STORM WATER MANAGEMENT REPORT

FOR

Johnson Park and Auburn Hills Subdivision

Village of Caledonia, Racine County, Wisconsin

September 11, 2018

PREPARED FOR:
Robert Rafel
City of Racine – Parks Department
800 Center Street
Room 127
Racine, WI 53403
Ph: (262) 210-1167
Email: Robert.rafel@cityofracine.org

PREPARED BY:
Mark R. Madsen, P.E.
Nielsen Madsen & Barber, S.C.
1458 Horizon Boulevard
Suite 200
Racine, WI 53406
Ph: (262) 634-5588
Email: mmadsen@nmbsc.net

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INTRODUCTION

Nielsen Madsen + Barber was retained by the City of Racine Parks & Recreation Department to investigate and prepare a Storm Water Management Report for the potential impact of the Auburn Hills Subdivision development on Johnson Park located at the northwest corner CTH "K" (Northwestern Avenue) and Emmertsen Road in the Village of Caledonia. The specific concerns were for the existing ponds and overtopping of Johnson Park Road.

Currently there are two natural ponds (J.P. North and J.P. South) located on the Johnson Park property that are connected by an 8-inch pipe draining North to South. The existing 24-inch culvert outlet for the two connected ponds is in the southwest corner of the J.P. South pond, underneath the Johnson Park Road. From here the storm water makes its way to a 36-inch diameter storm sewer in the Aldebaran subdivision.

To the East and upstream of these two ponds and The Johnson Park property is the Auburn Hills Subdivision development. This conservation development was originally started in 2002 by Bielinski Development. The Village approved Plan by Welch, Hanson and Associates (WHA) can be found in Appendix A. Currently Phase III, A & B, is being developed by Newport Development.

The Village has required the original SWMP report to be updated to the current WDNR and Village stormwater design standards. This work was completed by Short, Elliot & Henderson, Inc (SEH) and can be found in Appendix "B". The original development design had two retention basins constructed along the West Side of the Subdivision, A.H. Basin E outlets towards the Park's North Pond and A.H. Basin CD outlets towards the Park's South Pond. It is proposed by SEH to enlarge the A.H. Basin CD to handle the current Village Stormwater Ordinance requirements for the proposed Phase III A&B. There is no plan to modify A.H. Basin E as it meets the current standards.

The SWMP information for the Auburn Hills Subdivision was provided by the Engineer for the Village of Caledonia. Johnson Park data was incorporated from LiDAR data available from Racine County and previous work done by NMB for the Racine Parks Department.

METHOD OF ANALYSIS

The method used for this storm water analysis was the United States Department of Agriculture, Natural Resources Conservation Service, Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR-55). The specific software is Pond Pack V10.1, as produced by Haestad Methods, Waterbury, Connecticut. In running this model, NMB determined runoff curve numbers (CN) and times of concentration (Tc) for the individual drainage areas. This information was then used to generate storm hydrographs and peak discharge rates.

POST - DEVELOPED CONDITIONS

Post-Developed conditions consist of the existing Johnson Park lands comprising of woods, lawn and ponds; the Auburn Hills Subdivision comprising of the undetained lawn areas downstream of the subdivision retention basins and the residential and road areas upstream of the retention basins.

A post development drainage exhibit of this area can be found in Appendix "D".

The Post-Developed drainage areas have been classified in six sub-basins as follows:

J.P. NORTH BASIN (Johnson Park Area Tributary to the North J.P. Pond)

Sub-basin J.P. NORTH BASIN totals 9.69 acres and consists of Johnson Park Drive pavement, woods and the existing pond. The travel path for the post-developed Tc starts at the North end of the basin and travels South and West thru the wooded area via swales into the existing North pond.

J.P. SOUTH BASIN (Johnson Park Area Tributary to the South J.P. Pond)

Sub-basin J.P. SOUTH BASIN totals 9.45 acres and consists of Johnson Park Drive pavement, woods. Lawn and the existing pond. The travel path for the post-developed Tc starts at the South end of the basin and travels northerly through the wooded and lawn areas via swales into the existing South pond.

A.H. NORTH UNDETAINED BASIN (Un-detained Areas Downstream of A.H. Retention Basin E)

Sub-basin A.H. NORTH UNDETAINED BASIN totals 0.41 acres and consists of the area between the Johnson Park property and the outlet side of the A.H. Retention Basin E. This area is un-detained and will continue to surface drain to the existing J.P. North Pond. The post-developed Tc path starts at the East end of the basin and travels westerly across lawn areas to the subdivision West property line.

A.H. SOUTH UNDETAINED BASIN (Un-detained Areas Downstream of A.H. Retention Basin CD)

Sub-basin A.H. SOUTH UNDETAINED BASIN totals 2.32 acres and consists of the area between the Johnson Park property and the outlet side of the A.H. Retention Basin CD. This area is un-detained and will continue to surface drain to the existing J.P. South Pond. The post-developed Tc path starts at the East end of the basin and travels westerly across lawn areas to the subdivision West property line.

A.H. RETENTION BASIN E (Detained Areas Upstream of A.H. Retention Basin E)

Sub-basin A.H. RETENTION BASIN E totals 14.40 acres and consists of the area upstream of the A.H. Retention Basin E. This area is detained and will continue to surface drain to the existing J.P. North Pond.

The post developed and retained discharge rates for the basin per the FHA SWMP Report is has follows:

	Post-Developed	Post-Retained
Q_2	15.02 cfs	n/a
Q_{10}	30.29 cfs	3.43 cfs
Q_{100}	50.49 cfs	8.59 cfs

A.H. RETENTION BASIN CD (Detained Areas Upstream of A.H. Retention Basin CD)

Sub-basin A.H. RETENTION BASIN CD totals 32.40 acres and consists of the area upstream of the A.H. Retention Basin CD. This area is detained and will continue to surface drain to the existing J.P. South Pond.

The post developed and retained discharge rates for the basin per the FHA SWMP Report is has follows:

	Post-Developed	Post-Retained
Q_2	32.66 cfs	3.85 cfs
Q_{10}	59.42 cfs	10.50 cfs
Q_{100}	128.42 cfs	17.34 cfs

STORM WATER QUANTITY

Storm water quality and quantity standards have been established by the Wisconsin Department of Natural Resources through the "NR 151 Runoff Management" regulation. This regulation establishes runoff pollution performance standards for various types of land uses including residential, commercial and industrial developments. The Village of Caledonia has also established their own stormwater quality and quantity standards in their Post-construction Stormwater Management Ordinance.

The applicability of these standards is site specific and relates to the Johnson Park/Auburn Hills Subdivision drainage basin as follows:

Peak Discharge Management: The Village of Caledonia's Post-construction Stormwater Management Ordinance for this area of the Village requires that the peak discharge rate for the post-developed 100-year, 24-hour rainfall event not exceed the peak discharge rate for the 2-year, 24-hour rainfall event under existing conditions. This requirement has been achieved through the creation of onsite stormwater storage within the Auburn Hills Subdivision. Detailed Auburn Hill's routing information can be found in Appendices "A" and "B" and the NMB routing information of the entire drainage basin can be found in Appendix "C" of this report.

The NMB routing information for the Johnson Park Ponds are as follows:

North Pond

Contributory Watershed:	9.69 Acres
Pond Surface Area:	36,808 Square Feet
Normal Water Level (NWL):	693.00
Top of Berm:	699.00
High Water Mark (100-Year storm):	697.80
High Water Mark (10-Year storm):	697.33
High Water Mark (2-Year storm):	696.25
Free Board provided:	1.20 Feet
Outlet Structure:	8" Outlet Pipe
Emergency Spillway Elevation:	698.11 @ Johnson Park Road

South Pond

Contributory Watershed:	9.45 Acres
Pond Surface Area:	113,604 Square Feet
Normal Water Level (NWL):	692.00
Top of Berm:	699.00
High Water Mark (100-Year storm):	696.54
High Water Mark (10-Year storm):	695.62
High Water Mark (2-Year storm):	695.16
Free Board provided:	2.46 Feet
Outlet Structure:	24" RCP Culvert Pipe
Emergency Spillway Elevation:	698.92 @ Johnson Park Road

POST-DEVELOPED CONDITIONS RUNOFF CALCULATIONS

J.P. NORTH BASIN

Area: 9.69 Acres

CN: 76 (Composite)

- 0.30 Acres (Pavement)
- 0.85 Acres (Pond)
- 8.54 Acres (Woods)

Tc: 77 LF @ 2.59% (Sheet Flow – n = 0.24)
110 LF @ 5.91% (Shallow Concentrated Flow - Unpaved)
309 LF @ 0.31% (Shallow Concentrated Flow - Unpaved)
119 LF @ 2.52% (Shallow Concentrated Flow - Unpaved)
77 LF @ 3.90% (Shallow Concentrated Flow - Unpaved)
159 LF @ 3.77% (Shallow Concentrated Flow - Unpaved)
182 LF @ 2.19% (Shallow Concentrated Flow - Unpaved)
Total Tc: 0.3471

Q_2: 7.91 cfs
Q_{10}: 16.29 cfs
Q_{100}: 35.05 cfs

J.P. SOUTH BASIN

Area: 9.45 Acres
CN: 81 (Composite)
- 2.61 Acres (Pond)
- 0.27 Acres (Pavement)
- 2.10 Acres (Open Space)
- 4.47 Acres (woods)

Tc: 145 LF @ 4.14% (Sheet Flow – n = 0.24)
173 LF @ 3.53% (Shallow Concentrated Flow - Unpaved)
83 LF @ 2.41% (Shallow Concentrated Flow - Unpaved)
39 LF @ 2.57% (Shallow Concentrated Flow - Unpaved)
123 LF @ 2.03% (Shallow Concentrated Flow - Unpaved)
Total Tc: 0.3061
Q_2: 11.55 cfs
Q_{10}: 21.26 cfs
Q_{100}: 41.68 cfs

A.H. NORTH UNDETAINED BASIN

Area: 0.41 Acres
CN: 73 (Woods)
Tc: 43 LF @ 5.81% (Sheet Flow – n = 0.24)
45 LF @ 13.33% (Shallow Concentrated Flow - Unpaved)
Total Tc: 0.0886
Used 0.1667 hrs
Q_2: 0.39 cfs
Q_{10}: 0.86 cfs
Q_{100}: 1.93 cfs

A.H. SOUTH UNDETAINED BASIN

Area: 2.32 Acres
CN: 75 (Composite)
- 0.15 Acres (Pavement)
- 1.04 Acres (Open Space)
- 1.13 Acres (woods)

Tc: 60 LF @ 6.67% (Sheet Flow – n = 0.24)
102 LF @ 4.90% (Shallow Concentrated Flow - Unpaved)
42 LF @ 2.38% (Shallow Concentrated Flow - Unpaved)
207 LF @ 1.933% (Shallow Concentrated Flow - Unpaved)

Total Tc: 0.1451
Used 0.1667 hrs.

Q_2: 2.57cfs
Q_{10}: 5.35 cfs
Q_{100}: 11.54 cfs

COMPOSITE DISCHARGE (Total Johnson Park Discharge Including Undetained Areas)

Q_2: 22.42 cfs
Q_{10}: 43.76 cfs
Q_{100}: 90.20 cfs

COMPOSITE DISCHARGE INCLUDING AUBURN HILLS RETAINED DISCHARGE (Total Basin Discharge)

Q_2: 28.55 cfs
Q_{10}: 57.69 cfs
Q_{100}: 116.13 cfs

JOHNSON PARK NORTH POND STAGE-STORAGE DATA

Elevation	Area	Volume	Sum
695.0	0.8450 Ac	0.000 Ac-Ft	0.000 Ac-Ft
698.0	1.4629 Ac	3.420 Ac-Ft	3.420 Ac-Ft
699.0	1.9056 Ac	1.679 Ac-Ft	5.099 Ac-Ft

J.P. NORTH OUTLET CONTROL STRUCTURE

Primary Outlet:
Single Stage Outlet 320' – 8" PVC @ 0.31%

Emergency Overflow Outlet:
Johnson Park Road Pavement - Crest Elevation at 698.11

JOHNSON PARK SOUTH POND STAGE-STORAGE DATA

Elevation	Area	Volume	Sum
694.25	2.6078 Ac	0.000 Ac-Ft	0.000 Ac-Ft
696.0	3.6326 Ac	5.436 Ac-Ft	5.436 Ac-Ft
698.0	5.7597 Ac	9.311 Ac-Ft	14.747 Ac-Ft
699.0	6.6968 Ac	6.222 Ac-Ft	20.969 Ac-Ft

J.P. SOUTH OUTLET CONTROL STRUCTURE

Primary Outlet:
Single Stage Outlet 40′ – 24″ RCP @ 1.85%

Emergency Overflow Outlet:
Johnson Park Road Pavement - Crest Elevation at 698.92

ROUTING DATA CURRENT POND CONFIGURATION

J.P. NORTH POND	NWL	Peak Inflow	Peak Outflow	HWM	Storage (Ac-ft)
2-Yr. 24-Hour Storm	695.00	10.29 cfs	1.02 cfs	696.25	2.754
10-Yr. 24-Hour Storm	695.00	19.46 cfs	1.16 cfs	697.33	3.985
100-Yr. 24-Hour Storm	695.00	40.98 cfs	6.92 cfs	697.80	4.519

J.P. SOUTH POND	NWL	Peak Inflow	Peak Outflow	HWM	Storage (Ac-ft)
2-Yr. 24-Hour Storm	694.25	15.93 cfs	2.87 cfs	695.16	7.752
10-Yr. 24-Hour Storm	694.25	29.94 cfs	6.08 cfs	695.62	9.184
100-Yr. 24-Hour Storm	694.25	59.94 cfs	14.43 cfs	696.54	12.892

ROUTING DATA PROPOSED POND CONFIGURATION

J.P. NORTH POND	NWL	Peak Inflow	Peak Outflow	HWM	Storage (Ac-ft)
2-Yr. 24-Hour Storm	695.00	10.29 cfs	1.21 cfs	696.00	2.470
10-Yr. 24-Hour Storm	695.00	19.46 cfs	2.98 cfs	696.38	2.900
100-Yr. 24-Hour Storm	695.00	40.98 cfs	12.94 cfs	696.71	3.275

J.P. SOUTH POND	NWL	Peak Inflow	Peak Outflow	HWM	Storage (Ac-ft)
2-Yr. 24-Hour Storm	694.25	15.93 cfs	3.47 cfs	695.25	7.752
10-Yr. 24-Hour Storm	694.25	29.94 cfs	7.30 cfs	695.77	9.184
100-Yr. 24-Hour Storm	694.25	59.94 cfs	16.93 cfs	696.73	12.892

CONCLUSION & RECOMMENDATION

After comparing the peak storm water discharges for both the Johnson Park and Auburn Hill Subdivision Post-Developed conditions, we conclude that the proposed retention / water quality basin for Auburn Hills meets the Village of Caledonia design standards.

The peak discharge from the entire drainage basin also meets the Village of Caledonia design standards for the two natural ponds on the Johnson Park property. However, the high-water elevation for the J.P. North pond nearly overtops the Johnson Park Road. It is high enough to saturate the base course and raises concerns about the stability of the road and therefore the impact to the traveling public. City of Racine Parks & Recreation staff have witnessed the water at, or near, the edge of pavement several times in the last few years (since the development of Auburn Hills Subdivision).

We are recommending that an overflow swale be constructed from the J.P. North Pond to the J.P. South Pond. The 8" PVC connector pipe between ponds cannot provide enough flow capacity for the added storm water runoff from the Auburn Hills subdivision. This would alleviate the potential of the J.P. North Pond overtopping the Johnson Park Road. With the installation of the proposed 10-foot-wide swale at 0.80% for approximately 250 feet, the High-Water elevation for the J.P. North pond will be 696.71 which is 1.40 feet below the Johnson Park Road and the High-Water elevation for the J.P. South pond will be 696.73, which is 1.38 feet below the Johnson Park Road. Detailed routing information with the new swale design can be found in Appendix "C" of this report.

APPENDIX
“A”

PRE-DEVELOPED CONDITIONS

TR-55 Tabular Hydrograph Method
Input Summary

Description .....
E-exist
Rainfall Distribution ..... Type II
Ia/P Interpolation ..... On
Total Area ..... 12.95 ac

Peak Time ..... 756.00 min
Peak Flow ..... 6.15 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (min)	Tt (min)	Rainfall (in)
E		12.95	74	33.79	0.00	2.70

Support Data:

Messages:
Info: Time of Concentration rounded to 30.00 min in row <1>.
Info: Time of Travel rounded to 6.00 min in row <1>.

TR-55 Tabular Hydrograph Method
Input Summary

Description .....
E-exist
Rainfall Distribution ..... Type II
Ia/P Interpolation ..... On
Total Area ..... 12.95 ac

Peak Time ..... 750.00 min
Peak Flow ..... 10.91 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (min)	Tt (min)	Rainfall (in)
E		12.95	74	33.79	0.00	3.50

Support Data:

Messages:
Info: Time of Concentration rounded to 30.00 min in row <1>.
Info: Time of Travel rounded to 6.00 min in row <1>.

TR-55 Tabular Hydrograph Method
Input Summary

Description .....
E-exist
Rainfall Distribution ..... Type II
Ia/P Interpolation ..... On
Total Area ..... 12.95 ac

Peak Time ..... 750.00 min
Peak Flow ..... 14.57 cfs

Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (min)	Tt (min)	Rainfall (in)
E		12.95	74	33.79	0.00	4.00

Support Data:

Messages:
Info: Time of Concentration rounded to 30.00 min in row <1>.
Info: Time of Travel rounded to 6.00 min in row <1>.

TR-55 Tabular Hydrograph Method
Input Summary

Description .....
E-exist
Rainfall Distribution ..... Type II
Ia/P Interpolation ..... On
Total Area ..... 12.95 ac

Peak Time ..... 750.00 min
Peak Flow ..... 19.30 cfs

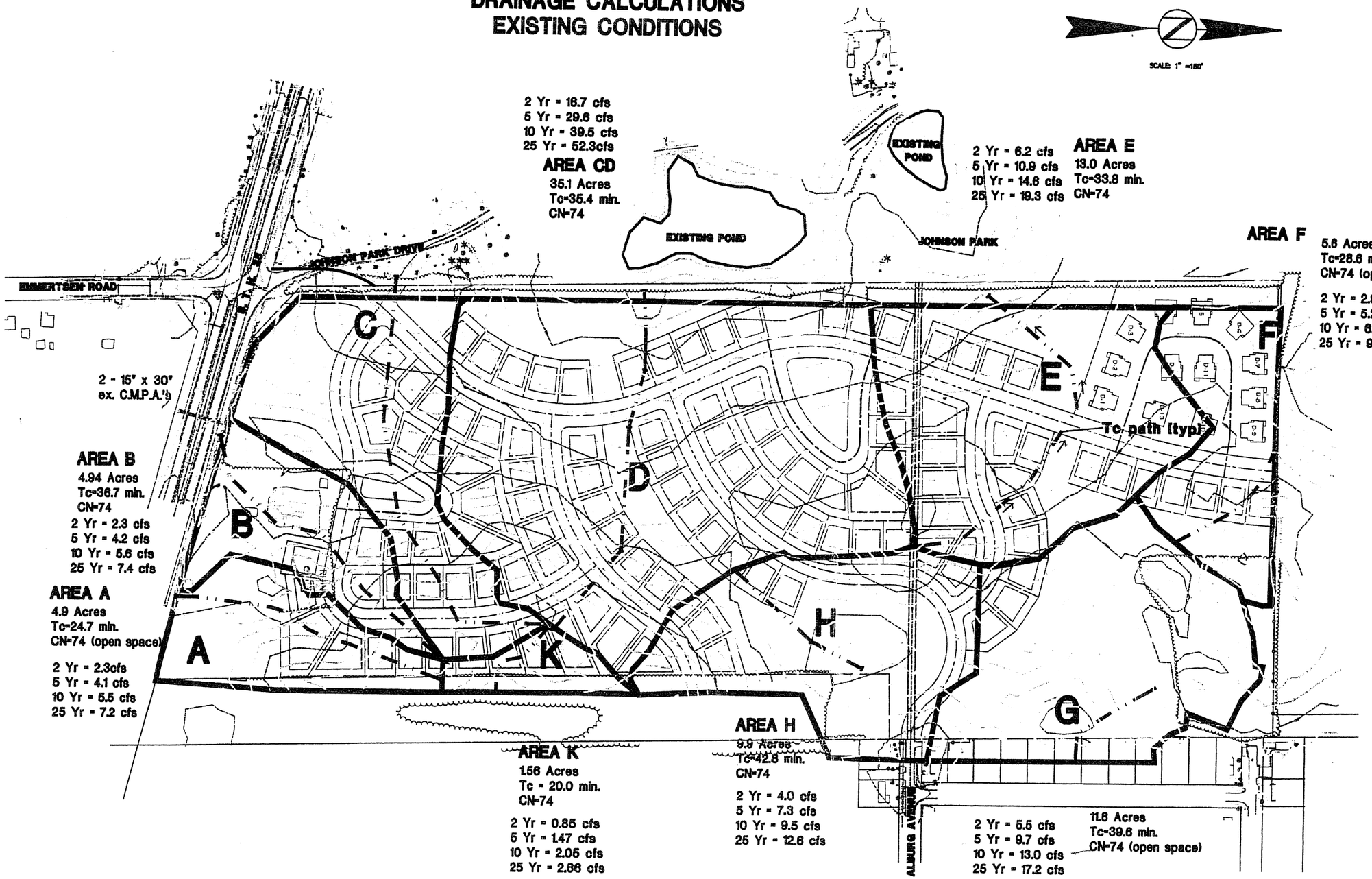
Given Input Data:

Subarea Description	D/S Subareas	Area (ac)	CN	Tc (min)	Tt (min)	Rainfall (in)
E		12.95	74	33.79	0.00	4.60

Support Data:

Messages:
Info: Time of Concentration rounded to 30.00 min in row <1>.
Info: Time of Travel rounded to 6.00 min in row <1>.

