

HYDROLOGY REPORT

Primrose Schools – Church Road

L.L. 379 of the 17th District, 2nd Section

Cobb County

Smyrna, Georgia

January 23, 2008

Revised February 23, 2009 (Approved)

Revised: November 18, 2009 (Approved)

Revised: October 11, 2012



Stantec

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HYDROLOGY STUDY

Hydrology & Hydraulic Design Report

Primrose Schools - Smyrna

February 23, 2009 - Approved

Revised November 18, 2009 - Approved

October 11, 2012 Revision: The hydrology study dated November 18, 2009 for the Primrose School – Smyrna was approved by the City of Smyrna. A revision to the approved hydrology is being issued for the addition of approximately 1000sf to the existing facility. The addition is to accommodate an infant care room with a maximum of 8 students and 2 staff along with some internal reconfiguration. There are no additional changes proposed to the site.

As a result of the additional impervious area of the building, the proposed drainage basin and runoff coefficients have been recalculated and routed through the existing pond. The following summary and hydro-data show the impact to remain under the allowable flow characteristics. Therefore no changes to the existing pond or infrastructure are proposed.

November 18, 2009 Revision: The hydrology study dated February 23, 2008 for the Primrose School – Smyrna was approved by the City of Smyrna. A revision to the approved Hydrology Report is being issued for the addition of an overflow parking lot, which is proposed for the site and is designed using a grass-pave system. The overflow parking will be used only for special events, and will be a fenced, recreational area the remainder of the time.

As a result of the proposed overflow parking, the proposed drainage basin, run-off coefficient, and pond have been revised.

I. Introduction and Overall Site Location

The proposed Primrose School site is located at 661 Church Road SE, east of South Cobb Drive in the City of Smyrna, Georgia. The overall site is approximately 4.4 acres. The site previously consisted of a single residence with associated infrastructure. Associations with the residence, such as a shed and drive into the site remain; the remainder of the site is wooded. An unnamed tributary to Nickajack Creek forms the northern boundary of the property. The tributary flows from east to west. Please see Figure 1, Location Map.

II. Pre-development Conditions

In pre-development conditions the site is mostly undeveloped and wooded. A single family residence was formerly on the site. The house has been removed, but an associated shed, drive, and cleared area remain. An unnamed tributary to Nickajack Creek flows west along the northern property boundary of the site.

The site does lie within a flood hazard zoned as defined by the DFIRM digital flood insurance rate map of Cobb County, GA and incorporated areas, Map 13067C0070F, preliminary and F.I.R.M. panel numbers 13067C0118G & 13067 C0075F dated August 18, 1992.

The pre-developed stormwater runoff from the site flows to the unnamed tributary to Nickajack Creek. The study point for the development is located in the northwestern corner of the site. The eastern portion of the site that will remain undeveloped has been excluded from the hydrology study. The pre-development basin area is 3.10 acres with a run-off coefficient of 0.31. The time of concentration is 10 minutes. Please see Figure 2, Pre-Development Conditions.

III. Developed Conditions

The proposed development consists of a day care facility, with an approximately 10,699 s.f building, an associated parking lot, overflow grass-pave parking, playground, and utilities.

Stormwater in the parking lot will be captured through inlets and piped to a detention pond located north of the building. Stormwater run-off in the playground area will be captured in yard drains and also piped to the detention pond.

In developed conditions, a pond was designed to provide attenuation to reduce pre-developed discharge by 10%, and to provide water quality. Approximately 1.7 acres of the developed area is tributary to the proposed detention pond. The run-off coefficient for the post developed area is 0.71 with a 10 minute time of concentration.

A portion of the site development included in the overall pre-development basin bypasses the pond. The bypass area is approximately 1.4 acres and consists of a portion of Church Road and the decel lane, along the northern portion of the site, side slopes along the eastern portion of the site, and undeveloped area tributary to the stream on the northern portion of the site. The pond was designed to account for the developed bypass. The run-off coefficient for the bypass area is 0.37 and the time of concentration is 10 minutes.

Please see Figure 3, Post-Development Conditions.

Discharge from the detention pond, along with run-off from the bypass area was compared to the pre-developed stormwater run-off.

The developed combined discharge into the creek was compared with a 10% reduction in pre-developed discharge at the study point for the 2, 5, 10, 25, and 100 year storms. The developed discharge was less than 90% of the pre-developed for each storm:

Attenuation Summary:

	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
PRE-DEVELOPED	4.54	5.30	5.86	6.71	7.38	8.05
10% REDUCTION (ALLOWABLE)	4.08	4.77	5.27	6.04	6.64	7.25
COMBINED DISCHARGE AT STUDY POINT	3.09	3.98	4.58	5.43	6.04	6.62
100 YR STORM (POND)	Max Elev:	938.22	Top of Dam:	939		

(October 11, 2012 revision has been incorporated into the summary chart)

A summary of basin areas, run-off coefficients, time of concentrations, and outflows is included in the Summary Spreadsheet.

IV. Water Quality

Water quality has been provided in the pond through a 6" under drain. The water quality storage elevation is located at 936.10, providing a water quality volume of 4154 s.f. The water quality required for the site was calculated based on the GSWMM formula, $WQv = (1.2 \times R_v \times A)/12$. The required water quality volume was calculated to be 3,836 c.f.

The under drain was sized to provide 24-hour bleed down of the water quality volume; however, the calculated required orifice size was 1". With the use of the under drain, the water will flow through a gravel filter and perforated pipe, which will extend the drawdown time. In addition a 1" under drain is extremely susceptible to clogging, causing the system to operate improperly; therefore a minimum 6" under drain has been designed to provide water quality drawdown. Please see the hydrology worksheet included in this report for detailed calculations.

V. Channel Protection Volume

The GSWMM, section 1.32.2 allows “channel protection criteria to be waived by the local jurisdiction for sites that discharge directly into larger streams...where the reduction in the smaller flows will not have an impact on the streambank or channel integrity”. We respectfully request that channel protection be waived for this site based on the following:

- The site discharges directly into a tributary to Nickajack Creek
- The tributary has a drainage basin of over 100 acres. The subject site basin area is 3.1 acres, only 3% of the overall basin.
- Discharge from the pond is less than 7 cfs during the 100-year storm. With low discharge from the site, we do not anticipate any impact on the streambank or to the channel integrity.

VI. General Methodology

Time of Concentration:

The time of concentration was approximated using the TR55 method. Due to the nature of the site, the Tcs are based on a combination of overland flow, shallow concentrated flow, channel flow, and pipe flow (in developed conditions).

Run-off Coefficient Calculations:

Curve numbers were taken from Table A-3.1 in the Manual for Erosion and Sedimentation Control in Georgia. Soils on the site are primarily in hydrologic soil groups B and C from the soil survey of Cobb County.

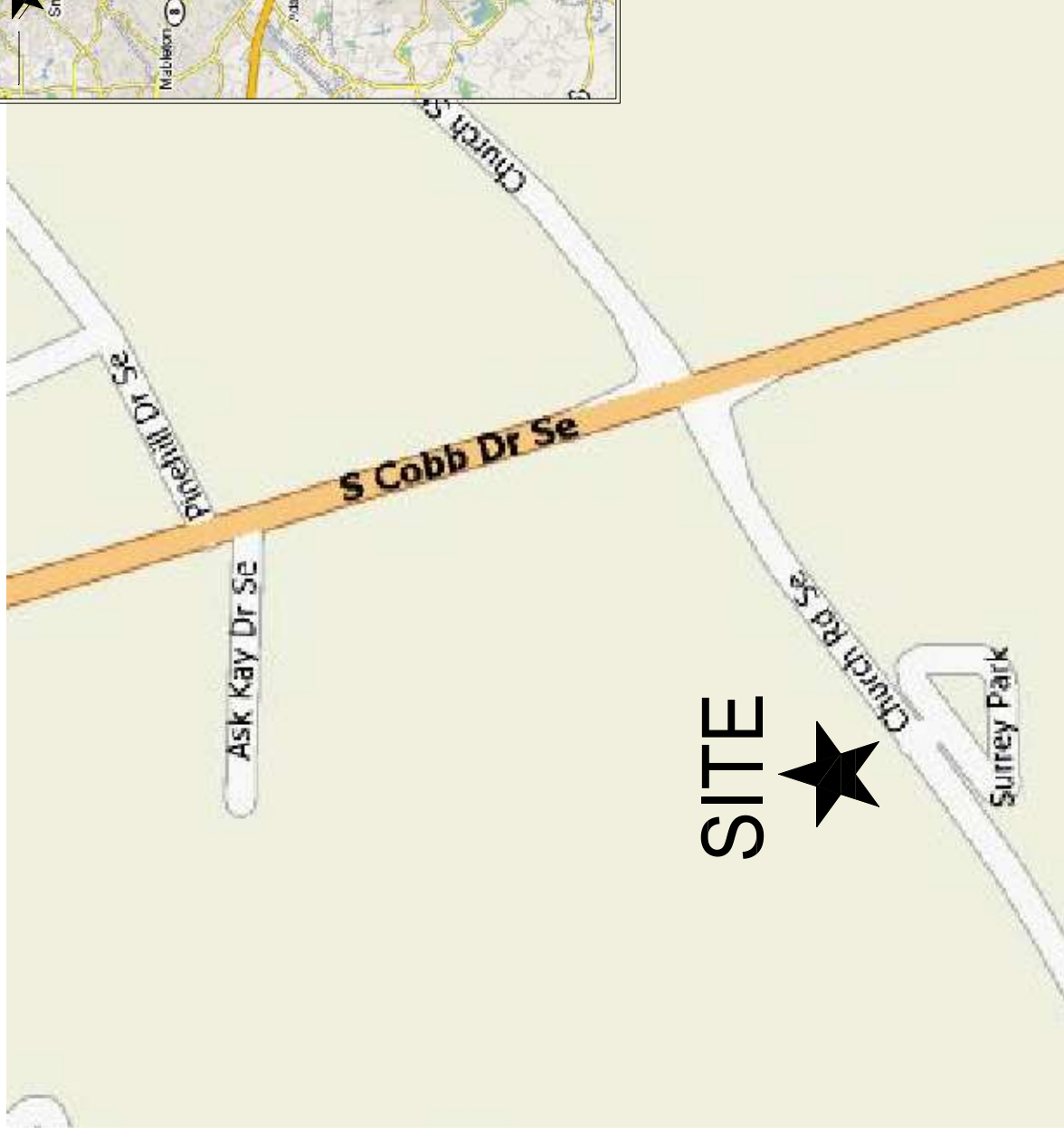
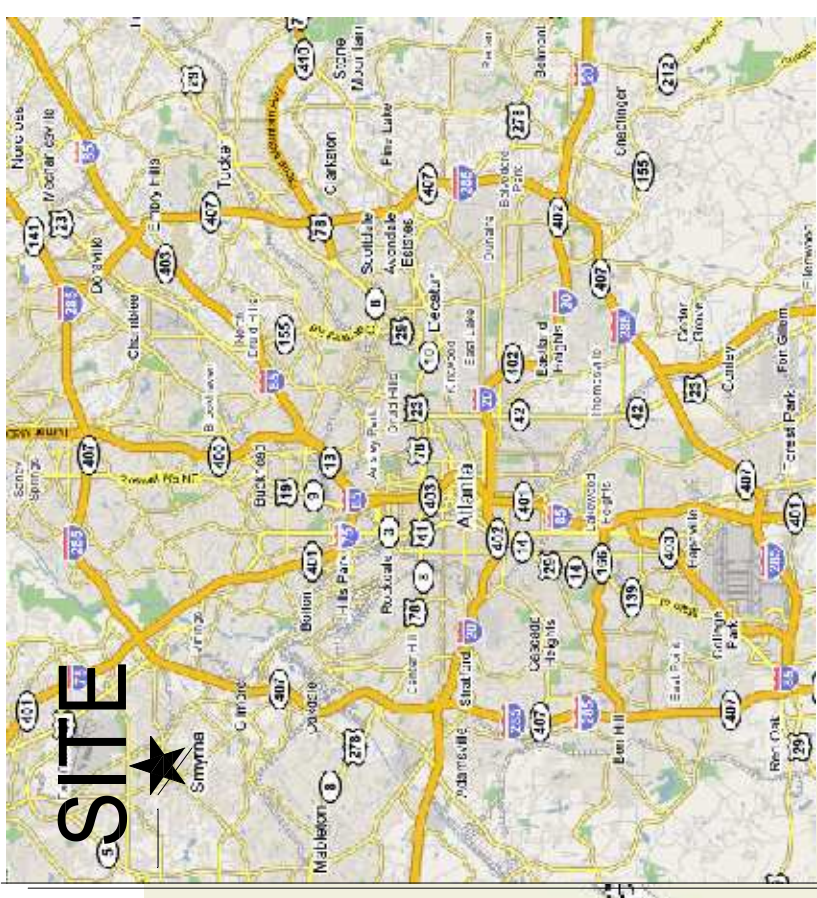
Peak Flow Calculations:

Developed and pre-developed flows have been calculated using the rational method. Reservoir routing calculations are computer modeled using Hydraflow Hydrographs published by Intelisolve, with inflow and outflow hydrographs developed from the Dekalb Rational Method.

PRIMROSE SCHOOLS - SMYRNA WORKSHEET				10/11/2012
Pre Development Basin				
	Acreage	C	Description	
Pre-developed basin	3.10	0.31	C taken from table A-3.1 in the Manual for Erosion and Sedimentation Control in Georgia	
Disturbed Residential Area	1	0.55		
Wooded Area	2.1	0.2		
Post Development Basin				
	Acreage	C		
Tributary to Pond	1.8	0.70	total area and weighted C	
Impervious Area (building, parking, sidewalks)	0.95	0.95	C taken from table A-3.1 in the Manual for Erosion and Sedimentation Control in Georgia	
Disturbed Pervious Areas (pervious pavement, graded slopes and playgrounds)	0.88	0.40		
Dev. Bypass	1.3	0.36	total area and weighted C	
Impervious Area (road & decel lane)	0.16	0.95		
Undisturbed Area to Stream	0.61	0.20	C taken from table A-3.1 in the Manual for Erosion and Sedimentation Control in Georgia	
Disturbed Pervious Areas (graded slopes and playgrounds)	0.48	0.40		
TIME OF CONCENTRATION				
	Pre-Developed (min)			10
	Post Developed to Pond (min)			10
	Post Developed Bypass (min)			10

WATER QUALITY			
I	Rv	Water Quality Volume (ac-ft)	Water Quality Volume (req'd) (c.f)
(% Impervious)			
52	0.52	0.09	3,836
overall percentage no change			
Water Quality Elevation	936.10	Water Quality Provided	3,838
Pond Bottom Elevation	934.00		
Bleed Down Orifice Calculations			
Pond A	Q _{24-hr}	0.044	c.f.s.
	Avg. Head	1.05	ft
	Orifice Area	0.01	s.f.
	Orifice Diameter calc.	1.29	inch
	Orifice Diameter	6	inch

FIGURES

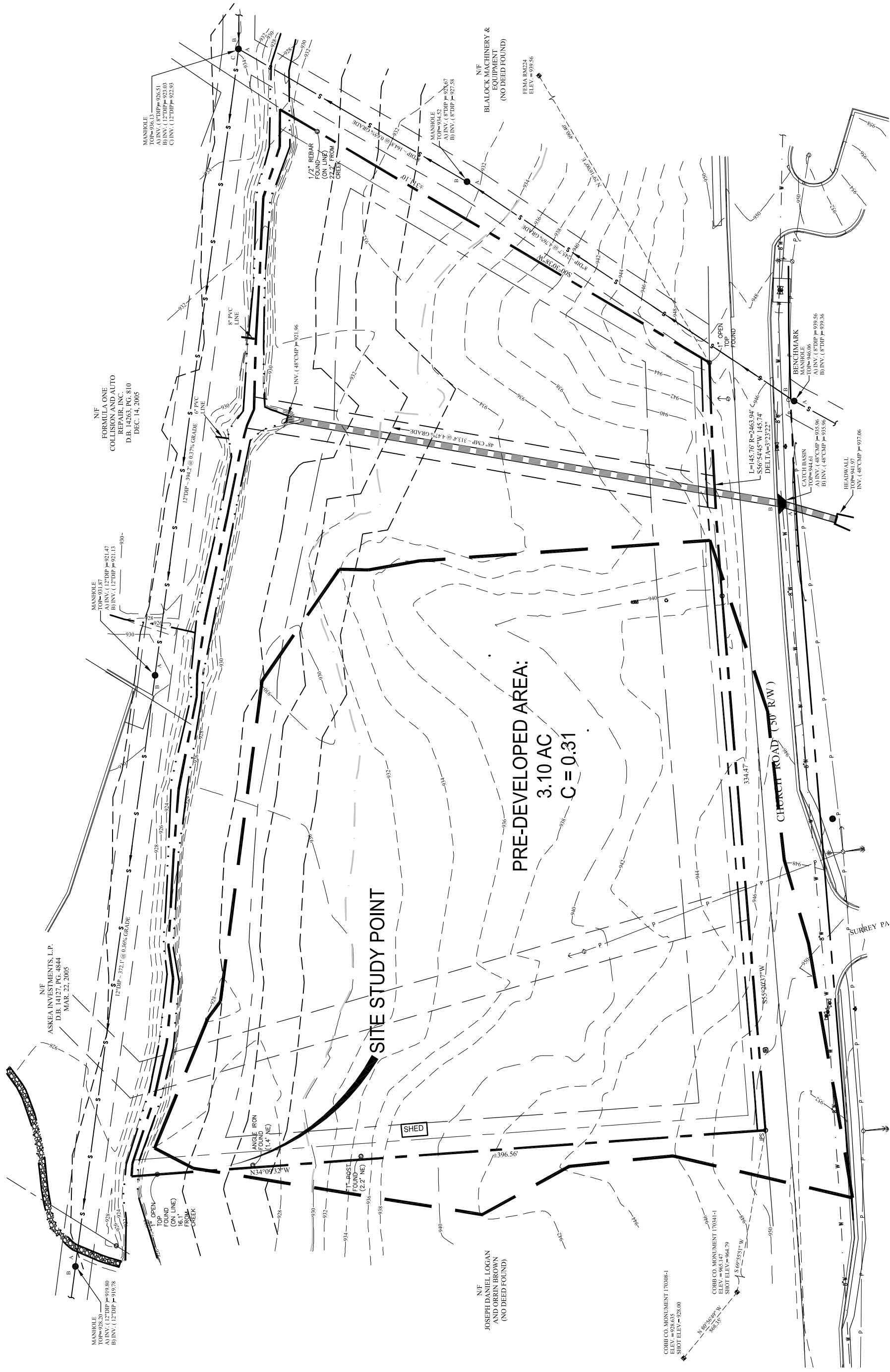


NTS

PRIMROSE SCHOOLS- SMYRNA
LOCATION MAP

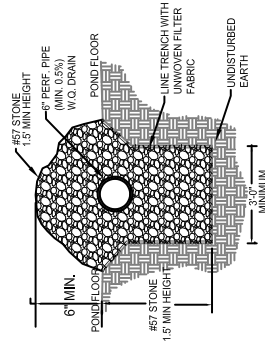
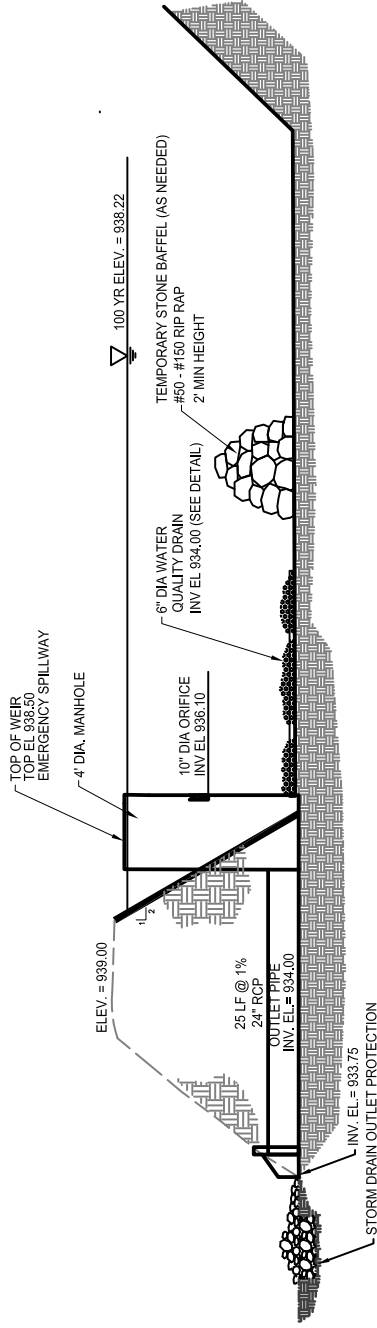


FIGURE 1



PRIMROSE SCHOOLS- SMYRNA PRE-DEVELOPED CONDITIONS





WATER QUALITY DRAIN DETAIL
(TO BE INSTALLED AFTER FINAL STABILIZATION) **M.T.S.**

POND DETAILS

N.T.S.

