DRAINAGE CALCULATIONS, HYDRAULICS & HYDROLOGY REPORT

1492 Hartford – New London Turnpike (CT Route 85)
Montville, CT

April 8th, 2024
Revised 5/1/24

Green Site Design, LLC

DRAINAGE HYDRAULICS AND HYDROLOGY REPORT

1492 Hartford – New London Turnpike (CT Route 85)
Montville, CT

EXISTING CONDITIONS

The site is approximately 5.62 acres in area and is shown on the Existing Conditions Survey (Sheet 1 of the site plans). The site has frontage on Hartford – New London Turnpike (Route 85). There are approximately 0.38 acres of wetlands on the site.

PROPOSED DEVELOPMENT

The project proposes the development of a processing, material storage, and equipment storage facility. There will be no free standing buildings on the site but there will be several storage bays and a construction trailer.

The 5.62 acres site contains wetlands as shown on sheet 1. Of the 5.62 acres, 4.08 acres will be disturbed during the development process. There will be no disturbance within the wetlands or upland review area.

EXISTING AND PROPOSED HYDRAULICS

The stormwater management system has been designed to provide for zero increase in peak stormwater discharge from the site. The project has been designed to actually result in a decrease in the peak stormwater rates leaving the project site. The proposed stormwater water quality basin will provide treatment of the runoff from the proposed site.

The current site is divided into two, existing, drainage areas:

Existing Drainage Area 1	2.98 Acres
Existing Drainage Area 2	2.64 Acres

The development of the proposed site will result in two drainage areas:

Proposed Drainage Area 1	4.08 Acres
Proposed Drainage Area 2	1.54 Acres

Proposed Drainage Area 1 contains the developed site. The stormwater runoff from this area will be treated by the water quality basin in the northwestern corner of the site. Proposed Drainage Area 2 contains the wetlands and upland review area and will remain undeveloped. The basin has been modelled to assume that the basin will have water in it up to elevation 206 at the onset of the storm event. The basin will drain between storms down to elevation 206 thru the new outlet structure and then connect to the existing drainage system in Route 85.

Both the existing and the proposed conditions for the development site have been analyzed for the 2-year, 10-year, 25-year, 50-year, and 100 year design storms using the Rational Method.

Drainage Area 1

	2 Year	10 Year	25 Year	50 Year	100 Year
Existing	3.32 cfs	4.98 cfs	5.99 cfs	6.75 cfs	7.56 cfs
Proposed	0.29 cfs	1.18 cfs	2.69 cfs	4.06 cfs	5.68 cfs

Drainage Area 2

	2 Year	10 Year	25 Year	50 Year	100 Year
Existing	1.96 cfs	2.94 cfs	3.54 cfs	3.99 cfs	4.46 cfs
Proposed	1.28 cfs	1.93 cfs	2.33 cfs	2.62 cfs	2.93 cfs

EROSION & SEDIMENTATION CONTROL

The 2002 CT Guidelines for Soil Erosion & Sedimentation Control applies to the construction phase of the project. A detailed erosion and sediment control plan has been provided in the site development plans. The proposed stormwater water quality basin has been designed to function as sedimentation traps during stabilization.

The first calculation required by the Guidelines is for the sediment storage volume (SSV). The sediment storage volume is the calculation for one year of predicted sediment load. The required SSV calculation for the temporary sediment trap is shown below.

Drainage Area 1A

SSV = A(134CY/Acre)

A = 4.08 ACRE

SSV = 546.72 CY = **14,760 CF**

The second calculation required by the Guidelines is for wet storage volume (WSV). The wet storage volume is the volume in the basin that is located below the bottom of the riprap for the level spreader outlet of the basin. The volume of the wet storage is required to be half of the required SSV. The required wet storage volume is shown below along with the dry storage volumes (DSV).

Drainage Area 1A

WSV = DSV = SSV/2

= **7,380 CF**

The required and provided storage for each basin are as follows:

Drainage Area 1 (Outlet structure inlet elevation = 206.0)

Sedimentation Trap

Forebay and Basin:

7,380 CF of Wet Storage Volume Required	11,770 CF Provided
7,380 CF of Dry Storage Volume Required	23,439 CF Provided
14,760 CF of Sediment Storage Volume Required	35,209 CF Total Provided

CONNECTICUT STORMWATER QUALITY MANUAL

The Connecticut 2024 Stormwater Quality Manual (Manual) applies to the post construction phase, for the operation of the facility. The temporary sediment traps have been designed to function as water quality basins after the site is stabilized. They all meet the criteria of the Connecticut Stormwater Quality Manual for a Water Quality Basin.

Drainage Area 1

WQV = (1.3")(R)(A)/12

A = 4.08 Acre

R = 0.05 + 0.009(I)

I = 3.8 Acres / 4.08 Acres = 0.93 (93%)

R = 0.88

WQV = 0.388 Ac-Ft = 16,901 CF (Required)

16,678 CF (Provided in Water Quality Basin)

6,761 CF (Provided in Forbay)

Once development of the site is completed, there will be a decrease in runoff from the site. The temporary sedimentation basin provides ample wet and dry storage volume to meet and exceed the requirements of the 2002 CT Guidelines for Soil & Sedimentation Control. Likewise, Water Quality Basin meets and exceeds the post construction requirements of the Connecticut 2024 Stormwater Quality Manual.

DRAINAGE SWALE:

The attached drainage calculations shows that for a 25 year design storm, the swale will have a peak flow of 7.8 cfs and a depth of 1.5 feet, providing 6 inches of free board in the swale. The calculations also show a velocity of 0.9 ft/sec.

The site soils are generally gravel or sandy-loam. The stormwater velocity within the swales are all below the Maximum Permissible Velocity for poor condition as outlined in the chart below. The swales will be stable during the early stabilization phase during construction and when fully grown-in and stable post construction.

Figure VW-1 Maximum Permissible Velocity (ft./sec.)

Soil Texture	Channel Vegetation Condition[1]			
	Poor	Fair	Good	Stone Center
Sand, silt loam, sandy loam, loamy sand, loam and muck	2.0	2.5	3.5	8.0
Silty clay loam, sandy clay loam, clay, clay loam, sandy clay, silty clay	3.0	4.0	5.0	8.0

[1]For channels with geosynthetic turf reinforcement, permissible velocities shall be designed on a product-specific basis and for long duration flows (>24 hours).

Source: USDA-NRCS

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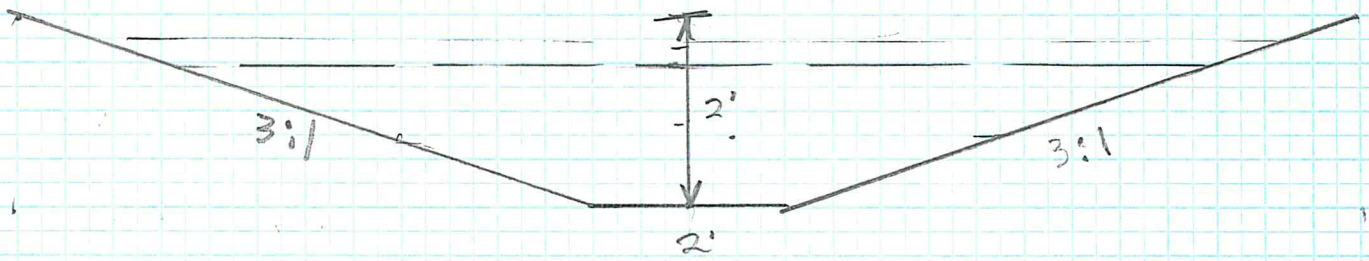
PROJECT NAME: JEFF DANIELS
PROJECT NO: _____ SHEET NO. _____ OF _____
BY: _____ DATE _____
SCALE: _____

DRAINAGE SWALE



$$Q = A\left(\frac{1.486}{n}\right) r^{2/3} S^{1/2}$$

$Q_{25} = 7.8$ CFS (SEE DRAINAGE MODEL)

$S = 3.3\%$ $n = 0.35$ $r = \frac{A}{P}$

1.5 DEPTH: (6" FREEBOARD)

$$Q = 9.3\left(\frac{1.486}{0.35}\right)\left(\frac{9.3}{12.7}\right)^{2/3}(0.033)^{1/2}$$

$Q = 8.4$ CFS CAPACITY @ DEPTH = 1.5 FT

$$V = \frac{Q}{A} = \frac{7.8}{9.3} = 0.8 \text{ FT/S}$$

$$V = \left(\frac{1.486}{0.35}\right)\left(\frac{9.3}{7}\right)^{2/3}(0.033)^{1/2} = 0.9 \text{ FT/S}$$

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	3.318	1	9	1,792	------	------	------	Existing Area 1
2	Rational	12.11	1	9	6,541	------	------	------	Proposed Area 1
3	Reservoir(i)	1.865	1	17	2,070	2	206.66	6,096	forebay
4	Reservoir	0.295	1	43	2,056	3	206.22	1,410	Water Quality Basin
5	Rational	1.960	1	9	1,058	------	------	------	Existing Area 2
6	Rational	1.288	1	7	541	------	------	------	Proposed Area 2
8	Rational	4.349	1	7	1,827	------	------	------	Runoff to Swale