BIELINSKI DEV. - AUBURN HILLS
DRAINAGE CALCULATIONS
EXISTING CONDITIONS



WELCH HANSON ASSOCIATES

ENGINEERS • ARCHITECTS
SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS

355 AUSTIN CIRCLE, SUITE 100
DELAFIELD, WISCONSIN 53018
262-646-6855
FAX 262-646-6864
EMAIL:INFO@WELCHHANSON.COM

AUBURN HILLS
DRAINAGE CALCULATIONS
CALEDONIA, WISCONSIN
EXISTING CONDITIONS

PROJECT NUMBER	11927
COMPUTER FILE	11927.DWG
DATE	03/23/2001
DRAWN BY	IV
CHECKED BY	MM
REVISIONS	

SHEET NUMBER

1

POST-DEVELOPED CONDITIONS

Sheet Flow

Description	
Manning's n	0.2400
Flow Length	200.0000 ft
Two Yr, 24 hr Rainfall	2.7000 in
Land Slope	0.0500 ft/ft
Computed Sheet flow time	> 18.7488 min

Shallow Concentrated Flow

Description	
Surface	Unpaved
Flow Length	250.0000 ft
Watercourse Slope	0.0200 ft/ft
Velocity	2.2818 fps
Computed Shallow flow time	> 1.8261 min

Channel Flow

Description	
Flow Area	1.2300 ft2
Wetted Perimeter	3.9300 ft
Flow Length	540.0000 ft
Channel Slope	0.0050 ft/ft
Manning's n	0.0150
Hydraulic radius	0.3130 ft
Velocity	3.2291 fps
Computed Channel flow time	> 2.7871 min

Channel Flow

Description	
Flow Area	5.0000 ft2
Wetted Perimeter	4.0000 ft
Flow Length	250.0000 ft
Channel Slope	0.0250 ft/ft
Manning's n	0.0375
Hydraulic radius	1.2500 ft
Velocity	7.2705 fps
Computed Channel flow time	> 0.5731 min

****
Total Time of Concentration ..... > 23.9351 min
****

Composite Runoff Curve Number Calculator

AREA E

Description		Area (ac)	Curve Number	
OPEN SPACE		2.5000	74	
RESIDENTIAL		5.9500	83	
CONDOS		5.9500	83	
Total Area	----->	14.4000	81	<----- Weighted CN

Hydrograph Report

English

Hyd. No. 5

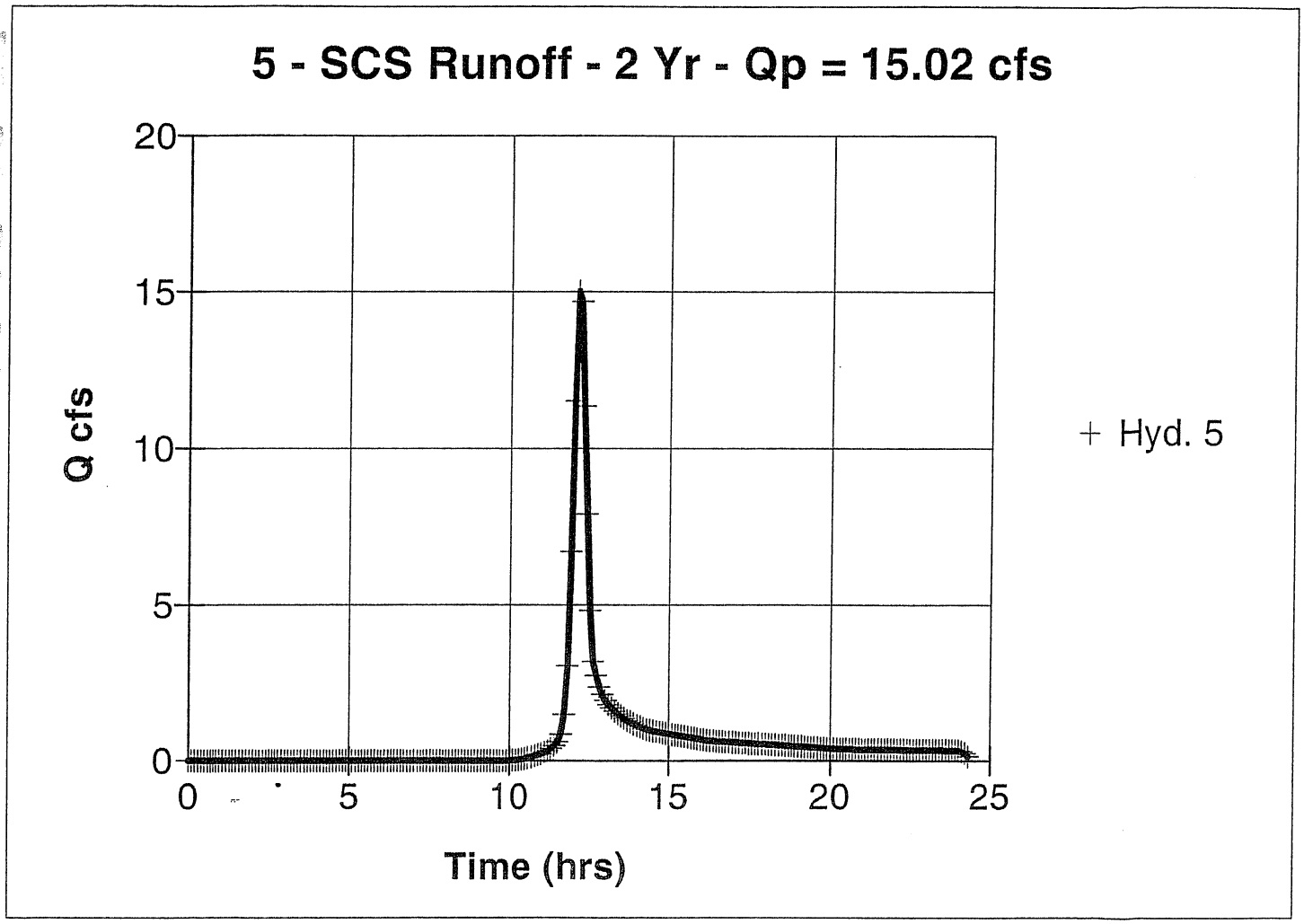
Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 15.02 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 14.40 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 560

Total Volume = 1.321 acft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
11.60	0.84	14.80	0.90
11.70	1.49	14.90	0.88
11.80	3.05	15.00	0.87
11.90	6.70	15.10	0.85
12.00	11.53	15.20	0.83
12.10	15.02 <<	15.30	0.81
12.20	14.69	15.40	0.80
12.30	11.34	15.50	0.78
12.40	7.91	15.60	0.76
12.50	4.82		
12.60	3.17		
12.70	2.73	*...End*	
12.80	2.37		
12.90	2.12		
13.00	1.94		
13.10	1.80		
13.20	1.69		
13.30	1.59		
13.40	1.51		
13.50	1.43		
13.60	1.36		
13.70	1.30		
13.80	1.24		
13.90	1.18		
14.00	1.13		
14.10	1.08		
14.20	1.04		
14.30	1.00		
14.40	0.97		
14.50	0.95		
14.60	0.93		
14.70	0.92		


5 - SCS Runoff - 2 Yr - Qp = 15.02 cfs
Q cfs
20
15
10
5
0
0
5
10
15
20
25
Time (hrs)
+ Hyd. 5

Hydrograph Report

English

Hyd. No. 5

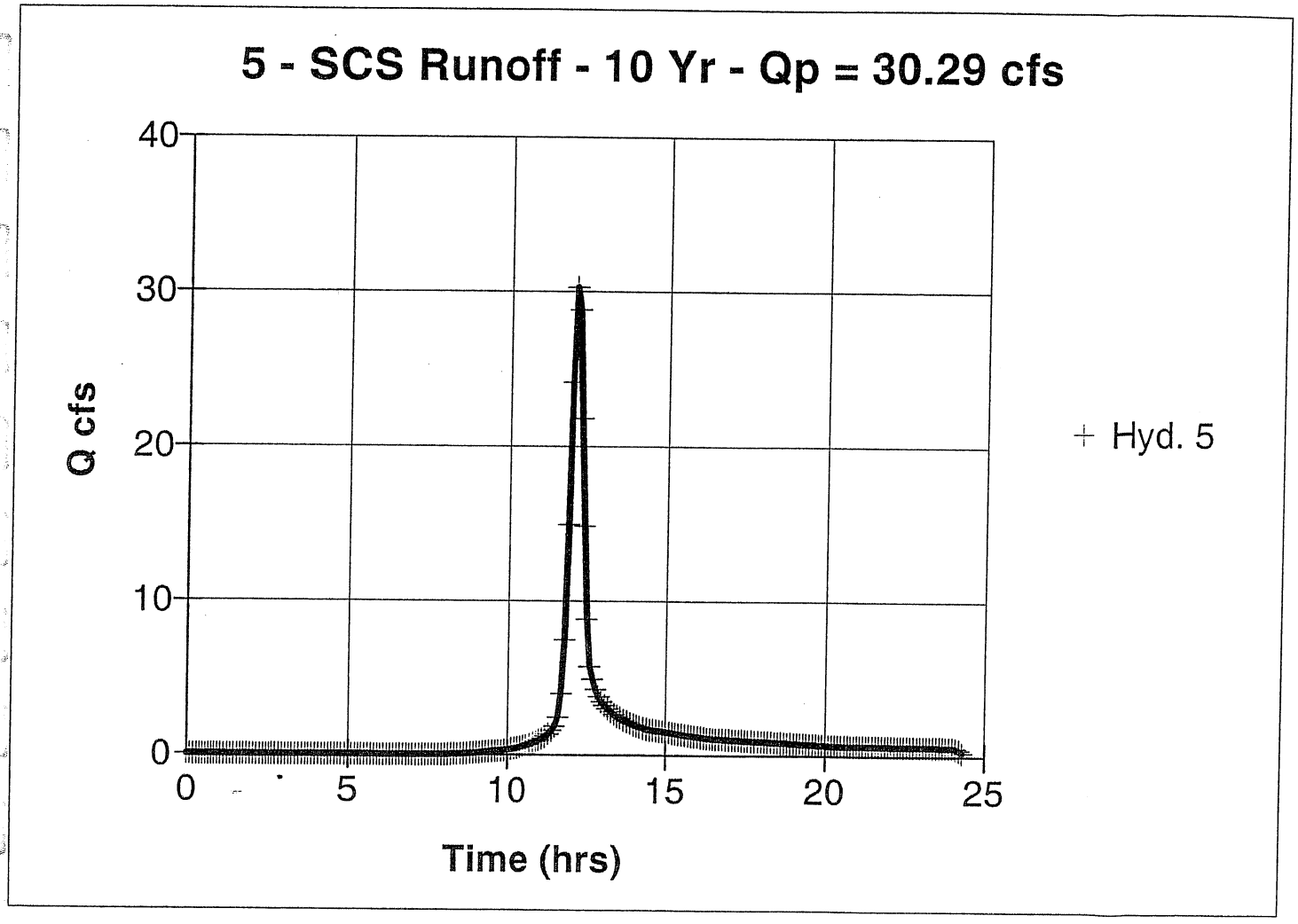
Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 30.29 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 14.40 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 4.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 560

Total Volume = 2.577 acft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)	Time (hrs)	Outflow cfs)
11.40	1.58	14.60	1.63
11.50	1.85	14.70	1.60
11.60	2.45	14.80	1.57
11.70	3.99	14.90	1.54
11.80	7.47		
11.90	14.93		
12.00	24.15	*...End*	
12.10	30.29 <<		
12.20	28.83		
12.30	21.81		
12.40	14.86		
12.50	8.83		
12.60	5.73		
12.70	4.91		
12.80	4.25		
12.90	3.78		
13.00	3.45		
13.10	3.21		
13.20	3.00		
13.30	2.82		
13.40	2.66		
13.50	2.53		
13.60	2.40		
13.70	2.28		
13.80	2.18		
13.90	2.08		
14.00	1.98		
14.10	1.89		
14.20	1.81		
14.30	1.75		
14.40	1.70		
14.50	1.66		


5 - SCS Runoff - 10 Yr - Qp = 30.29 cfs
Q cfs
40
30
20
10
0
0
5
10
15
20
25
Time (hrs)
+ Hyd. 5

Hydrograph Report

English

Hyd. No. 5

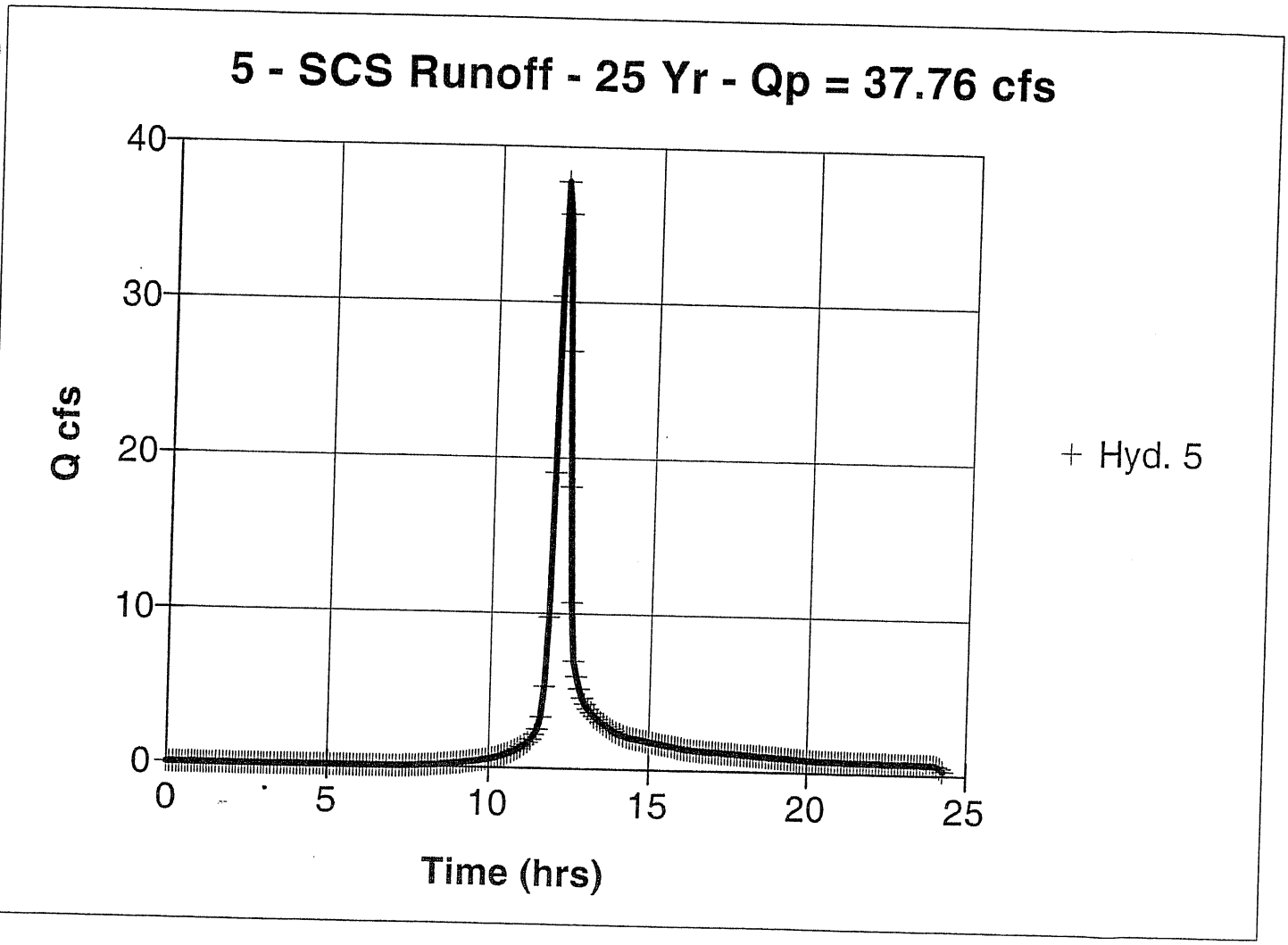
Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 37.76 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 14.40 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 4.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 560

Total Volume = 3.201 acft

Hydrograph Discharge Table

Time (hrs)	Outflow cfs)	Time (hrs)	Outflow cfs)
11.40	2.17	14.60	1.95
11.50	2.52	14.70	1.92
11.60	3.30		
11.70	5.30		
11.80	9.75	*...End*	
11.90	19.07		
12.00	30.39		
12.10	37.76 <<		
12.20	35.68		
12.30	26.85		
12.40	18.17		
12.50	10.72		
12.60	6.94		
12.70	5.93		
12.80	5.14		
12.90	4.57		
13.00	4.16		
13.10	3.86		
13.20	3.61		
13.30	3.39		
13.40	3.21		
13.50	3.04		
13.60	2.89		
13.70	2.75		
13.80	2.61		
13.90	2.49		
14.00	2.38		
14.10	2.27		
14.20	2.18		
14.30	2.10		
14.40	2.04		
14.50	1.99		


5 - SCS Runoff - 25 Yr - Qp = 37.76 cfs
Q cfs
40
30
20
10
0
0
5
10
15
20
25
Time (hrs)
+ Hyd. 5

Hydrograph Report

English

Hyd. No. 5

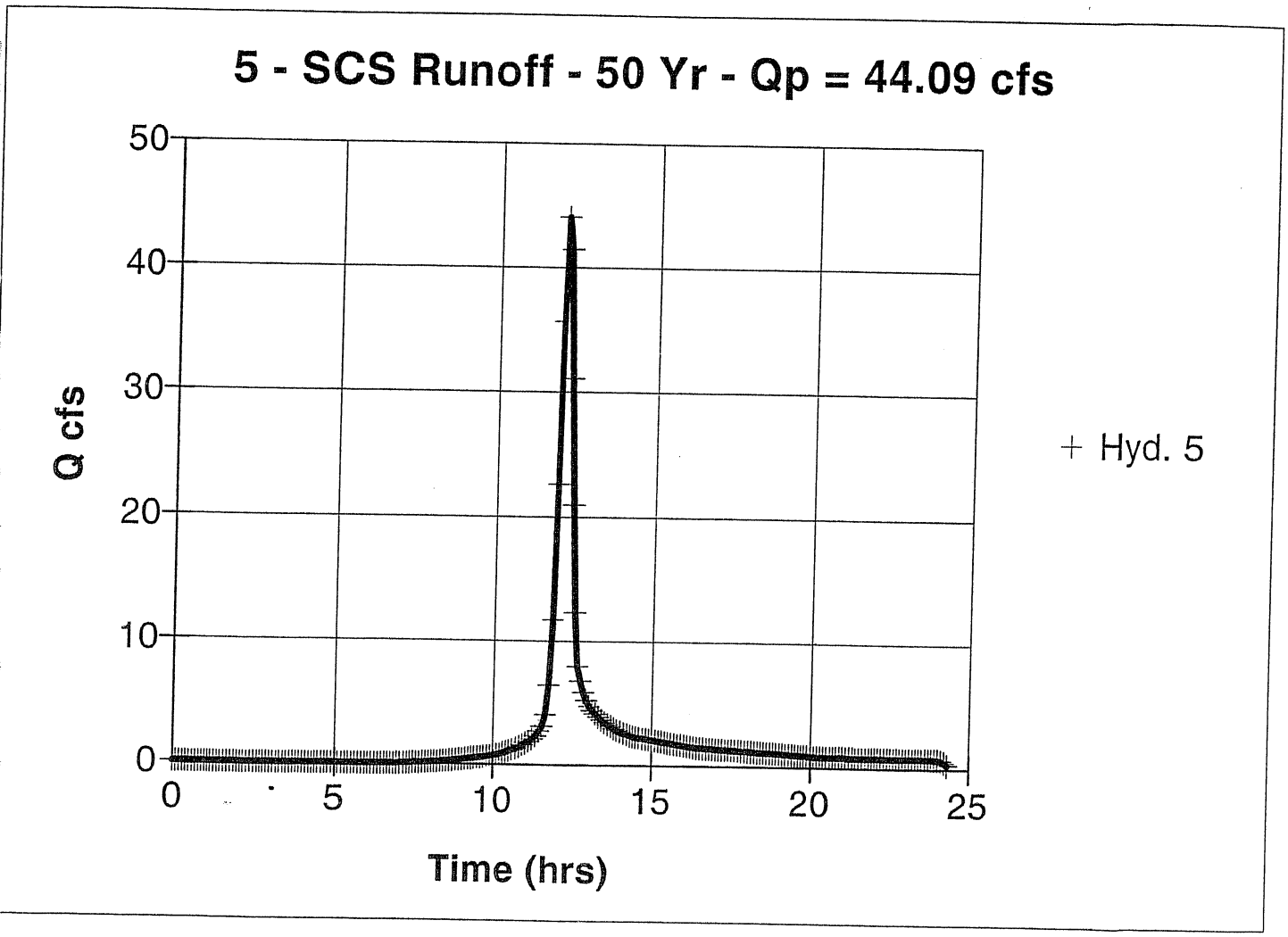
Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 44.09 cfs
Storm frequency	= 50 yrs	Time interval	= 6 min
Drainage area	= 14.40 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 5.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 560