HYDROGRAPHS

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HYDRO REV4-101112.gpw

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Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	-----	-----	4.537	-----	5.298	5.856	6.712	7.376	8.052	PRE-DEV
3	Dekalb	-----	-----	5.949	-----	6.946	7.678	8.800	9.672	10.56	POST DEV. TO POND
4	Dekalb	-----	-----	2.210	-----	2.580	2.852	3.269	3.592	3.921	POST DEV. BYPASS
6	Reservoir	3	-----	1.841	-----	2.282	2.569	2.965	3.228	3.424	ROUTED POND
7	Combine	4, 6	-----	3.094	-----	3.984	4.579	5.437	6.043	6.628	POND & BYPASS
9	Reservoir	3	-----	0.000	-----	0.000	1.056	2.113	2.776	3.760	EMERGENCY OVERFLOW
Proj. file: HYDRO REV4-101112.gpw										Monday, Oct 8, 2012	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	4.537	1	50	8,140	-----	-----	-----	PRE-DEV
3	Dekalb	5.949	1	50	10,673	-----	-----	-----	POST DEV. TO POND
4	Dekalb	2.210	1	50	3,964	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	1.841	1	64	6,825	3	937.01	7,077	ROUTED POND
7	Combine	3.094	1	53	10,790	4, 6	-----	-----	POND & BYPASS
9	Reservoir	0.000	1	n/a	0	3	938.09	10,673	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 2 Year			Monday, Oct 8, 2012	

Hydrograph Report

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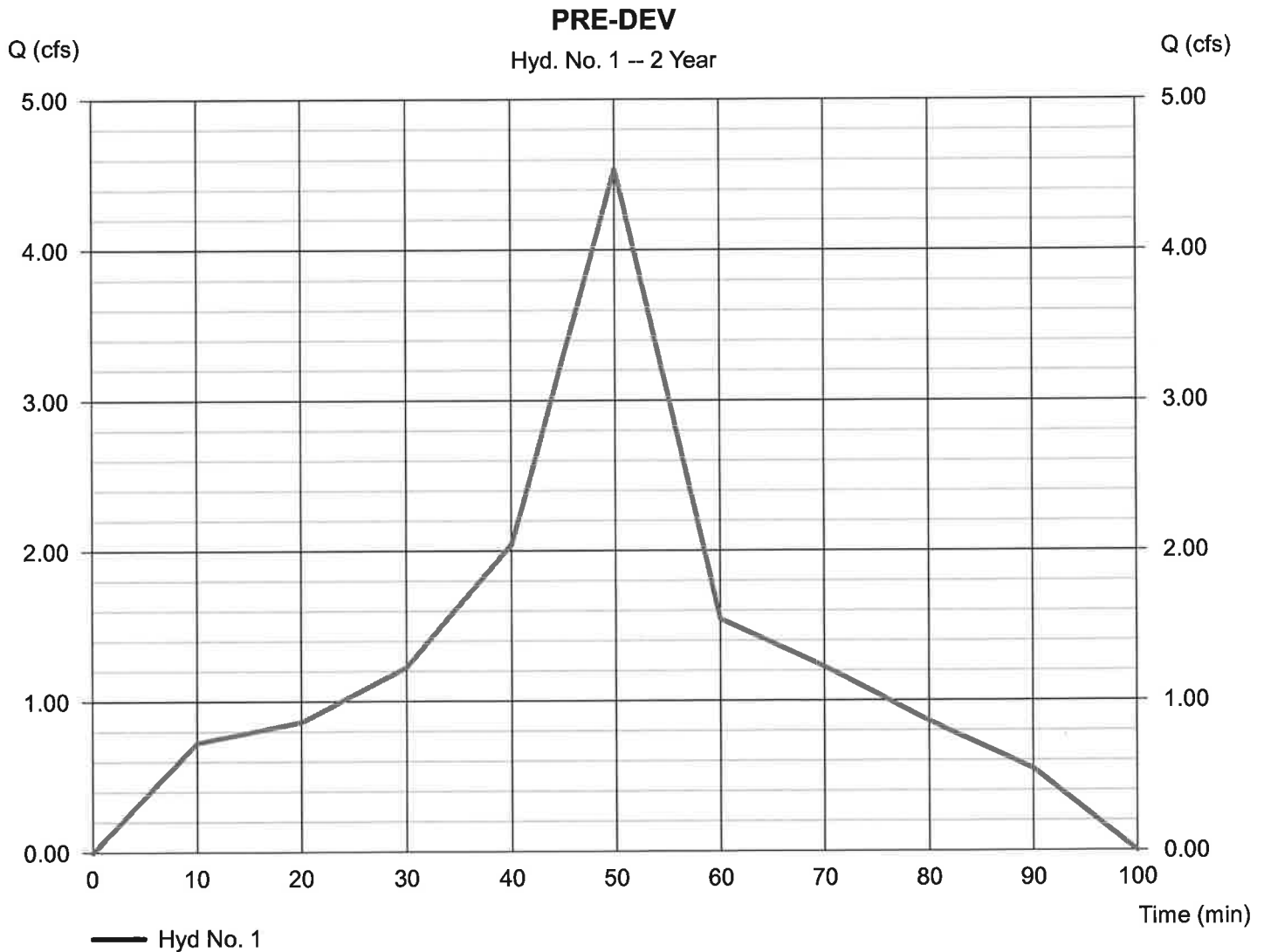
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Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
Storm frequency = 2 yrs
Time interval = 1 min
Drainage area = 3.100 ac
Intensity = 4.721 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 4.537 cfs
Time to peak = 50 min
Hyd. volume = 8,140 cuft
Runoff coeff. = 0.31
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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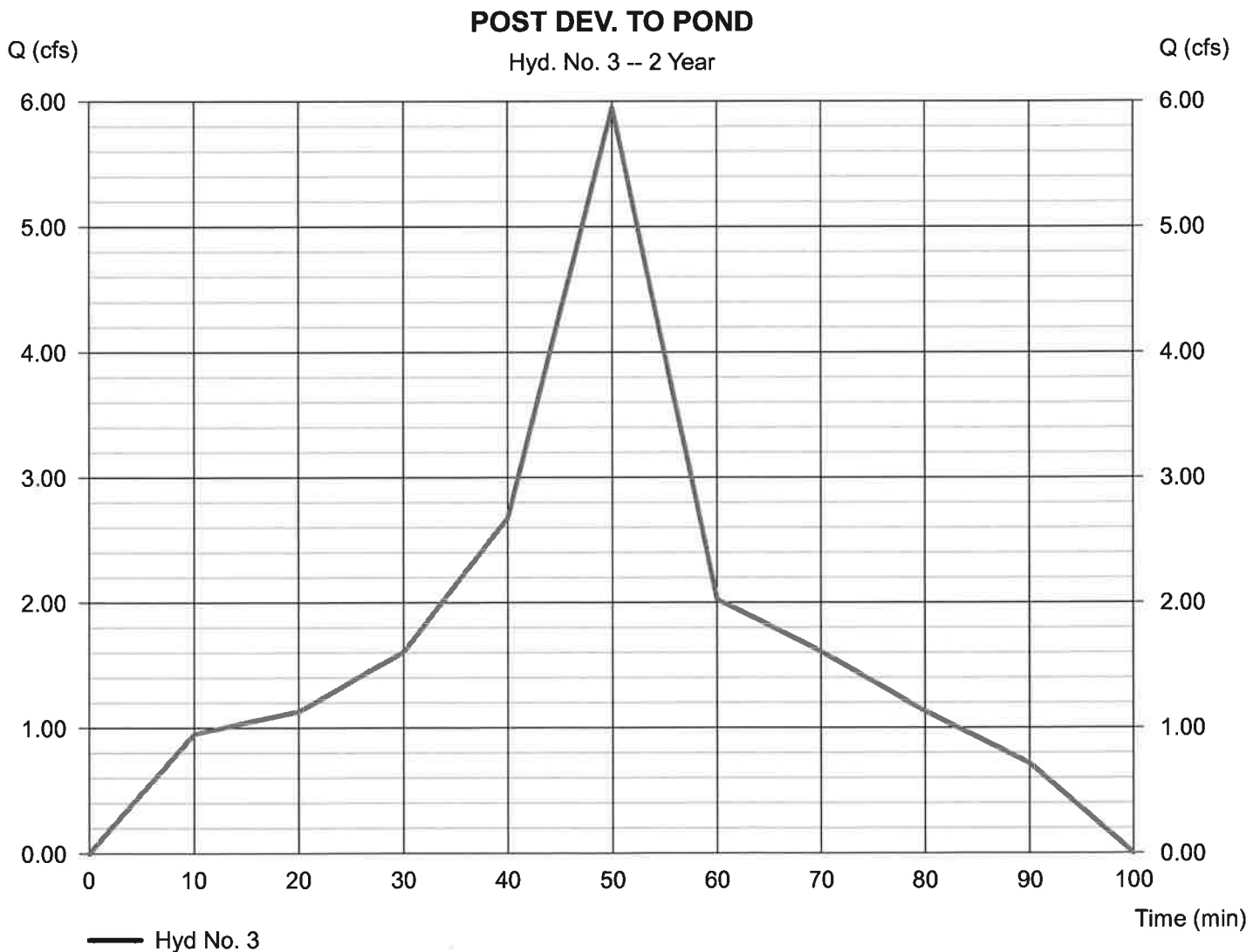
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 2 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 4.721 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 5.949 cfs
 Time to peak = 50 min
 Hyd. volume = 10,673 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

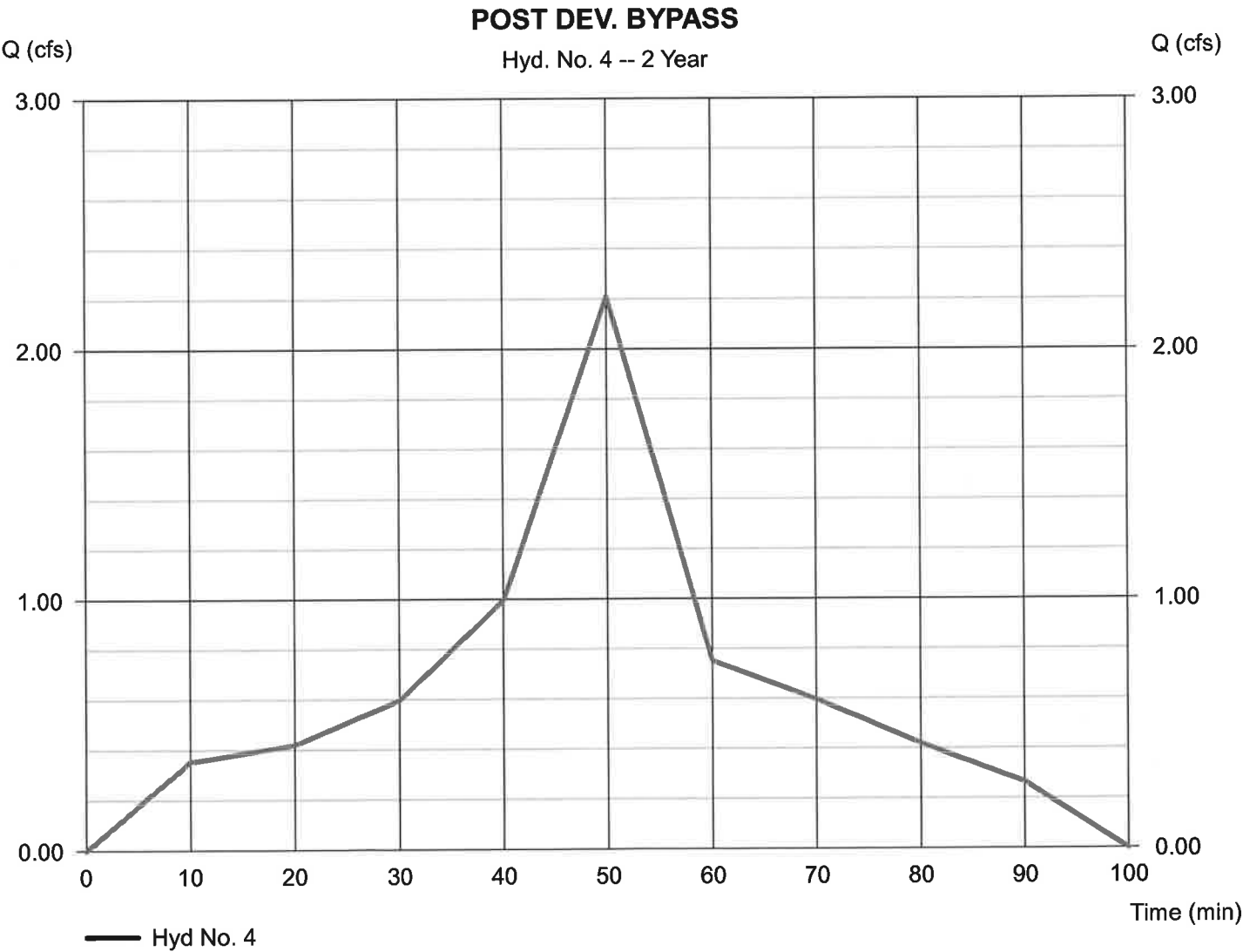
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Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type	=	Dekalb	Peak discharge	=	2.210 cfs
Storm frequency	=	2 yrs	Time to peak	=	50 min
Time interval	=	1 min	Hyd. volume	=	3,964 cuft
Drainage area	=	1.300 ac	Runoff coeff.	=	0.36
Intensity	=	4.721 in/hr	Tc by User	=	10.00 min
IDF Curve	=	Atlanta.idf	Asc/Rec limb fact	=	n/a



Hydrograph Report

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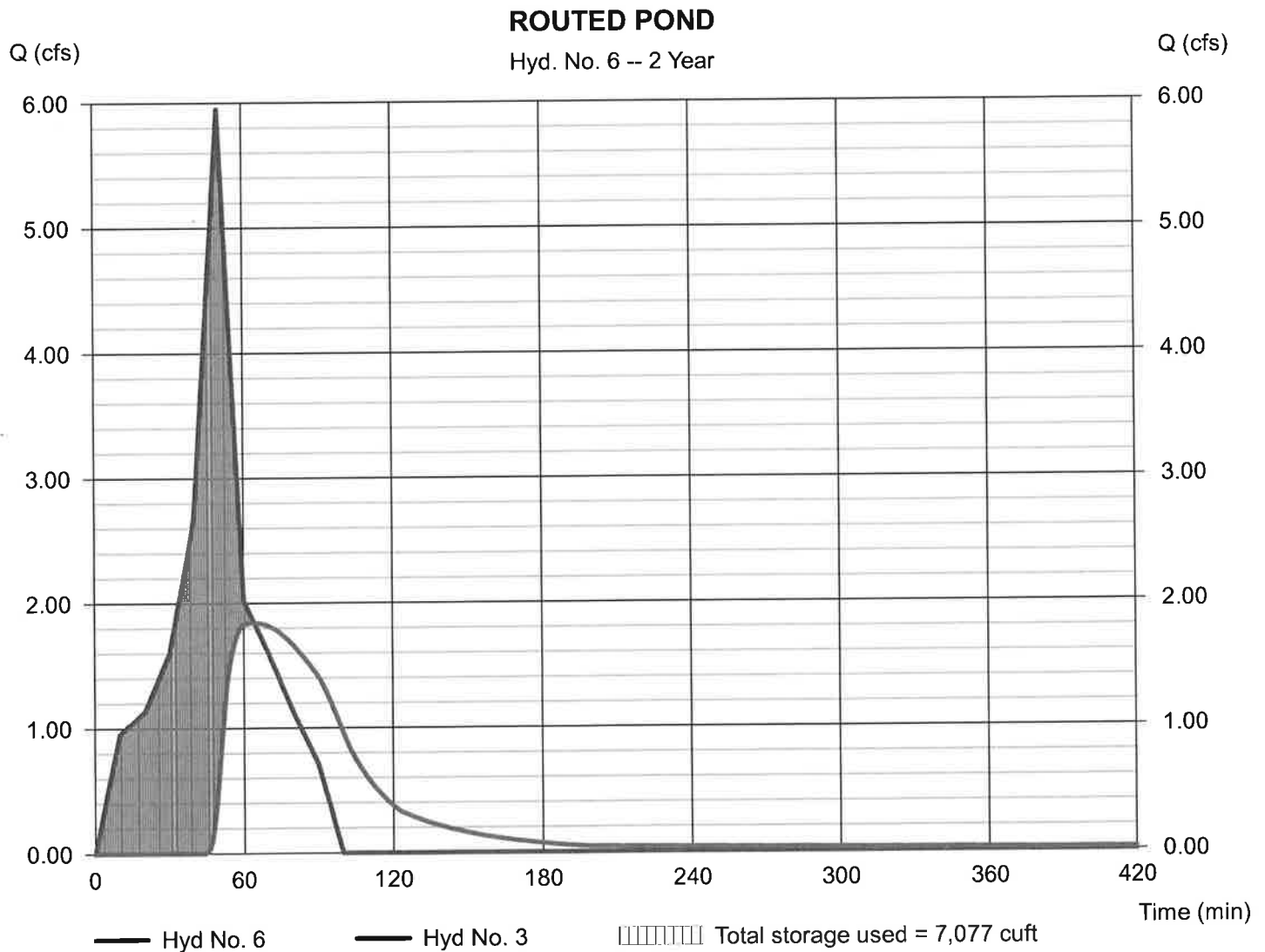
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
 Storm frequency = 2 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV

Peak discharge = 1.841 cfs
 Time to peak = 64 min
 Hyd. volume = 6,825 cuft
 Max. Elevation = 937.01 ft
 Max. Storage = 7,077 cuft

Storage Indication method used.



Pond Report

7

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Monday, Oct 8, 2012

Pond No. 1 - Pond REV

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 934.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	934.00	1,301	0	0
2.00	936.00	2,531	3,832	3,832
4.00	938.00	3,901	6,432	10,264
5.00	939.00	5,097	4,499	14,763

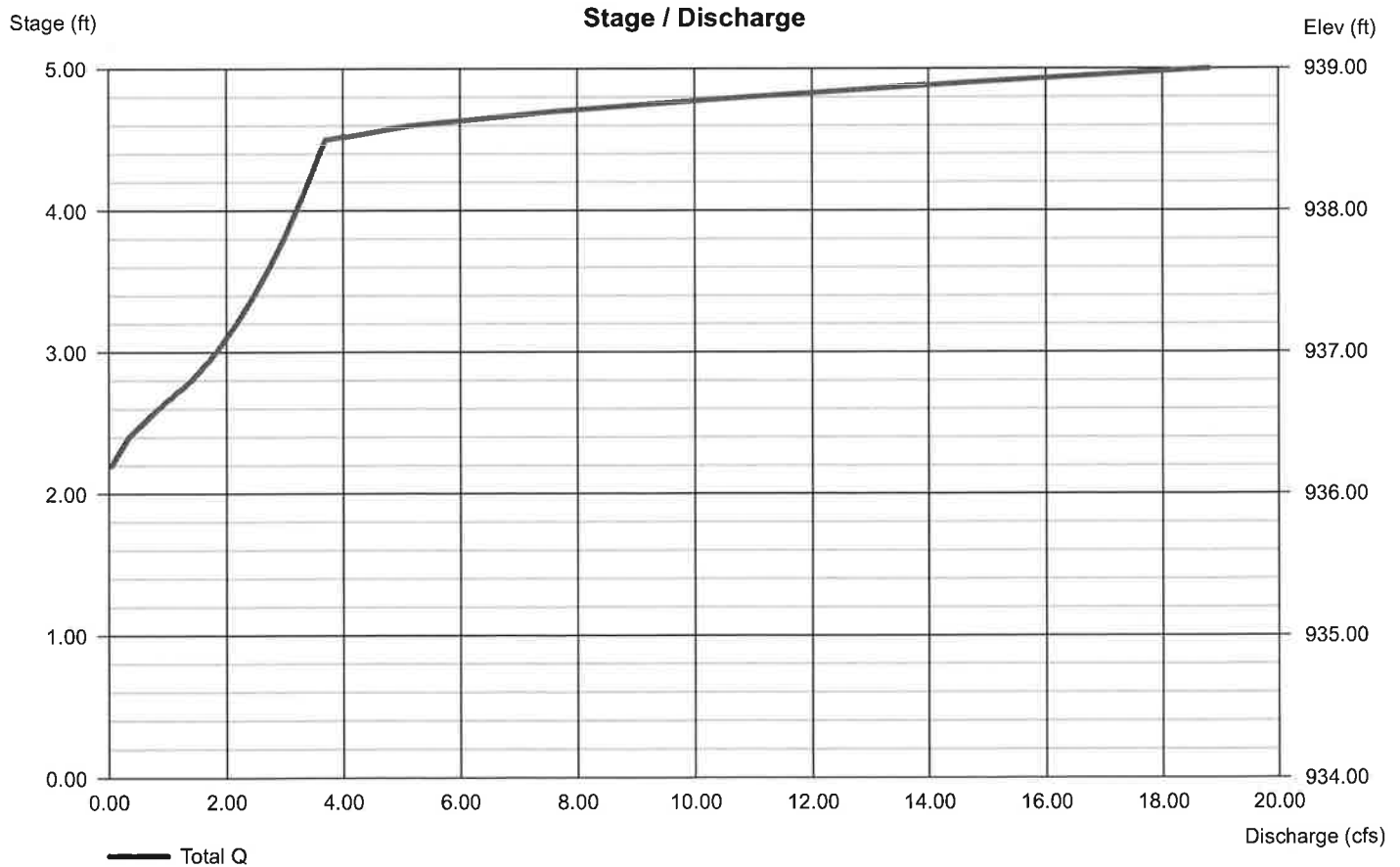
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	10.00	0.00	0.00
Span (in)	= 24.00	10.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 934.00	936.10	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.60	0.00	0.00	0.00
Crest El. (ft)	= 938.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

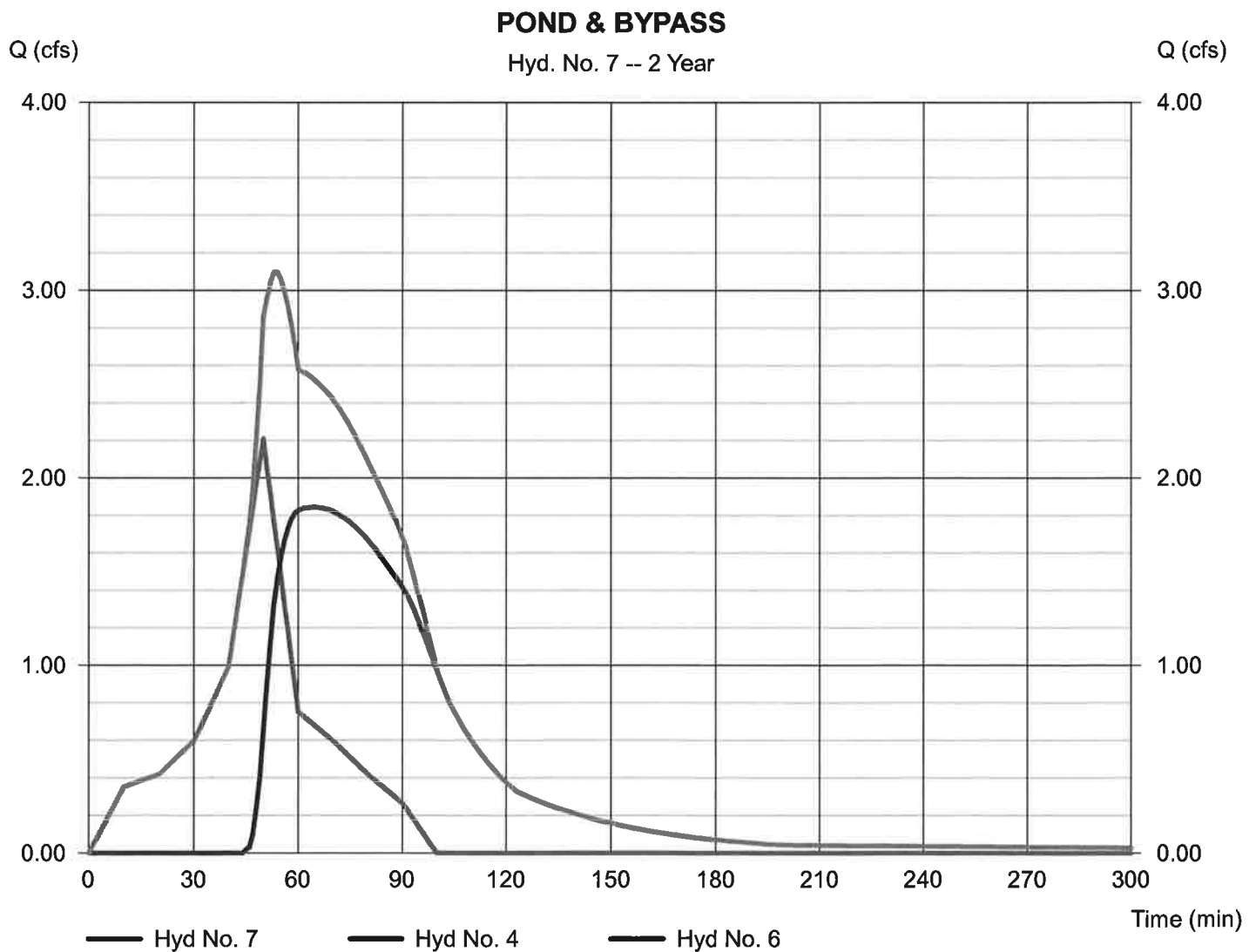
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 3.094 cfs
Time to peak = 53 min
Hyd. volume = 10,790 cuft
Contrib. drain. area = 1.300 ac