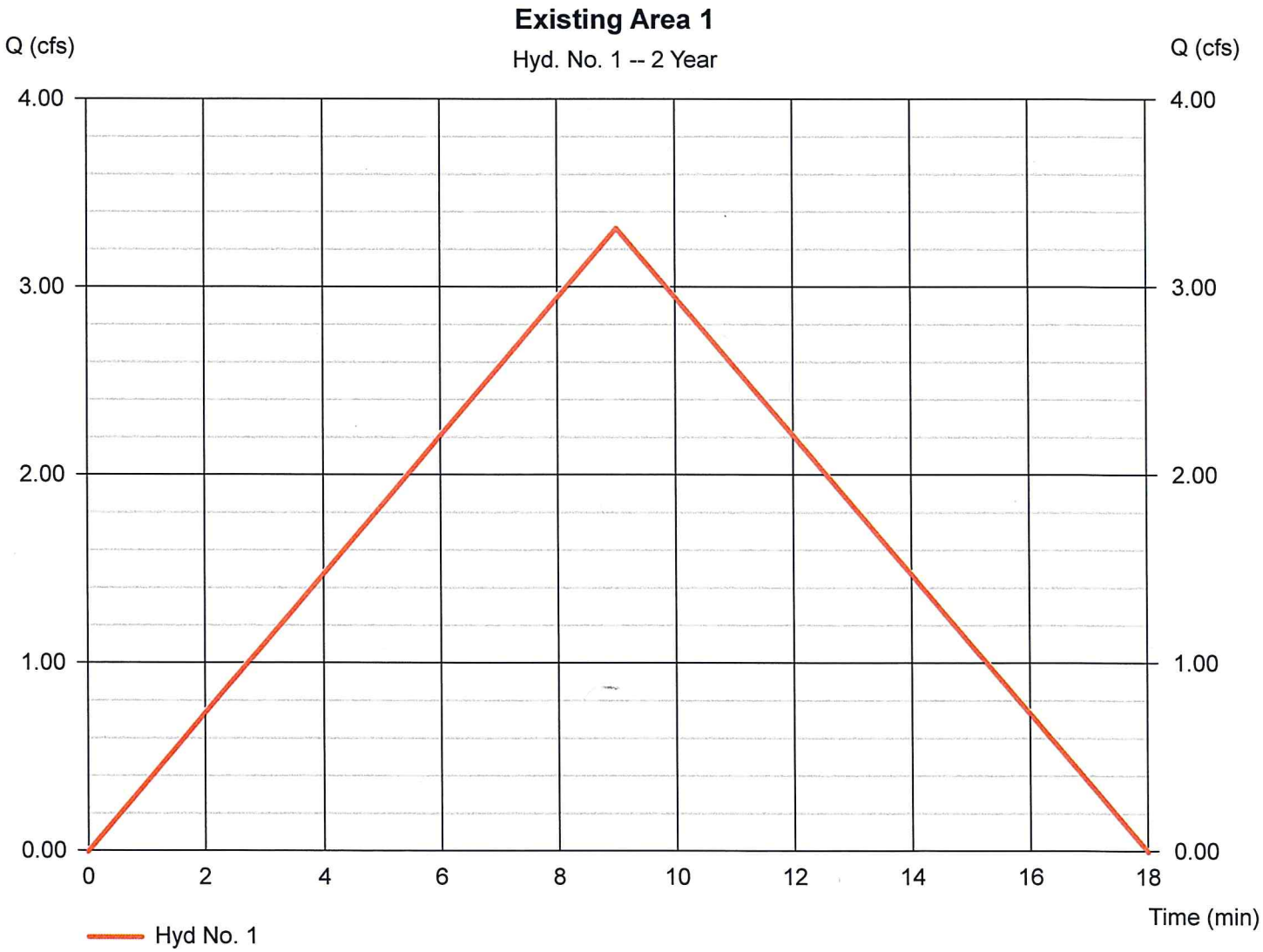
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, May 9, 2024

Hyd. No. 1

Existing Area 1

Hydrograph type	= Rational	Peak discharge	= 3.318 cfs
Storm frequency	= 2 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 1,792 cuft
Drainage area	= 2.980 ac	Runoff coeff.	= 0.3
Intensity	= 3.711 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1

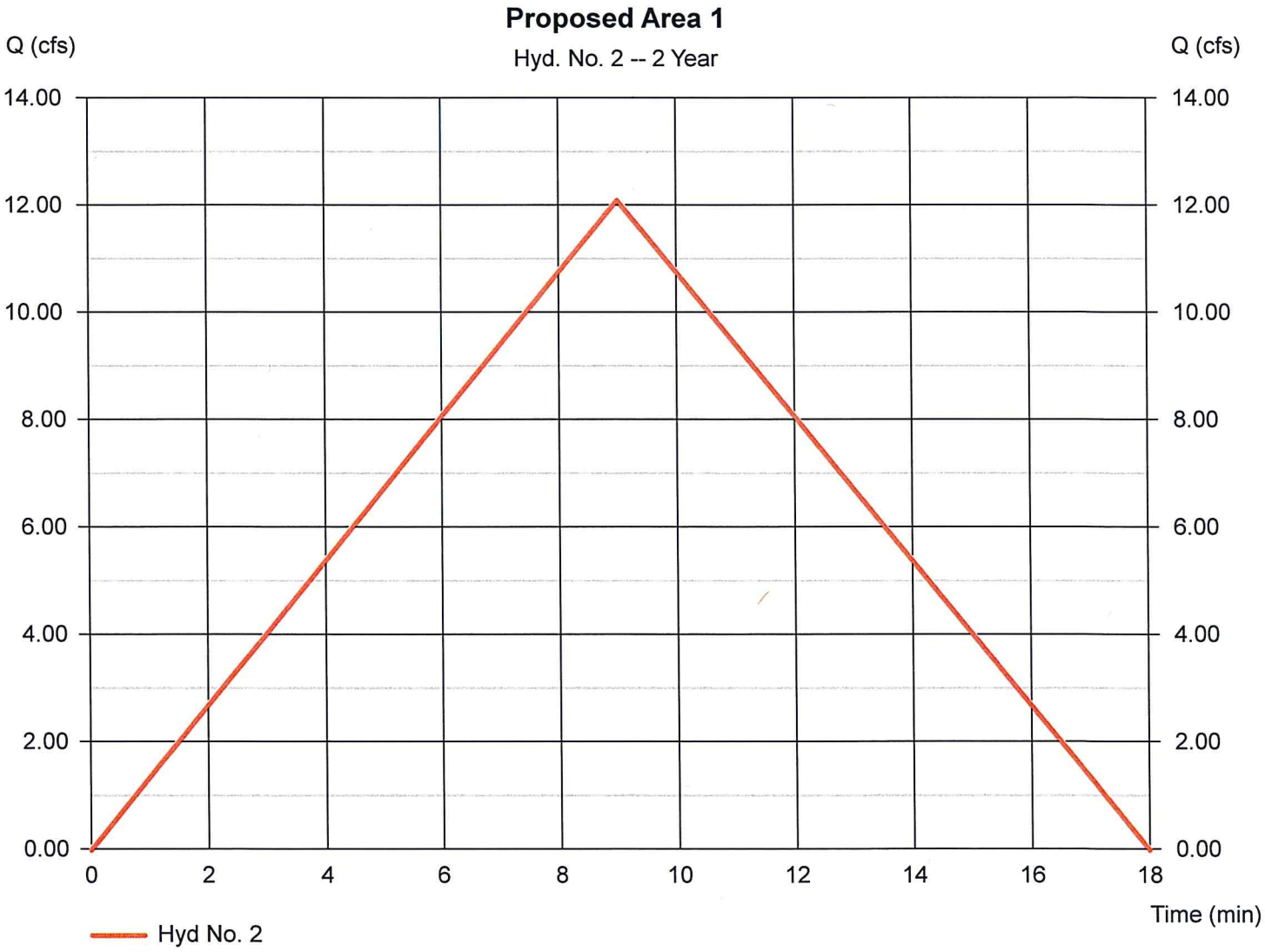


Hydrograph Report

Hyd. No. 2

Proposed Area 1

Hydrograph type	= Rational	Peak discharge	= 12.11 cfs
Storm frequency	= 2 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 6,541 cuft
Drainage area	= 4.080 ac	Runoff coeff.	= 0.8
Intensity	= 3.711 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



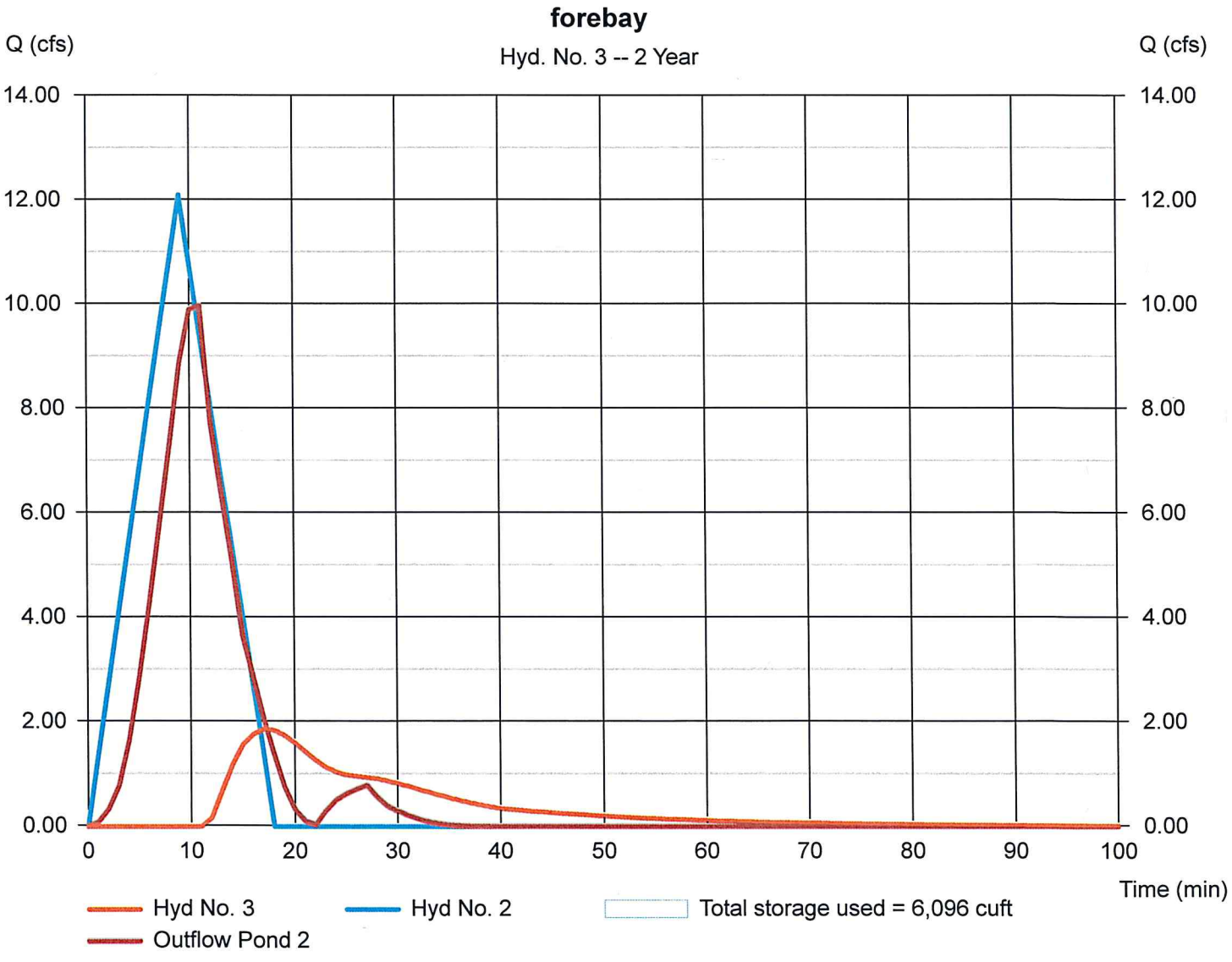
Hydrograph Report

Hyd. No. 3

forebay

Hydrograph type	=	Reservoir (Interconnected)	Peak discharge	=	1.865 cfs
Storm frequency	=	2 yrs	Time to peak	=	17 min
Time interval	=	1 min	Hyd. volume	=	2,070 cuft
Upper Pond			**Lower Pond**		
Pond name	=	forbay	Pond name	=	Pond 1
Inflow hyd.	=	2 - Proposed Area 1	Other Inflow hyd.	=	None
Max. Elevation	=	206.66 ft	Max. Elevation	=	206.65 ft
Max. Storage	=	1,766 cuft	Max. Storage	=	4,330 cuft

Interconnected Pond Routing. Storage Indication method used.