Total Volume = 3.734 acft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
11.30	2.33	14.50	2.27
11.40	2.70	14.60	2.22
11.50	3.12		
11.60	4.05		
11.70	6.44	*...End*	
11.80	11.72		
11.90	22.62		
12.00	35.70		
12.10	44.09 <<		
12.20	41.47		
12.30	31.09		
12.40	20.96		
12.50	12.31		
12.60	7.94		
12.70	6.79		
12.80	5.87		
12.90	5.22		
13.00	4.76		
13.10	4.41		
13.20	4.13		
13.30	3.87		
13.40	3.66		
13.50	3.47		
13.60	3.29		
13.70	3.13		
13.80	2.98		
13.90	2.84		
14.00	2.71		
14.10	2.59		
14.20	2.48		
14.30	2.39		
14.40	2.32		


5 - SCS Runoff - 50 Yr - Qp = 44.09 cfs
Q cfs
50
40
30
20
10
0
0
5
10
15
20
25
Time (hrs)
+ Hyd. 5

Hydrograph Report

English

Hyd. No. 5

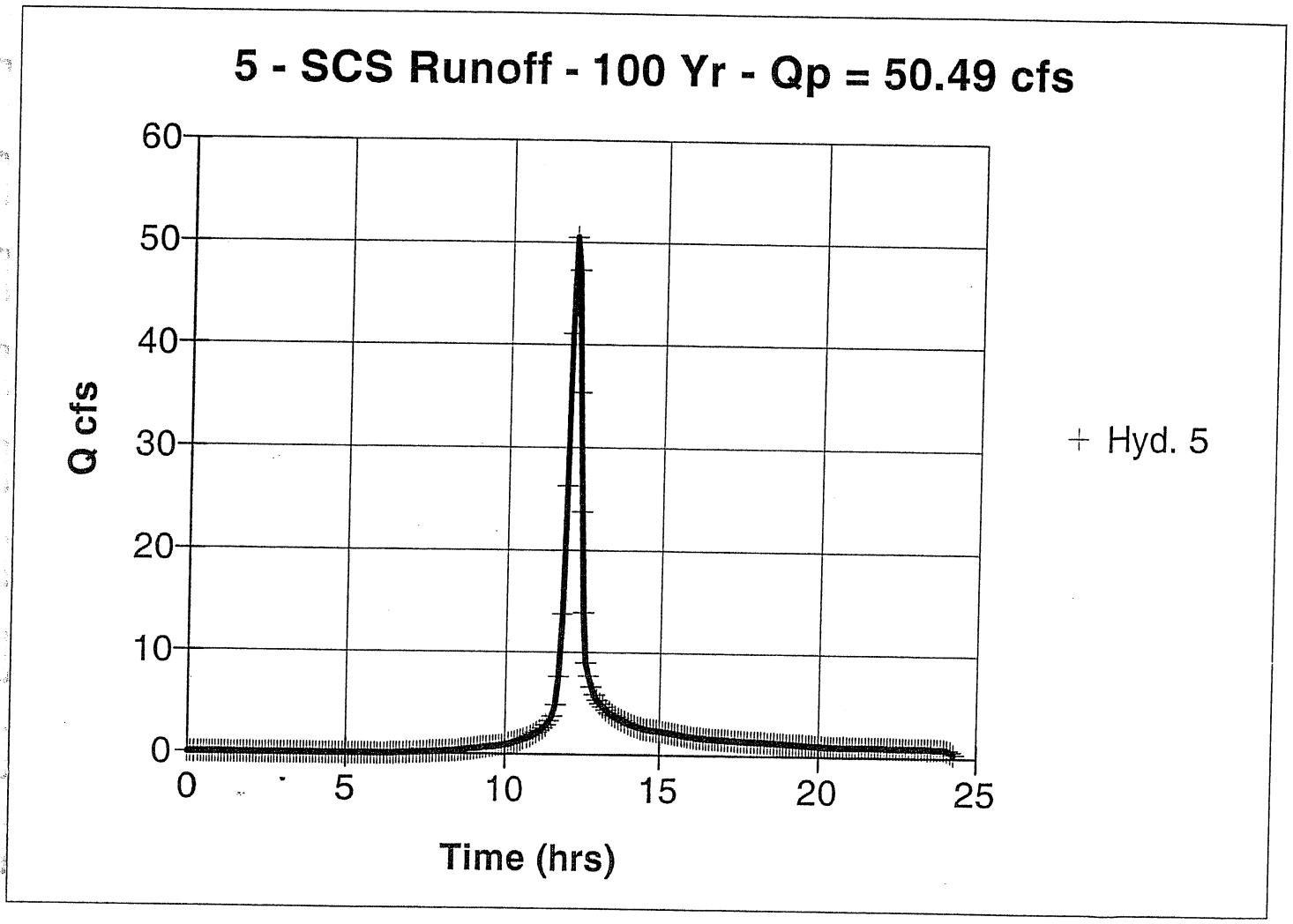
Area E

Hydrograph type	= SCS Runoff	Peak discharge	= 50.49 cfs
Storm frequency	= 100 yrs	Time interval	= 6 min
Drainage area	= 14.40 ac	Curve number	= 81
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 5.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 560

Total Volume = 4.278 acft

Hydrograph Discharge Table

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
11.20	2.53	14.40	2.61
11.30	2.81	14.50	2.55
11.40	3.24		
11.50	3.73		
11.60	4.83	*...End*	
11.70	7.62		
11.80	13.74		
11.90	26.24		
12.00	41.09		
12.10	50.49 <<		
12.20	47.31		
12.30	35.36		
12.40	23.76		
12.50	13.89		
12.60	8.95		
12.70	7.64		
12.80	6.61		
12.90	5.87		
13.00	5.35		
13.10	4.96		
13.20	4.64		
13.30	4.35		
13.40	4.11		
13.50	3.89		
13.60	3.70		
13.70	3.52		
13.80	3.35		
13.90	3.19		
14.00	3.04		
14.10	2.91		
14.20	2.78		
14.30	2.68		


5 - SCS Runoff - 100 Yr - Qp = 50.49 cfs
Q cfs
60
50
40
30
20
10
0
0
5
10
15
20
25
Time (hrs)
Hyd. 5

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	9.41	6	732	0.979	2	----	------	------	Area B
2	Reservoir	0.61	6	924	0.979	2	1	718.25	0.563	Basin B
3	SCS Runoff	32.38	6	732	3.128	2	----	------	------	Area CD
4	Reservoir	5.28	6	774	3.120	2	3	697.87	1.432	CD
5	SCS Runoff	15.02	6	726	1.321	2	----	------	------	Area E
6	Reservoir	2.33	6	792	1.321	2	5	707.26	0.623	Area E
7	SCS Runoff	7.50	6	726	0.568	2	----	------	------	Area H
8	Reservoir	0.00	6	0	0.000	2	7	714.09	0.568	Wetlands H
9	SCS Runoff	9.30	6	732	0.947	2	----	------	------	Area G
10	Reservoir	0.93	6	840	0.947	2	9	714.21	0.441	Basin G
11	SCS Runoff	0.60	6	726	0.052	2	----	------	------	Area F
12	SCS Runoff	1.33	6	732	0.150	2	----	------	------	Area A
13	SCS Runoff	0.85	6	732	0.096	2	----	------	------	Area K-EXISTING
14	SCS Runoff	0.47	6	726	0.040	2	----	------	------	Area K-PROPOSED

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	19.18	6	732	1.940	10	----	------	------	Area B
2	Reservoir	2.40	6	792	1.940	10	1	719.01	1.037	Basin B
3	SCS Runoff	65.88	6	726	6.201	10	----	------	------	Area CD
4	Reservoir	15.93	6	756	6.193	10	3	698.87	2.823	CD
5	SCS Runoff	30.29	6	726	2.577	10	----	------	------	Area E
6	Reservoir	3,43	6	804	2.577	10	5	708,31	1.376	Area E
7	SCS Runoff	16.29	6	720	1.165	10	----	------	------	Area H
8	Reservoir	0.00	6	0	0.000	10	7	714.58	1.165	Wetlands H
9	SCS Runoff	21.41	6	732	2.049	10	----	------	------	Area G
10	Reservoir	2.55	6	798	2.049	10	9	715.04	1.024	Basin G
11	SCS Runoff	1.42	6	726	0.114	10	----	------	------	Area F
12	SCS Runoff	3.21	6	732	0.332	10	----	------	------	Area A
13	SCS Runoff	2.05	6	732	0.211	10	----	------	------	Area K-EXISTING
14	SCS Runoff	1.10	6	726	0.088	10	----	------	------	Area K-PROPOSED

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	23.98	6	732	2.420	25	----	------	------	Area B
2	Reservoir	2.93	6	792	2.420	25	1	719.27	1.308	Basin B
3	SCS Runoff	82.76	6	726	7.735	25	----	------	------	Area CD
4	Reservoir	20.33	6	756	7.728	25	3	699.27	3.537	CD
5	SCS Runoff	37.76	6	726	3.201	25	----	------	------	Area E
6	Reservoir	5.10	6	774	3.201	25	5	708.65	1.657	Area E
7	SCS Runoff	20.68	6	720	1.466	25	----	------	------	Area H
8	Reservoir	0.00	6	0	0.000	25	7	714.83	1.466	Wetlands H
9	SCS Runoff	27.56	6	732	2.617	25	----	------	------	Area G
10	Reservoir	3.70	6	780	2.617	25	9	715.25	1.305	Basin G
11	SCS Runoff	1.83	6	726	0.146	25	----	------	------	Area F
12	SCS Runoff	4.17	6	732	0.426	25	----	------	------	Area A
13	SCS Runoff	2.66	6	732	0.271	25	----	------	------	Area K-EXISTING
14	SCS Runoff	1.42	6	726	0.113	25	----	------	------	Area K-PROPOSED

Proj. file: 11927-100year.GPW | IDF file: Sample.IDF | Run date: 04-06-2001

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	28.05	6	732	2.832	50	----	------	------	Area B
2	Reservoir	3.33	6	792	2.832	50	1	719.51	1.551	Basin B
3	SCS Runoff	97.12	6	726	9.052	50	----	------	------	Area CD
4	Reservoir	23.07	6	756	9.043	50	3	699.61	4.179	CD
5	SCS Runoff	44.09	6	726	3.734	50	----	------	------	Area E
6	Reservoir	6.96	6	762	3.734	50	5	708.91	1.880	Area E
7	SCS Runoff	24.43	6	720	1.726	50	----	------	------	Area H
8	Reservoir	0.00	6	0	0.000	50	7	715.03	1.726	Wetlands H
9	SCS Runoff	32.94	6	726	3.111	50	----	------	------	Area G
10	Reservoir	4.73	6	774	3.111	50	9	715.44	1.553	Basin G
11	SCS Runoff	2.19	6	726	0.174	50	----	------	------	Area F
12	SCS Runoff	5.01	6	732	0.508	50	----	------	------	Area A
13	SCS Runoff	3.19	6	732	0.324	50	----	------	------	Area K-EXISTING
14	SCS Runoff	1.69	6	726	0.135	50	----	------	------	Area K-PROPOSED

Proj. file: 11927-100year.GPW | IDF file: Sample.IDF | Run date: 04-06-2001

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (acft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (acft)	Hydrograph description
1	SCS Runoff	32.16	6	732	3.252	100	----	------	------	Area B
2	Reservoir	3.69	6	792	3.252	100	1	719.76	1.803	Basin B
3	SCS Runoff	111.68	6	726	10.394	100	----	------	------	Area CD
4	Reservoir	25.66	6	756	10.386	100	3	699.96	4.845	CD
5	SCS Runoff	50.49	6	726	4.278	100	----	------	------	Area E
6	Reservoir	8.59	6	756	4.278	100	5	709.14	2.125	Area E
7	SCS Runoff	28.25	6	720	1.992	100	----	------	------	Area H
8	Reservoir	0.00	6	0	0.000	100	7	715.18	1.992	Wetlands H
9	SCS Runoff	38.56	6	726	3.619	100	----	------	------	Area G
10	Reservoir	5.74	6	774	3.619	100	9	715.64	1.813	Basin G
11	SCS Runoff	2.55	6	726	0.203	100	----	------	------	Area F
12	SCS Runoff	5.86	6	732	0.593	100	----	------	------	Area A
13	SCS Runoff	3.73	6	732	0.377	100	----	------	------	Area K-EXISTING
14	SCS Runoff	1.98	6	726	0.157	100	----	------	------	Area K-PROPOSED

Proj. file: 11927-100year.GPW | IDF file: Sample.IDF | Run date: 04-06-2001

Reservoir Report

English

Reservoir No. 3 - Basin E

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage acft	Total storage acft
0.00	706.00	6,641	0.000	0.000
1.00	707.00	17,829	0.281	0.281
2.00	708.00	31,405	0.565	0.846
3.00	709.00	45,224	0.794	1.554
4.00	710.00	61,380	1.224	2.187
5.00	711.00	74,350	1.558	3.745
5.80	711.80	80,000	1.417	5.162

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 8.0	18.0	0.0	0.0
Span in	= 8.0	18.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 706.00	708.50	0.00	0.00
Length ft	= 40.0	40.0	0.0	0.0
Slope %	= 1.00	1.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.0	0.0	0.0	0.0
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Stage / Storage / Discharge Table

Note: All outflows have been analyzed under inlet and outlet control.

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0.000	706.00	0.00	0.00	---	---	---	---	---	---	0.00
1.00	0.281	707.00	1.26	0.00	---	---	---	---	---	---	1.26
2.00	0.846	708.00	1.94	0.00	---	---	---	---	---	---	1.94
3.00	1.554	709.00	2.43	1.30	---	---	---	---	---	---	3.74
4.00	2.187	710.00	2.84	6.02	---	---	---	---	---	---	8.86
5.00	3.745	711.00	3.20	11.25	---	---	---	---	---	---	14.46

Reservoir Report

English

Reservoir No. 3 - Basin E

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage acft	Total storage acft
0.00	705.00	5,000	0.000	0.000
1.00	706.00	6,641	0.134	0.134
2.00	707.00	17,829	0.281	0.415
3.00	708.00	31,405	0.565	0.980
4.00	709.00	45,224	0.880	1.860
5.00	710.00	61,380	1.224	3.084
6.50	711.50	79,000	2.417	5.501

Culvert / Orifice Structures

		[A]	[B]	[C]	[D]
Rise in	=	8.0	18.0	0.0	0.0
Span in	=	8.0	18.0	0.0	0.0
No. Barrels	=	1	1	0	0
Invert El. ft	=	705.00	708.00	0.00	0.00
Length ft	=	0.0	0.0	0.0	0.0
Slope %	=	0.00	0.00	0.00	0.00
N-Value	=	.013	.013	.000	.000
Orif. Coeff.	=	0.60	0.60	0.00	0.00
Multi-Stage	=	-----	No	No	No

Weir Structures

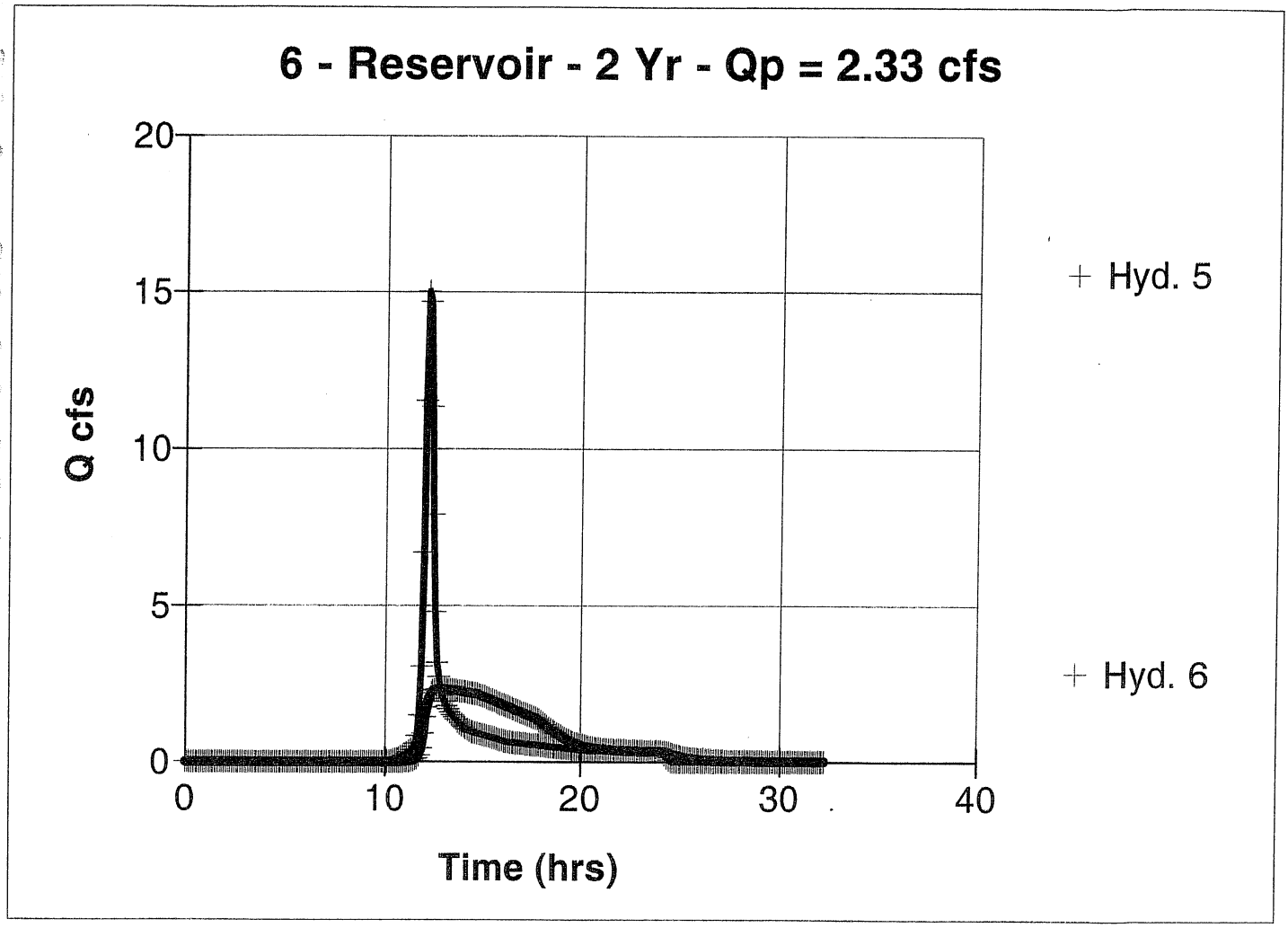
		[A]	[B]	[C]	[D]
Crest Len ft	=	0.0	0.0	0.0	0.0
Crest El. ft	=	0.00	0.00	0.00	0.00
Weir Coeff.	=	0.00	0.00	0.00	0.00
Eqn. Exp.	=	0.00	0.00	0.00	0.00
Multi-Stage	=	No	No	No	No