Hydrograph Report

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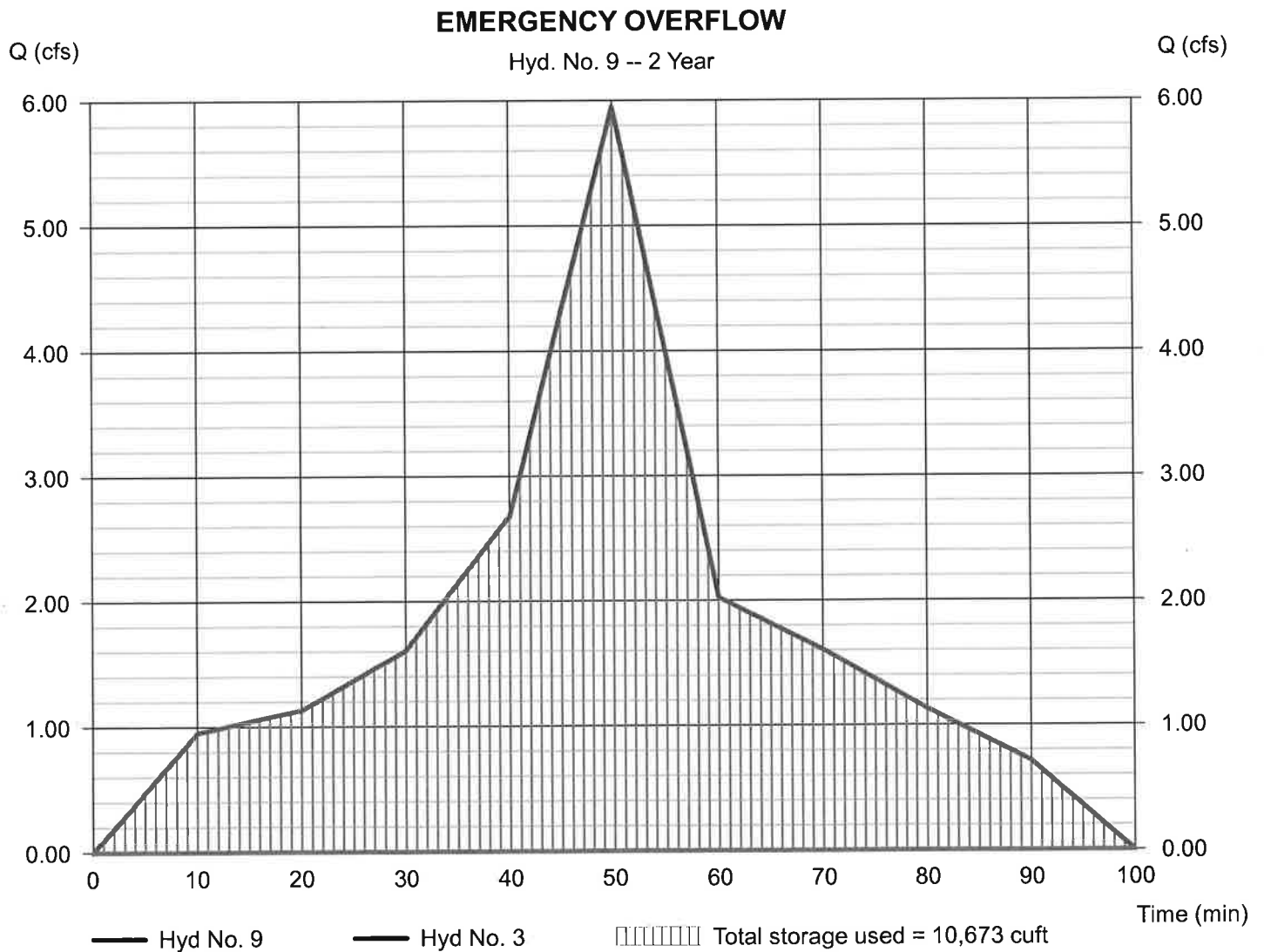
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 2 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 0.000 cfs
 Time to peak = n/a
 Hyd. volume = 0 cuft
 Max. Elevation = 938.09 ft
 Max. Storage = 10,673 cuft

Storage Indication method used,



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

Pond No. 2 - Pond REV - EMG

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 934.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	934.00	1,301	0	0
2.00	936.00	2,531	3,832	3,832
4.00	938.00	3,901	6,432	10,264
5.00	939.00	5,097	4,499	14,763

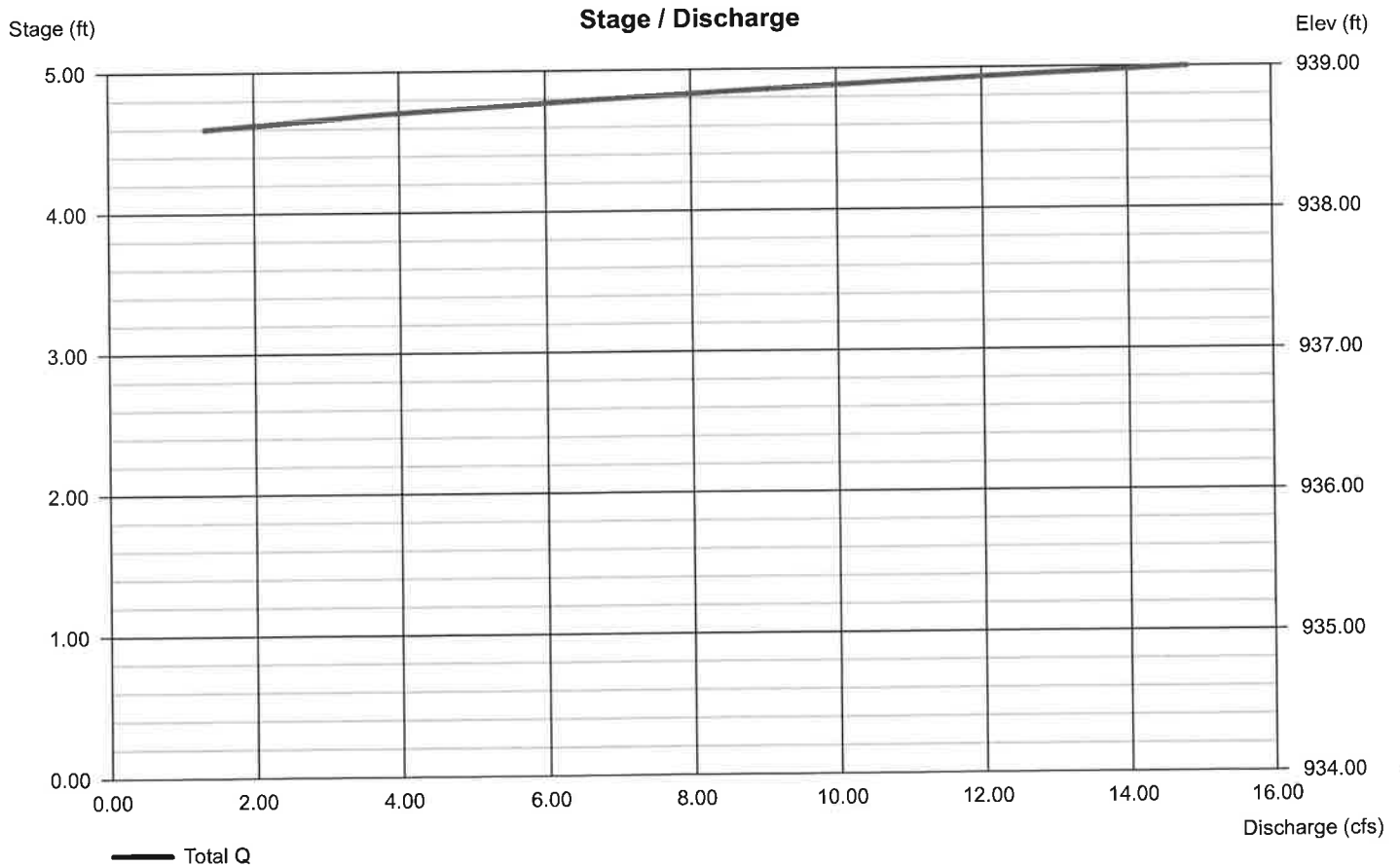
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 934.00	0.00	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.60	0.00	0.00	0.00
Crest El. (ft)	= 938.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	5.298	1	50	9,504	-----	-----	-----	PRE-DEV
3	Dekalb	6.946	1	50	12,462	-----	-----	-----	POST DEV. TO POND
4	Dekalb	2.580	1	50	4,629	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	2.282	1	62	8,614	3	937.27	7,931	ROUTED POND
7	Combine	3.984	1	52	13,243	4, 6	-----	-----	POND & BYPASS
9	Reservoir	0.000	1	n/a	0	3	938.49	12,462	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 5 Year			Monday, Oct 8, 2012	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

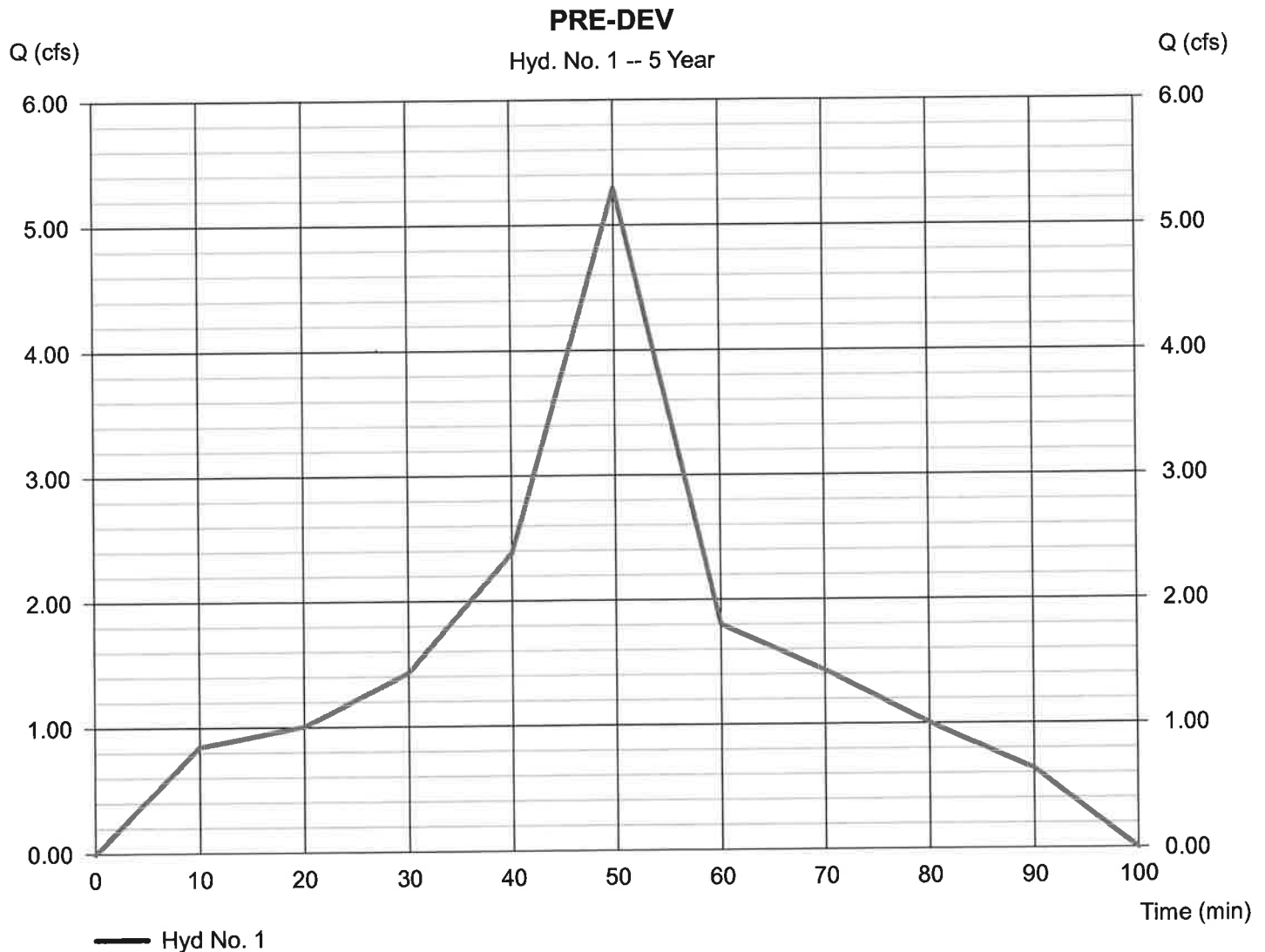
Monday, Oct 8, 2012

Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
Storm frequency = 5 yrs
Time interval = 1 min
Drainage area = 3.100 ac
Intensity = 5.513 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 5.298 cfs
Time to peak = 50 min
Hyd. volume = 9,504 cuft
Runoff coeff. = 0.31
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

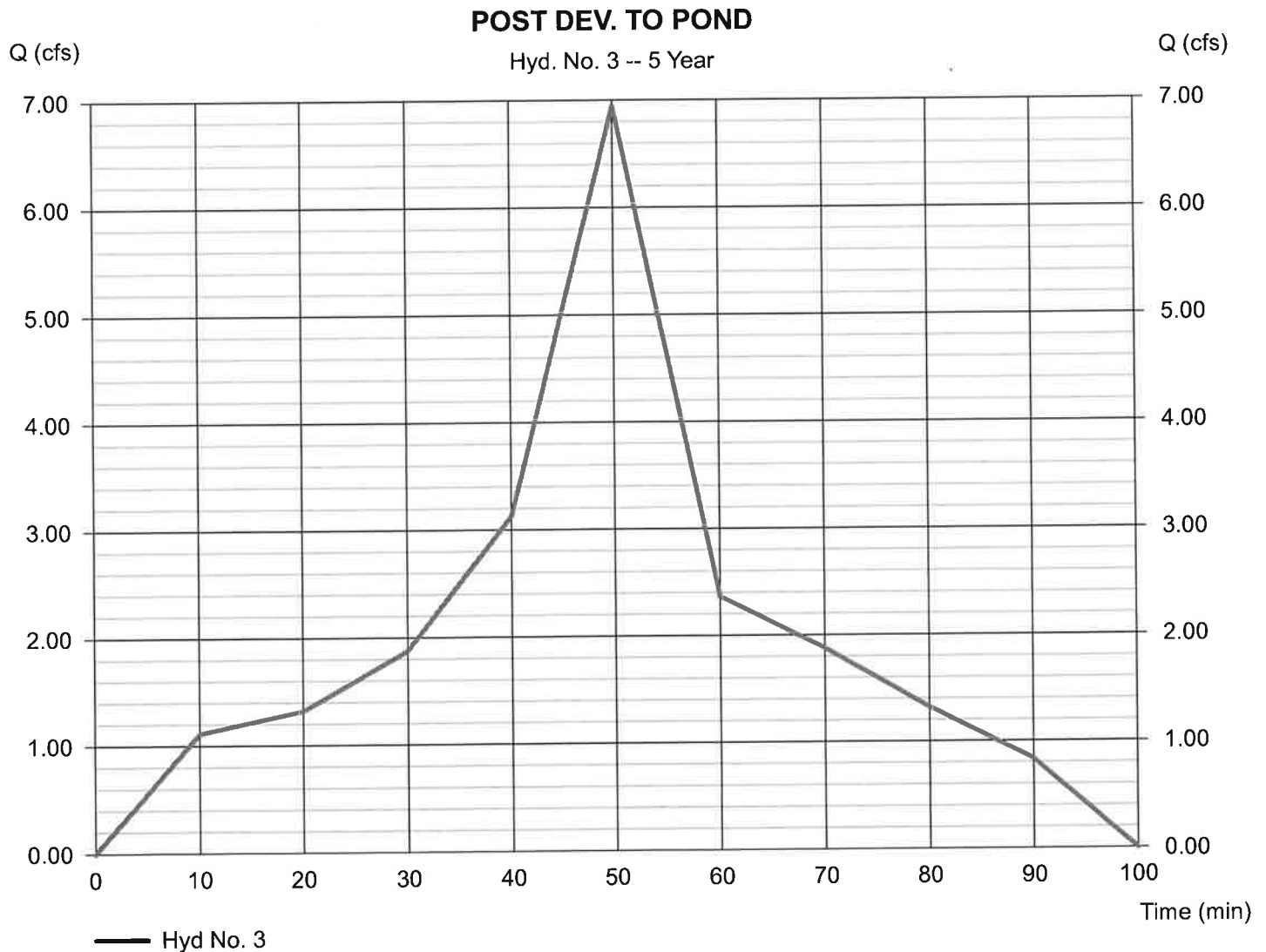
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 5 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 5.513 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 6.946 cfs
 Time to peak = 50 min
 Hyd. volume = 12,462 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

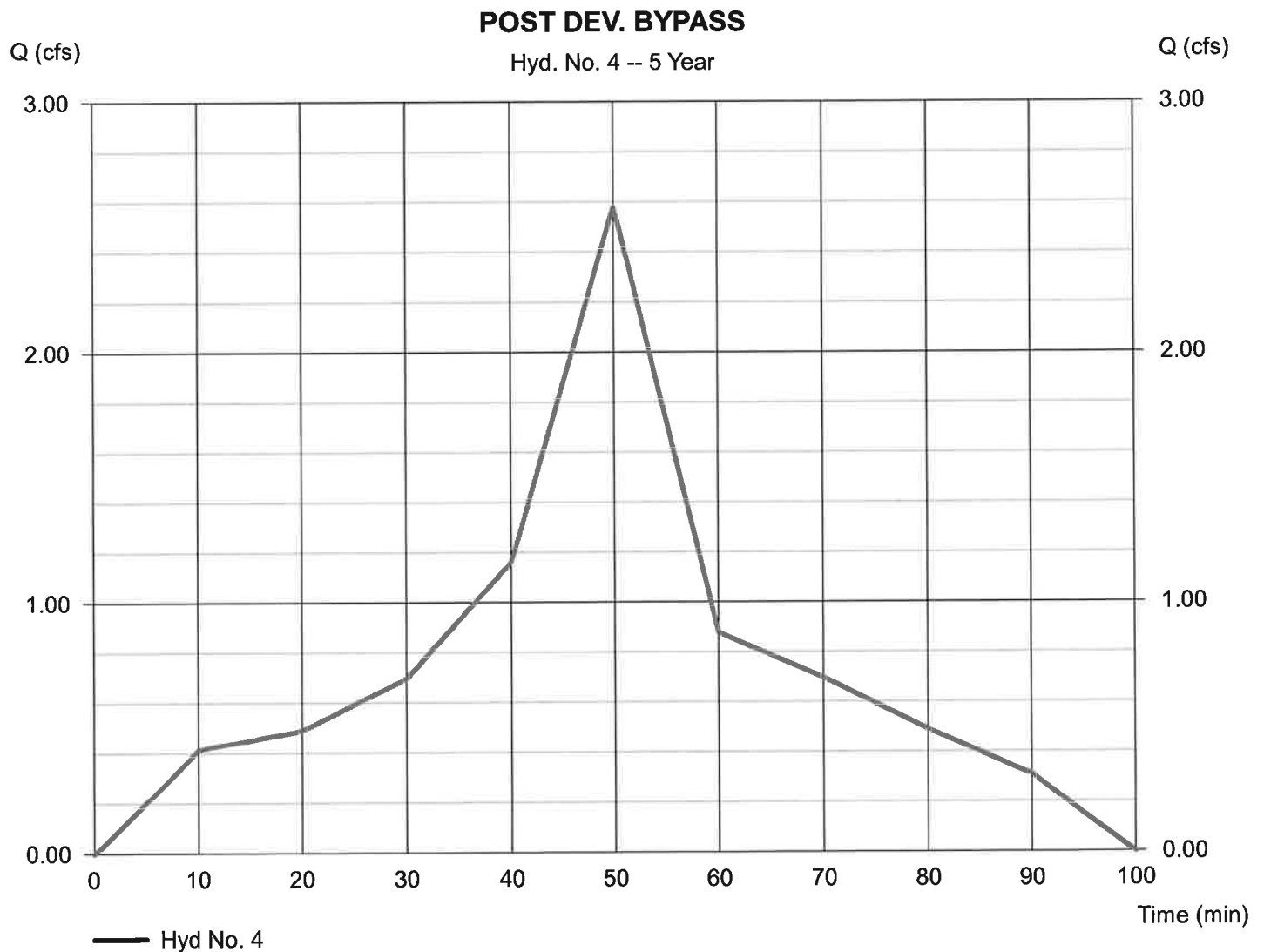
Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type = Dekalb
 Storm frequency = 5 yrs
 Time interval = 1 min
 Drainage area = 1.300 ac
 Intensity = 5.513 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 2.580 cfs
 Time to peak = 50 min
 Hyd. volume = 4,629 cuft
 Runoff coeff. = 0.36
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

