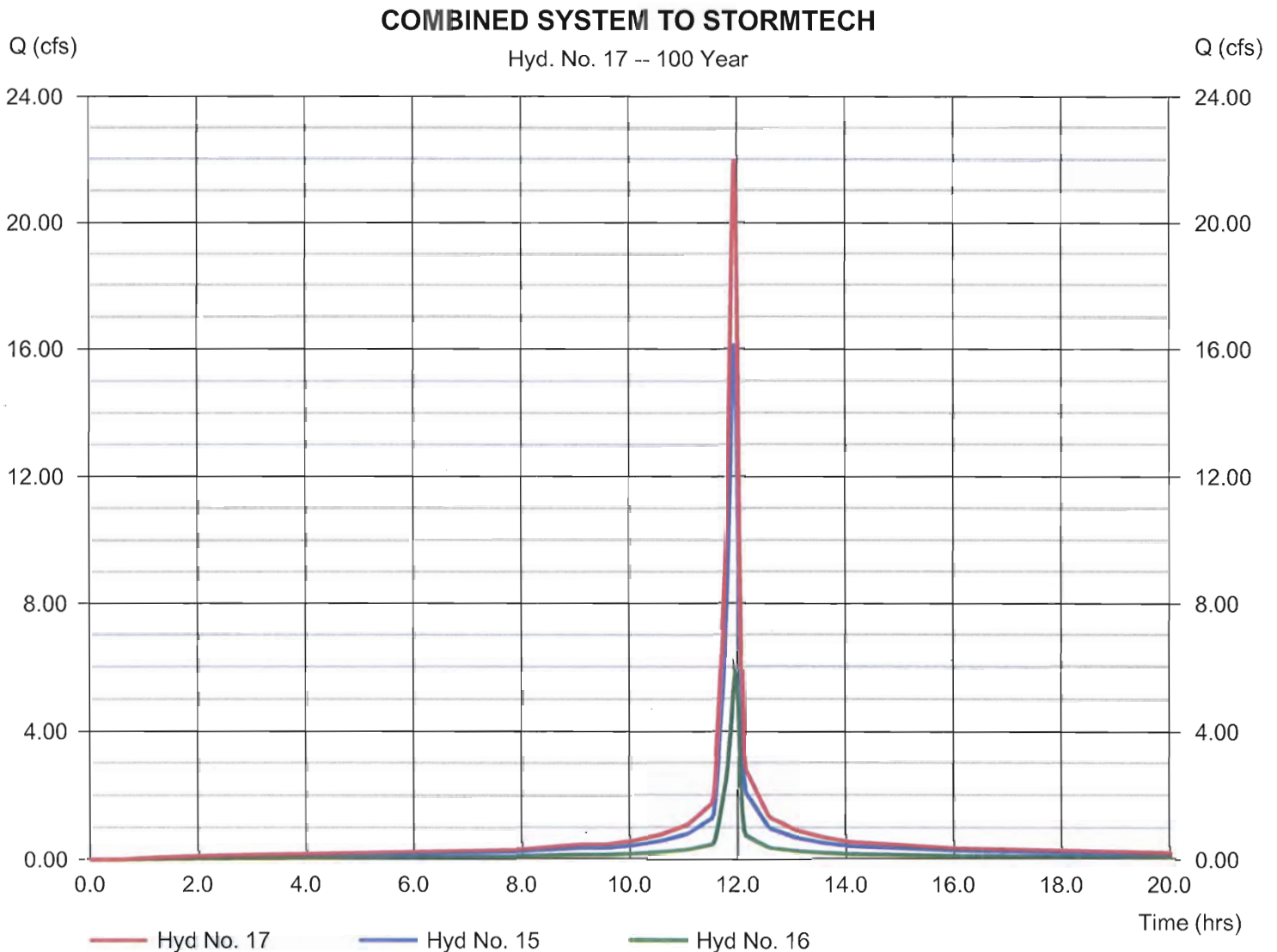
Hydrograph type	= SCS Runoff	Peak discharge	= 5.848 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 0.325 acft
Drainage area	= 0.550 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 3.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



## Hyd. No. 17

### COMBINED SYSTEM TO STORMTECH

Hydrograph type	= Combine	Peak discharge	= 22.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1.223 acft
Inflow hyds.	= 15, 16	Contrib. drain. area	= 0.550 ac