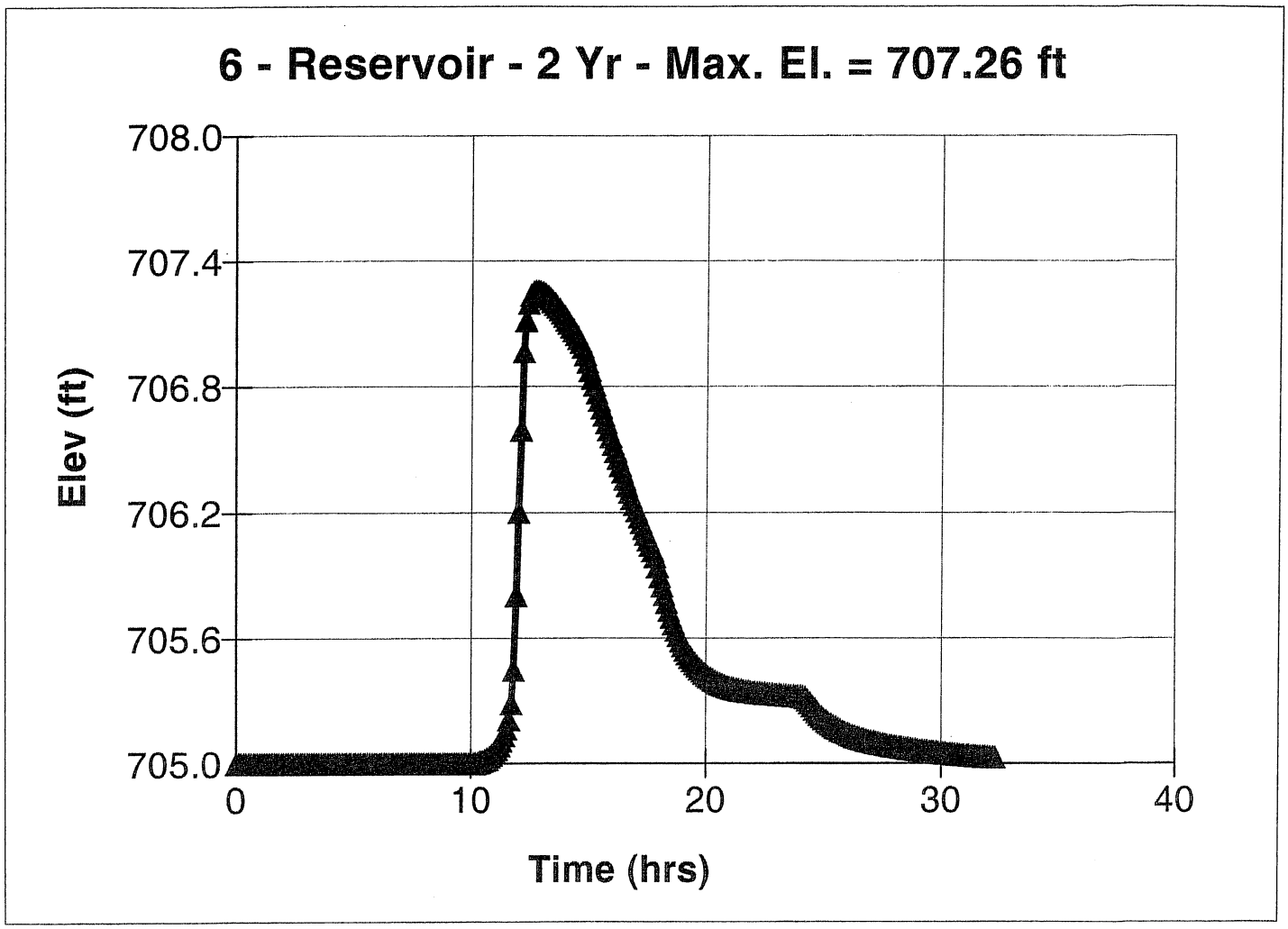
Tailwater Elevation = 0.00 ft

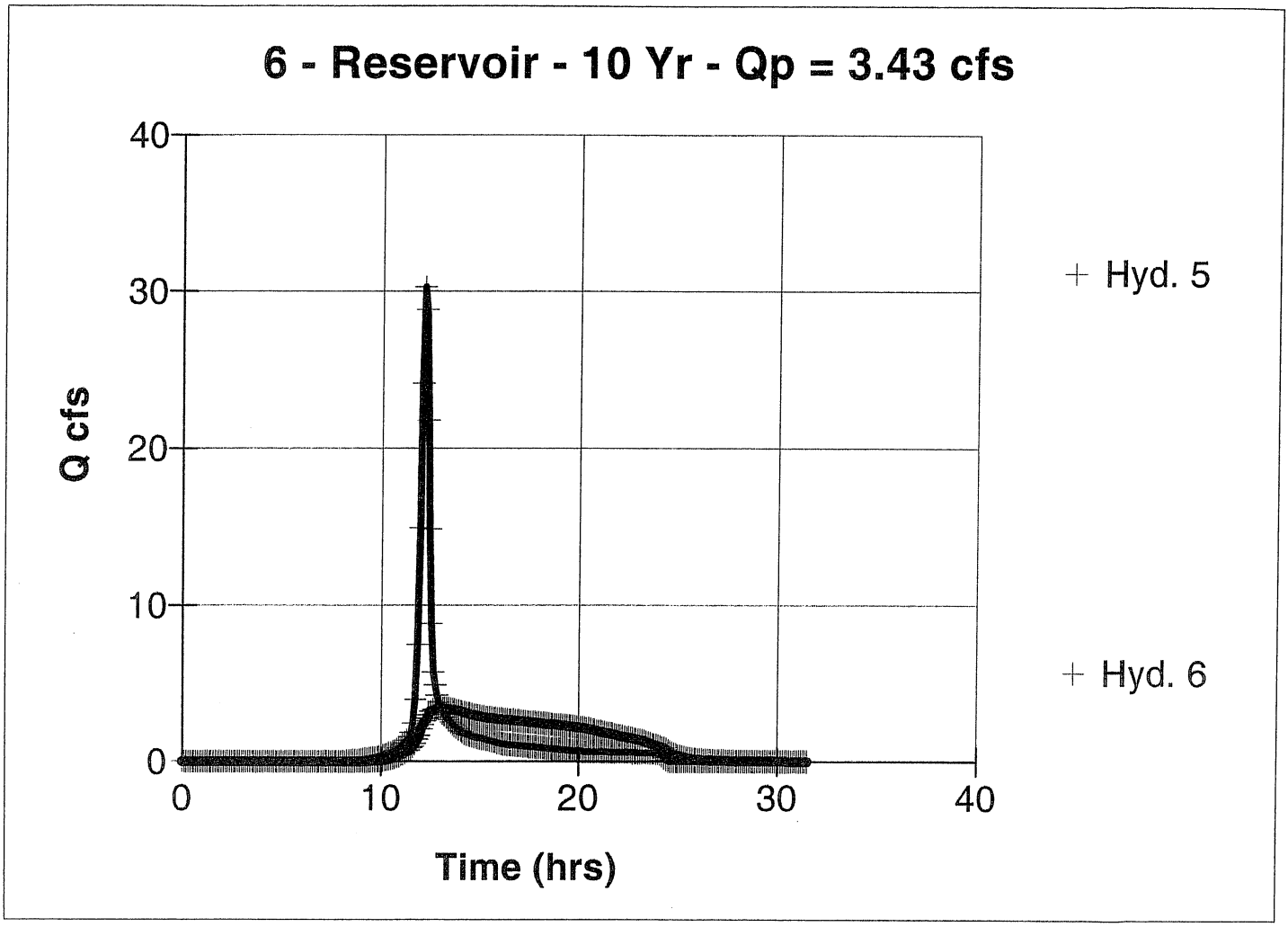
Stage / Storage / Discharge Table

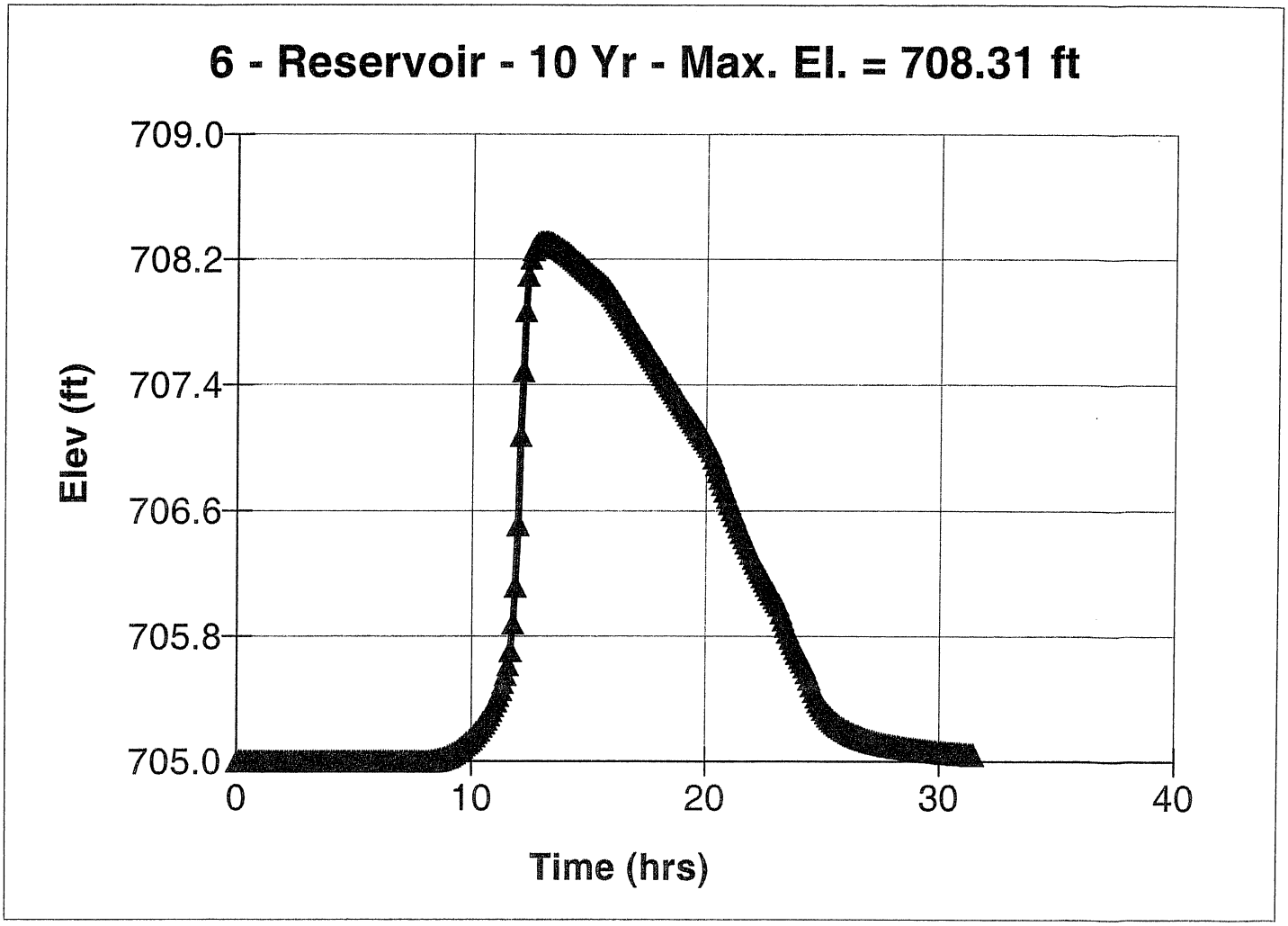
Note: All outflows have been analyzed under inlet and outlet control.

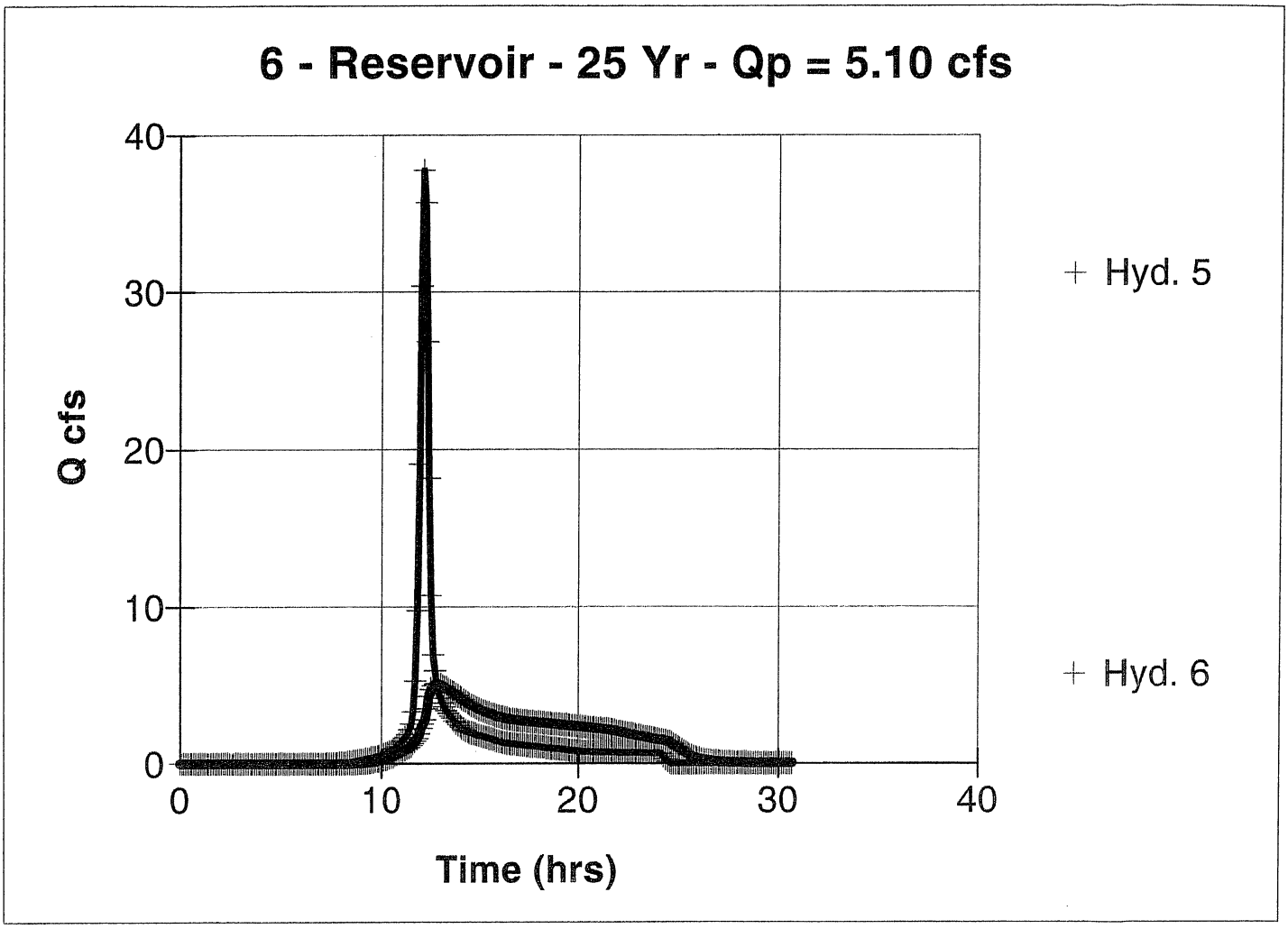
Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0.000	705.00	0.00	0.00	---	---	---	---	---	---	0.00
1.00	0.134	706.00	1.37	0.00	---	---	---	---	---	---	1.37
2.00	0.415	707.00	2.17	0.00	---	---	---	---	---	---	2.17
3.00	0.980	708.00	2.74	0.00	---	---	---	---	---	---	2.74
4.00	1.860	709.00	3.22	4.31	---	---	---	---	---	---	7.53
5.00	3.084	710.00	3.63	9.51	---	---	---	---	---	---	13.14

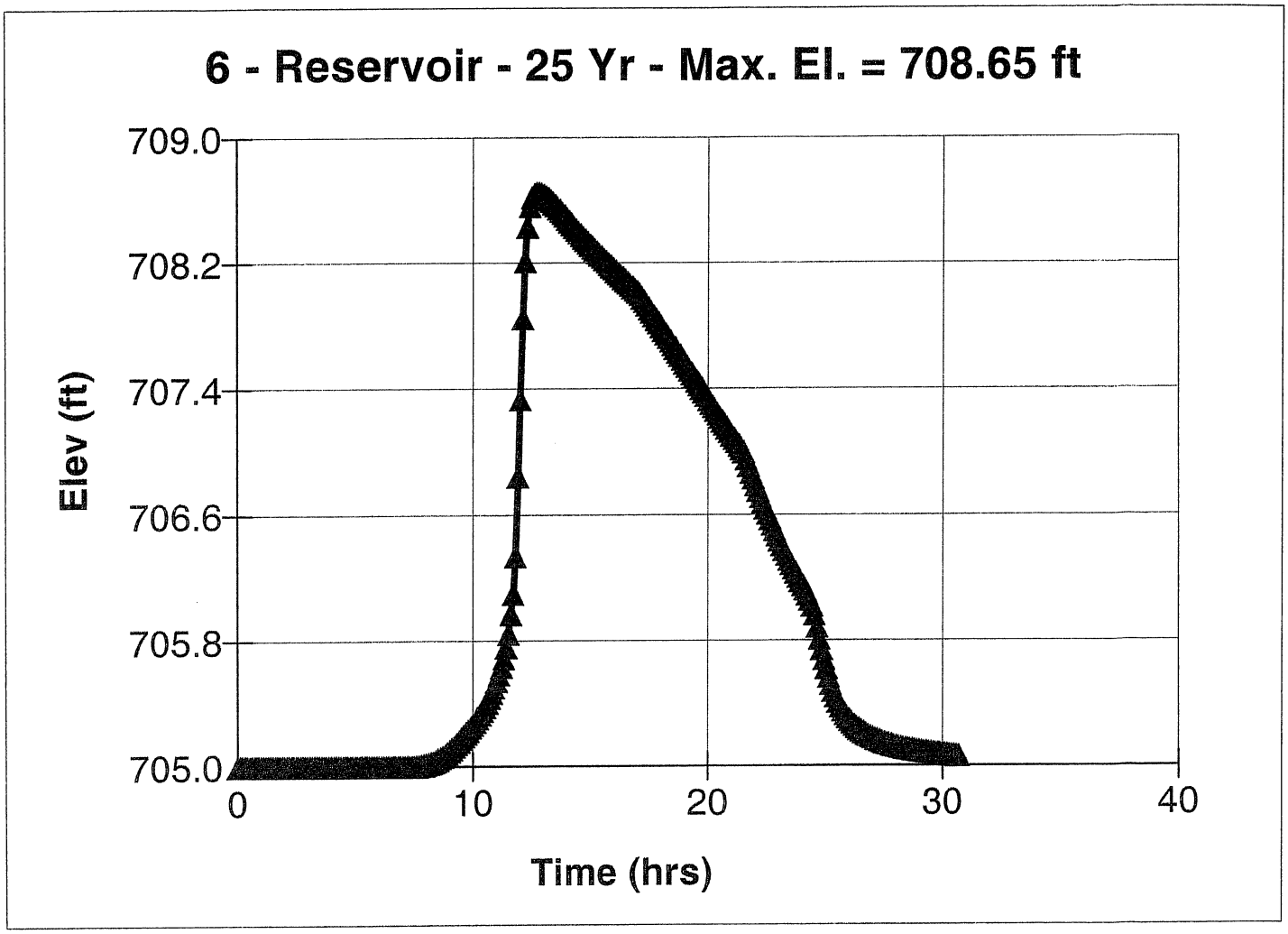

6 - Reservoir - 2 Yr - Qp = 2.33 cfs
Q cfs
20
15
10
5
0
0
10
20
30
40
Time (hrs)
Hyd. 5
Hyd. 6