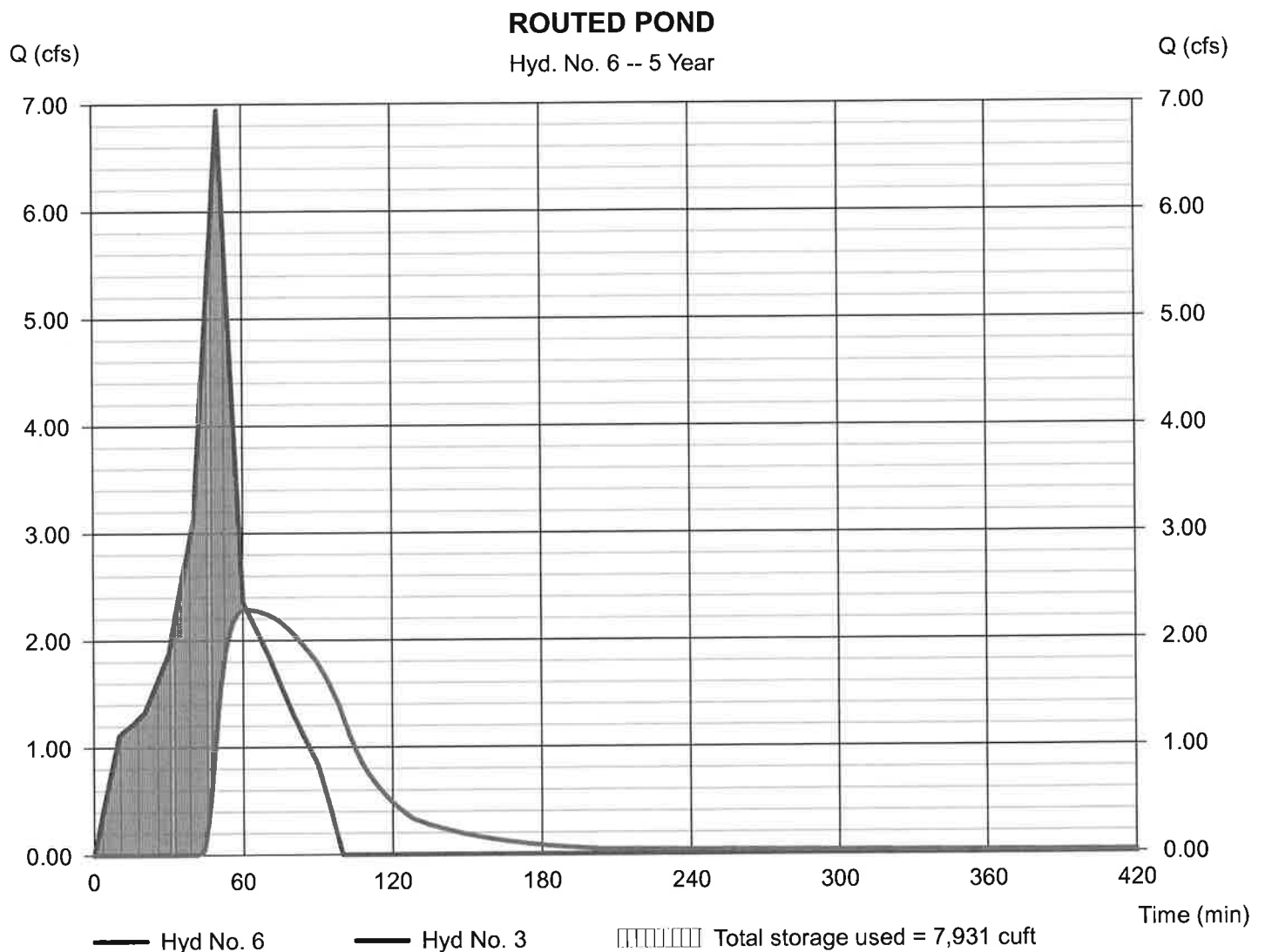
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
 Storm frequency = 5 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV

Peak discharge = 2.282 cfs
 Time to peak = 62 min
 Hyd. volume = 8,614 cuft
 Max. Elevation = 937.27 ft
 Max. Storage = 7,931 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

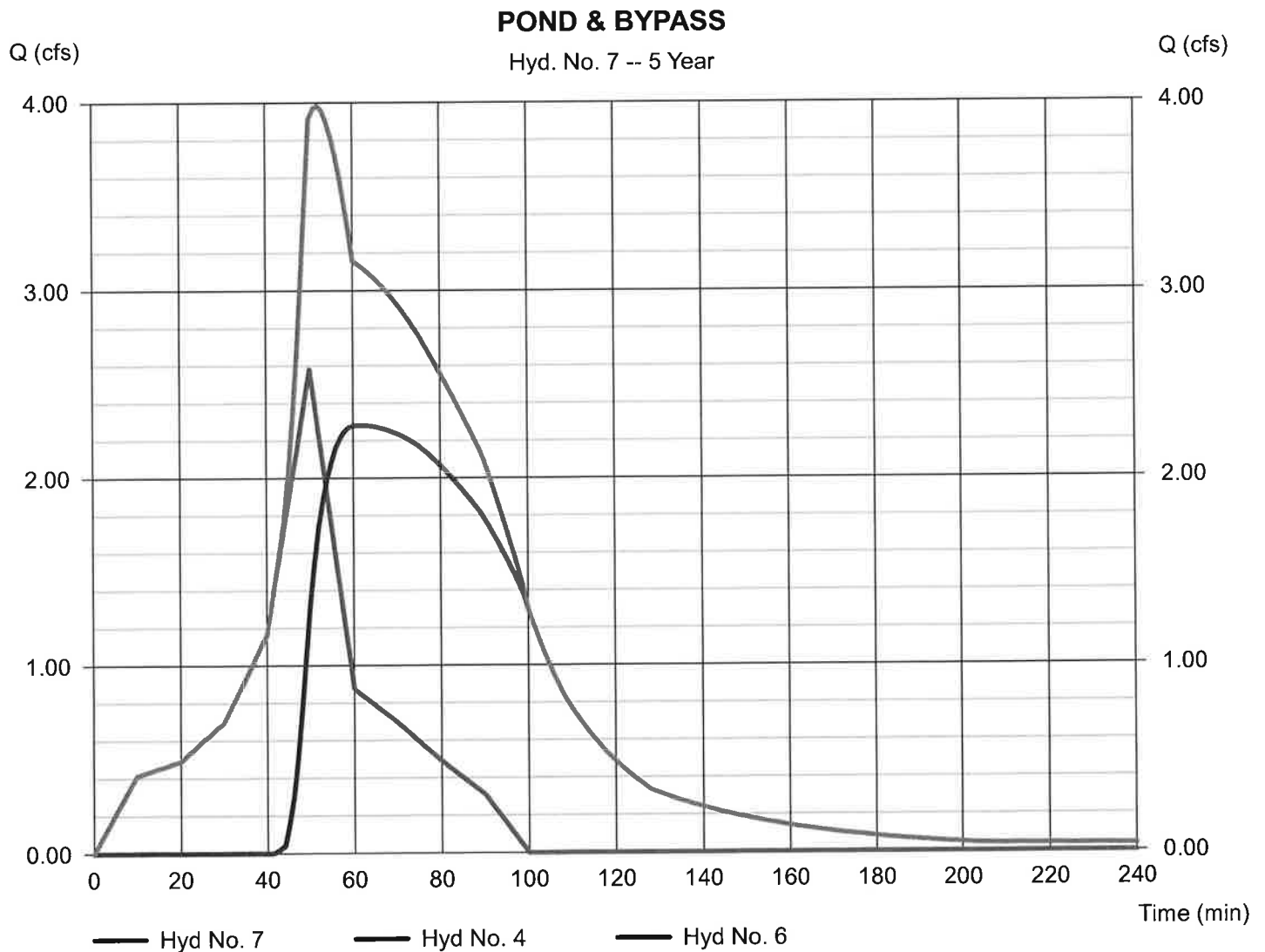
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 5 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 3.984 cfs
Time to peak = 52 min
Hyd. volume = 13,243 cuft
Contrib. drain. area = 1.300 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

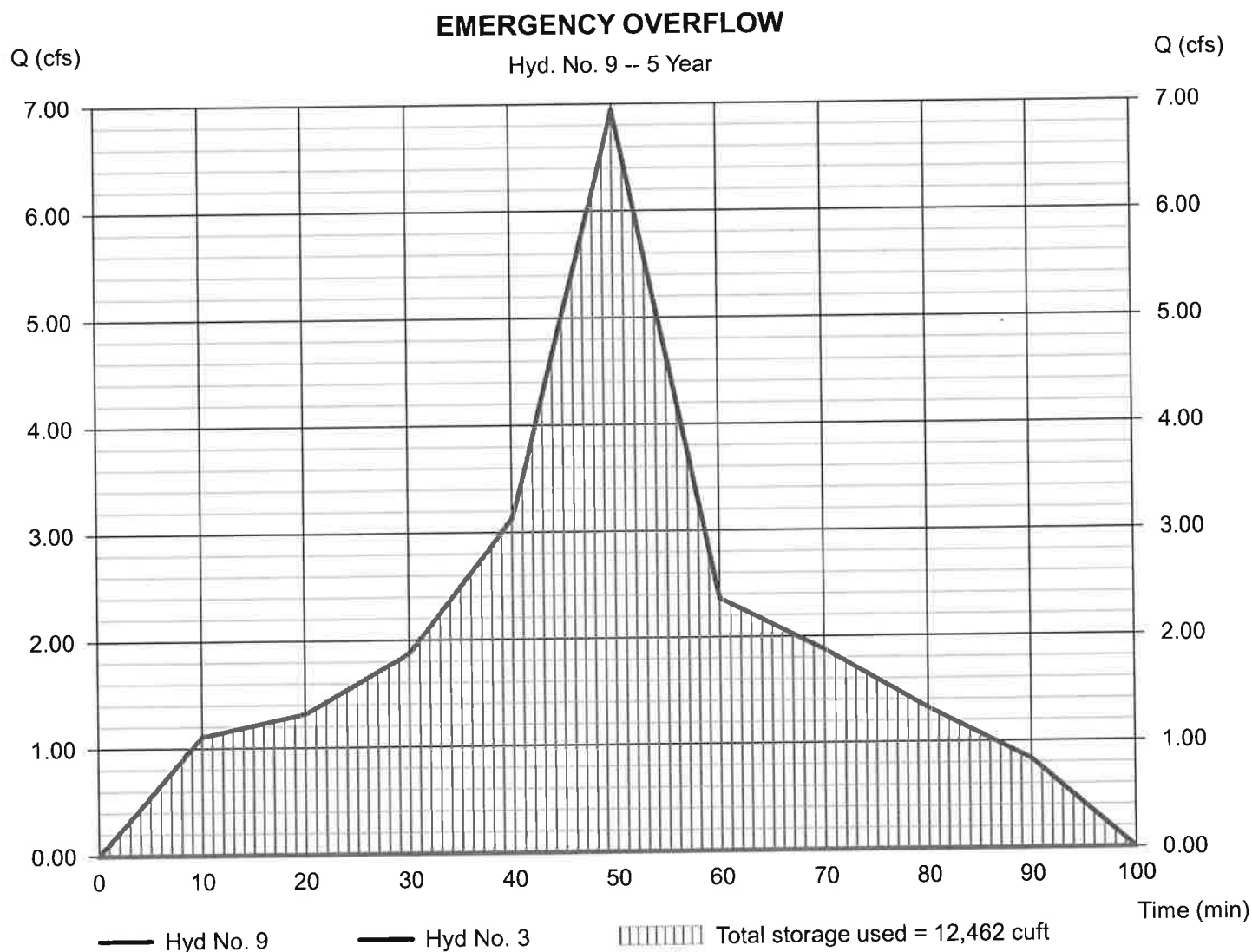
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 5 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 0.000 cfs
 Time to peak = n/a
 Hyd. volume = 0 cuft
 Max. Elevation = 938.49 ft
 Max. Storage = 12,462 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	5.856	1	50	10,506	-----	-----	-----	PRE-DEV
3	Dekalb	7.678	1	50	13,774	-----	-----	-----	POST DEV. TO POND
4	Dekalb	2.852	1	50	5,116	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	2.569	1	61	9,927	3	937.48	8,580	ROUTED POND
7	Combine	4.579	1	51	15,043	4, 6	-----	-----	POND & BYPASS
9	Reservoir	1.056	1	88	1,260	3	938.58	12,872	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 10 Year			Monday, Oct 8, 2012	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

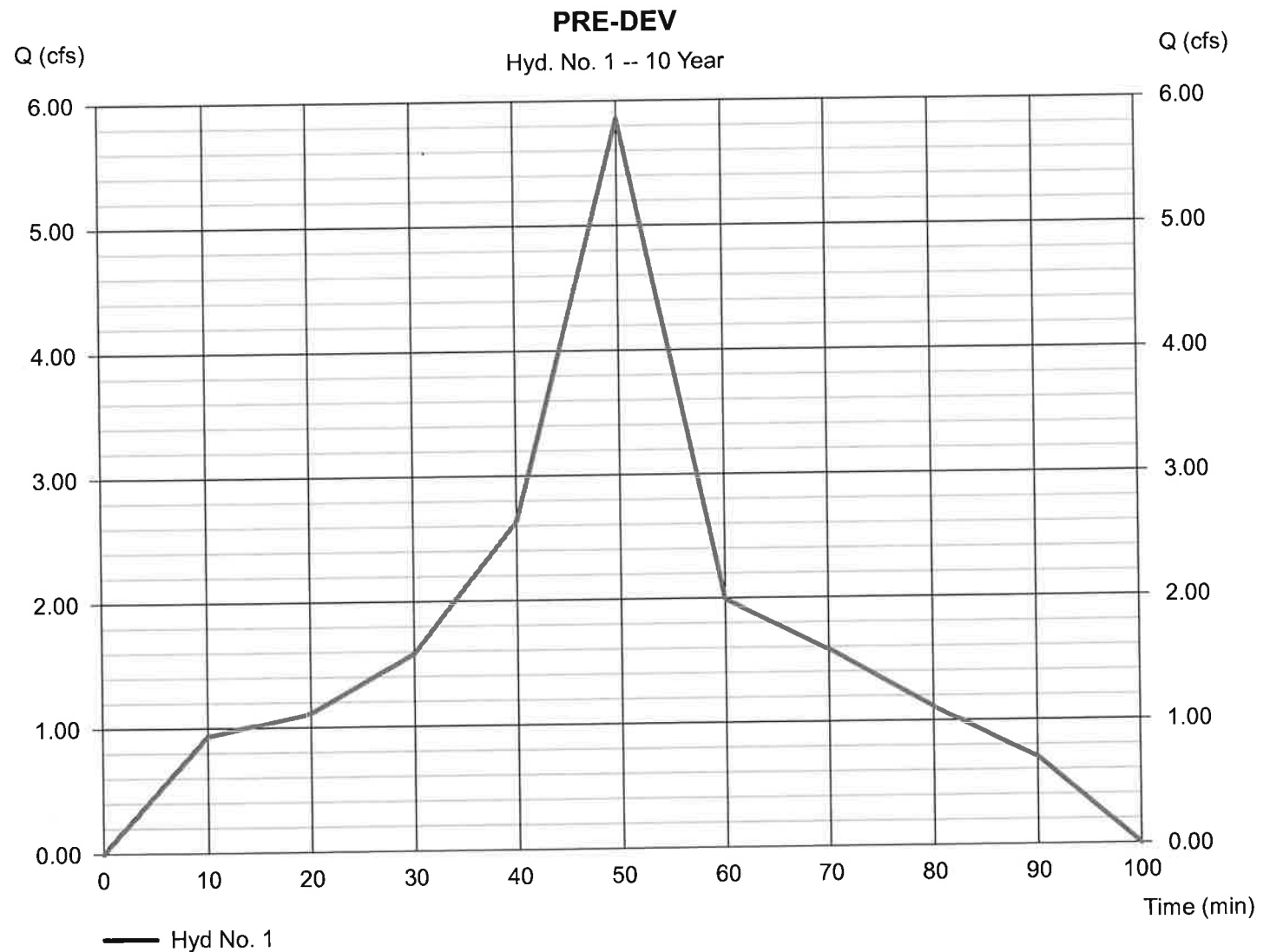
Monday, Oct 8, 2012

Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 3.100 ac
Intensity = 6.094 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 5.856 cfs
Time to peak = 50 min
Hyd. volume = 10,506 cuft
Runoff coeff. = 0.31
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

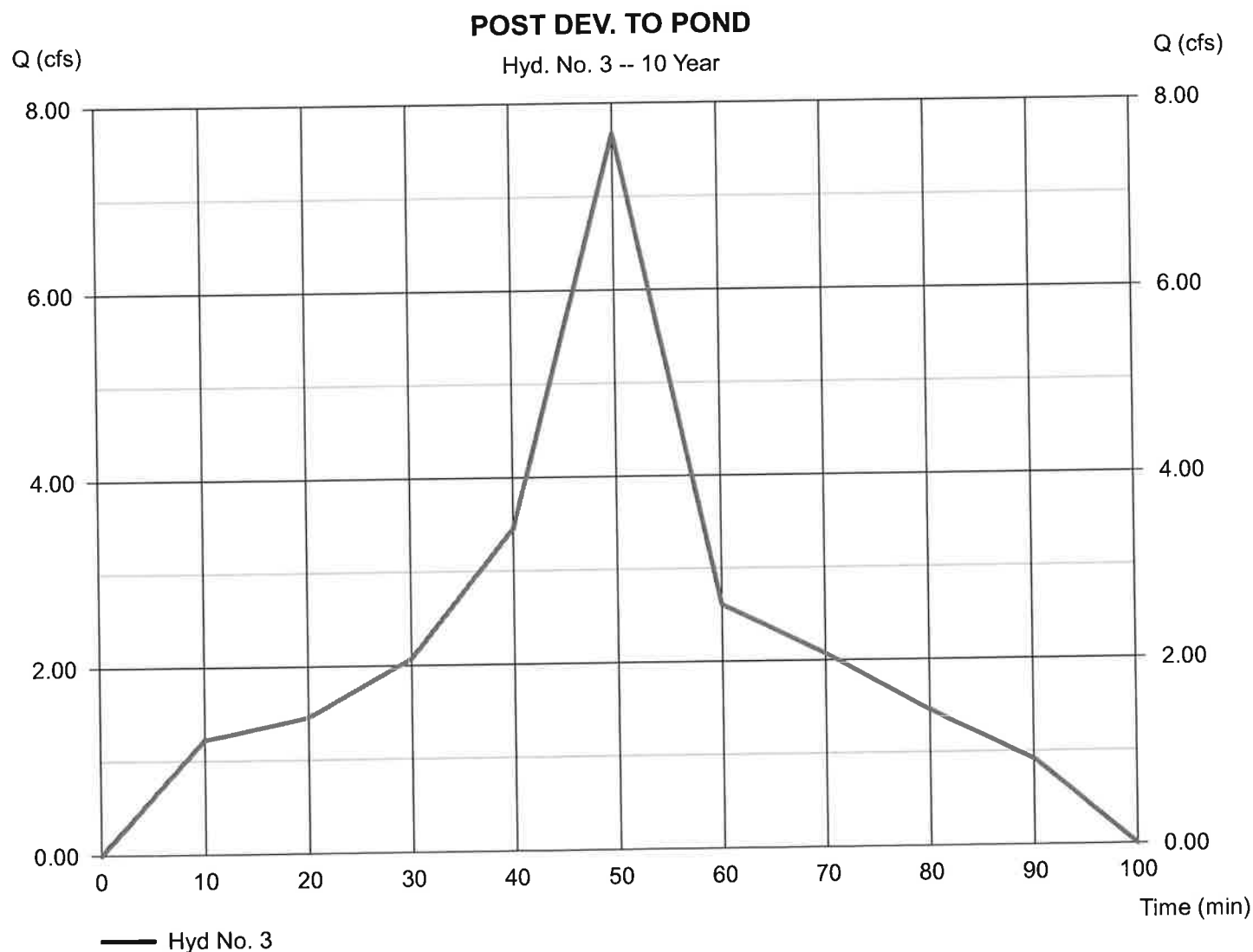
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 6.094 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 7.678 cfs
 Time to peak = 50 min
 Hyd. volume = 13,774 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

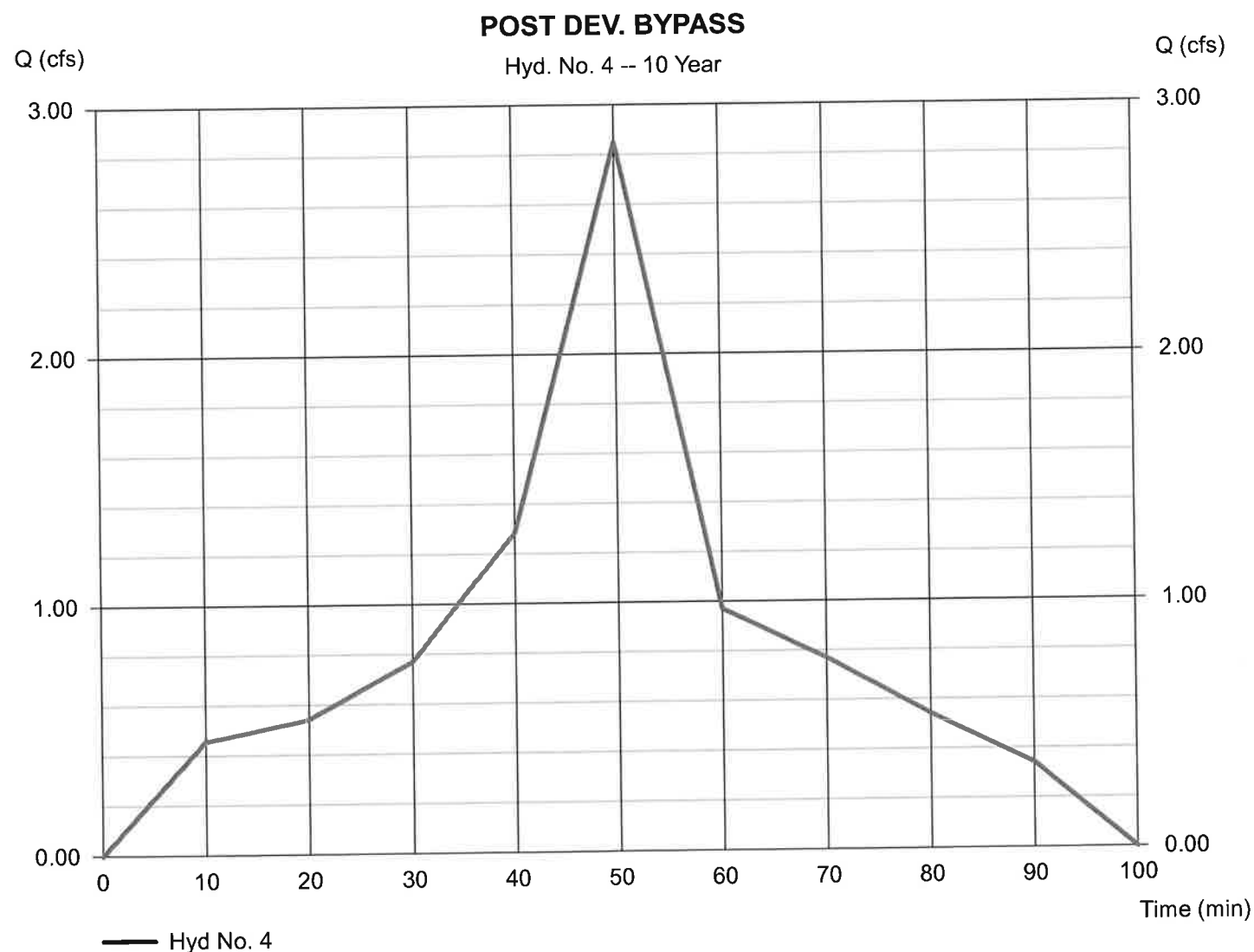
Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type = Dekalb
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 1.300 ac
 Intensity = 6.094 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 2.852 cfs
 Time to peak = 50 min
 Hyd. volume = 5,116 cuft
 Runoff coeff. = 0.36
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