Hydrograph Report

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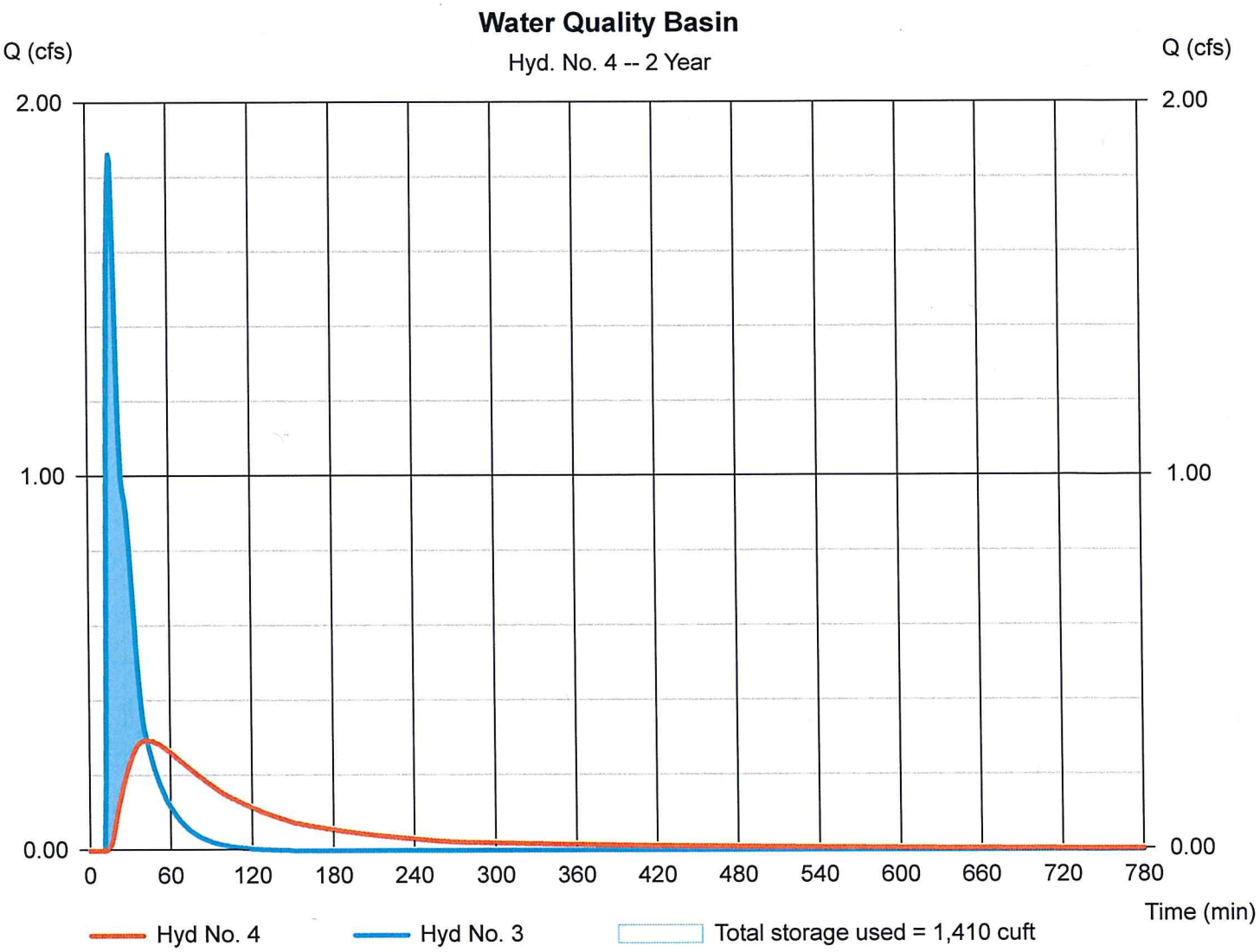
Hyd. No. 4

Water Quality Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.295 cfs
Storm frequency	= 2 yrs	Time to peak	= 43 min
Time interval	= 1 min	Hyd. volume	= 2,056 cuft
Inflow hyd. No.	= 3 - forebay	Max. Elevation	= 206.22 ft
Reservoir name	= Pond 1	Max. Storage	= 1,410 cuft

Storage Indication method used.

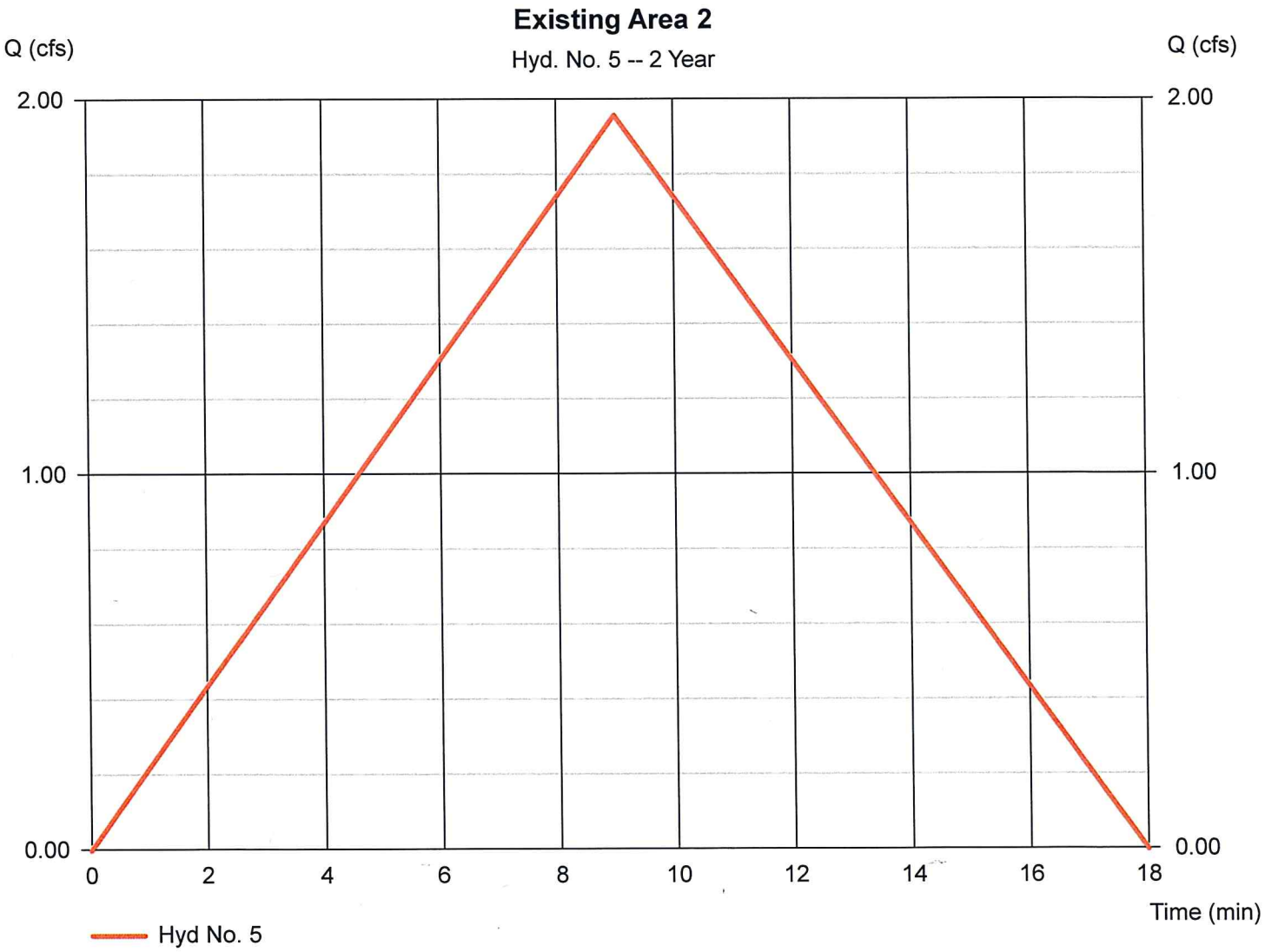


Hydrograph Report

Hyd. No. 5

Existing Area 2

Hydrograph type	= Rational	Peak discharge	= 1.960 cfs
Storm frequency	= 2 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 1,058 cuft
Drainage area	= 2.640 ac	Runoff coeff.	= 0.2
Intensity	= 3.711 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