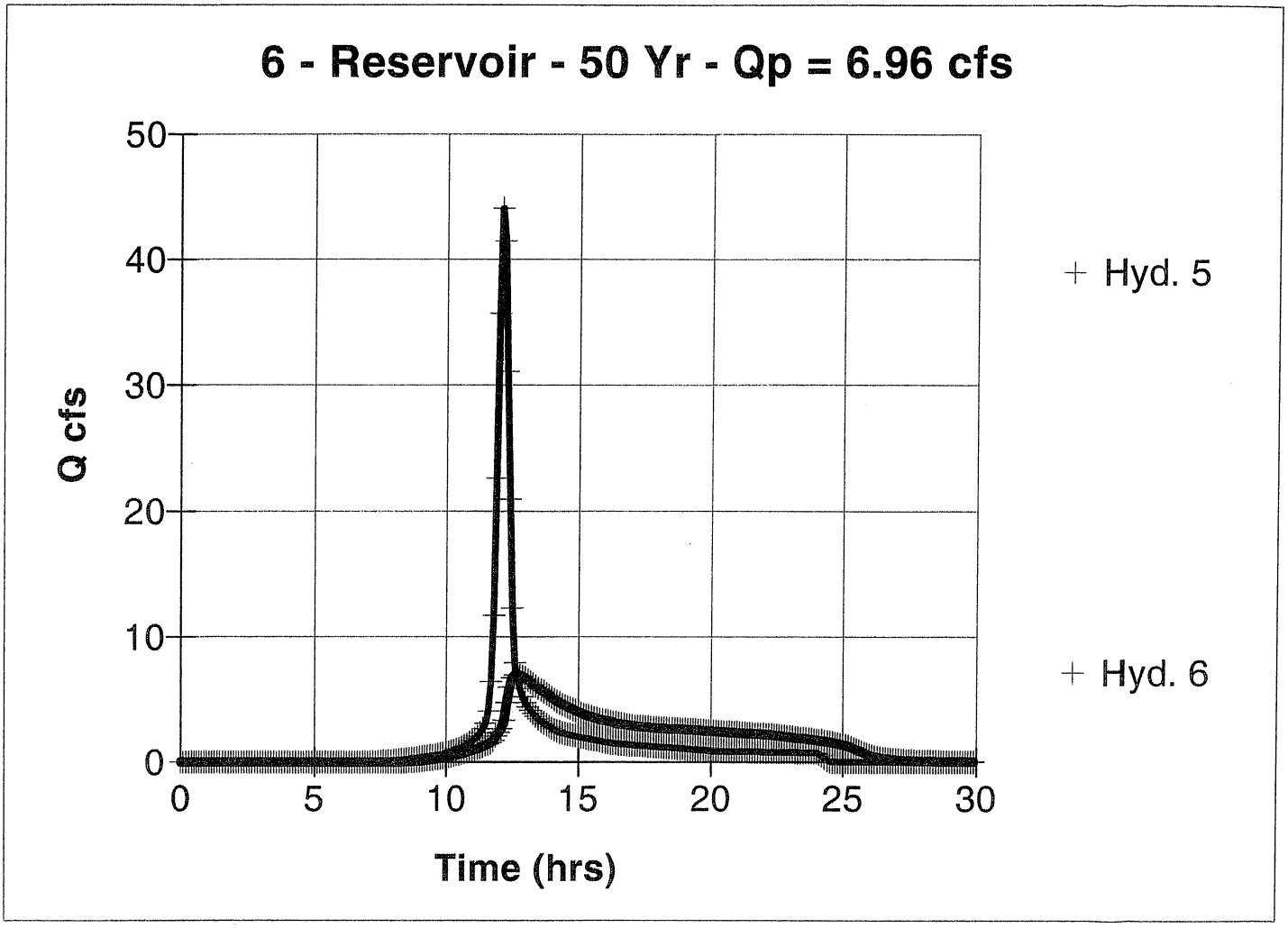

6 - Reservoir - 2 Yr - Max. El. = 707.26 ft
708.0
707.4
706.8
706.2
705.6
705.0
Elev (ft)
0
10
20
30
40
Time (hrs)

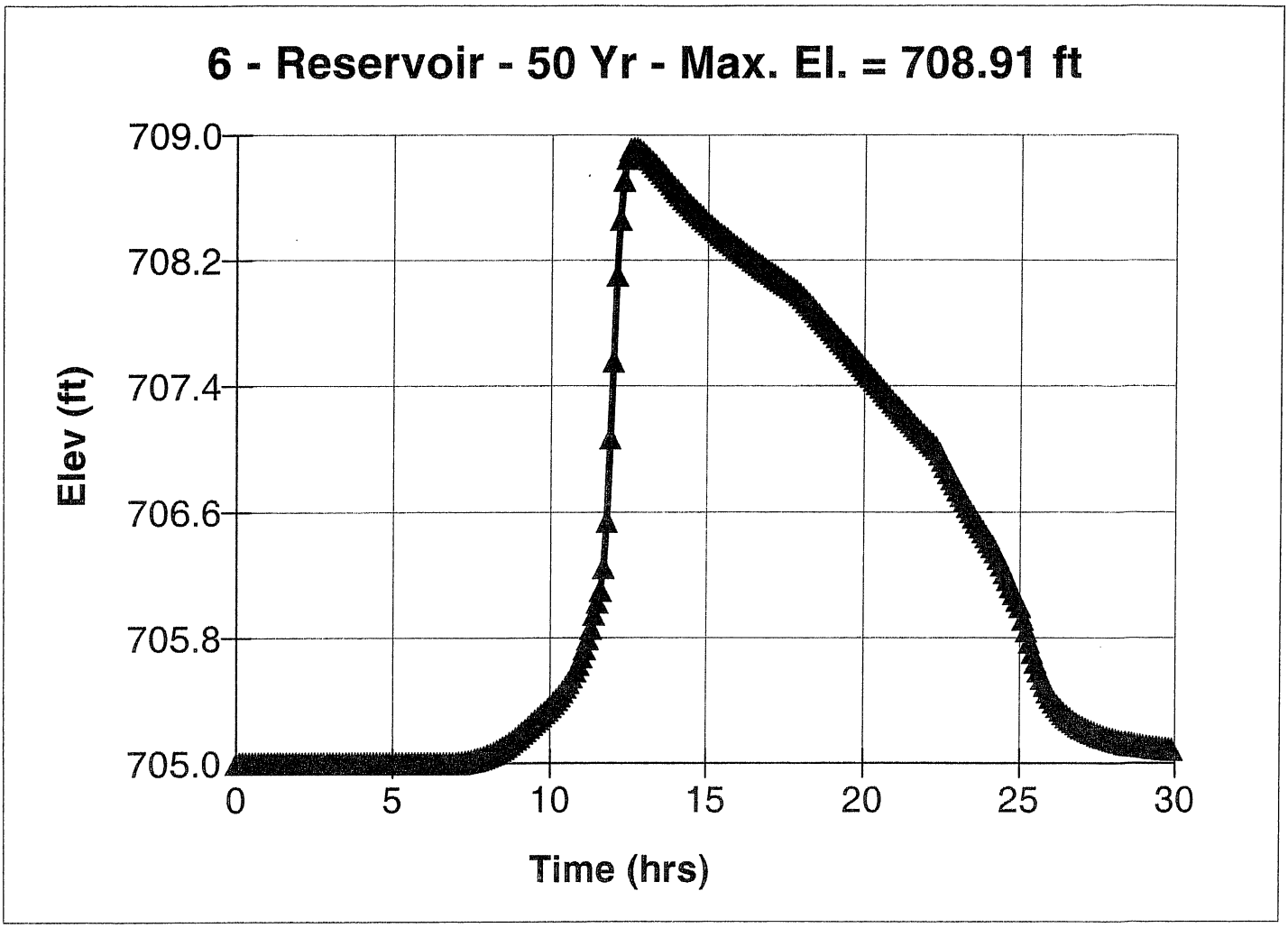

6 - Reservoir - 10 Yr - Qp = 3.43 cfs
Q cfs
40
30
20
10
0
0
10
20
30
40
Time (hrs)
Hyd. 5
Hyd. 6

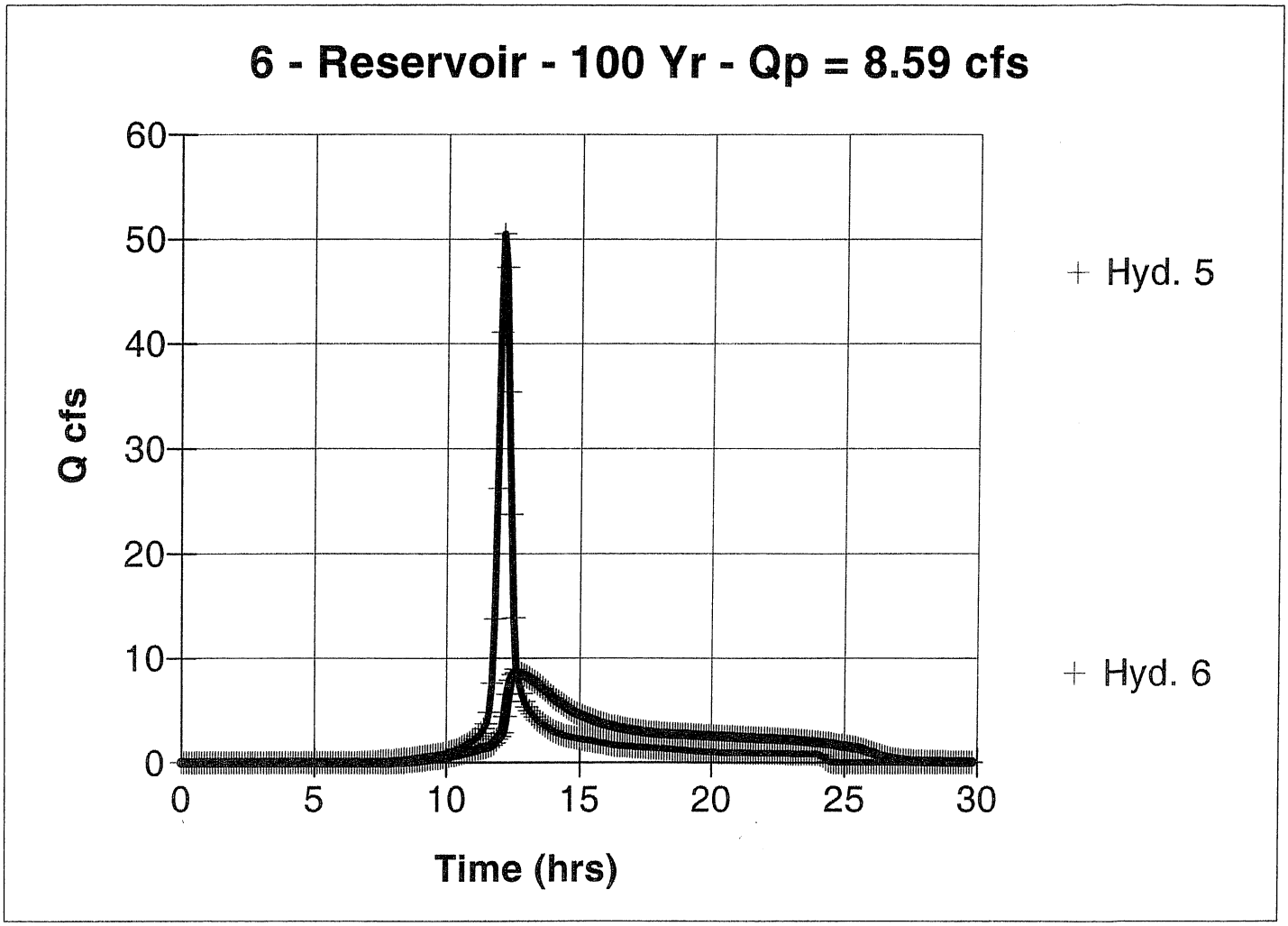

6 - Reservoir - 10 Yr - Max. El. = 708.31 ft
709.0
708.2
707.4
706.6
705.8
705.0
Elev (ft)
0
10
20
30
40
Time (hrs)

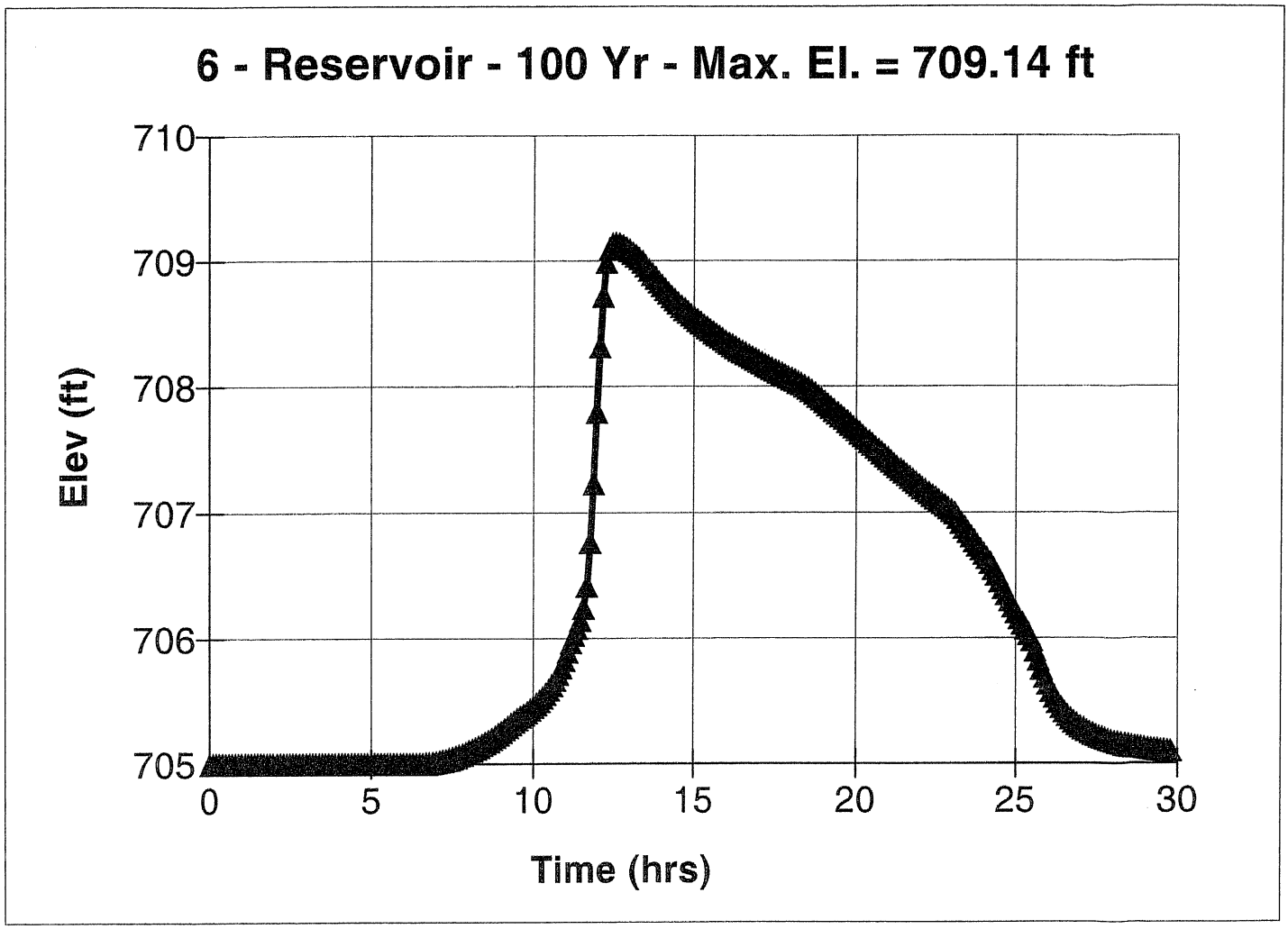

6 - Reservoir - 25 Yr - Qp = 5.10 cfs
Q cfs
Time (hrs)
0
10
20
30
40
Hyd. 5
Hyd. 6


6 - Reservoir - 25 Yr - Max. El. = 708.65 ft
709.0
708.2
707.4
706.6
705.8
705.0
Elev (ft)
0
10
20
30
40
Time (hrs)

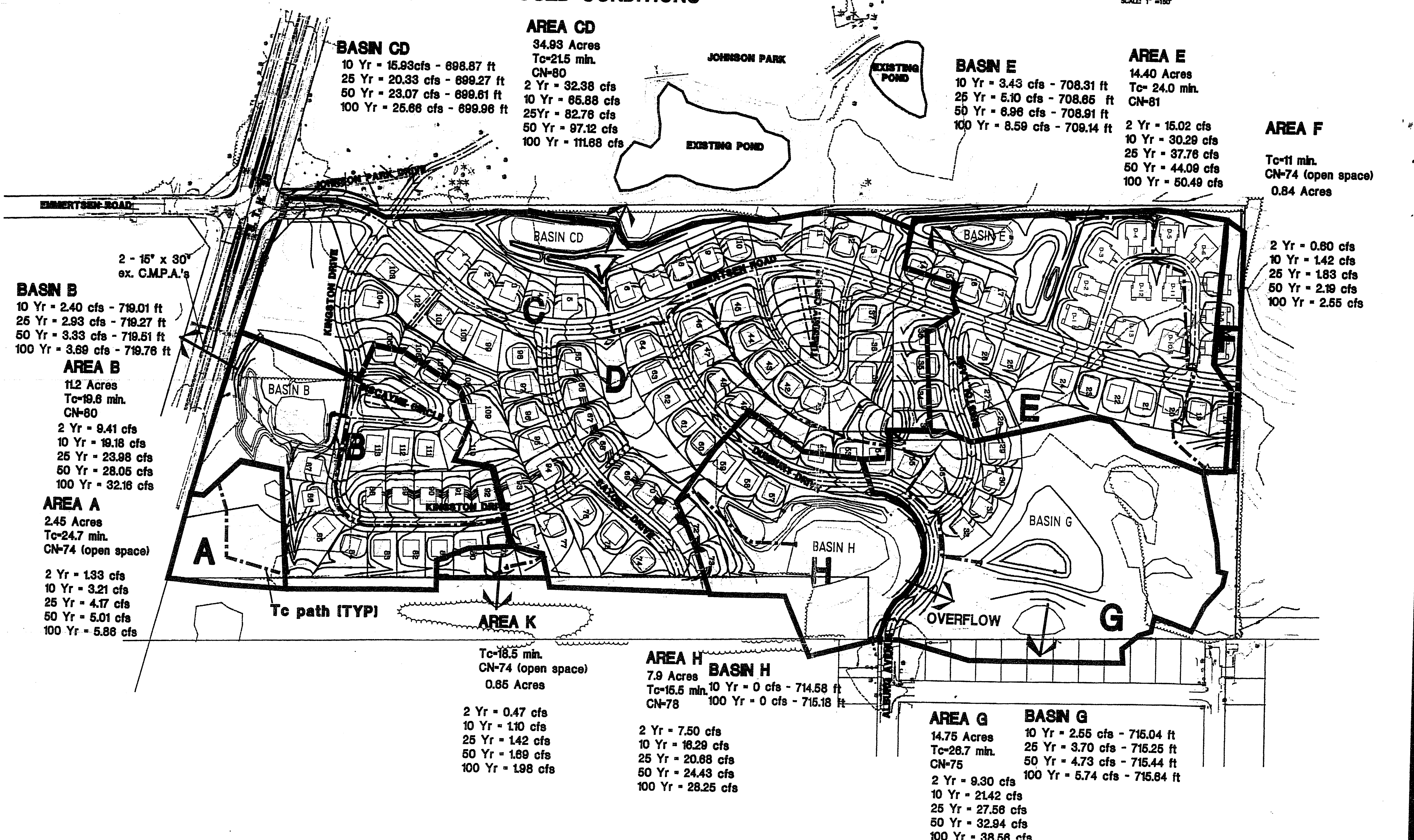

6 - Reservoir - 50 Yr - Qp = 6.96 cfs
Q cfs
50
40
30
20
10
0
0
5
10
15
20
25
30
Time (hrs)
Hyd. 5
Hyd. 6


6 - Reservoir - 50 Yr - Max. El. = 708.91 ft
709.0
708.2
707.4
706.6
705.8
705.0
Elev (ft)
0
5
10
15
20
25
30
Time (hrs)


6 - Reservoir - 100 Yr - Qp = 8.59 cfs
Q cfs
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Time (hrs)
Hyd. 5
Hyd. 6


6 - Reservoir - 100 Yr - Max. El. = 709.14 ft
Elev (ft)
710
709
708
707
706
705
0
5
10
15
20
25
30
Time (hrs)

BIELINSKI DEV. - AUBURN HILLS
DRAINAGE CALCULATIONS
PROPOSED CONDITIONS


SCALE: 1" =150'
JOHNSON PARK
EXISTING POND
EXISTING POND
BASIN CD
10 Yr = 15.93cfs - 698.87 ft
25 Yr = 20.33 cfs - 699.27 ft
50 Yr = 23.07 cfs - 699.61 ft
100 Yr = 25.66 cfs - 699.96 ft
AREA CD
34.93 Acres
Tc=21.5 min.
CN=80
2 Yr = 32.38 cfs
10 Yr = 65.88 cfs
25Yr = 82.76 cfs
50 Yr = 97.12 cfs
100 Yr = 111.68 cfs
BASIN E
10 Yr = 3.43 cfs - 708.31 ft
25 Yr = 5.10 cfs - 708.65 ft
50 Yr = 6.96 cfs - 708.91 ft
100 Yr = 8.59 cfs - 709.14 ft
AREA E
14.40 Acres
Tc= 24.0 min.
CN=81
2 Yr = 15.02 cfs
10 Yr = 30.29 cfs
25 Yr = 37.76 cfs
50 Yr = 44.09 cfs
100 Yr = 50.49 cfs
AREA F
Tc=11 min.
CN=74 (open space)
0.84 Acres
2 Yr = 0.60 cfs
10 Yr = 1.42 cfs
25 Yr = 1.83 cfs
50 Yr = 2.19 cfs
100 Yr = 2.55 cfs
EMMERTSEN ROAD
JOHNSON PARK DRIVE
2 - 15" x 30" ex. C.M.P.A.'s
BASIN B
10 Yr = 2.40 cfs - 719.01 ft
25 Yr = 2.93 cfs - 719.27 ft
50 Yr = 3.33 cfs - 719.51 ft
100 Yr = 3.69 cfs - 719.76 ft
AREA B
11.2 Acres
Tc=19.6 min.
CN=80
2 Yr = 9.41 cfs
10 Yr = 19.18 cfs
25 Yr = 23.98 cfs
50 Yr = 28.05 cfs
100 Yr = 32.16 cfs
AREA A
2.45 Acres
Tc=24.7 min.
CN=74 (open space)
2 Yr = 1.33 cfs
10 Yr = 3.21 cfs
25 Yr = 4.17 cfs
50 Yr = 5.01 cfs
100 Yr = 5.86 cfs
BASIN CD
BASIN E
BASIN B
BASIN G
BASIN H
KINGSTON DRIVE
KINGSTON DRIVE
A
B
C
D
E
G
H
Tc path (TYP)
AREA K
OVERFLOW
Tc=18.5 min.
CN=74 (open space)
0.65 Acres
2 Yr = 0.47 cfs
10 Yr = 1.10 cfs
25 Yr = 1.42 cfs
50 Yr = 1.69 cfs
100 Yr = 1.98 cfs
AREA H
7.9 Acres
Tc=15.5 min.
CN=78
2 Yr = 7.50 cfs
10 Yr = 16.29 cfs
25 Yr = 20.68 cfs
50 Yr = 24.43 cfs
100 Yr = 28.25 cfs
BASIN H
10 Yr = 0 cfs - 714.58 ft
100 Yr = 0 cfs - 715.18 ft
AREA G
14.75 Acres
Tc=26.7 min.
CN=75
2 Yr = 9.30 cfs
10 Yr = 21.42 cfs
25 Yr = 27.56 cfs
50 Yr = 32.94 cfs
100 Yr = 38.56 cfs
BASIN G
10 Yr = 2.55 cfs - 715.04 ft
25 Yr = 3.70 cfs - 715.25 ft
50 Yr = 4.73 cfs - 715.44 ft
100 Yr = 5.74 cfs - 715.64 ft