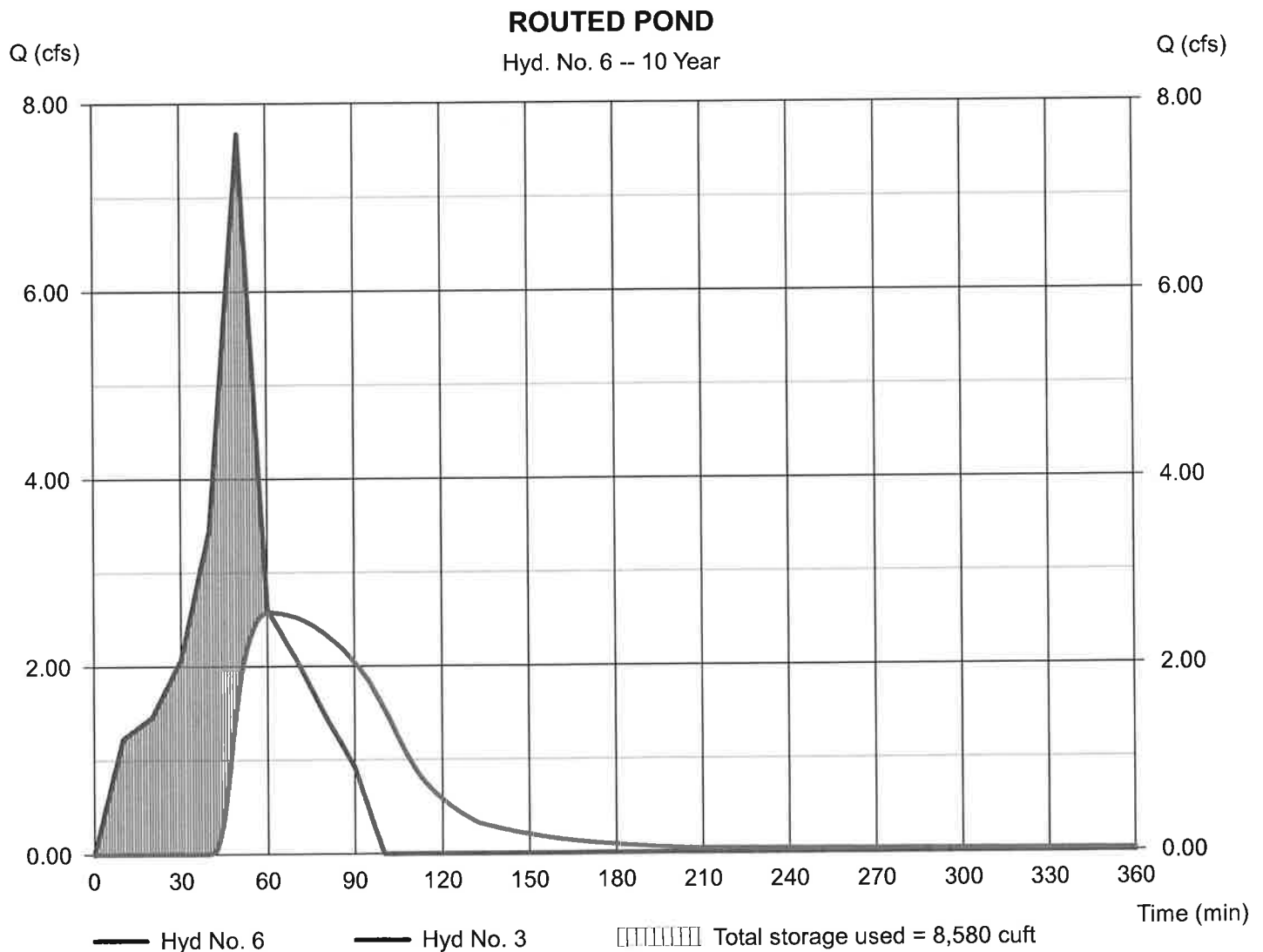
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV

Peak discharge = 2.569 cfs
 Time to peak = 61 min
 Hyd. volume = 9,927 cuft
 Max. Elevation = 937.48 ft
 Max. Storage = 8,580 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

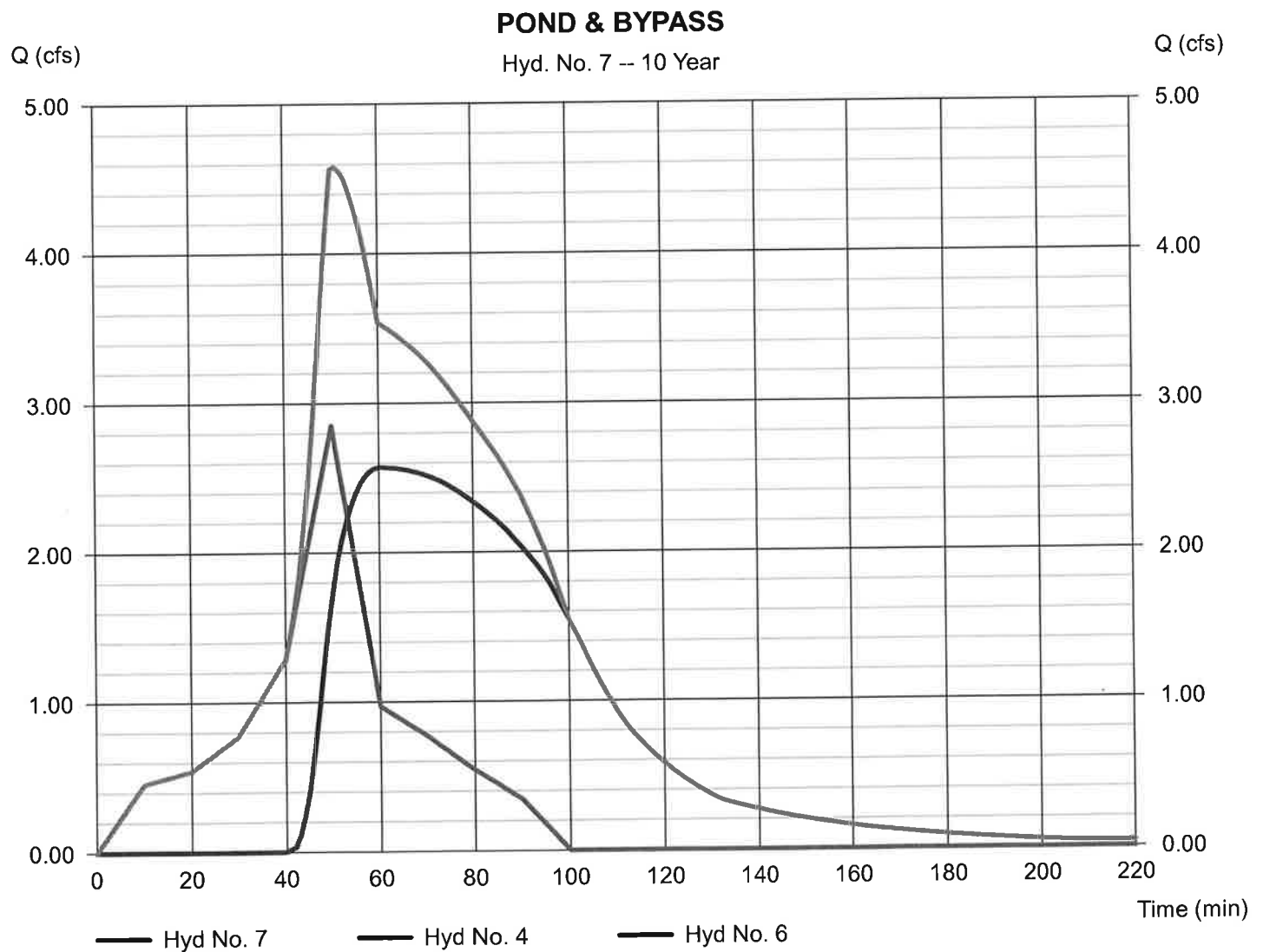
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 4.579 cfs
Time to peak = 51 min
Hyd. volume = 15,043 cuft
Contrib. drain. area = 1.300 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

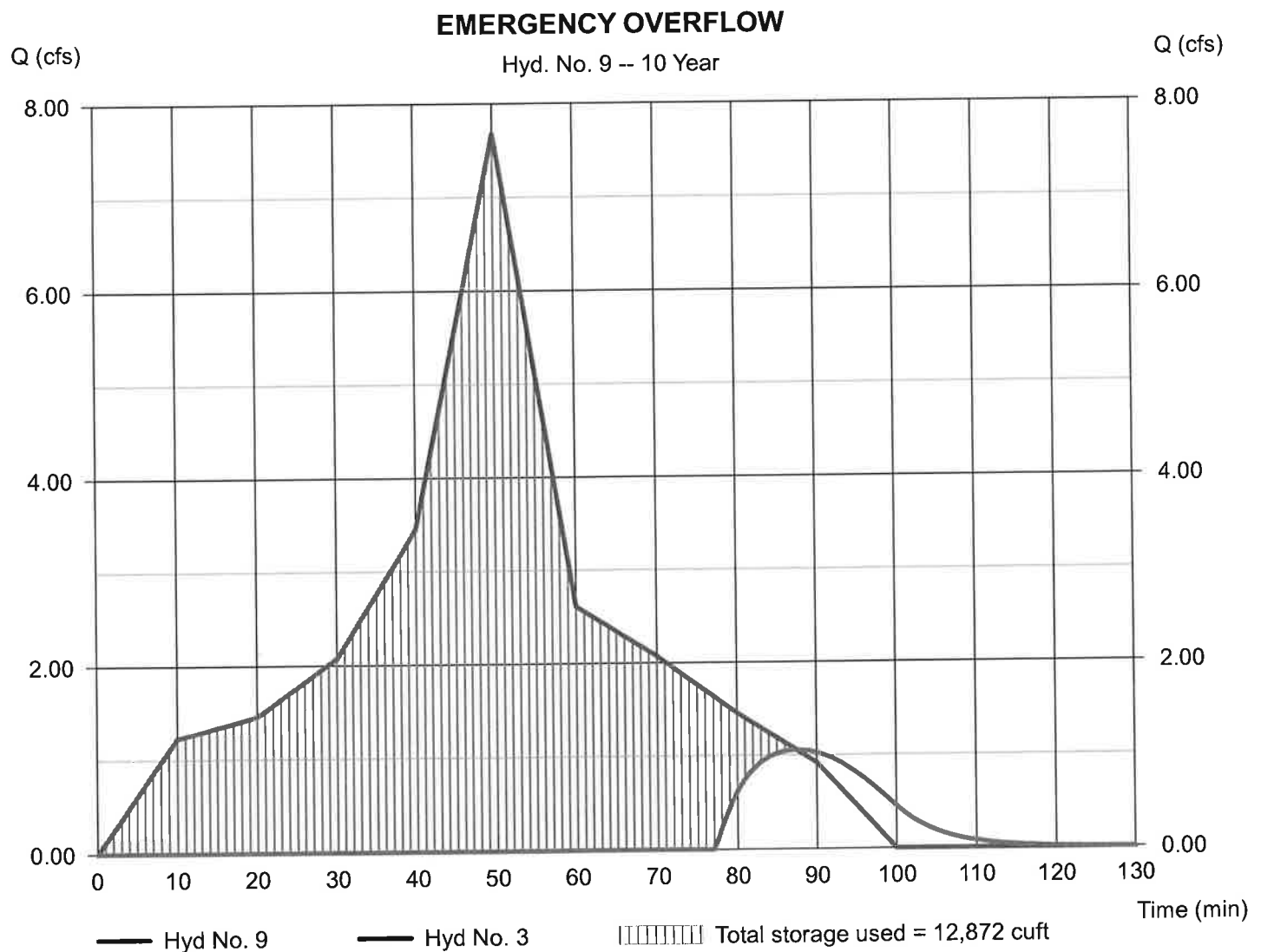
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 1.056 cfs
 Time to peak = 88 min
 Hyd. volume = 1,260 cuft
 Max. Elevation = 938.58 ft
 Max. Storage = 12,872 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	6.712	1	50	12,041	-----	-----	-----	PRE-DEV
3	Dekalb	8.800	1	50	15,787	-----	-----	-----	POST DEV. TO POND
4	Dekalb	3.269	1	50	5,864	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	2.965	1	60	11,940	3	937.79	9,594	ROUTED POND
7	Combine	5.437	1	50	17,804	4, 6	-----	-----	POND & BYPASS
9	Reservoir	2.113	1	74	3,274	3	938.63	13,110	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 25 Year			Monday, Oct 8, 2012	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

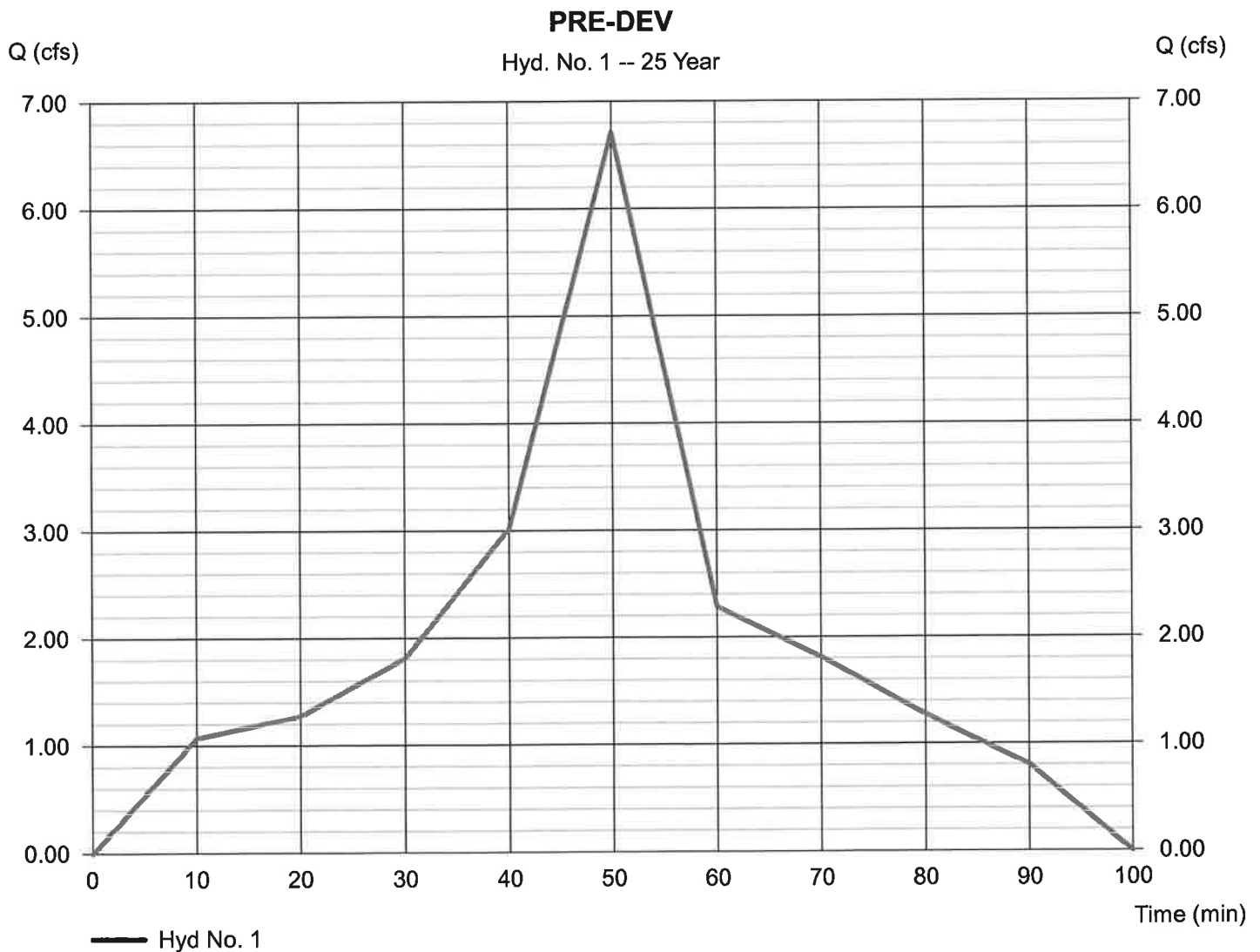
Monday, Oct 8, 2012

Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 3.100 ac
 Intensity = 6.984 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 6.712 cfs
 Time to peak = 50 min
 Hyd. volume = 12,041 cuft
 Runoff coeff. = 0.31
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

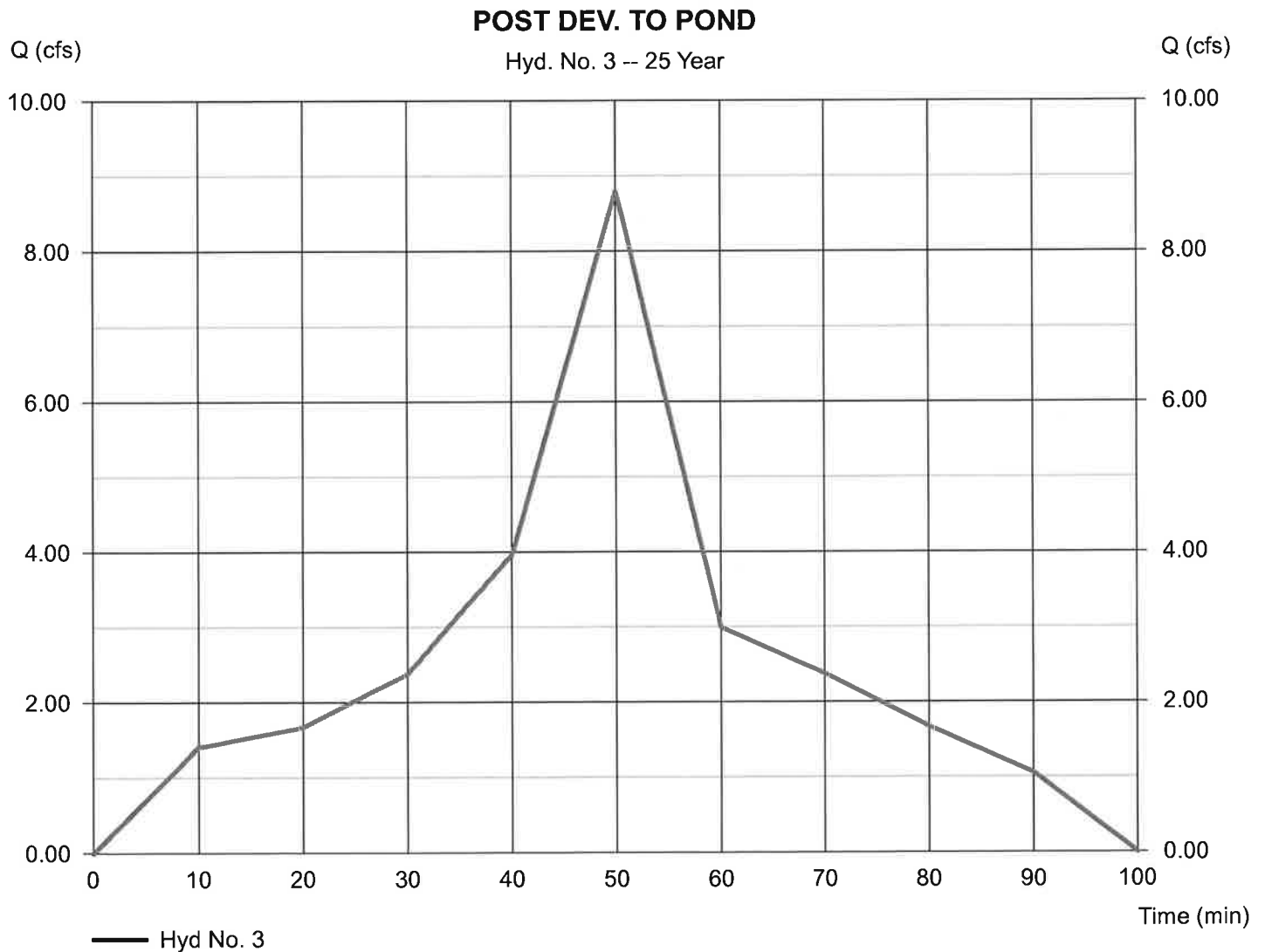
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 25 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 6.984 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 8.800 cfs
 Time to peak = 50 min
 Hyd. volume = 15,787 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