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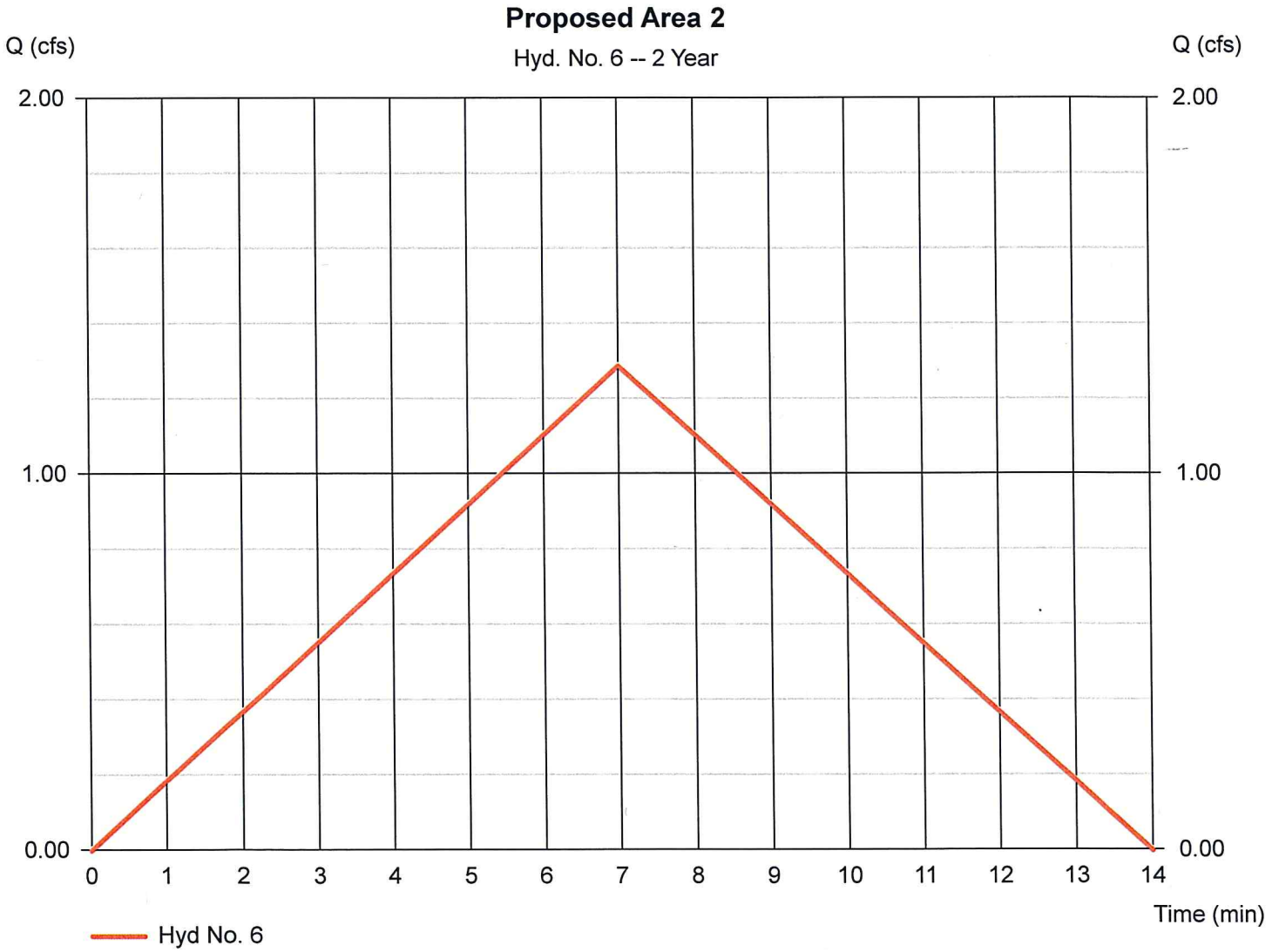
Hyd. No. 6

Proposed Area 2

Hydrograph type	= Rational	Peak discharge	= 1.288 cfs
Storm frequency	= 2 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 541 cuft
Drainage area	= 1.540 ac	Runoff coeff.	= 0.2
Intensity	= 4.182 in/hr	Tc by User	= 7.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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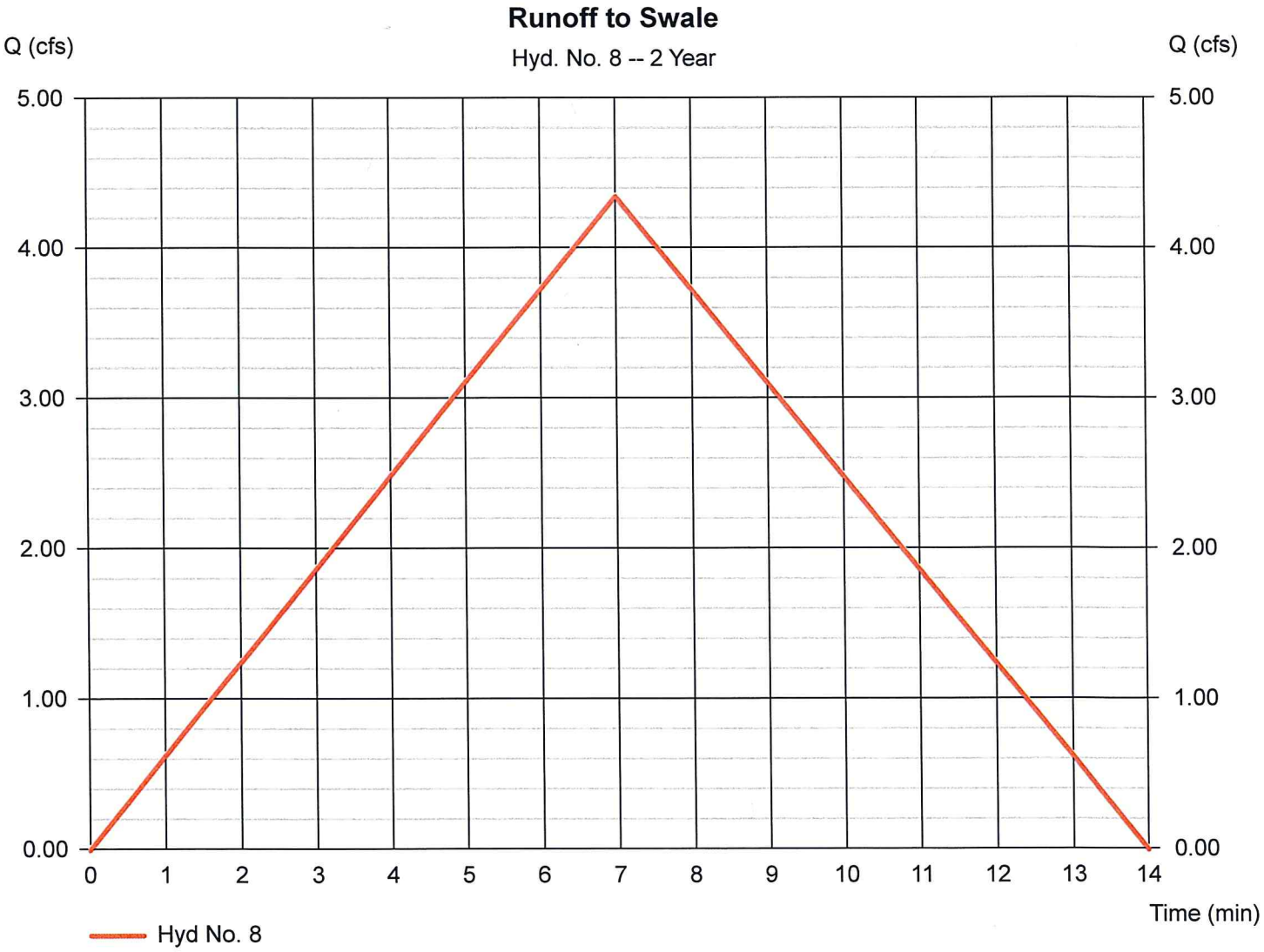
Hyd. No. 8

Runoff to Swale

Hydrograph type	= Rational	Peak discharge	= 4.349 cfs
Storm frequency	= 2 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 1,827 cuft
Drainage area	= 1.300 ac	Runoff coeff.	= 0.8
Intensity	= 4.182 in/hr	Tc by User	= 7.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

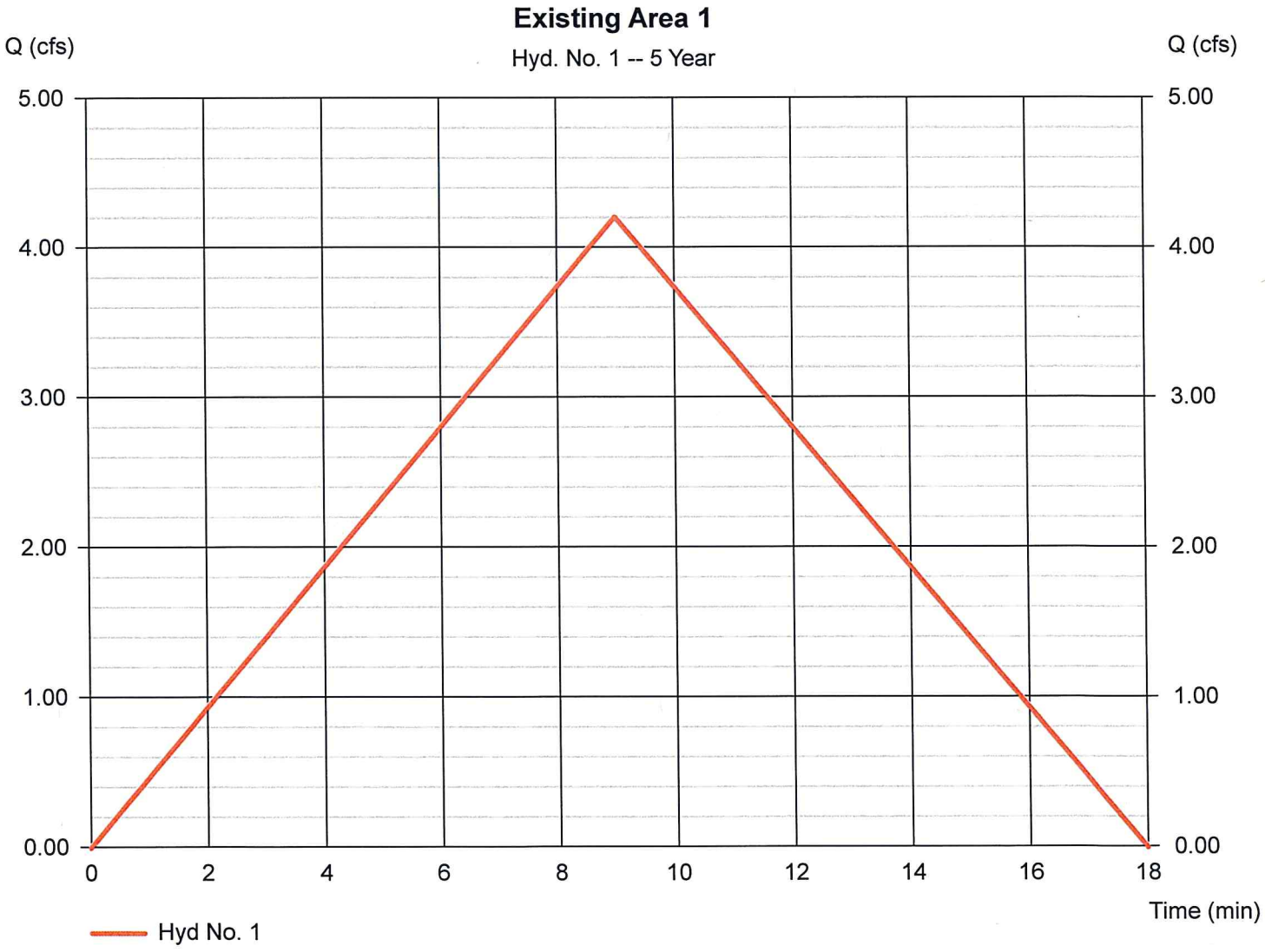
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	4.210	1	9	2,273	------	------	------	Existing Area 1
2	Rational	15.37	1	9	8,300	------	------	------	Proposed Area 1
3	Reservoir(i)	3.570	1	17	3,783	2	206.96	7,631	forebay
4	Reservoir	0.680	1	41	3,769	3	206.38	2,399	Water Quality Basin
5	Rational	2.486	1	9	1,343	------	------	------	Existing Area 2
6	Rational	1.634	1	7	686	------	------	------	Proposed Area 2
8	Rational	5.517	1	7	2,317	------	------	------	Runoff to Swale