WELCH HANSON ASSOCIATES
ENGINEERS • ARCHITECTS
SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS
355 AUSTIN CIRCLE, SUITE 100
DELAFIELD, WISCONSIN 53018
262-646-6855
FAX 262-646-6864
EMAIL INFO@WELCHHANSON.COM

AUBURN HILLS
DRAINAGE CALCULATIONS
CALEDONIA, WISCONSIN

PROPOSED CONDITIONS

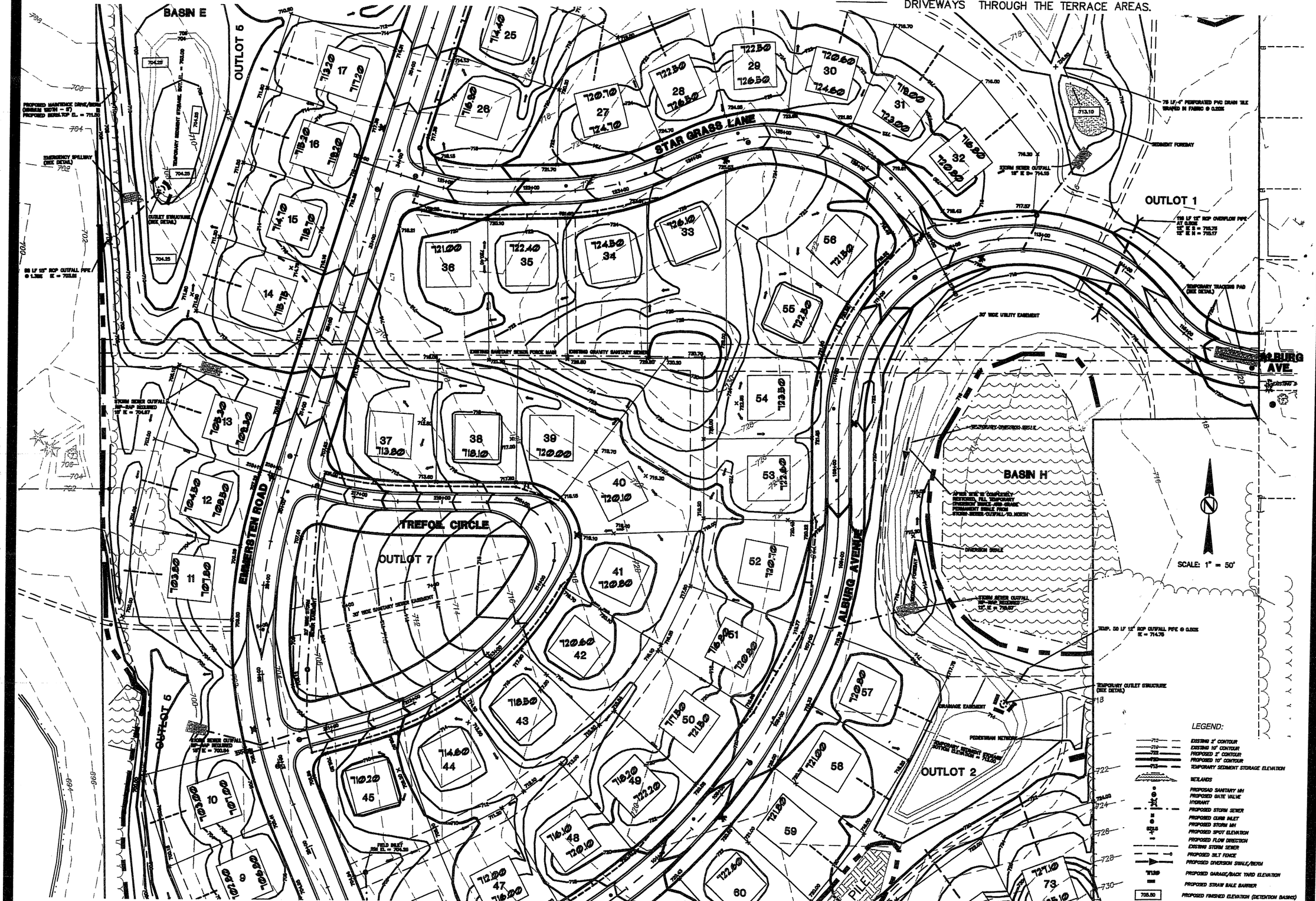
PROJECT NUMBER	11927
COMPUTER FILE	11927.DWG
DATE	03/23/2001
DRAWN BY	IV
CHECKED BY	MM
REVISIONS	

SHEET NUMBER

2

SEE SHEET 2

NOTE: SLOPE VARIES FROM 2% TO 6% FOR THE DRIVEWAYS THROUGH THE TERRACE AREAS.



SEE SHEET 4

WELCH HANSON ASSOCIATES

ENGINEERS • ARCHITECTS
SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS

355 AUSTIN CIRCLE, SUITE 100
DELAFIELD, WISCONSIN 53018
262-646-6855
FAX 262-646-6864
EMAIL INFO@WELCHHANSON.COM

AUBURN HILLS
GRADING AND EROSION CONTROL PLAN
CALEDONIA, WISCONSIN

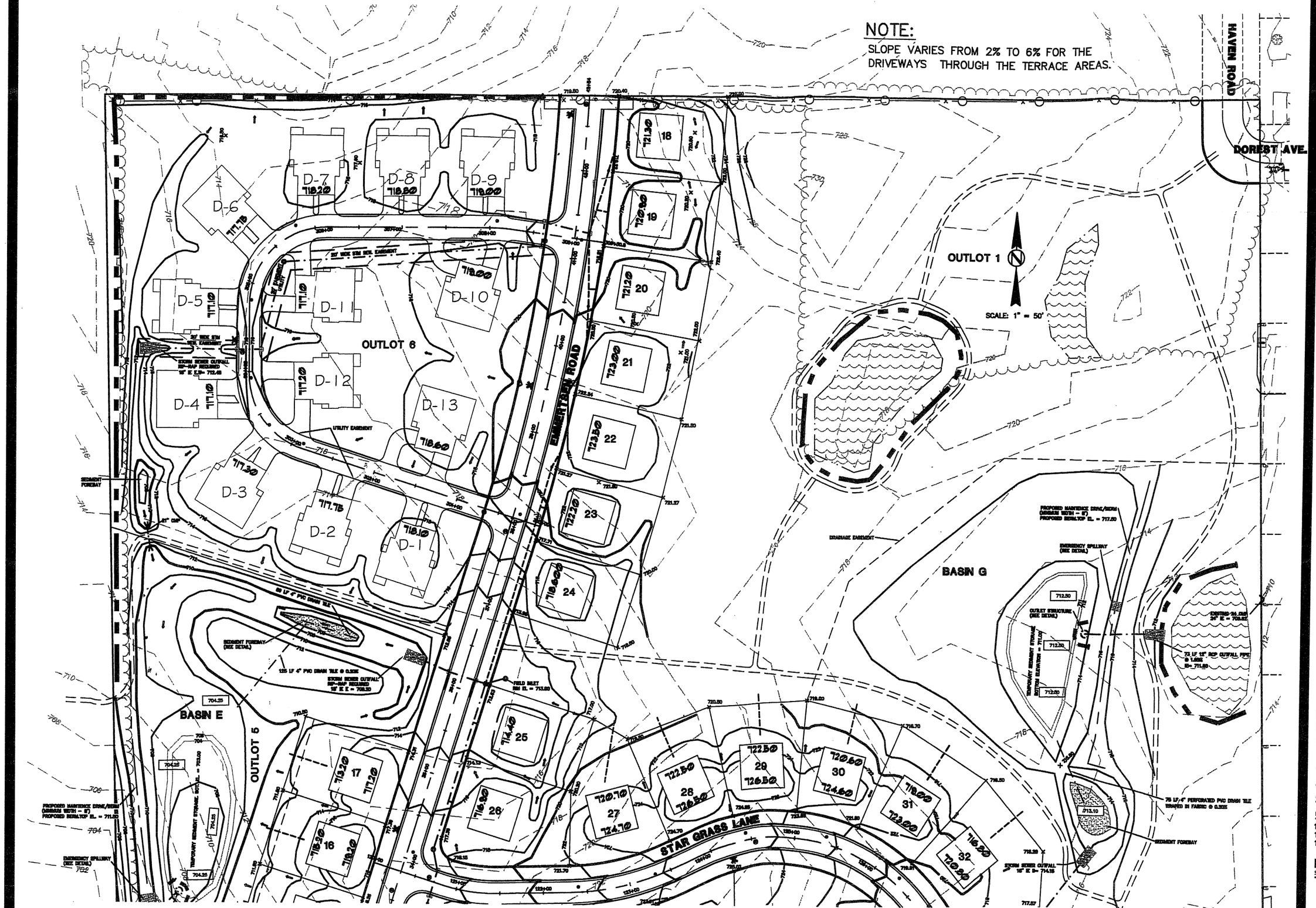
PART 2

PROJECT NUMBER	11927
COMPUTER FILE	11927.DWG
DATE	01/23/01
DRAWN BY	IV
CHECKED BY	MM
REVISIONS	11/05/01 T.G. 01/18/02

SHEET NUMBER

3

NOTE:
SLOPE VARIES FROM 2% TO 6% FOR THE DRIVEWAYS THROUGH THE TERRACE AREAS.



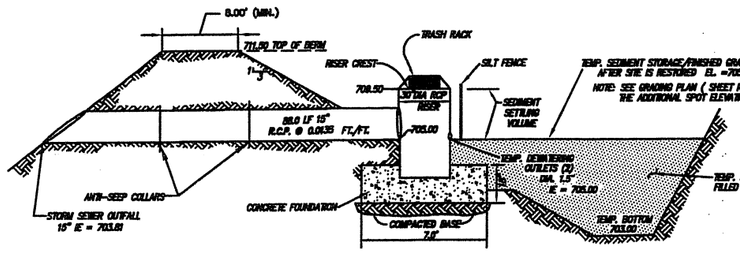
SEE SHEET 3

WELCH HANSON ASSOCIATES
ENGINEERS • ARCHITECTS
SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS
355 AUSTIN CIRCLE, SUITE 100
DELAFIELD, WISCONSIN 53018
262-646-6855
FAX 262-646-6864
EMAIL INFO@WELCHHANSON.COM

AUBURN HILLS
GRADING AND EROSION CONTROL PLAN
CALEDONIA, WISCONSIN
PART 1

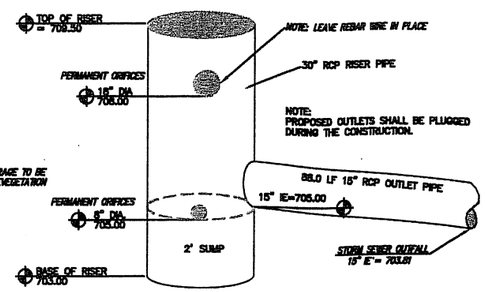
PROJECT NUMBER	11927
COMPUTER FILE	11927PRD.DWG
DATE	01/23/01
DRAWN BY	IV
CHECKED BY	MM
REVISIONS	12/19/01 T.G. 12/13/2001 IV 11/05/01 T.G. 10/18/02

SHEET NUMBER
2
OF SHEETS

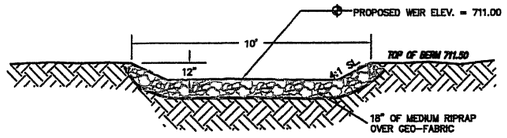


TEMPORARY SEDIMENT BASIN CONTROL STRUCTURE

SEDIMENT BASIN CONTROL DETENTION BASIN RISER ORIFICES SHALL BE PLUGGED AND PERMANENT OUTLETS SHALL BE OPENED AFTER STABILIZATION OF SITE IS COMPLETE.



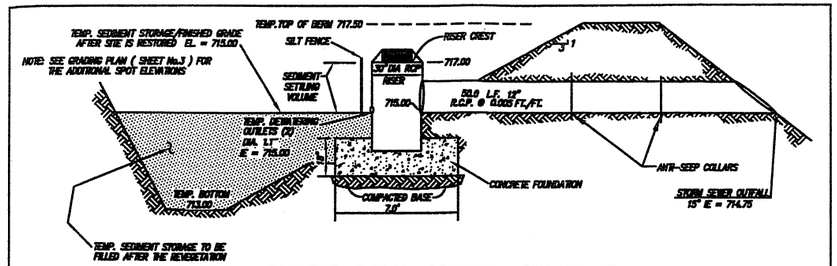
STORMWATER DETENTION BASIN RISER DETAIL



EMERGENCY SPILLWAY DETAIL
(N.T.S.)

NOTE:
THE SEDIMENT BASIN IS TO BE CHECKED AFTER EACH RUNOFF EVENT FOR STRUCTURAL STABILITY AND DEPTH OF SEDIMENT. THE BASIN IS TO BE CLEANED OUT WHEN THE DEPTH OF SEDIMENT REACHES THE DEWATERING HOLE.
FOLLOWING REVEGETATION OF THE SITE, THE SEDIMENT BASIN SHALL BE SEEDED AND MULCHED.
TEMPORARY DEWATERING OUTLETS SHALL BE PLUGGED,
TEMPORARY STORAGE SHALL BE FILLED,
AND PERMANENT OUTLETS OPENED PRIOR TO RESEEDING THE BASIN.

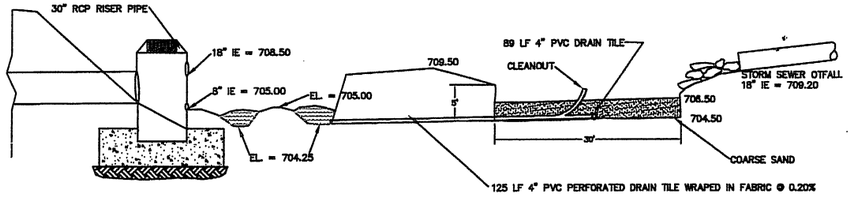
DETENTION BASIN E



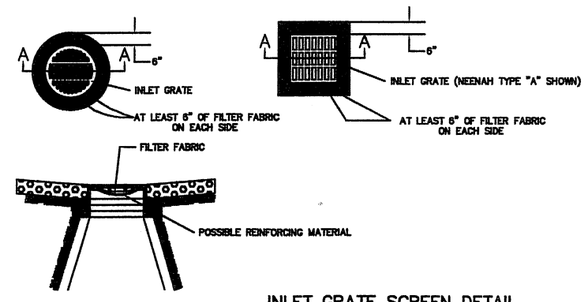
TEMPORARY SEDIMENT BASIN CONTROL STRUCTURE

NOTE:
THE SEDIMENT BASIN IS TO BE CHECKED AFTER EACH RUNOFF EVENT FOR STRUCTURAL STABILITY AND DEPTH OF SEDIMENT. THE BASIN IS TO BE CLEANED OUT WHEN THE DEPTH OF SEDIMENT REACHES THE DEWATERING HOLE.
FOLLOWING REVEGETATION OF THE SITE, THE TEMPORARY SEDIMENT STORAGE SHALL BE FILLED, THE ENTIRE BASIN SHALL BE SEEDED AND MULCHED. THE RISER AND TEMPORARY OUTFALL PIPE SHALL BE REMOVED.

DETENTION BASIN H

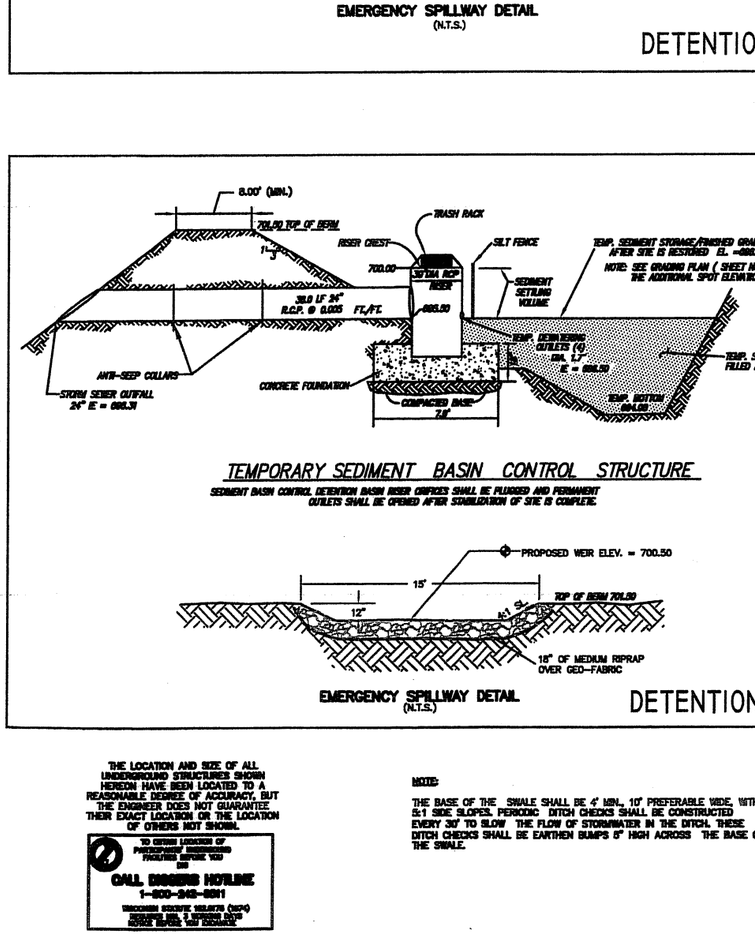


SEDIMENT FOREBAY DETAIL (DETENTION BASIN E)



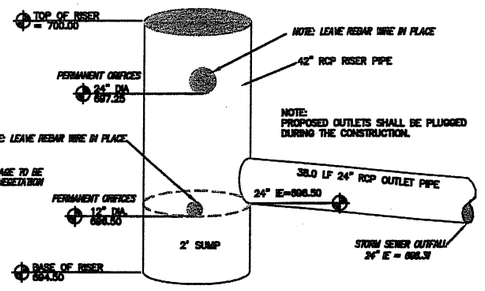
SECTION A – A

INLET GRATE SCREEN DETAIL
NOT TO SCALE



TEMPORARY SEDIMENT BASIN CONTROL STRUCTURE

SEDIMENT BASIN CONTROL DETENTION BASIN RISER ORIFICES SHALL BE PLUGGED AND PERMANENT OUTLETS SHALL BE OPENED AFTER STABILIZATION OF SITE IS COMPLETE.

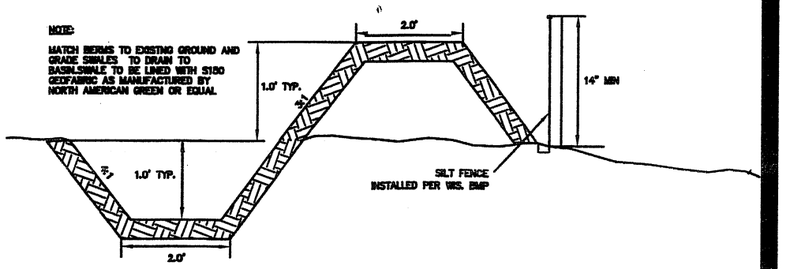


STORM WATER DETENTION BASIN RISER DETAIL

EMERGENCY SPILLWAY DETAIL
(N.T.S.)