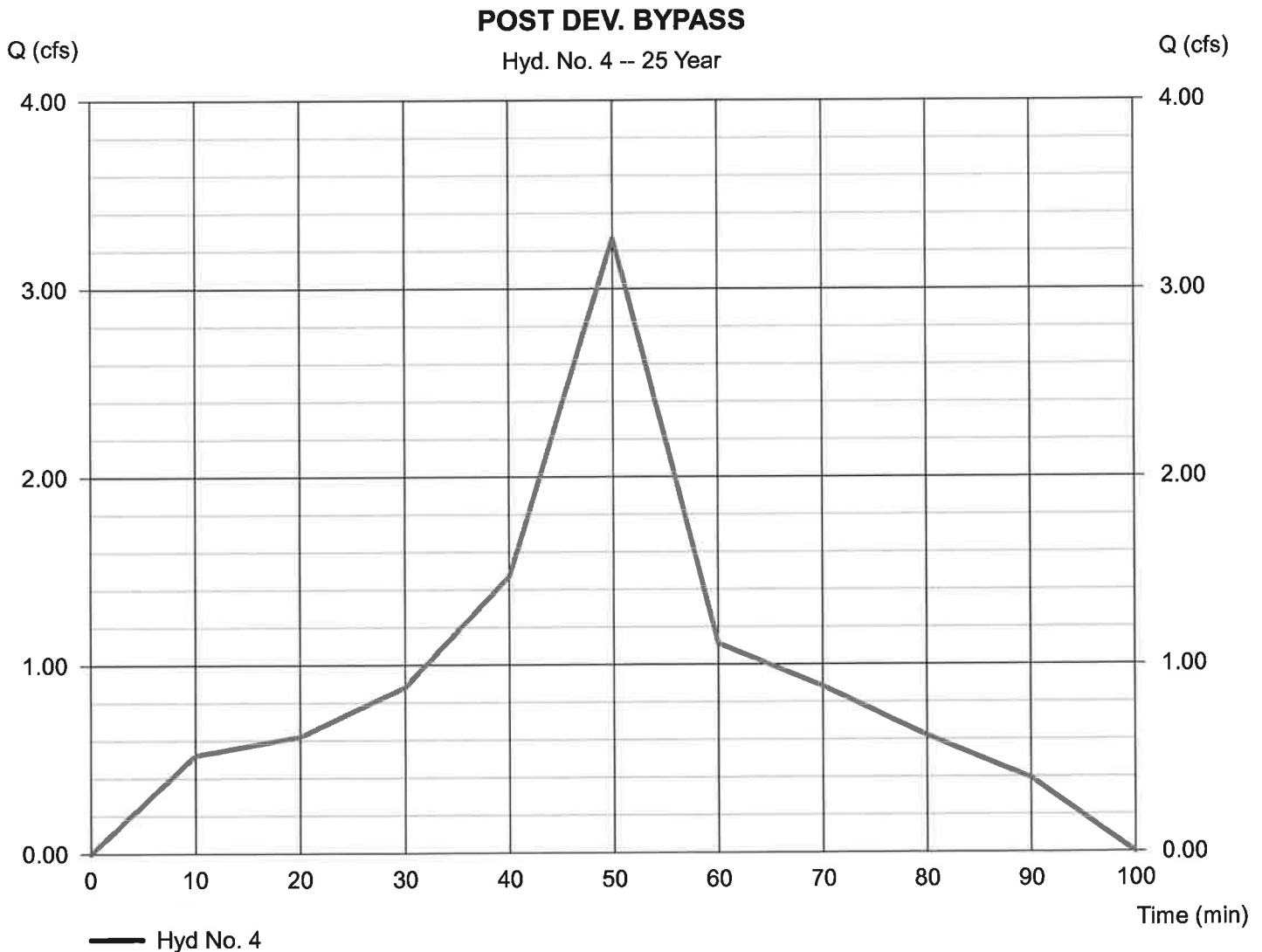
Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type = Dekalb
Storm frequency = 25 yrs
Time interval = 1 min
Drainage area = 1.300 ac
Intensity = 6.984 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 3.269 cfs
Time to peak = 50 min
Hyd. volume = 5,864 cuft
Runoff coeff. = 0.36
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

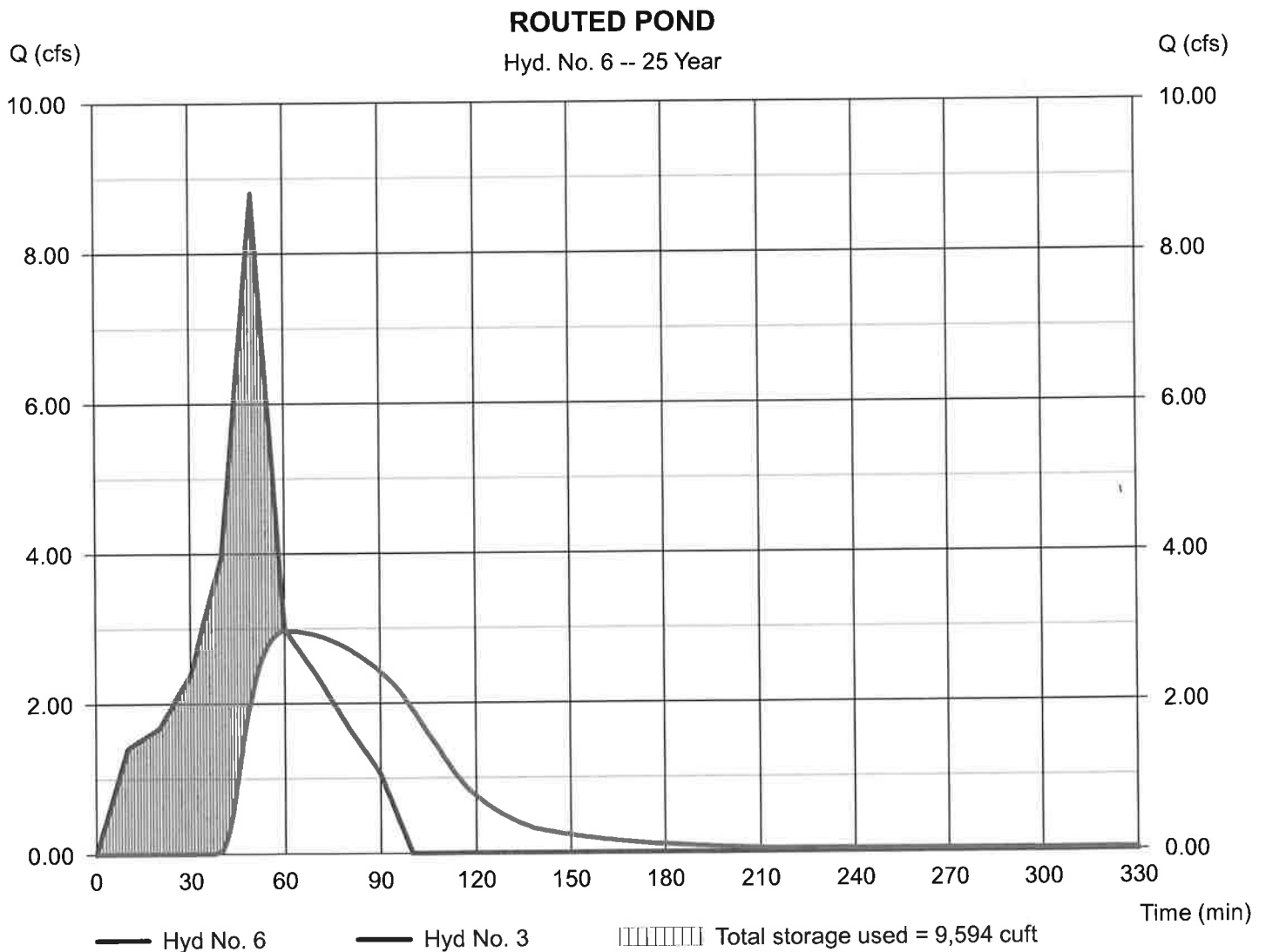
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyd. No. = 3 - POST DEV. TO POND
Reservoir name = Pond REV

Peak discharge = 2.965 cfs
Time to peak = 60 min
Hyd. volume = 11,940 cuft
Max. Elevation = 937.79 ft
Max. Storage = 9,594 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

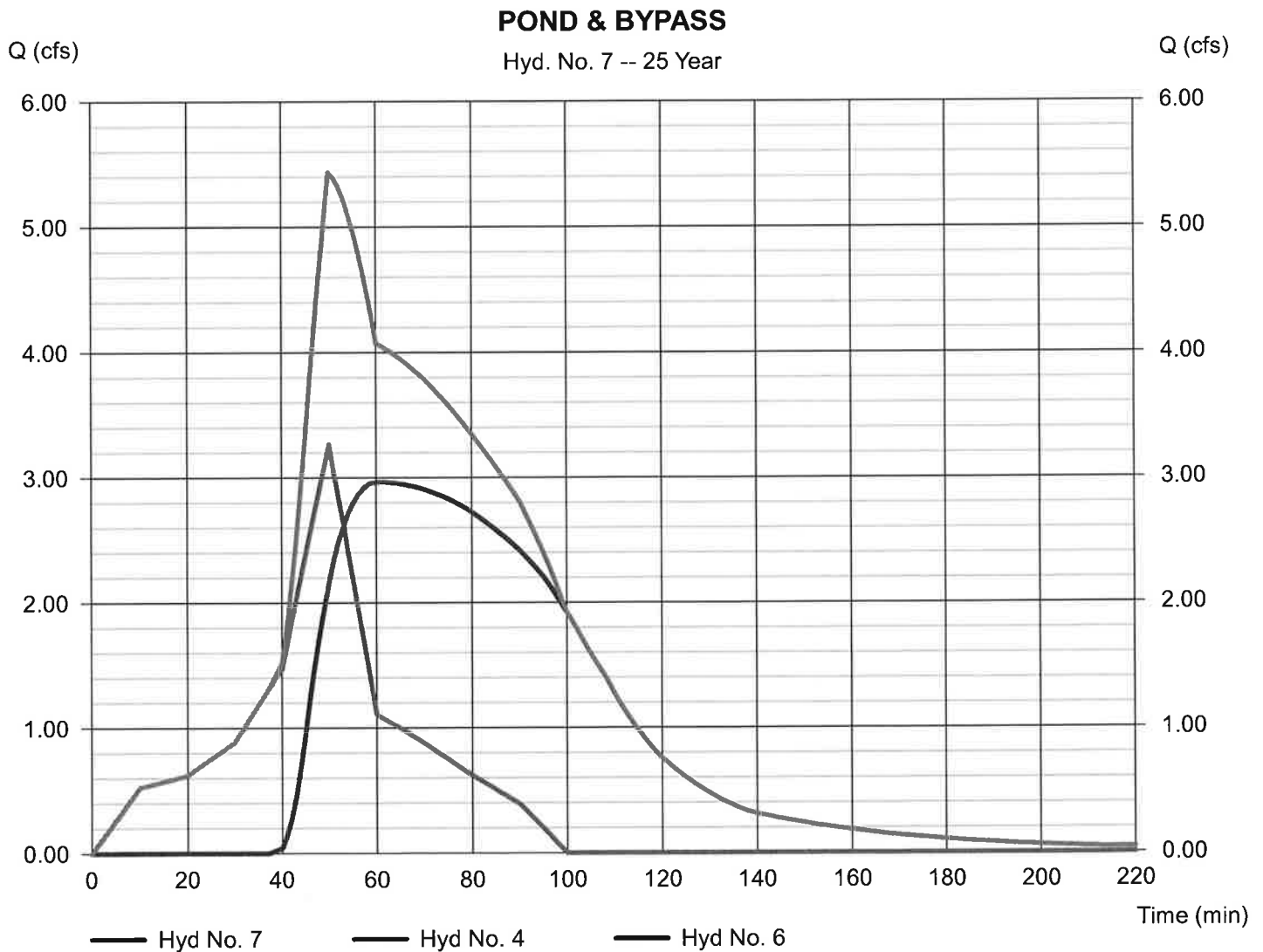
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 5.437 cfs
Time to peak = 50 min
Hyd. volume = 17,804 cuft
Contrib. drain. area = 1.300 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

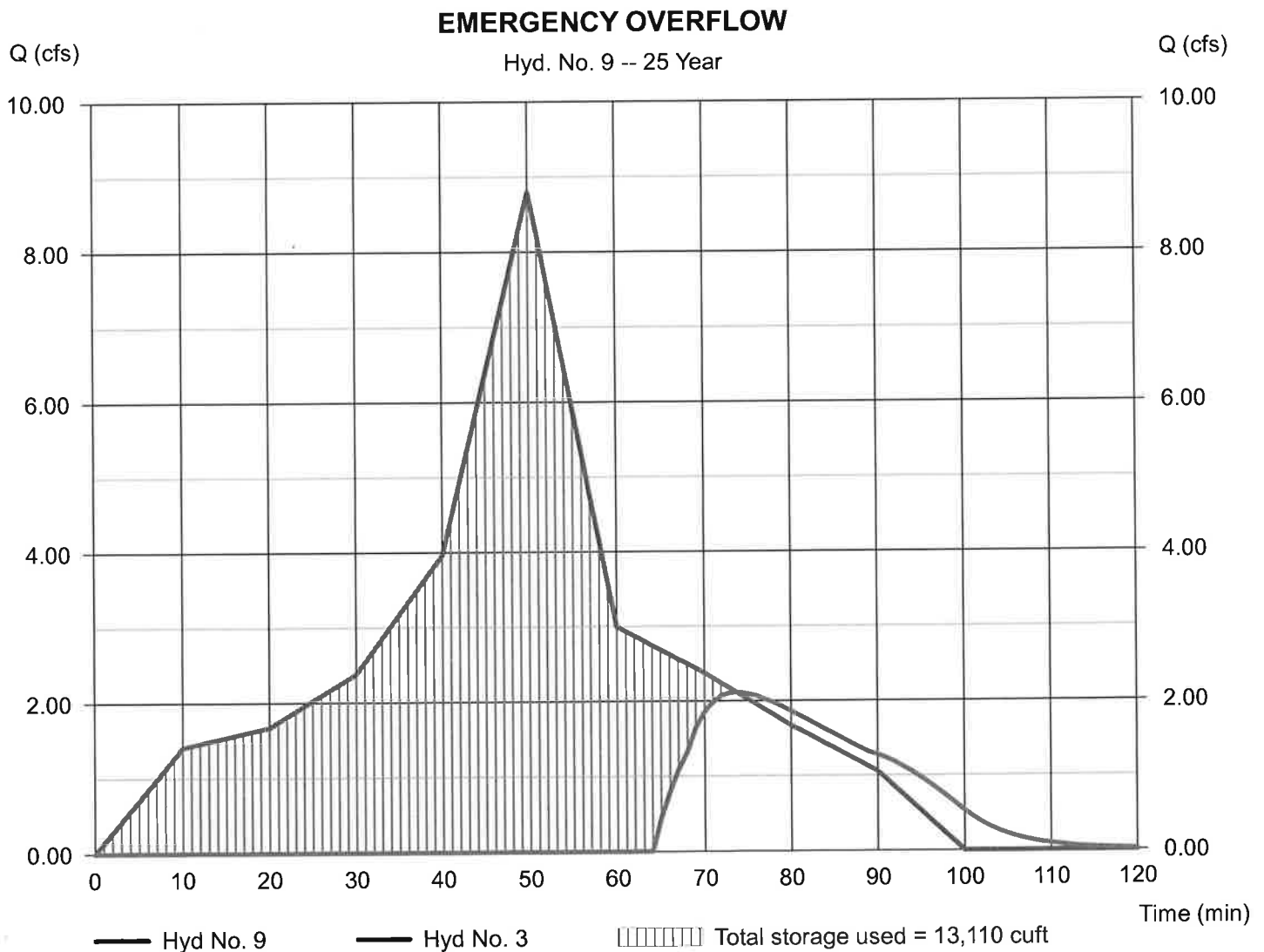
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 25 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 2.113 cfs
 Time to peak = 74 min
 Hyd. volume = 3,274 cuft
 Max. Elevation = 938.63 ft
 Max. Storage = 13,110 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	7.376	1	50	13,233	-----	-----	-----	PRE-DEV
3	Dekalb	9.672	1	50	17,351	-----	-----	-----	POST DEV. TO POND
4	Dekalb	3.592	1	50	6,445	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	3.228	1	61	13,503	3	938.03	10,393	ROUTED POND
7	Combine	6.043	1	50	19,948	4, 6	-----	-----	POND & BYPASS
9	Reservoir	2.776	1	68	4,837	3	938.66	13,233	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 50 Year			Monday, Oct 8, 2012	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

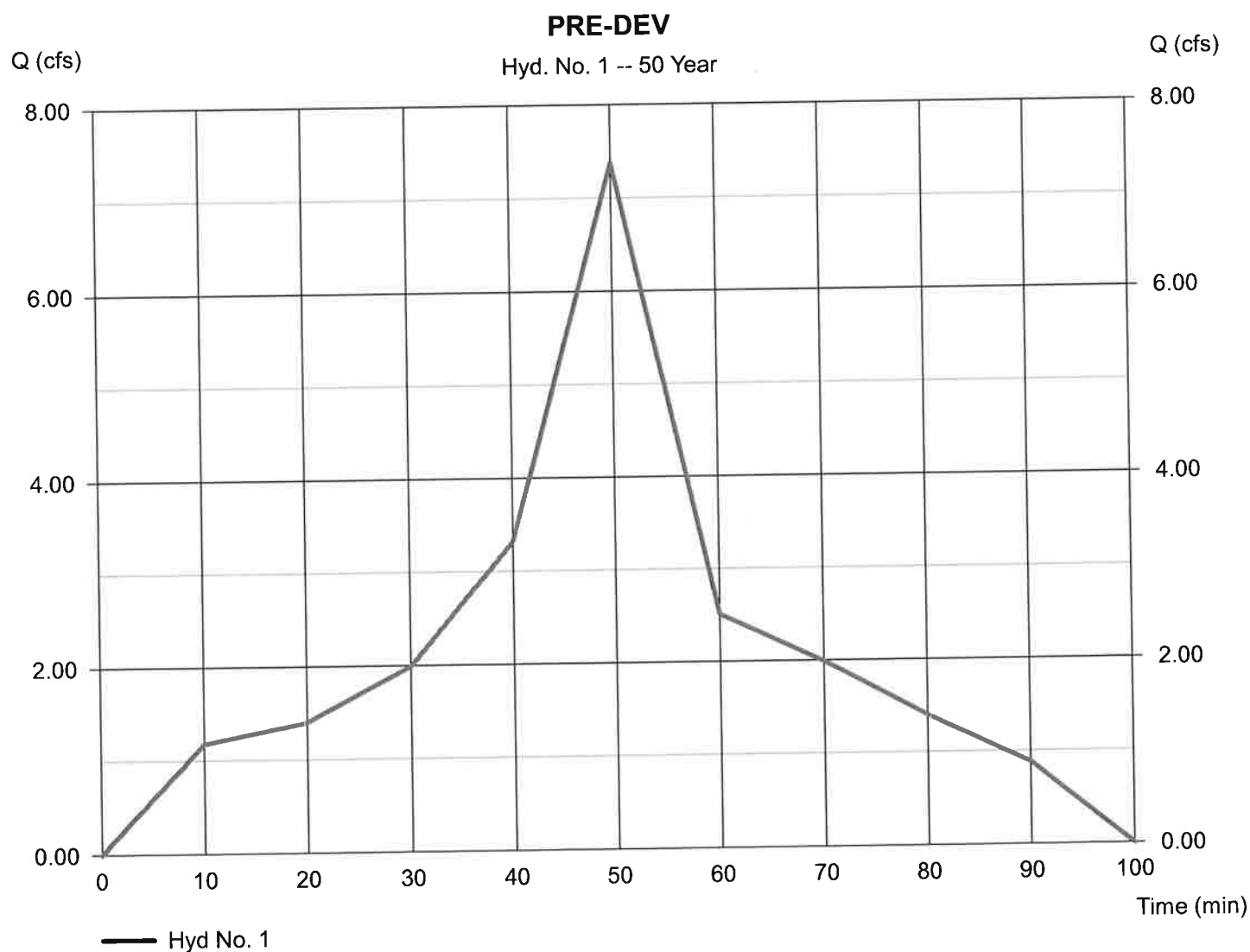
Monday, Oct 8, 2012

Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
Storm frequency = 50 yrs
Time interval = 1 min
Drainage area = 3.100 ac
Intensity = 7.676 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 7.376 cfs
Time to peak = 50 min
Hyd. volume = 13,233 cuft
Runoff coeff. = 0.31
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

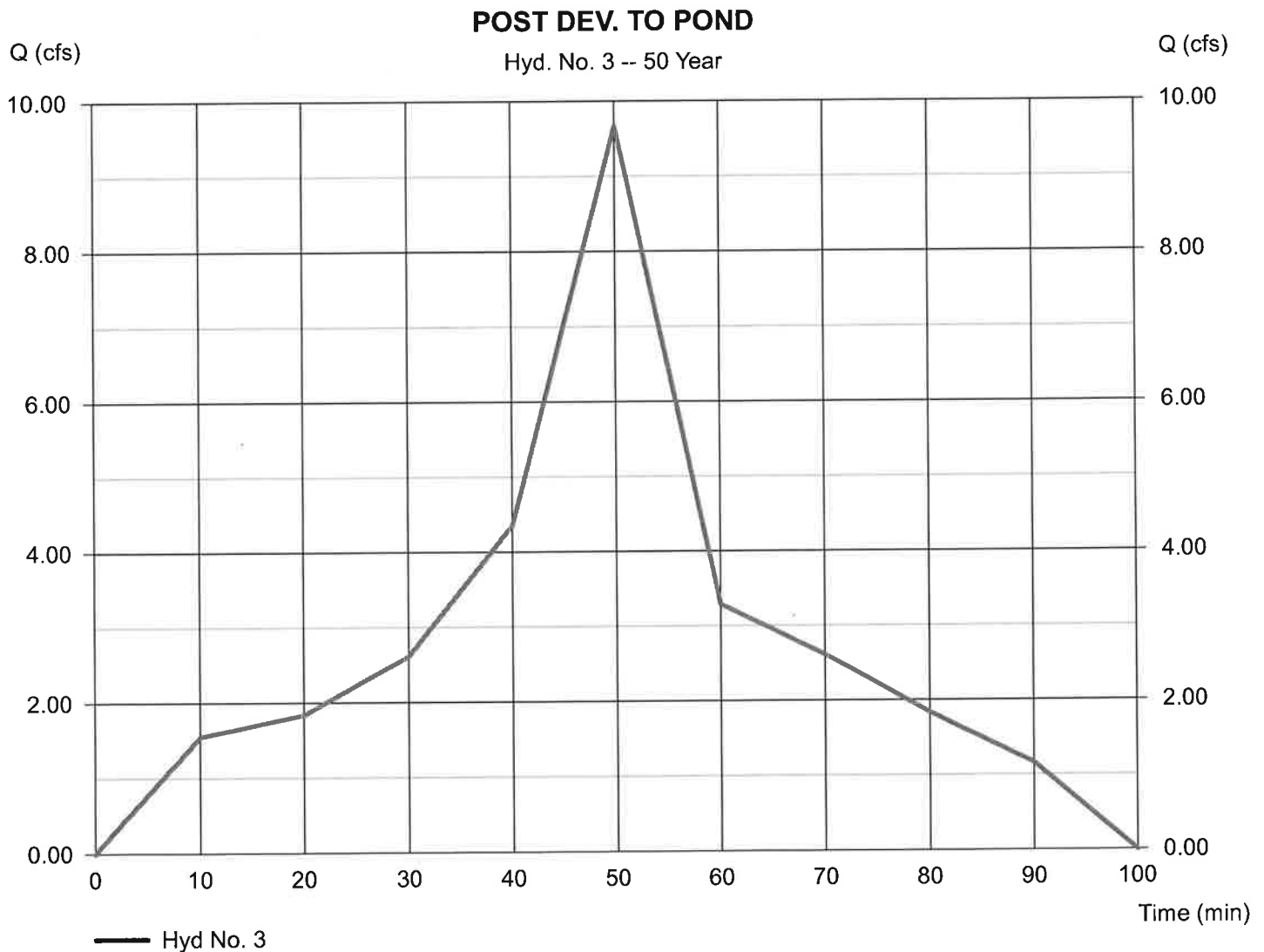
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 7.676 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 9.672 cfs
 Time to peak = 50 min
 Hyd. volume = 17,351 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