Hydrograph Report

Hyd. No. 1

Existing Area 1

Hydrograph type	= Rational	Peak discharge	= 4.210 cfs
Storm frequency	= 5 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 2,273 cuft
Drainage area	= 2.980 ac	Runoff coeff.	= 0.3
Intensity	= 4.709 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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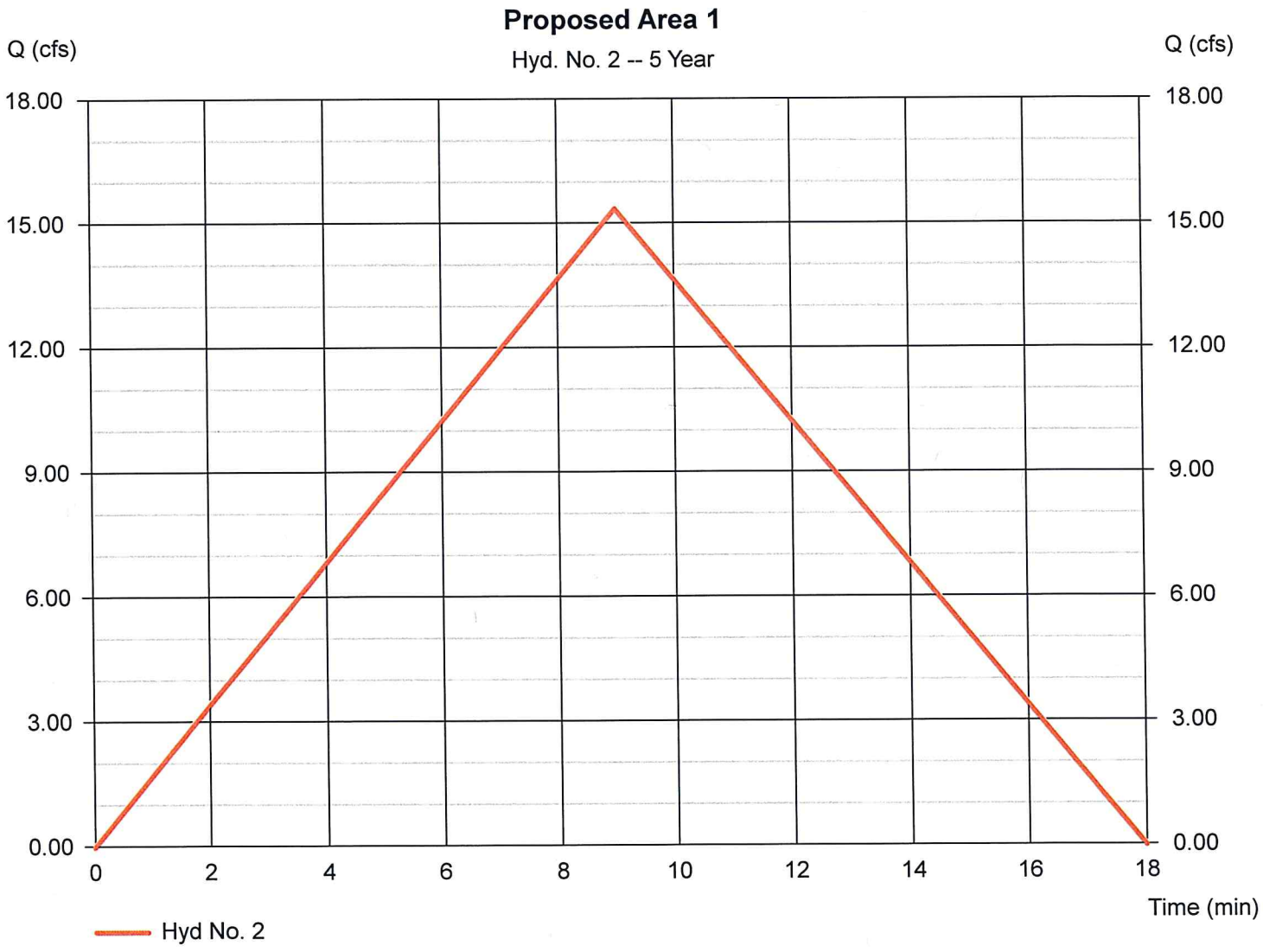
Hyd. No. 2

Proposed Area 1

Hydrograph type	= Rational	Peak discharge	= 15.37 cfs
Storm frequency	= 5 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 8,300 cuft
Drainage area	= 4.080 ac	Runoff coeff.	= 0.8
Intensity	= 4.709 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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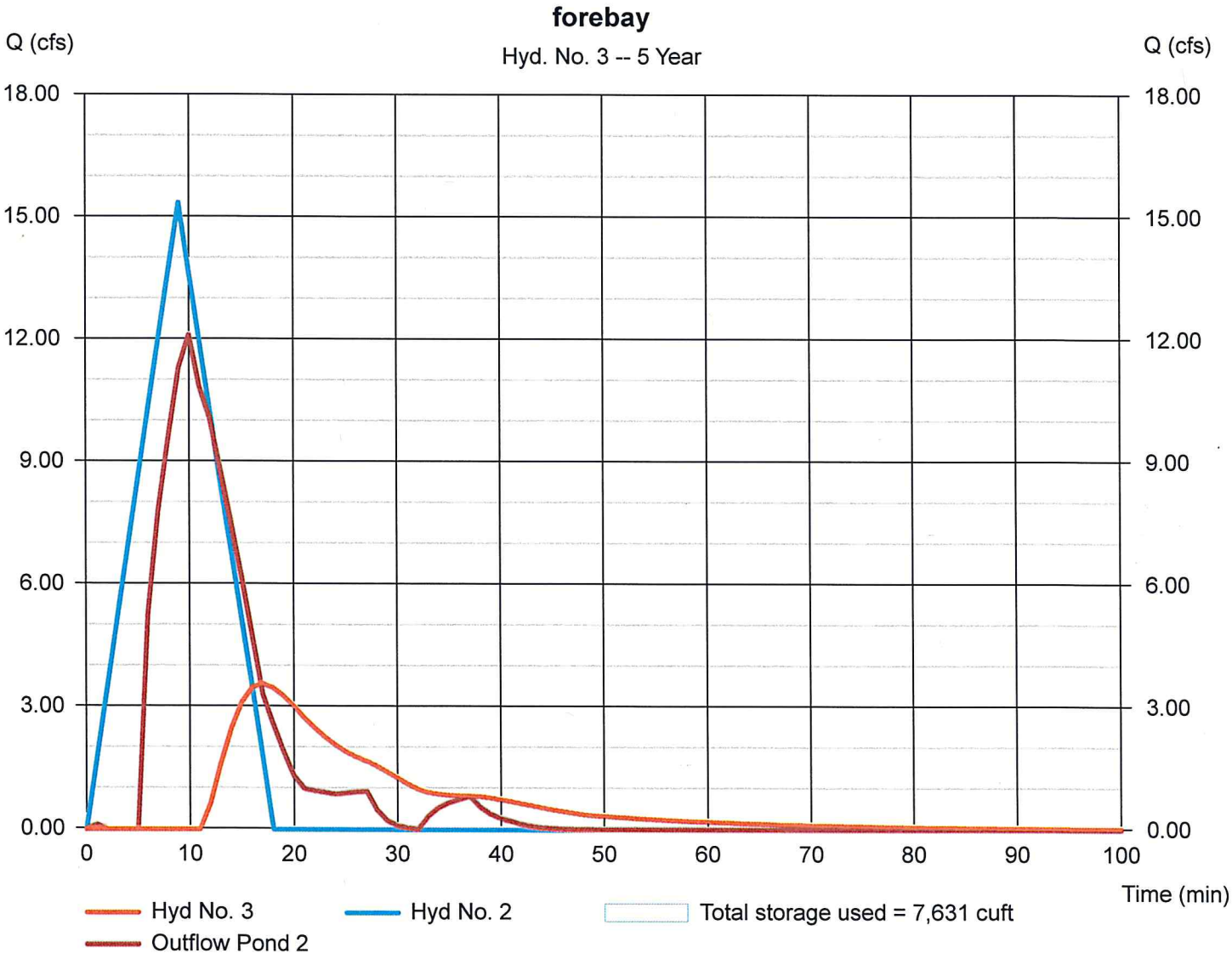
Hyd. No. 3

forebay

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 3.570 cfs
Storm frequency	= 5 yrs	Time to peak	= 17 min
Time interval	= 1 min	Hyd. volume	= 3,783 cuft
Upper Pond		**Lower Pond**	
Pond name	= forbay	Pond name	= Pond 1
Inflow hyd.	= 2 - Proposed Area 1	Other Inflow hyd.	= None
Max. Elevation	= 206.96 ft	Max. Elevation	= 206.74 ft
Max. Storage	= 2,657 cuft	Max. Storage	= 4,974 cuft

Interconnected Pond Routing. Storage Indication method used.