NOTE:
THE SEDIMENT BASIN IS TO BE CHECKED AFTER EACH RUNOFF EVENT FOR STRUCTURAL STABILITY AND DEPTH OF SEDIMENT. THE BASIN IS TO BE CLEANED OUT WHEN THE DEPTH OF SEDIMENT REACHES THE DEWATERING HOLE.
FOLLOWING REVEGETATION OF THE SITE, THE SEDIMENT BASIN SHALL BE SEEDED AND MULCHED.
TEMPORARY DEWATERING OUTLETS SHALL BE PLUGGED,
TEMPORARY STORAGE SHALL BE FILLED,
AND PERMANENT OUTLETS OPENED PRIOR TO RESEEDING THE BASIN.

DETENTION BASIN CD



TEMPORARY RUNOFF DIVERSION SWALE/BERM (BASIN H)
NOT TO SCALE

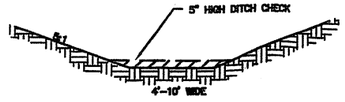
THE LOCATION AND SIZE OF ALL UNDERGROUND STRUCTURES SHOWN HEREON HAVE BEEN LOCATED TO A REASONABLE DEGREE OF ACCURACY, BUT THE ENGINEER DOES NOT GUARANTEE THEIR EXACT LOCATION OR THE LOCATION OF OTHERS NOT SHOWN.

TO OBTAIN LOCATION OF PARTICIPATING UNDERGROUND FACILITIES BEFORE YOU DIG

CALL DIGGERS HOTLINE
1-800-242-8511

WISCONSIN STATUTE 182.0175 (1974) REQUIRES NOT LESS THAN 3 WORKING DAYS NOTICE BEFORE YOU EXCAVATE

NOTE:
THE BASE OF THE SWALE SHALL BE 4' MIN., 10' PREFERABLE WIDE, WITH 5:1 SIDE SLOPES. PERIODIC DITCH CHECKS SHALL BE CONSTRUCTED EVERY 30' TO SLOW THE FLOW OF STORMWATER IN THE DITCH. THESE DITCH CHECKS SHALL BE EARTHEN BUMPS 5" HIGH ACROSS THE BASE OF THE SWALE.



BIO-FILTRATION SWALE DETAIL
NOT TO SCALE

WELCH HANSON ASSOCIATES
ENGINEERS • ARCHITECTS
SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS
355 AUSTIN CIRCLE, SUITE 100
DELAFIELD, WISCONSIN 53018
262-646-6855
FAX 262-646-6864
EMAIL INFO@WELCHHANSON.COM

AUBURN HILLS
GRADING AND EROSION CONTROL PLAN
CALEDONIA, WISCONSIN

DETAILS

PROJECT NUMBER	11927
COMPUTER FILE	11927.DWG
DATE	01/23/01
DRAWN BY	IV
CHECKED BY	MM
REVISIONS	11/08/01 T.G. 01/18/02

SHEET NUMBER
7
OF SHEETS

APPENDIX
“B”

Project No. RVRSV 141157
September 27, 2017

Stormwater Management for Auburn Hills Subdivision Update

Auburn Hills is an existing conservation design residential subdivision located on the north side of STH "38" adjacent to the east side of Johnson Park. Two phases were completed about 10 years ago. The developer is considering finishing the construction of the subdivision.

The original stormwater report was compiled by Welch, Hanson & Associates and Applied Ecological Services in 2002. In 2012 the report was modified to meet the new Village requirement to reduce 100-year discharge to the predeveloped 2-year peak flow. Even though the adjustments were approved, the project was not completed at that time (see attached report and memo).

The purpose of this update is to evaluate the current conditions with revisions to Phase III and revise the plan for the Areas B and CD to meet the new Village's requirements.

Below is a summary of the calculations based on the Village of Caledonia Ordinance, to calculate the peak flows. Updated Atlas 14 precipitation depths, along with NRCS MSE3 rainfall distribution were used for the modeling. For the summary of the original report, see attached.

Area B Existing Conditions*

Area = 4.94Ac
Tc = 36.7 min.
Q 1-year storm = 1.84 cfs
Q 2-year storm = 2.61 cfs
Q 10-year storm = 5.73 cfs
Q 100-year storm = 12.69 cfs

Area CD Existing Conditions

Area = 35.08 Ac
CN = 74
Tc = 35.4 min.
Q 1-year storm = 13.09 cfs
Q 2-year storm = 18.54 cfs
Q 10-year storm = 40.69 cfs
Q 100-year storm = 91.23 cfs

*Updated existing conditions flow with Atlas 14 and MSE3 distribution.

Area B Proposed Conditions

To meet the current ordinance, an additional Basin B1 was proposed. The new outfall structure will be constructed and an equalizer pipe will be installed to connect the existing basin with the proposed basin.

Area = 12.9 Ac
Tc = 19.6 min.
Q 1-year storm = 11.55 cfs
Q 2-year storm = 15.03 cfs
Q 10-year storm = 28.02 cfs
Q 100-year storm = 56.03 cfs

Routing Calculations

	Q cfs	HWE
Q 1-year	0.23	717.17
Q 2-year	0.25	717.40
Q 10-year	0.32	718.17
Q 100-year	2.57	718.91

The proposed plan will reduce peak runoff from the 100-year storm to 2.57 cfs. Existing 2-year peak flow is 2.61 cfs. The proposed plan will meet the village ordinance.

Area CD Proposed Conditions

Area CD was split in two subareas. An additional dry basin CD (2) was proposed to improve the original Stormwater Management Plan.

Existing basin CD (1) will be cleaned and the bottom will be lowered from 966.5 to 965.75. The outfall structure will be replaced. Also, a portion of the runoff from Outlot 6 that was originally designed to drain into Basin CD will be redirected to the expanded Basin B.

Area CD (2) draining into Basin CD (2).

Area = 7.2 Ac
Tc = 17.7 min.
Q 1-year storm = 6.45 cfs
Q 2-year storm = 8.39 cfs
Q 10-year storm = 15.64 cfs
Q 100-year storm = 31.27 cfs

Discharge from Basin CD (2)
Q 1-year storm = 4.37 cfs
Q 2-year storm = 5.43 cfs
Q 10-year storm = 8.77 cfs
Q 100-year storm = 25.17 cfs

Discharge from Basin CD (2) and Area CD (1) was added together to calculate the runoff to the Basin CD (1).
Q 1-year storm = 25.13 cfs
Q 2-year storm = 32.66 cfs
Q 10-year storm = 59.42 cfs
Q 100-year storm = 128.42 cfs

Area CD (1):

Area = 25.2 Ac
Tc = 21.5 min.
Q 1-year storm = 27.90 cfs
Q 2-year storm = 27.87 cfs
Q 10-year storm = 52.19 cfs
Q 100-year storm = 104.12 cfs

Routing Calculations

	Q cfs	**HWE**
Q 1-year	2.41	696.26
Q 2-year	3.85	696.63
Q 10-year	10.50	697.82
Q 100-year	17.34	700.09

The proposed plan will reduce runoff from the 100-year storm to 17.34 cfs. Existing 2-year peak flow is 18.54 cfs. The proposed plan will meet the village ordinance.

All basins were modeled under "plugged" conditions for 100 year storm event to verify a safety path. Below is the summary:

	Basin B	Basin CD(2)	Basin CD (1)
HWE	719.13	705.52	700.56

STORMWATER MANAGEMENT DURING CONSTRUCTION:

Runoff from Area B during construction will be controlled by the Basin B1 being utilized as temporary sediment basin during construction. Technical Standard 1064 of the Wisconsin DNR establishes the minimum standards for design, installation, and performance requirements for sediment basins and was used in determining the minimum treatment surface area for each basin. Sediment basins meeting the criteria in this standard area deemed 80% effective in trapping sediment. The minimum surface area of the sediment basin, measured at the invert of the lowest outlet, should be sized based on each basin's soil texture and the peak outflow during a 1-year, 24 hour storm event using the following equation:

Sa = 1.2* (qout/Vs)

Where: **Sa** = Treatment surface area measured at the invert of the lower outlet of the sediment basin (square feet)
qout = Peak outflow (cubic feet/second) during the 1-year, 24 hour storm design for the principal outlet
Vs = Particle settling velocity (feet/second) – 0.000073 for silt loam
1.2 = EPA recommended safety factor

Peak flow was calculated using curve number of 91 HSG C bare soils and a time of concentration of 10min. was assumed.

The 1-year, 24 hour peak outflows for Basin B1 is 0.3 cfs. The calculations for the required wet surface area of the temporary sediment basins are shown below:

Sa = 1.2(0.3/0.000073) = 4,981 sq. ft.

The actual pond area at the outlet inverts for Basin B is 5,721. The pond is greater than what is required to meet water quality standards during construction.

Runoff from Area CD during construction will be controlled by two sediment traps.

The minimum surface area for the trap per Technical Standard 1063 of the Wisconsin DNR.

As = 1,560*Adr.

Basin CD (2) will be utilized as sediment trap. The drainage area is 5.0 Ac

As = 1,560*5 = 7,800 SF

Drainage area to the sediment trap Phase III – A and B is 3.1 Ac

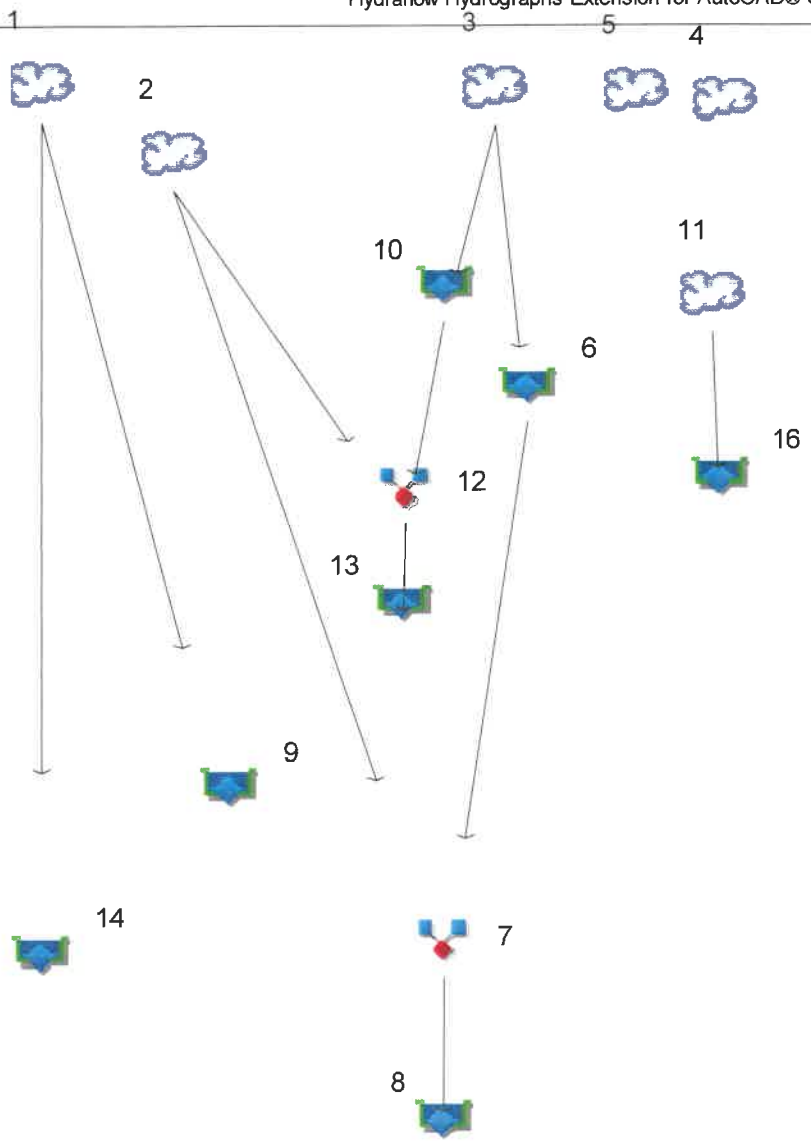
As = 1,560*3.1 = 4,800 SF

WATER QUALITY

The original water quality analysis were performed by Applied Ecological services (attached). Also, WinSLAMM v. 10.1 was used to calculate the water quality reductions for Area B. The proposed watershed was evaluated using the estimated land uses as stated in "Methodologies & Assumptions" above. Based on the model, 93.03% of the total suspended solids (TSS) would be reduced as compared to no runoff management controls. This would exceed the Village of Caledonia's requirement that new developments reduce TSS by at least 80%.

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5



Legend

Hyd.	Origin	Description
1	SCS Runoff	Area B proposed
2	SCS Runoff	Area CD(1) proposed
3	SCS Runoff	Area CD (2) proposed
4	SCS Runoff	Area B Existing
5	SCS Runoff	Area CD Existing
6	Reservoir	Basin CD (2) route
7	Combine	Total flow to CD (1)
8	Reservoir	Area CD outflow
9	Reservoir	Area B outflow
10	Reservoir	Basin CD (2) plugged r
11	SCS Runoff	Area B proposed construction
12	Combine	flow into Basin CD (1)
13	Reservoir	Plugged CD (1) route
14	Reservoir	CD (1) plugged route
16	Reservoir	during construction

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	-----	11.55	15.03	-----	-----	28.02	-----	-----	56.03	Area B proposed
2	SCS Runoff	-----	21.38	27.87	-----	-----	52.19	-----	-----	104.12	Area CD(1) proposed
3	SCS Runoff	-----	6.449	8.388	-----	-----	15.64	-----	-----	31.27	Area CD (2) proposed
4	SCS Runoff	-----	1.844	2.610	-----	-----	5.730	-----	-----	12.86	Area B Existing
5	SCS Runoff	-----	13.09	18.54	-----	-----	40.69	-----	-----	91.33	Area CD Existing
6	Reservoir	3	4.369	5.426	-----	-----	8.772	-----	-----	25.17	Basin CD (2) route
7	Combine	2, 6	25.13	32.66	-----	-----	59.42	-----	-----	128.42	Total flow to CD (1)
8	Reservoir	7	2.406	3.851	-----	-----	10.50	-----	-----	17.34	Area CD outflow
9	Reservoir	1	0.227	0.252	-----	-----	0.323	-----	-----	2.571	Area B outflow
10	Reservoir	3	0.000	0.000	-----	-----	1.392	-----	-----	24.62	Basin CD (2) plugged r
11	SCS Runoff	-----	27.51	32.76	-----	-----	50.91	-----	-----	86.11	Area B proposed construction
12	Combine	2, 10,	21.38	27.87	-----	-----	52.19	-----	-----	122.13	flow into Basin CD (1)
13	Reservoir	12	0.000	0.000	-----	-----	0.000	-----	-----	10.75	Plugged CD (1) route
14	Reservoir	1	0.000	0.000	-----	-----	0.000	-----	-----	1.854	CD (1) plugged route
16	Reservoir	11	0.302	0.321	-----	-----	1.678	-----	-----	9.433	during construction

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

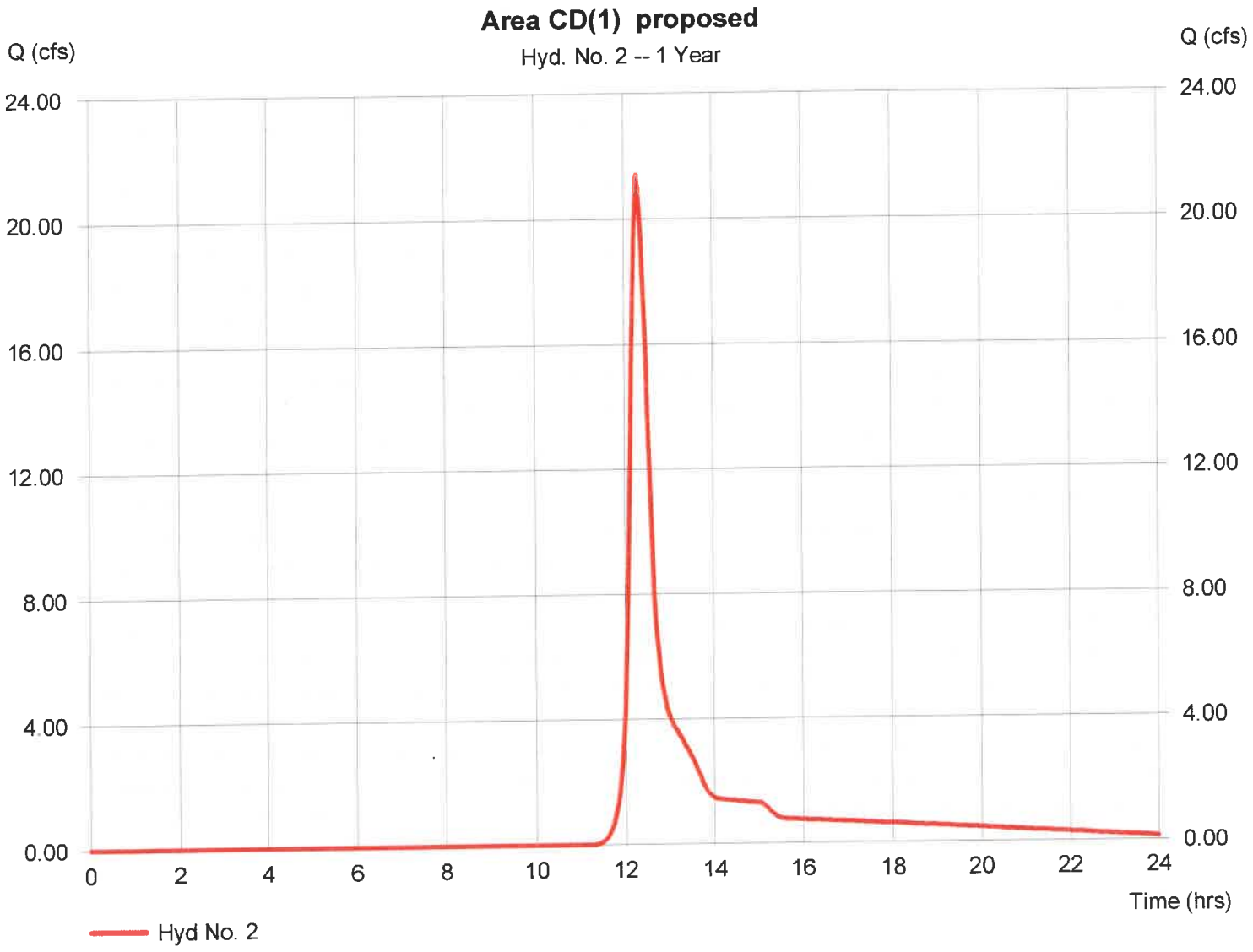
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	11.55	2	736	36,843	-----	-----	-----	Area B proposed
2	SCS Runoff	21.38	2	738	75,001	-----	-----	-----	Area CD(1) proposed
3	SCS Runoff	6.449	2	736	20,563	-----	-----	-----	Area CD (2) proposed
4	SCS Runoff	1.844	2	750	9,321	-----	-----	-----	Area B Existing
5	SCS Runoff	13.09	2	750	66,194	-----	-----	-----	Area CD Existing
6	Reservoir	4.369	2	746	20,562	3	700.49	4,008	Basin CD (2) route
7	Combine	25.13	2	738	95,563	2, 6	-----	-----	Total flow to CD (1)
8	Reservoir	2.406	2	830	94,754	7	696.26	54,552	Area CD outflow
9	Reservoir	0.227	2	1190	35,185	1	717.17	28,623	Area B outflow
10	Reservoir	0.000	2	n/a	0	3	703.50	20,563	Basin CD (2) plugged r
11	SCS Runoff	27.51	2	730	71,208	-----	-----	-----	Area B proposed construction
12	Combine	21.38	2	738	75,001	2, 10,	-----	-----	flow into Basin CD (1)
13	Reservoir	0.000	2	n/a	0	12	696.76	75,001	Plugged CD (1) route
14	Reservoir	0.000	2	n/a	0	1	717.37	36,843	CD (1) plugged route
16	Reservoir	0.302	2	1200	65,662	11	717.93	59,740	during construction

Hydrograph Report

Hyd. No. 2

Area CD(1) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 21.38 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 75,001 cuft
Drainage area	= 25.800 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.50 min
Total precip.	= 2.35 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2cds	Shape factor	= 484