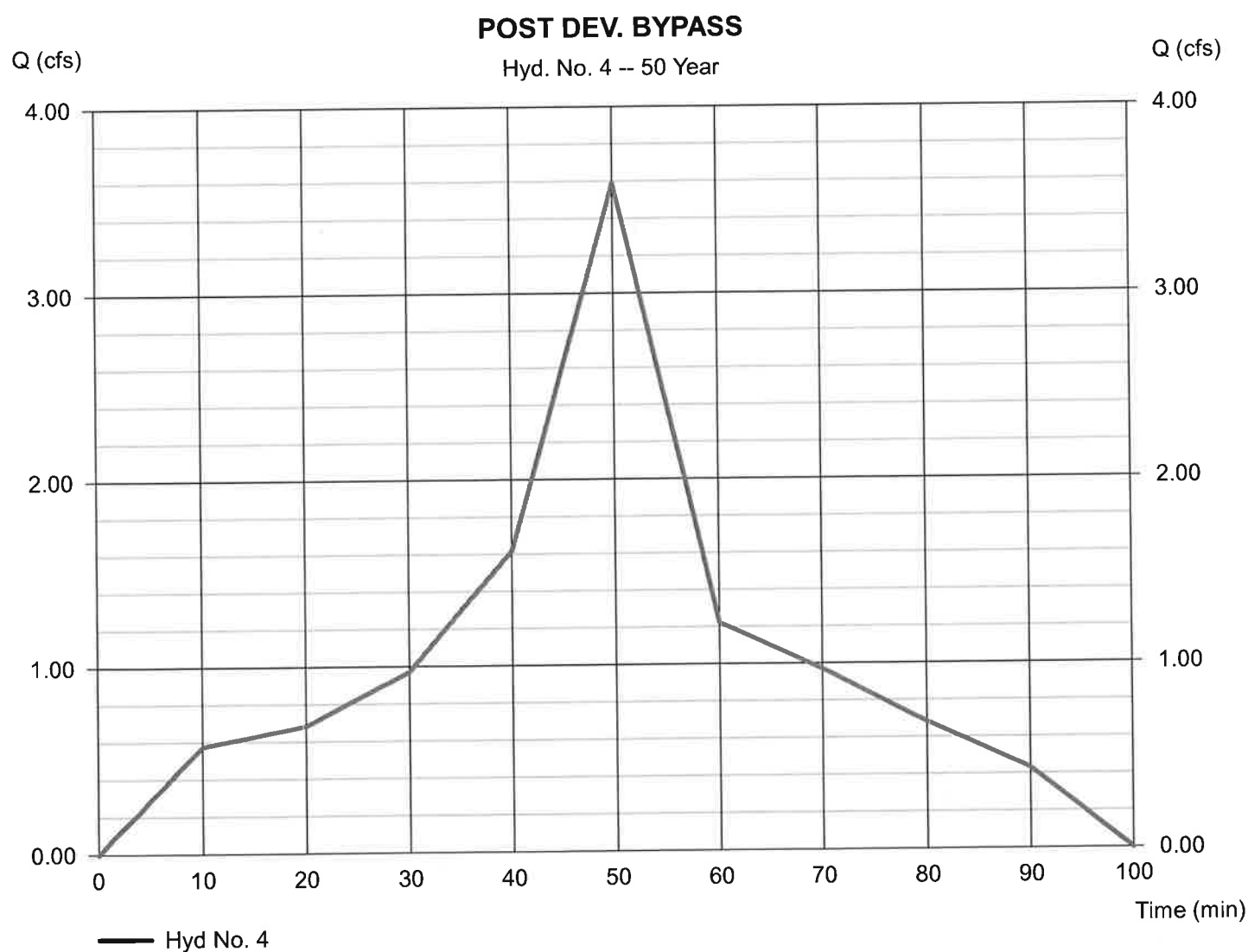
Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type = Dekalb
 Storm frequency = 50 yrs
 Time interval = 1 min
 Drainage area = 1.300 ac
 Intensity = 7.676 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 3.592 cfs
 Time to peak = 50 min
 Hyd. volume = 6,445 cuft
 Runoff coeff. = 0.36
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

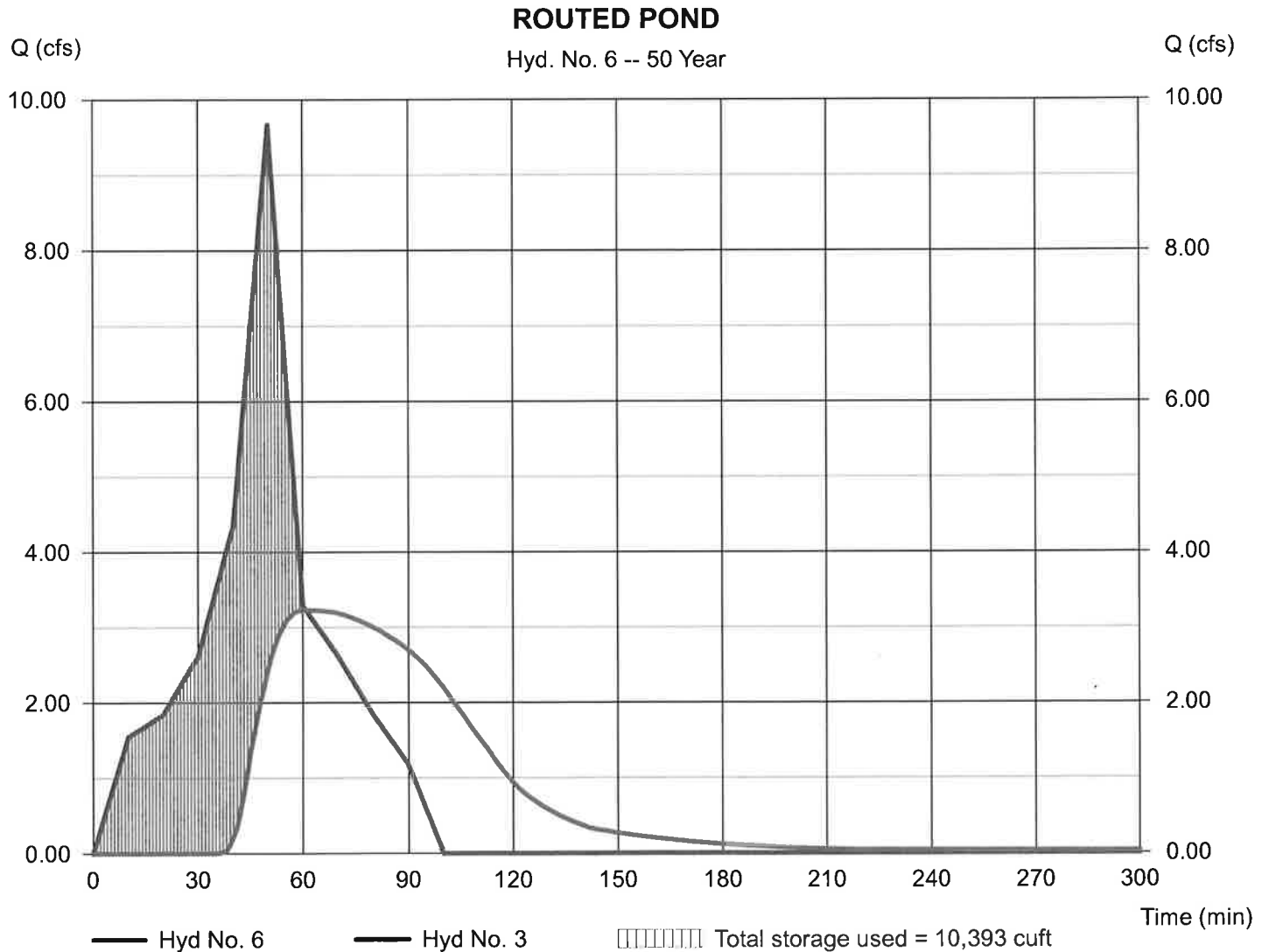
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
 Storm frequency = 50 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV

Peak discharge = 3.228 cfs
 Time to peak = 61 min
 Hyd. volume = 13,503 cuft
 Max. Elevation = 938.03 ft
 Max. Storage = 10,393 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

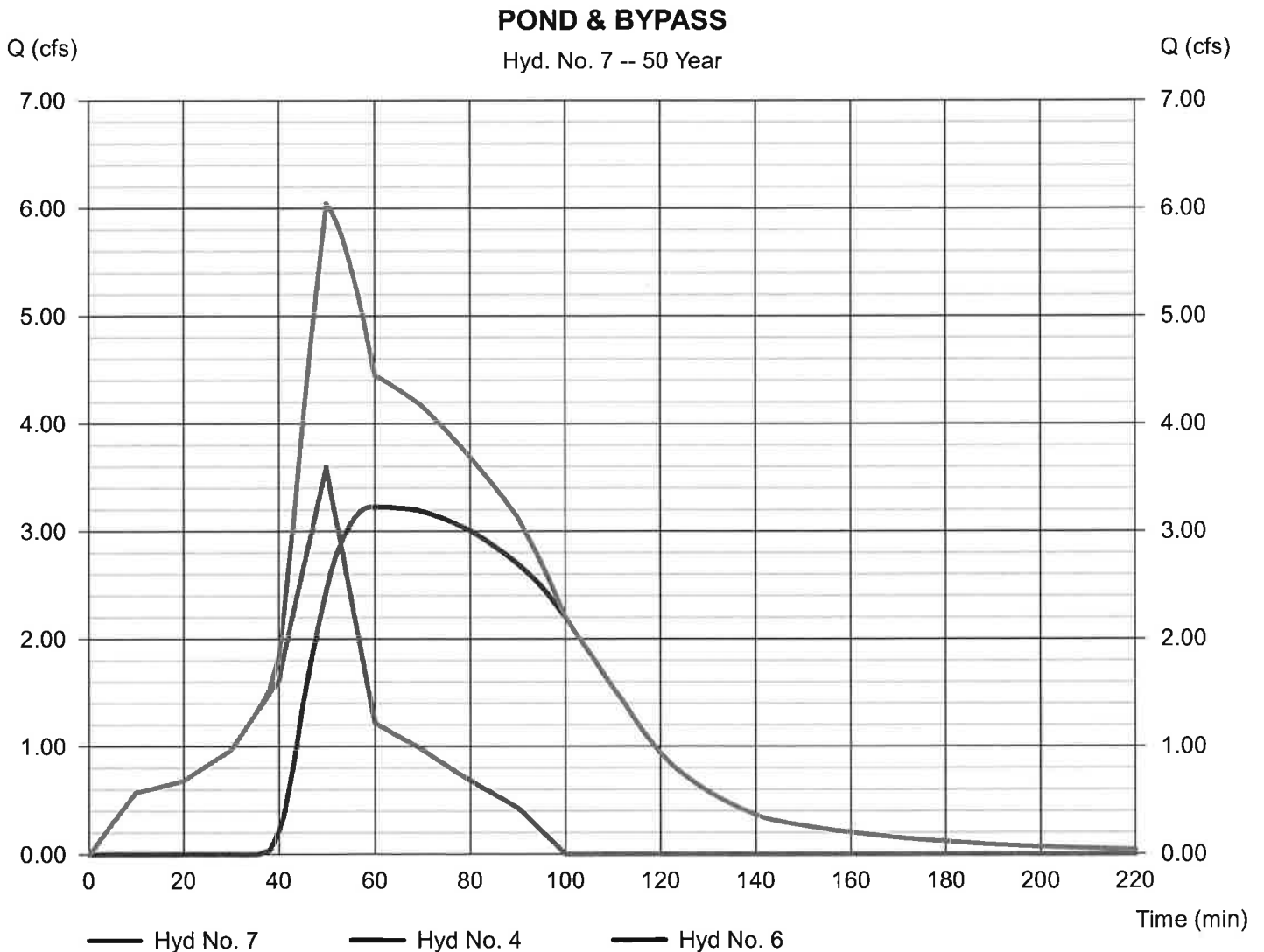
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 6.043 cfs
Time to peak = 50 min
Hyd. volume = 19,948 cuft
Contrib. drain. area = 1.300 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

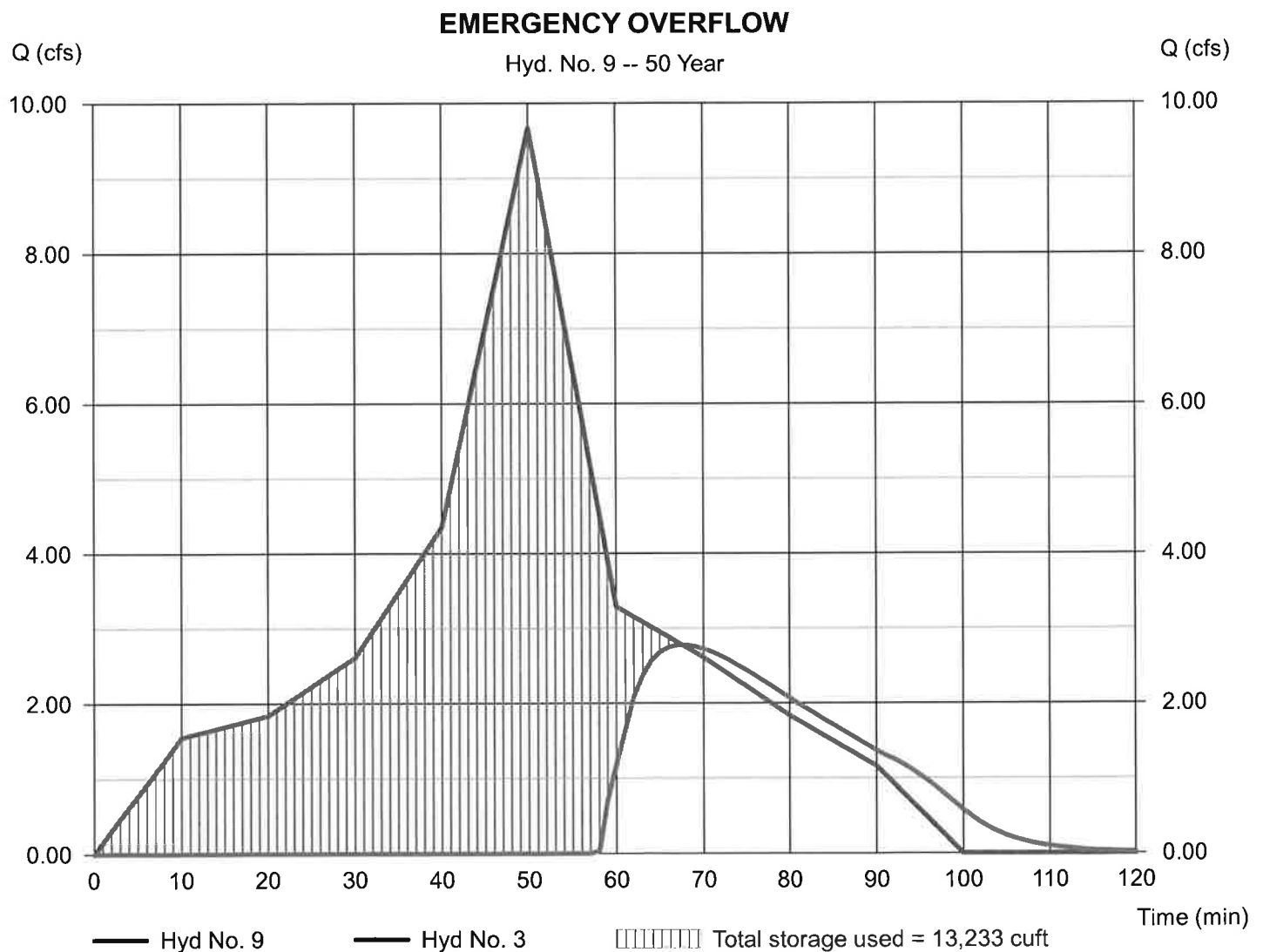
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 50 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 2.776 cfs
 Time to peak = 68 min
 Hyd. volume = 4,837 cuft
 Max. Elevation = 938.66 ft
 Max. Storage = 13,233 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	Dekalb	8.052	1	50	14,446	-----	-----	-----	PRE-DEV
3	Dekalb	10.56	1	50	18,941	-----	-----	-----	POST DEV. TO POND
4	Dekalb	3.921	1	50	7,035	-----	-----	-----	POST DEV. BYPASS
6	Reservoir	3.424	1	62	15,093	3	938.22	11,239	ROUTED POND
7	Combine	6.628	1	50	22,129	4, 6	-----	-----	POND & BYPASS
9	Reservoir	3.760	1	60	6,427	3	938.70	13,415	EMERGENCY OVERFLOW
HYDRO REV4-101112.gpw					Return Period: 100 Year			Monday, Oct 8, 2012	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

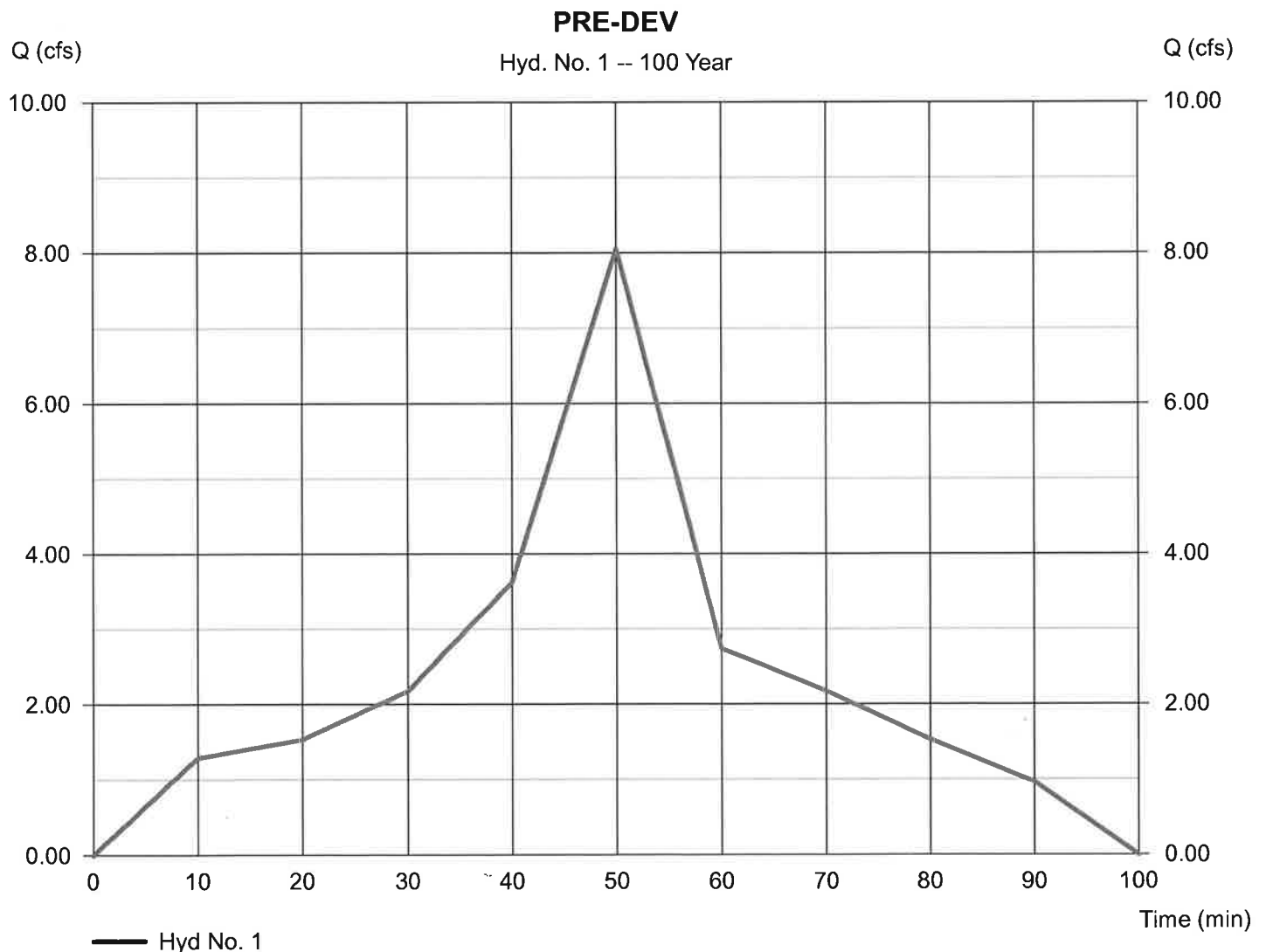
Monday, Oct 8, 2012

Hyd. No. 1

PRE-DEV

Hydrograph type = Dekalb
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 3.100 ac
 Intensity = 8.379 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 8.052 cfs
 Time to peak = 50 min
 Hyd. volume = 14,446 cuft
 Runoff coeff. = 0.31
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Oct 8, 2012