Hydrograph Report

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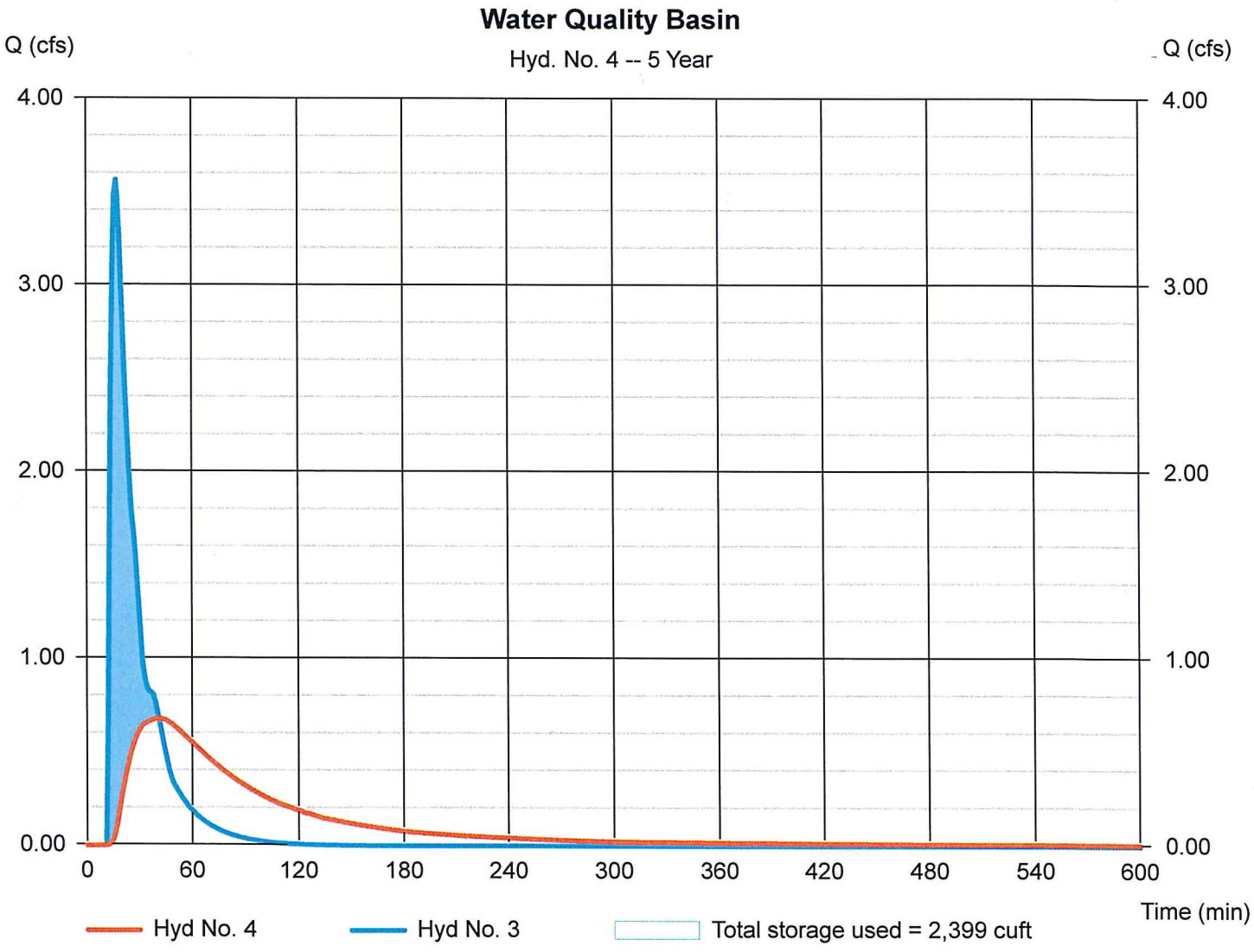
Hyd. No. 4

Water Quality Basin

Hydrograph type	=	Reservoir	Peak discharge	=	0.680 cfs
Storm frequency	=	5 yrs	Time to peak	=	41 min
Time interval	=	1 min	Hyd. volume	=	3,769 cuft
Inflow hyd. No.	=	3 - forebay	Max. Elevation	=	206.38 ft
Reservoir name	=	Pond 1	Max. Storage	=	2,399 cuft

Storage Indication method used.



Hydrograph Report

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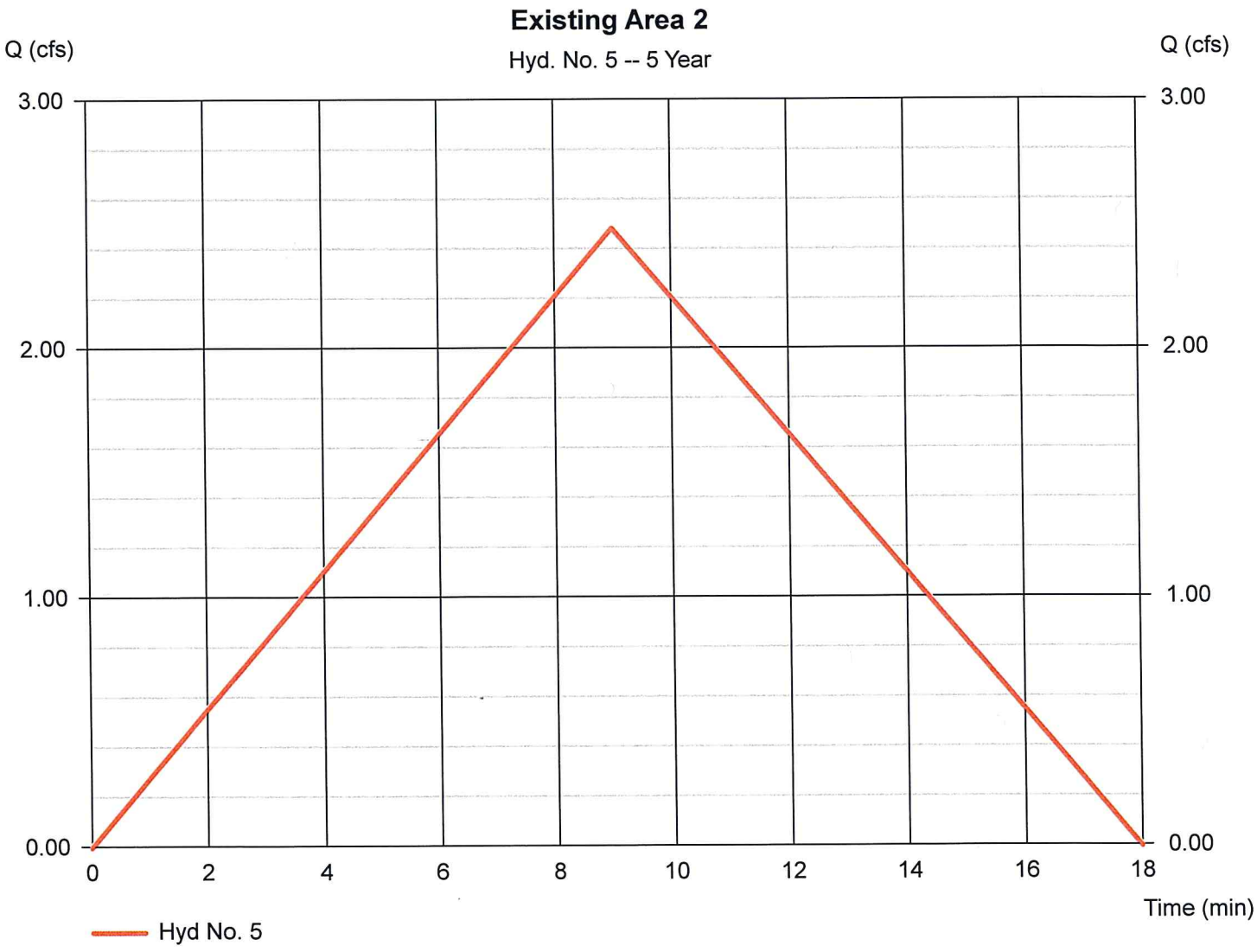
Hyd. No. 5

Existing Area 2

Hydrograph type	= Rational	Peak discharge	= 2.486 cfs
Storm frequency	= 5 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 1,343 cuft
Drainage area	= 2.640 ac	Runoff coeff.	= 0.2
Intensity	= 4.709 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1