# Hydrograph Report

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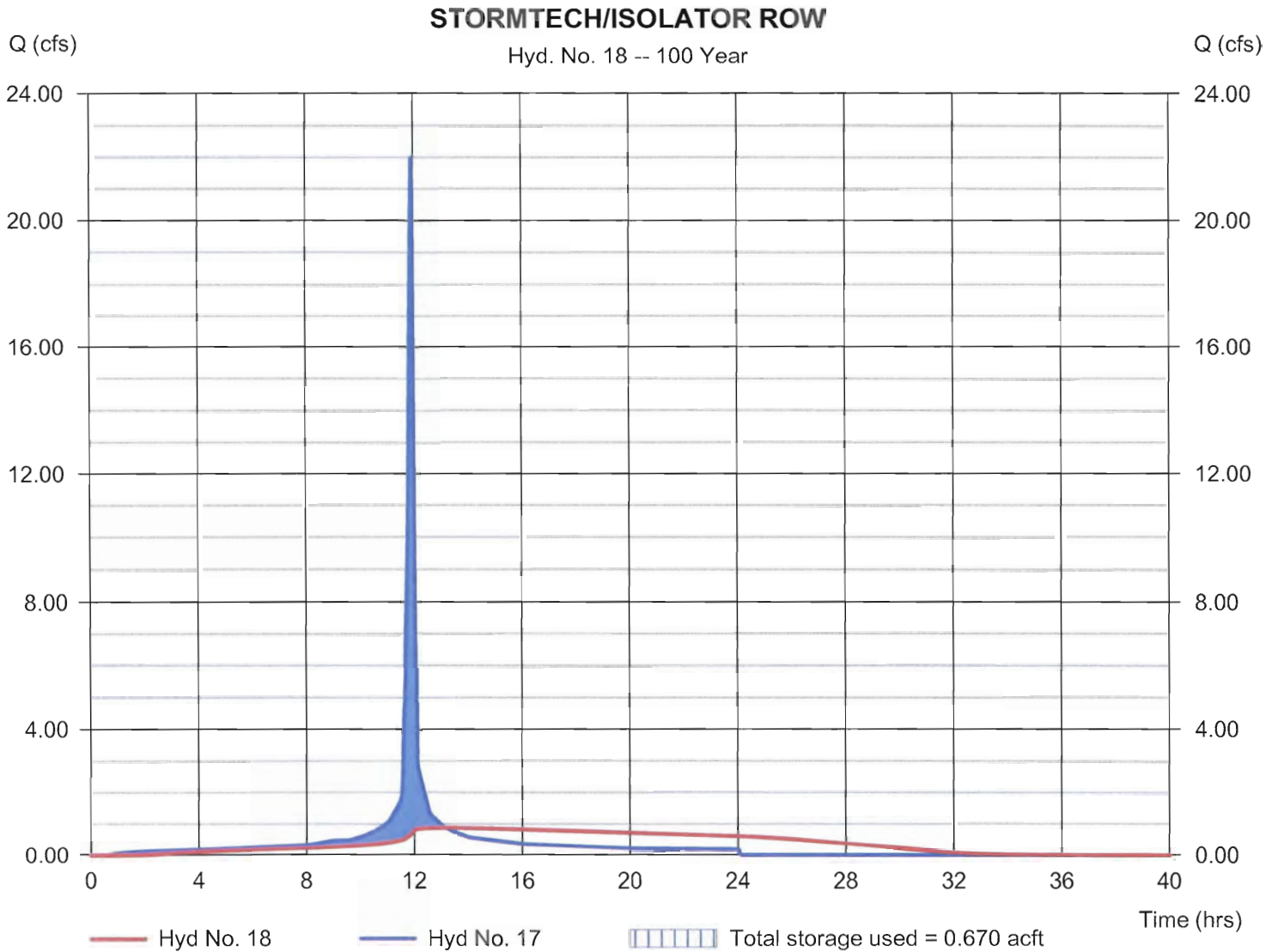
Friday, 00 6, 2012

## Hyd. No. 18

### STORMTECH/ISOLATOR ROW

Hydrograph type	= Reservoir	Peak discharge	= 0.888 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.17 hrs
Time interval	= 2 min	Hyd. volume	= 1.222 acft
Inflow hyd. No.	= 17 - COMBINED SYSTEM TO STORMTECH	Max. Storage	= 1344.63 ft
Reservoir name	= STORMTECH 3500		= 0.670 acft

Storage Indication method used.





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