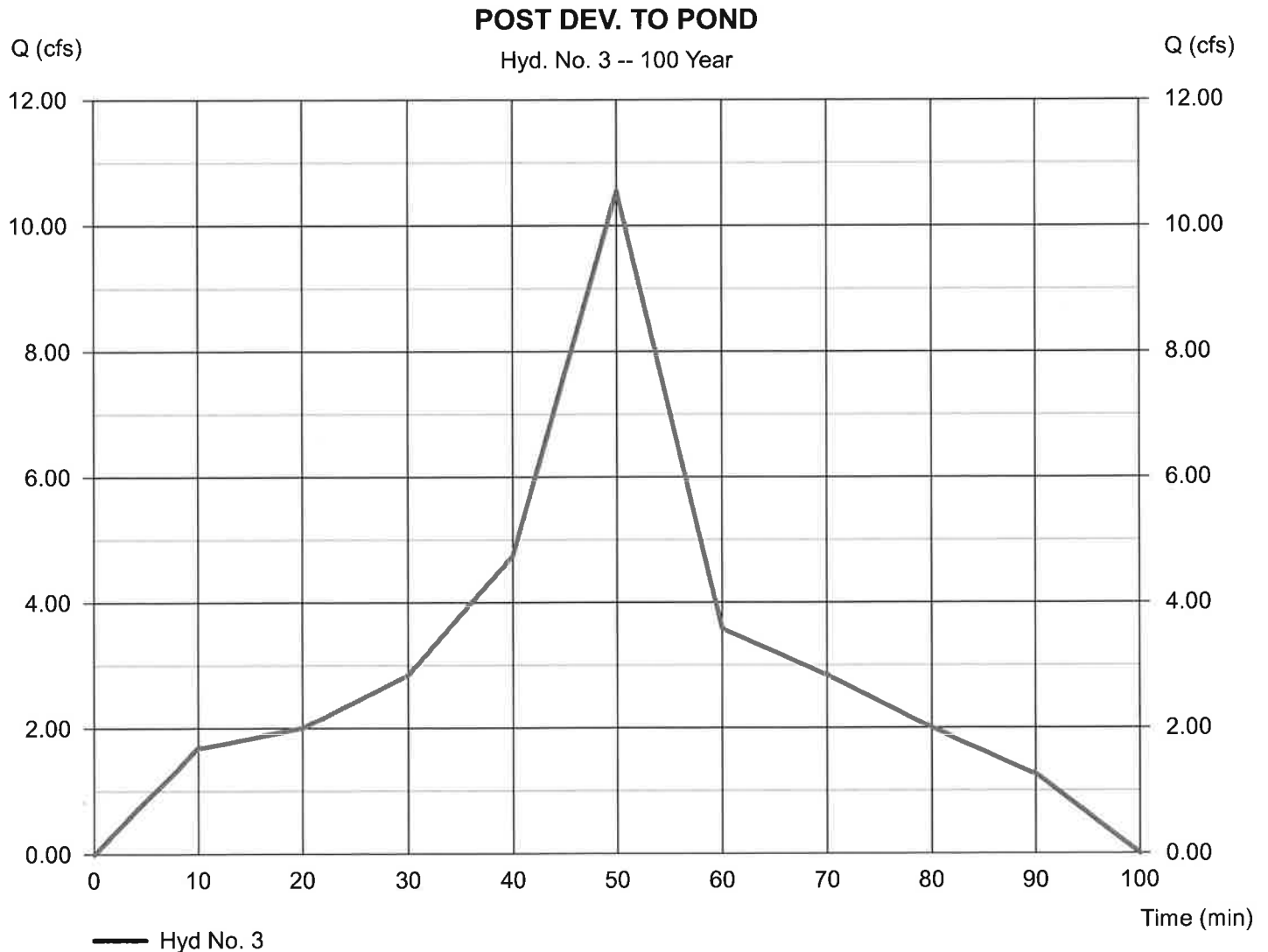
Hyd. No. 3

POST DEV. TO POND

Hydrograph type = Dekalb
 Storm frequency = 100 yrs
 Time interval = 1 min
 Drainage area = 1.800 ac
 Intensity = 8.379 in/hr
 IDF Curve = Atlanta.idf

Peak discharge = 10.56 cfs
 Time to peak = 50 min
 Hyd. volume = 18,941 cuft
 Runoff coeff. = 0.7*
 Tc by User = 10.00 min
 Asc/Rec limb fact = n/a

* Composite (Area/C) = $[(0.930 \times 0.95) + (0.900 \times 0.40)] / 1.800$



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

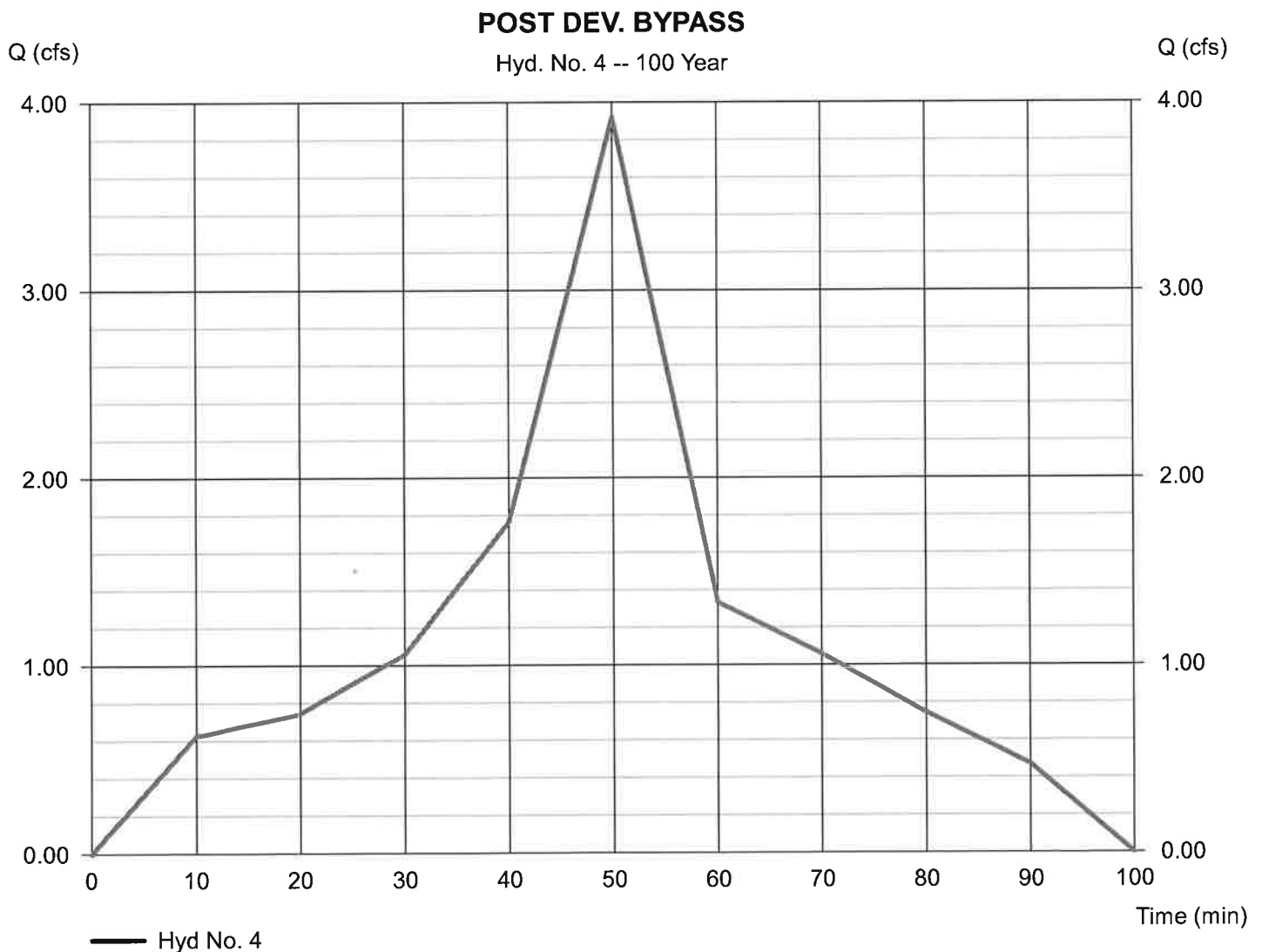
Monday, Oct 8, 2012

Hyd. No. 4

POST DEV. BYPASS

Hydrograph type = Dekalb
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 1.300 ac
Intensity = 8.379 in/hr
IDF Curve = Atlanta.idf

Peak discharge = 3.921 cfs
Time to peak = 50 min
Hyd. volume = 7,035 cuft
Runoff coeff. = 0.36
Tc by User = 10.00 min
Asc/Rec limb fact = n/a



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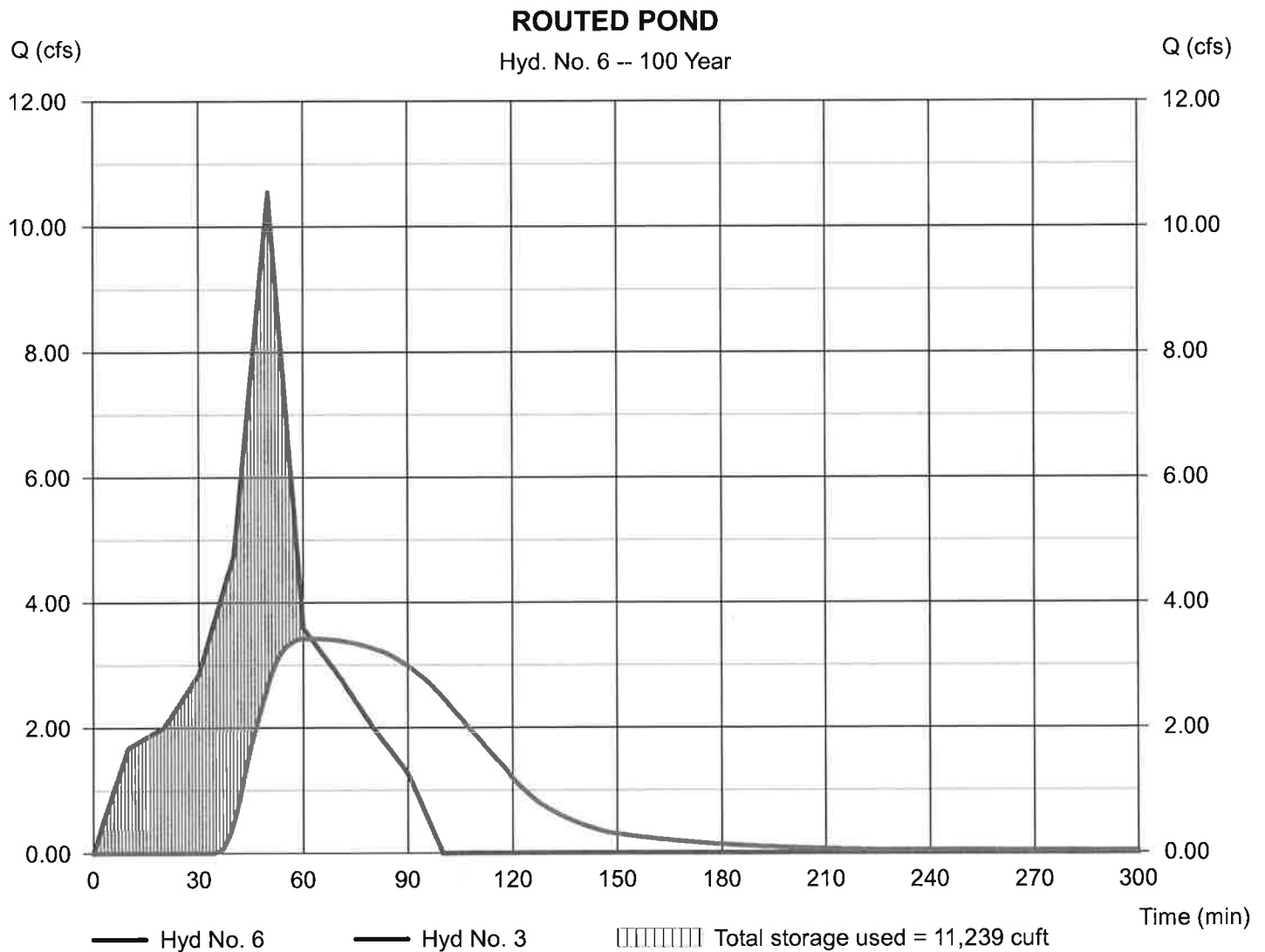
Hyd. No. 6

ROUTED POND

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV

Peak discharge = 3.424 cfs
 Time to peak = 62 min
 Hyd. volume = 15,093 cuft
 Max. Elevation = 938.22 ft
 Max. Storage = 11,239 cuft

Storage Indication method used.



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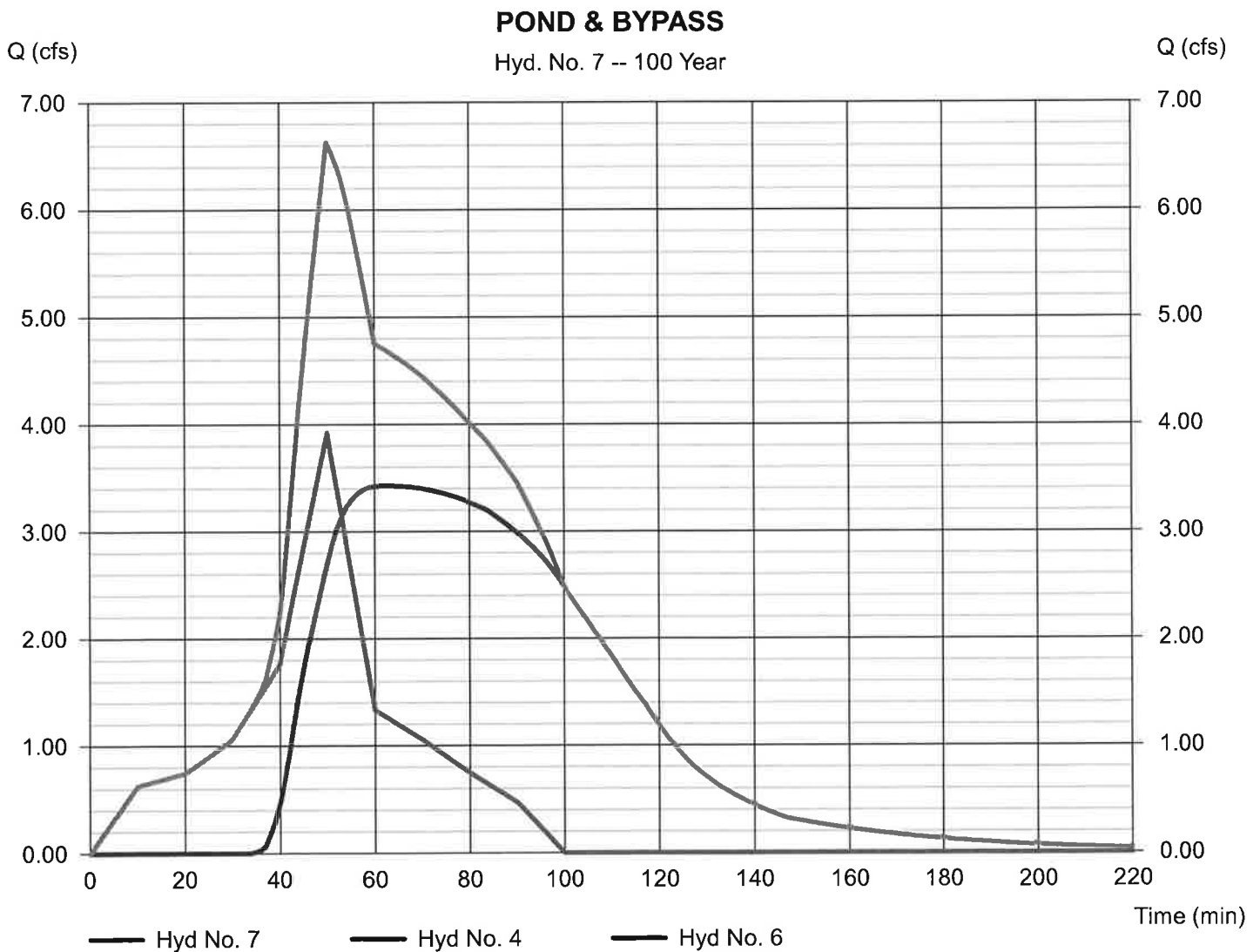
Monday, Oct 8, 2012

Hyd. No. 7

POND & BYPASS

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 1 min
Inflow hyds. = 4, 6

Peak discharge = 6.628 cfs
Time to peak = 50 min
Hyd. volume = 22,129 cuft
Contrib. drain. area = 1.300 ac



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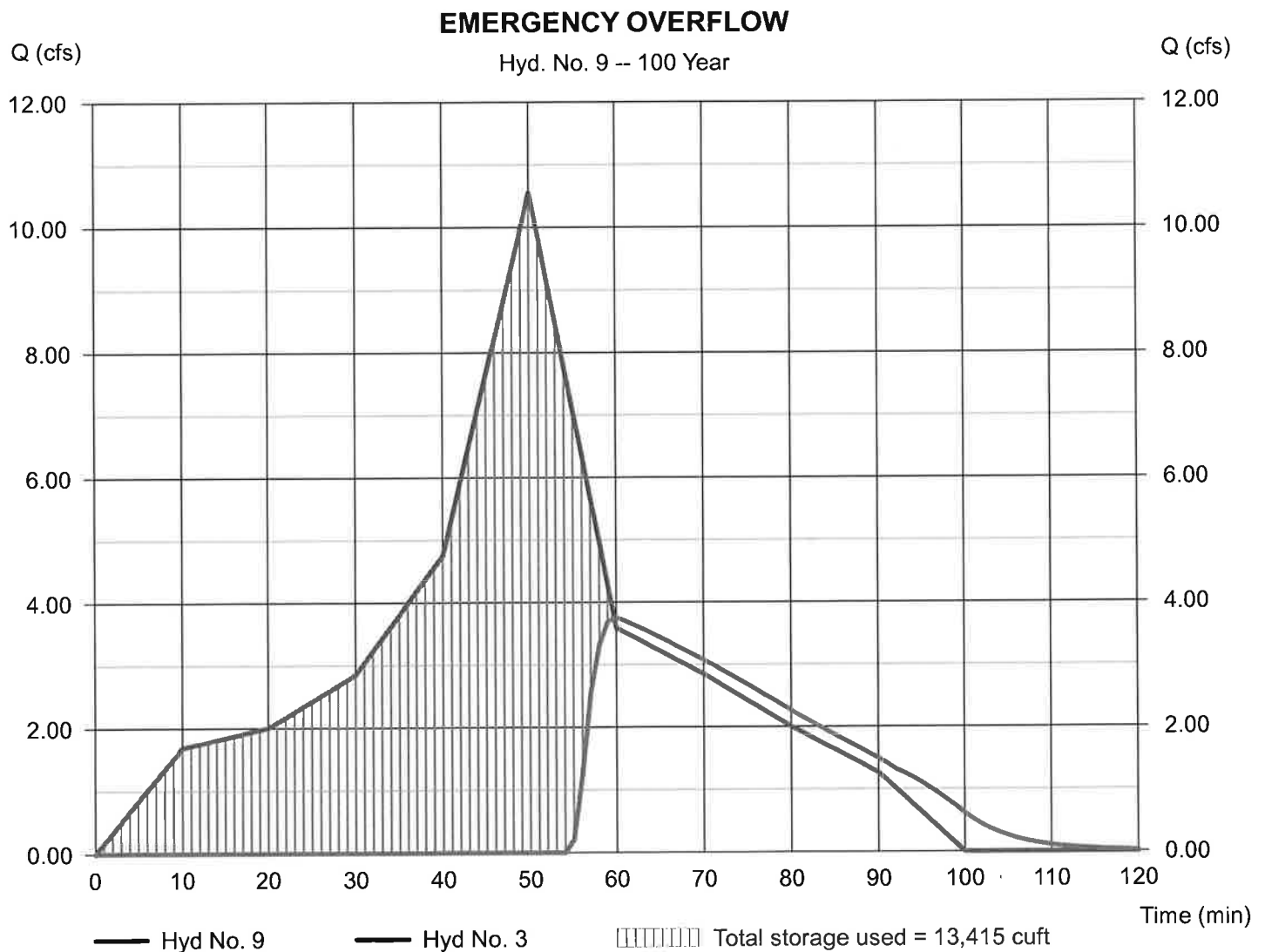
Hyd. No. 9

EMERGENCY OVERFLOW

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyd. No. = 3 - POST DEV. TO POND
 Reservoir name = Pond REV - EMG

Peak discharge = 3.760 cfs
 Time to peak = 60 min
 Hyd. volume = 6,427 cuft
 Max. Elevation = 938.70 ft
 Max. Storage = 13,415 cuft

Storage Indication method used.



STORM

PRIMROSE: SMYRNA -
SITE DEVELOPMENT
STORM DRAINAGE CALCULATIONS

		TYPE	DRAINAGE AREA (SF)	DRAINAGE AREA (AC)	RUNOFF COEFF.	RAINFALL INTENSITY	INLET FLOW	STRUCTURE S FEEDING	TOTAL FLOW
FROM	TO				"C"	"I"			
						25YR	(CFS)		(CFS)
A3	A2	HDPE	24850.22	0.57	0.90	9.06	4.65	YI 4	7.01
A2	A1	HDPE	6279.85	0.14	0.95	9.06	1.24		8.25

YI 9	YI 8	HDPE	1672.83	0.04	0.75	9.06	0.26		0.26
YI 8	YI 7	HDPE	4039.62	0.09	0.75	9.06	0.63		0.89
YI 7	YI 6	HDPE	3834.84	0.09	0.75	9.06	0.60		1.49
YI 6	YI 5	HDPE	4279.38	0.10	0.75	9.06	0.67		2.16
YI 5	YI 4	HDPE	600.32	0.01	0.75	9.06	0.09		2.25
YI 4	A3	HDPE	683.68	0.02	0.75	9.06	0.11		2.36

YI 3	YI 2	HDPE	2091.55	0.05	0.75	9.06	0.33		0.33
YI 2	YI 1	HDPE	5557.07	0.13	0.75	9.06	0.87		1.19
YI 1	outlet	HDPE	2928.81	0.07	0.75	9.06	0.46		1.65

FL1		CONC	10342.87	0.24	0.95	9.06	2.04		2.04
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