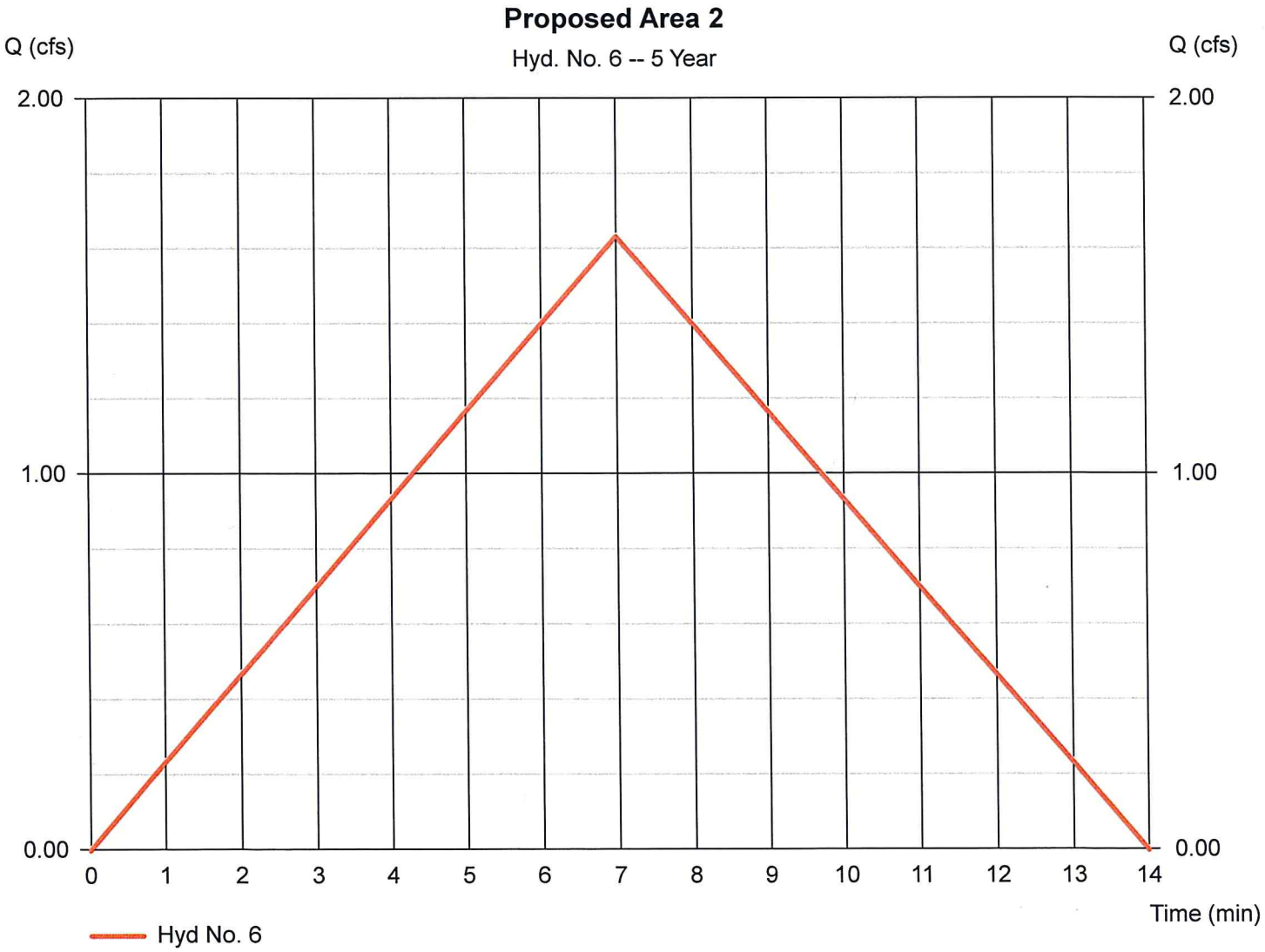


Hydrograph Report

Hyd. No. 6

Proposed Area 2

Hydrograph type	= Rational	Peak discharge	= 1.634 cfs
Storm frequency	= 5 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 686 cuft
Drainage area	= 1.540 ac	Runoff coeff.	= 0.2
Intensity	= 5.305 in/hr	Tc by User	= 7.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1

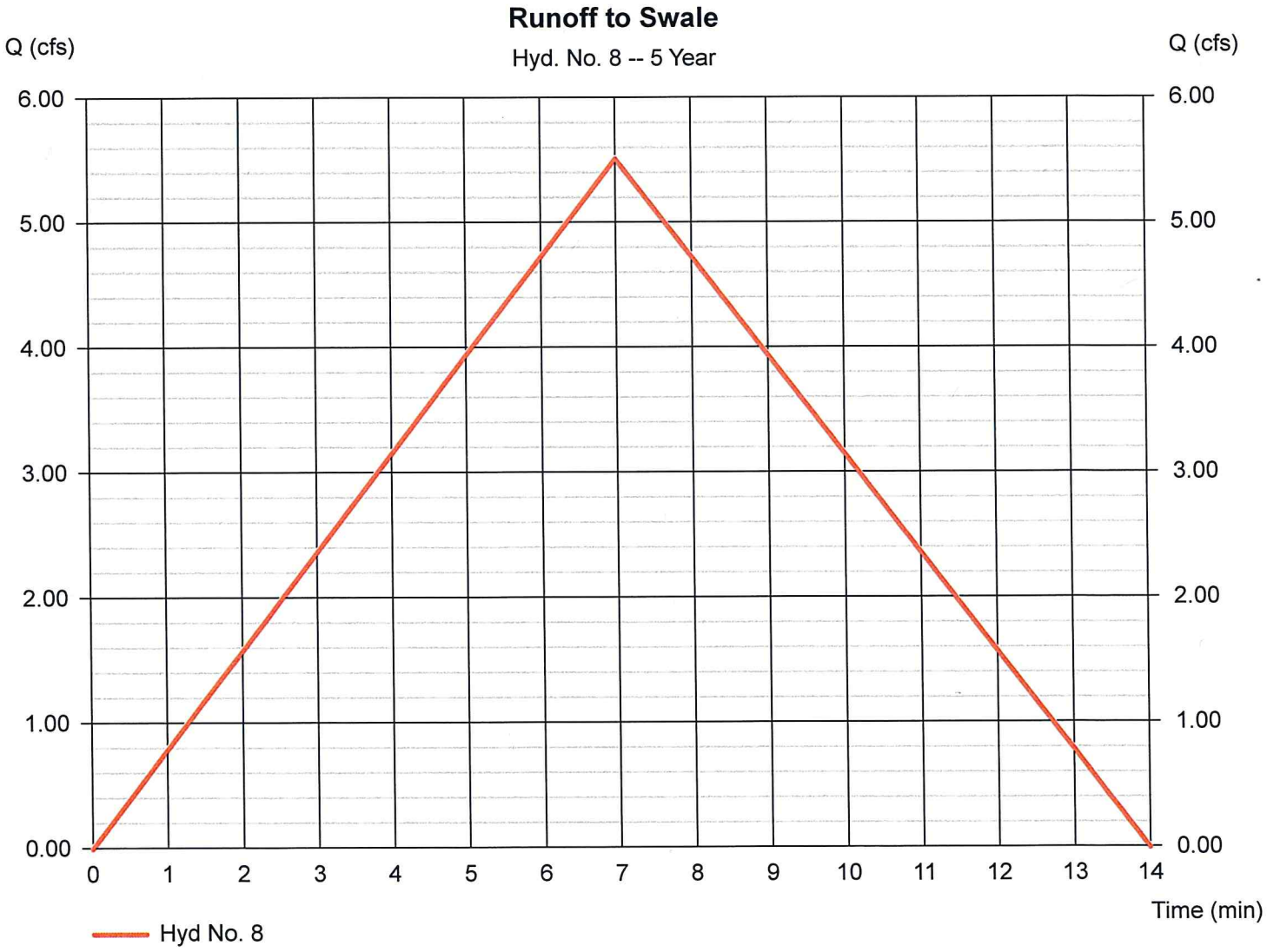


Hydrograph Report

Hyd. No. 8

Runoff to Swale

Hydrograph type	= Rational	Peak discharge	= 5.517 cfs
Storm frequency	= 5 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 2,317 cuft
Drainage area	= 1.300 ac	Runoff coeff.	= 0.8
Intensity	= 5.305 in/hr	Tc by User	= 7.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	4.977	1	9	2,688	------	------	------	Existing Area 1
2	Rational	18.17	1	9	9,813	------	------	------	Proposed Area 1
3	Reservoir(i)	5.533	1	16	5,305	2	207.05	8,551	forebay
4	Reservoir	1.180	1	33	5,291	3	206.52	3,306	Water Quality Basin
5	Rational	2.940	1	9	1,587	------	------	------	Existing Area 2
6	Rational	1.931	1	7	811	------	------	------	Proposed Area 2
8	Rational	6.520	1	7	2,739	------	------	------	Runoff to Swale

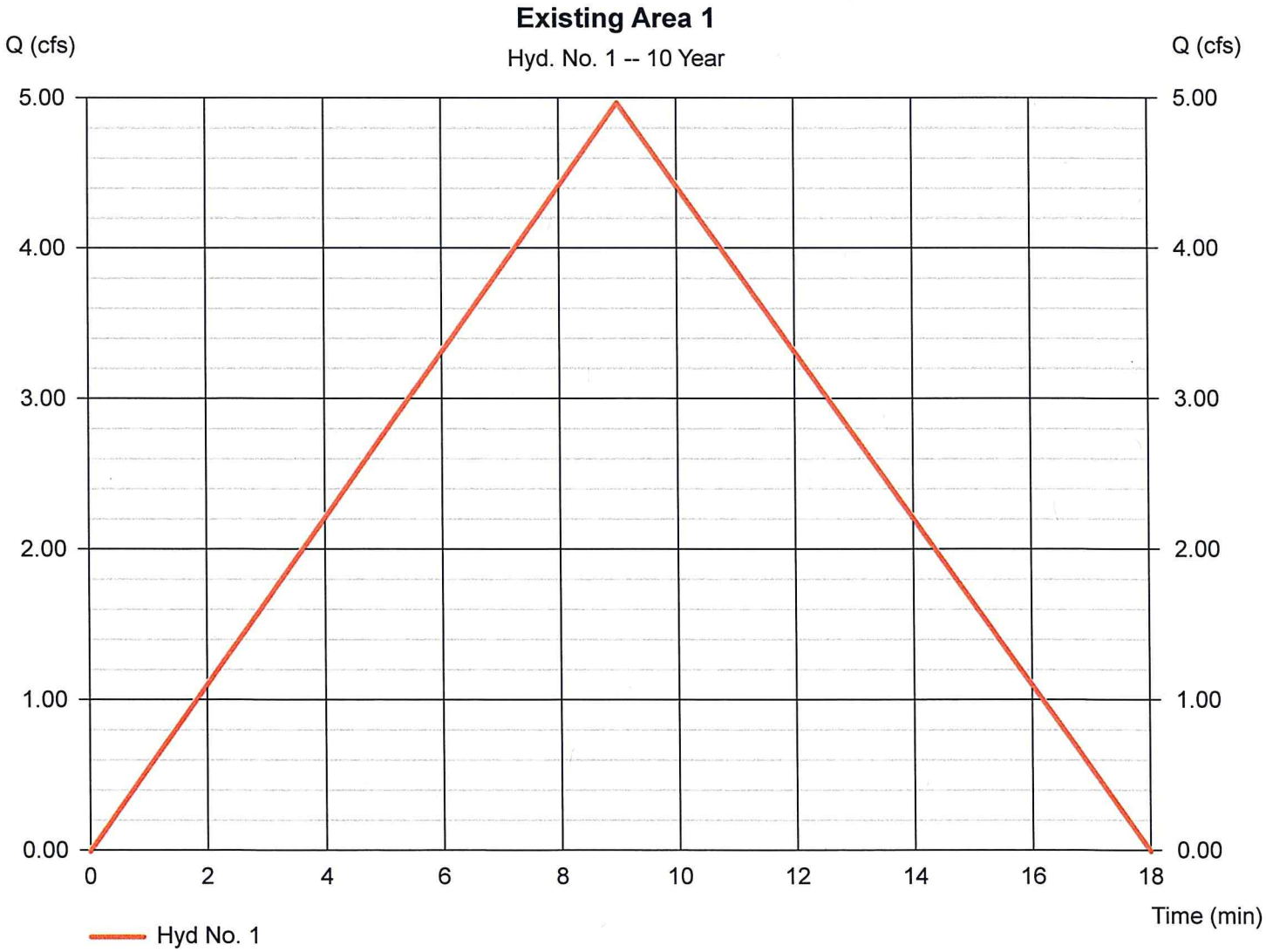
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, May 9, 2024

Hyd. No. 1

Existing Area 1

Hydrograph type	= Rational	Peak discharge	= 4.977 cfs
Storm frequency	= 10 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 2,688 cuft
Drainage area	= 2.980 ac	Runoff coeff.	= 0.3
Intensity	= 5.567 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1

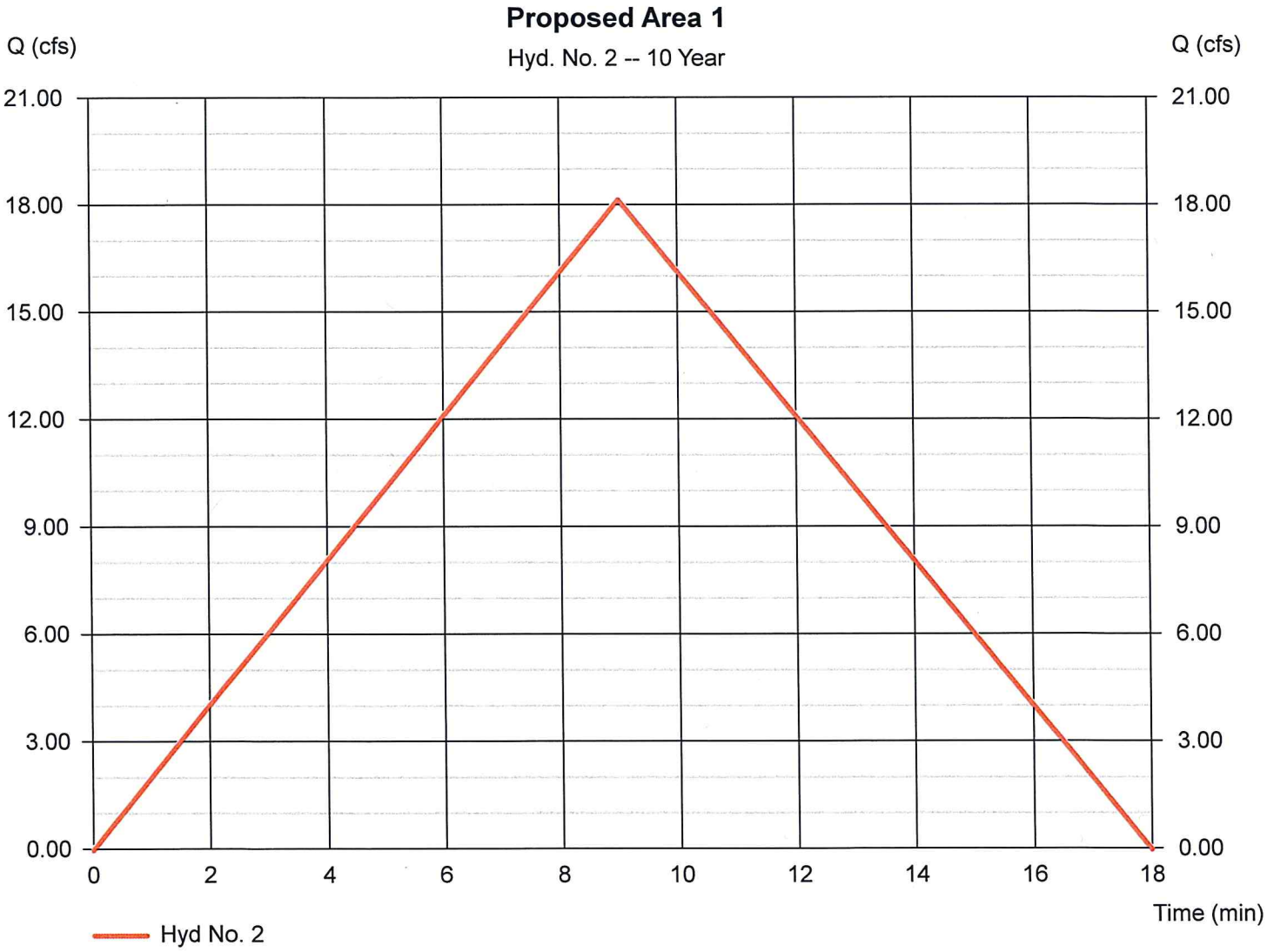


Hydrograph Report

Hyd. No. 2

Proposed Area 1

Hydrograph type	= Rational	Peak discharge	= 18.17 cfs
Storm frequency	= 10 yrs	Time to peak	= 9 min
Time interval	= 1 min	Hyd. volume	= 9,813 cuft
Drainage area	= 4.080 ac	Runoff coeff.	= 0.8
Intensity	= 5.567 in/hr	Tc by TR55	= 9.00 min
IDF Curve	= GSD-60 NOAA.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

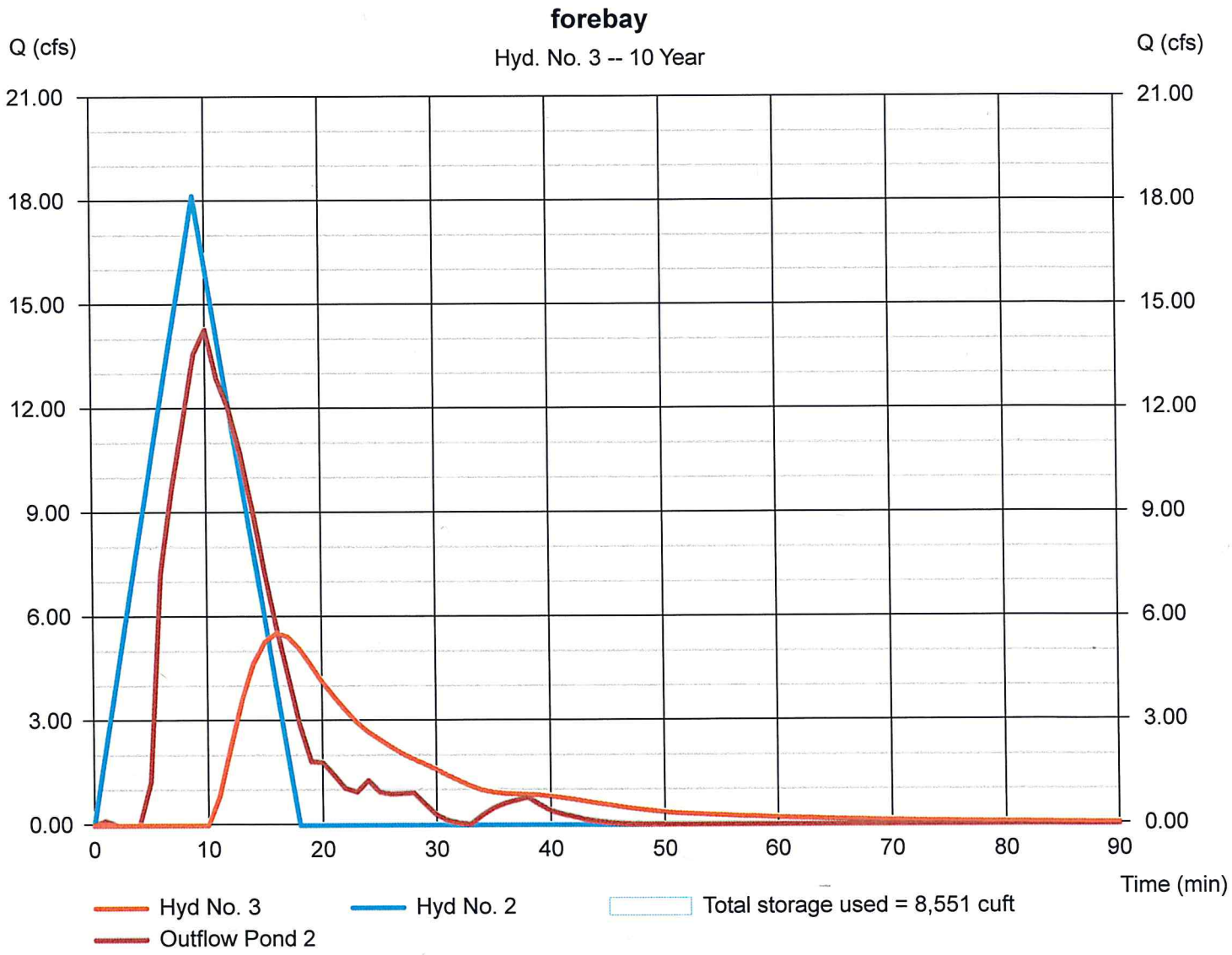
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, May 9, 2024

Hyd. No. 3

forebay

Hydrograph type	= Reservoir (Interconnected)	Peak discharge	= 5.533 cfs
Storm frequency	= 10 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 5,305 cuft
Upper Pond		**Lower Pond**	
Pond name	= forbay	Pond name	= Pond 1
Inflow hyd.	= 2 - Proposed Area 1	Other Inflow hyd.	= None
Max. Elevation	= 207.05 ft	Max. Elevation	= 206.82 ft
Max. Storage	= 2,951 cuft	Max. Storage	= 5,601 cuft

Interconnected Pond Routing. Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Thursday, May 9, 2024

Hyd. No. 4

Water Quality Basin

Hydrograph type	= Reservoir	Peak discharge	= 1.180 cfs
Storm frequency	= 10 yrs	Time to peak	= 33 min
Time interval	= 1 min	Hyd. volume	= 5,291 cuft
Inflow hyd. No.	= 3 - forebay	Max. Elevation	= 206.52 ft
Reservoir name	= Pond 1	Max. Storage	= 3,306 cuft

Storage Indication method used.