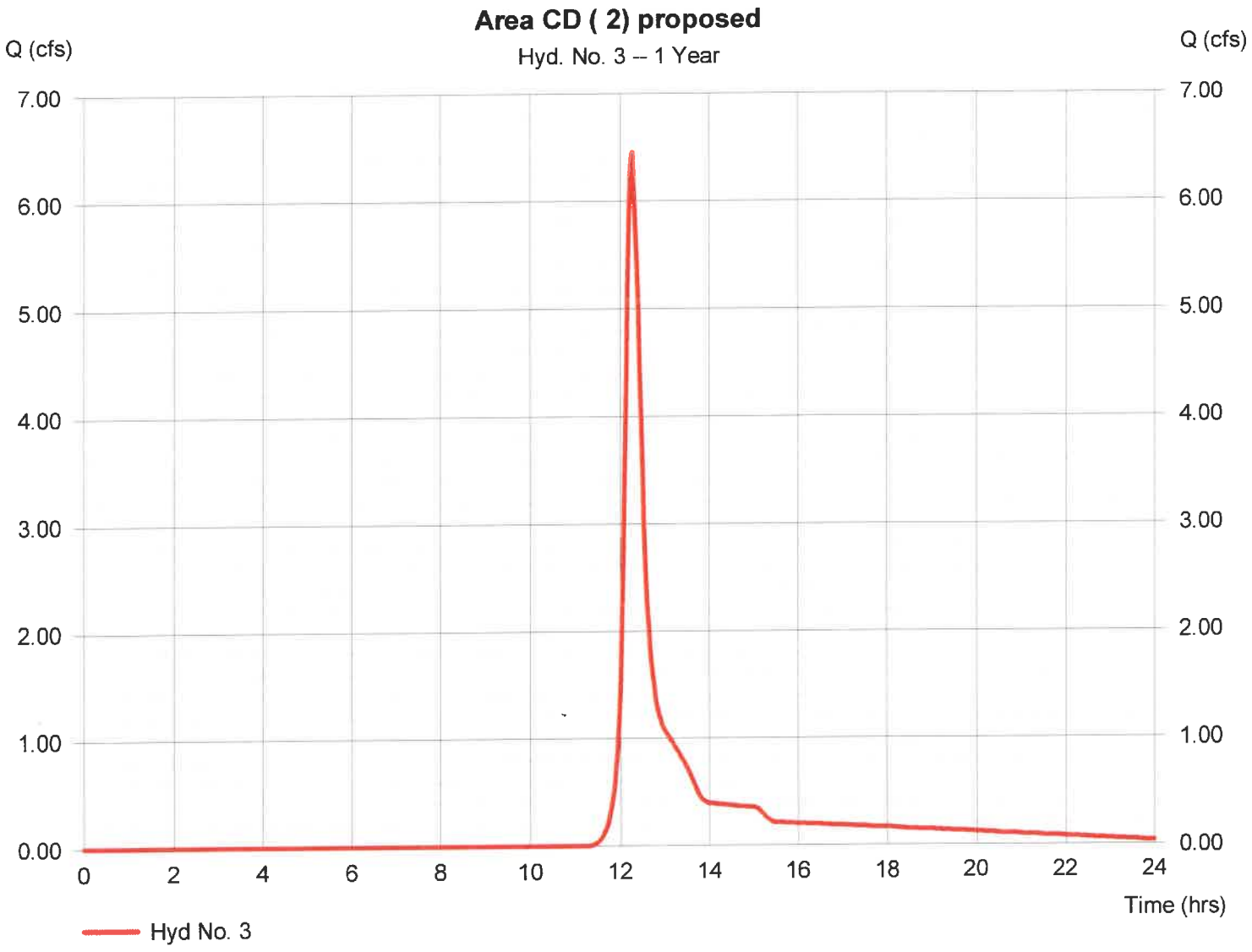


Hydrograph Report

Hyd. No. 3

Area CD (2) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 6.449 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 20,563 cuft
Drainage area	= 7.200 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.70 min
Total precip.	= 2.35 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2.cds	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No. 3

Area CD (2) proposed

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 140.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.67		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 15.52**	**+**	**0.00**	**+**	**0.00**	**=**	**15.52**
Shallow Concentrated Flow							
Flow length (ft)	= 130.00		120.00		0.00		
Watercourse slope (%)	= 3.00		0.50		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.79		1.44		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.39**	**+**	**0.00**	**=**	**2.17**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00		0.00		0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

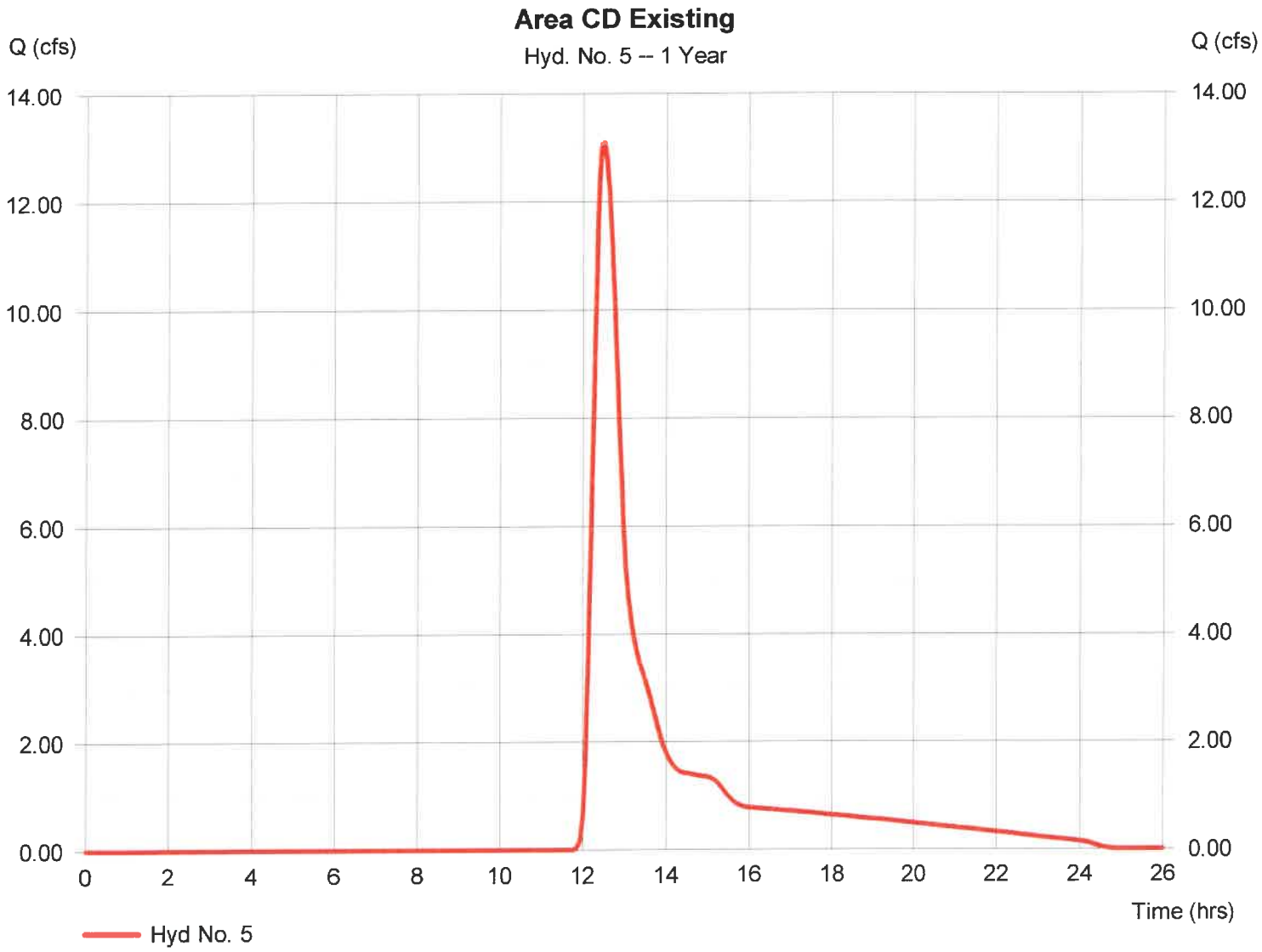
Total Travel Time, Tc ..... 17.70 min

Hydrograph Report

Hyd. No. 5

Area CD Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 13.09 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.50 hrs
Time interval	= 2 min	Hyd. volume	= 66,194 cuft
Drainage area	= 35.080 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.40 min
Total precip.	= 2.35 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2yr.csv	Shape factor	= 484



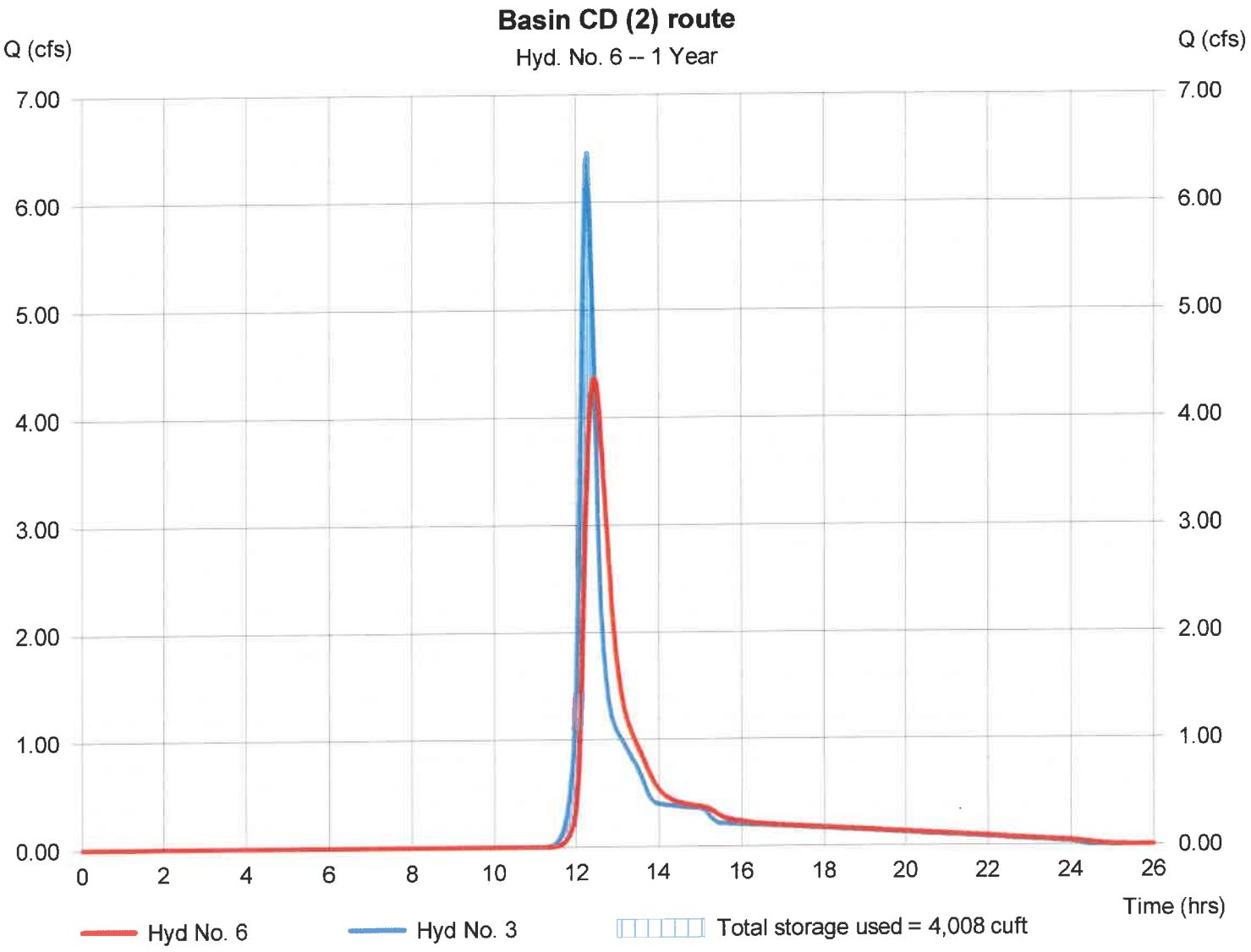
Hydrograph Report

Hyd. No. 6

Basin CD (2) route

Hydrograph type	= Reservoir	Peak discharge	= 4.369 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 20,562 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 700.49 ft
Reservoir name	= basin CD (2)	Max. Storage	= 4,008 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - basin CD (2)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 699.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	699.10	2,046	0	0
0.90	700.00	3,000	2,257	2,257
1.90	701.00	4,204	3,585	5,842
2.90	702.00	5,506	4,840	10,681
3.90	703.00	6,903	6,191	16,872
4.90	704.00	8,398	7,638	24,510
5.90	705.00	9,930	9,152	33,662
6.90	706.00	12,000	10,948	44,610

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	18.00	0.00	0.00
Span (in)	= 24.00	18.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 699.00	699.00	0.00	0.00
Length (ft)	= 49.00	0.00	0.00	0.00
Slope (%)	= 0.30	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)	= 12.56	20.00	0.00	0.00
Crest El. (ft)	= 702.25	705.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	699.10	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
0.09	226	699.19	0.14 oc	0.13 ic	---	---	0.00	0.00	---	---	---	---	0.134
0.18	451	699.28	0.29 oc	0.27 ic	---	---	0.00	0.00	---	---	---	---	0.271
0.27	677	699.37	0.48 oc	0.47 ic	---	---	0.00	0.00	---	---	---	---	0.468
0.36	903	699.46	0.70 oc	0.70 ic	---	---	0.00	0.00	---	---	---	---	0.697
0.45	1,128	699.55	0.96 oc	0.95 ic	---	---	0.00	0.00	---	---	---	---	0.951
0.54	1,354	699.64	1.27 oc	1.22 ic	---	---	0.00	0.00	---	---	---	---	1.219
0.63	1,580	699.73	1.55 oc	1.55 ic	---	---	0.00	0.00	---	---	---	---	1.554
0.72	1,805	699.82	1.86 oc	1.86 ic	---	---	0.00	0.00	---	---	---	---	1.863
0.81	2,031	699.91	2.19 oc	2.19 ic	---	---	0.00	0.00	---	---	---	---	2.193
0.90	2,257	700.00	2.54 oc	2.54 ic	---	---	0.00	0.00	---	---	---	---	2.538
1.00	2,615	700.10	2.97 oc	2.95 ic	---	---	0.00	0.00	---	---	---	---	2.948
1.10	2,974	700.20	3.33 oc	3.33 ic	---	---	0.00	0.00	---	---	---	---	3.332
1.20	3,332	700.30	3.77 oc	3.70 ic	---	---	0.00	0.00	---	---	---	---	3.697
1.30	3,691	700.40	4.13 oc	4.08 ic	---	---	0.00	0.00	---	---	---	---	4.080
1.40	4,049	700.50	4.41 oc	4.41 ic	---	---	0.00	0.00	---	---	---	---	4.406
1.50	4,408	700.60	4.74 oc	4.70 ic	---	---	0.00	0.00	---	---	---	---	4.704
1.60	4,766	700.70	5.00 oc	5.00 ic	---	---	0.00	0.00	---	---	---	---	4.999
1.70	5,125	700.80	5.24 oc	5.24 ic	---	---	0.00	0.00	---	---	---	---	5.241
1.80	5,483	700.90	5.52 oc	5.50 ic	---	---	0.00	0.00	---	---	---	---	5.501
1.90	5,842	701.00	5.73 oc	5.73 ic	---	---	0.00	0.00	---	---	---	---	5.728
2.00	6,326	701.10	5.96 oc	5.96 ic	---	---	0.00	0.00	---	---	---	---	5.959
2.10	6,810	701.20	6.20 oc	6.18 ic	---	---	0.00	0.00	---	---	---	---	6.175
2.20	7,294	701.30	6.39 oc	6.37 ic	---	---	0.00	0.00	---	---	---	---	6.368
2.30	7,778	701.40	6.56 oc	6.54 ic	---	---	0.00	0.00	---	---	---	---	6.540
2.40	8,262	701.50	6.68 oc	6.68 ic	---	---	0.00	0.00	---	---	---	---	6.678
2.50	8,746	701.60	6.74 oc	6.74 ic	---	---	0.00	0.00	---	---	---	---	6.736
2.60	9,230	701.70	7.03 oc	7.03 ic	---	---	0.00	0.00	---	---	---	---	7.031
2.70	9,714	701.80	7.44 oc	7.43 ic	---	---	0.00	0.00	---	---	---	---	7.435
2.80	10,197	701.90	7.82 oc	7.82 ic	---	---	0.00	0.00	---	---	---	---	7.818
2.90	10,681	702.00	8.18 oc	8.18 ic	---	---	0.00	0.00	---	---	---	---	8.183
3.00	11,301	702.10	8.53 oc	8.53 ic	---	---	0.00	0.00	---	---	---	---	8.533
3.10	11,920	702.20	8.87 oc	8.87 ic	---	---	0.00	0.00	---	---	---	---	8.868
3.20	12,539	702.30	9.57 oc	9.10 ic	---	---	0.47	0.00	---	---	---	---	9.566
3.30	13,158	702.40	11.41 oc	8.99 ic	---	---	2.43	0.00	---	---	---	---	11.41

Continues on next page...

basin CD (2)

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.40	13,777	702.50	13.80 oc	8.58 ic	---	---	5.22	0.00	---	---	---	---	13.80
3.50	14,396	702.60	16.49 oc	7.83 ic	---	---	8.65	0.00	---	---	---	---	16.49
3.60	15,015	702.70	19.29 oc	6.67 ic	---	---	12.62	0.00	---	---	---	---	19.29
3.70	15,634	702.80	21.57 oc	5.43 ic	---	---	16.14 s	0.00	---	---	---	---	21.57
3.80	16,253	702.90	22.92 oc	4.72 ic	---	---	18.20 s	0.00	---	---	---	---	22.92
3.90	16,872	703.00	23.99 oc	4.18 ic	---	---	19.82 s	0.00	---	---	---	---	23.99
4.00	17,636	703.10	24.91 oc	3.74 ic	---	---	21.16 s	0.00	---	---	---	---	24.90
4.10	18,400	703.20	25.71 oc	3.38 ic	---	---	22.33 s	0.00	---	---	---	---	25.71
4.20	19,163	703.30	26.44 oc	3.09 ic	---	---	23.35 s	0.00	---	---	---	---	26.44
4.30	19,927	703.40	27.12 oc	2.84 ic	---	---	24.28 s	0.00	---	---	---	---	27.12
4.40	20,691	703.50	27.76 oc	2.62 ic	---	---	25.14 s	0.00	---	---	---	---	27.76
4.50	21,455	703.60	28.37 ic	2.44 ic	---	---	25.92 s	0.00	---	---	---	---	28.35
4.60	22,218	703.70	28.81 ic	2.26 ic	---	---	26.54 s	0.00	---	---	---	---	28.80
4.70	22,982	703.80	29.24 ic	2.11 ic	---	---	27.12 s	0.00	---	---	---	---	29.23
4.80	23,746	703.90	29.66 ic	1.98 ic	---	---	27.67 s	0.00	---	---	---	---	29.65
4.90	24,510	704.00	30.07 ic	1.86 ic	---	---	28.19 s	0.00	---	---	---	---	30.05
5.00	25,425	704.10	30.47 ic	1.75 ic	---	---	28.70 s	0.00	---	---	---	---	30.45
5.10	26,340	704.20	30.86 ic	1.66 ic	---	---	29.19 s	0.00	---	---	---	---	30.85
5.20	27,255	704.30	31.24 ic	1.57 ic	---	---	29.65 s	0.00	---	---	---	---	31.22
5.30	28,171	704.40	31.61 ic	1.50 ic	---	---	30.10 s	0.00	---	---	---	---	31.60
5.40	29,086	704.50	31.98 ic	1.43 ic	---	---	30.53 s	0.00	---	---	---	---	31.96
5.50	30,001	704.60	32.35 ic	1.36 ic	---	---	30.94 s	0.00	---	---	---	---	32.30
5.60	30,916	704.70	32.71 ic	1.31 ic	---	---	31.36 s	0.00	---	---	---	---	32.67
5.70	31,832	704.80	33.06 ic	1.26 ic	---	---	31.80 s	0.00	---	---	---	---	33.05
5.80	32,747	704.90	33.41 ic	1.21 ic	---	---	32.19 s	0.00	---	---	---	---	33.39
5.90	33,662	705.00	33.76 ic	1.16 ic	---	---	32.58 s	0.00	---	---	---	---	33.75
6.00	34,757	705.10	34.10 ic	1.12 ic	---	---	32.97 s	1.64	---	---	---	---	35.73
6.10	35,852	705.20	34.44 ic	1.08 ic	---	---	33.35 s	4.65	---	---	---	---	39.08
6.20	36,946	705.30	34.77 ic	1.04 ic	---	---	33.71 s	8.54	---	---	---	---	43.29
6.30	38,041	705.40	35.10 ic	1.01 ic	---	---	34.05 s	13.15	---	---	---	---	48.21
6.40	39,136	705.50	35.43 ic	0.98 ic	---	---	34.40 s	18.38	---	---	---	---	53.76
6.50	40,231	705.60	35.75 ic	0.95 ic	---	---	34.74 s	24.16	---	---	---	---	59.85
6.60	41,325	705.70	36.07 ic	0.92 ic	---	---	35.13 s	30.44	---	---	---	---	66.50
6.70	42,420	705.80	36.39 ic	0.90 ic	---	---	35.45 s	37.19	---	---	---	---	73.54
6.80	43,515	705.90	36.70 ic	0.87 ic	---	---	35.79 s	44.38	---	---	---	---	81.05
6.90	44,610	706.00	37.02 ic	0.85 ic	---	---	36.16 s	52.00	---	---	---	---	89.01

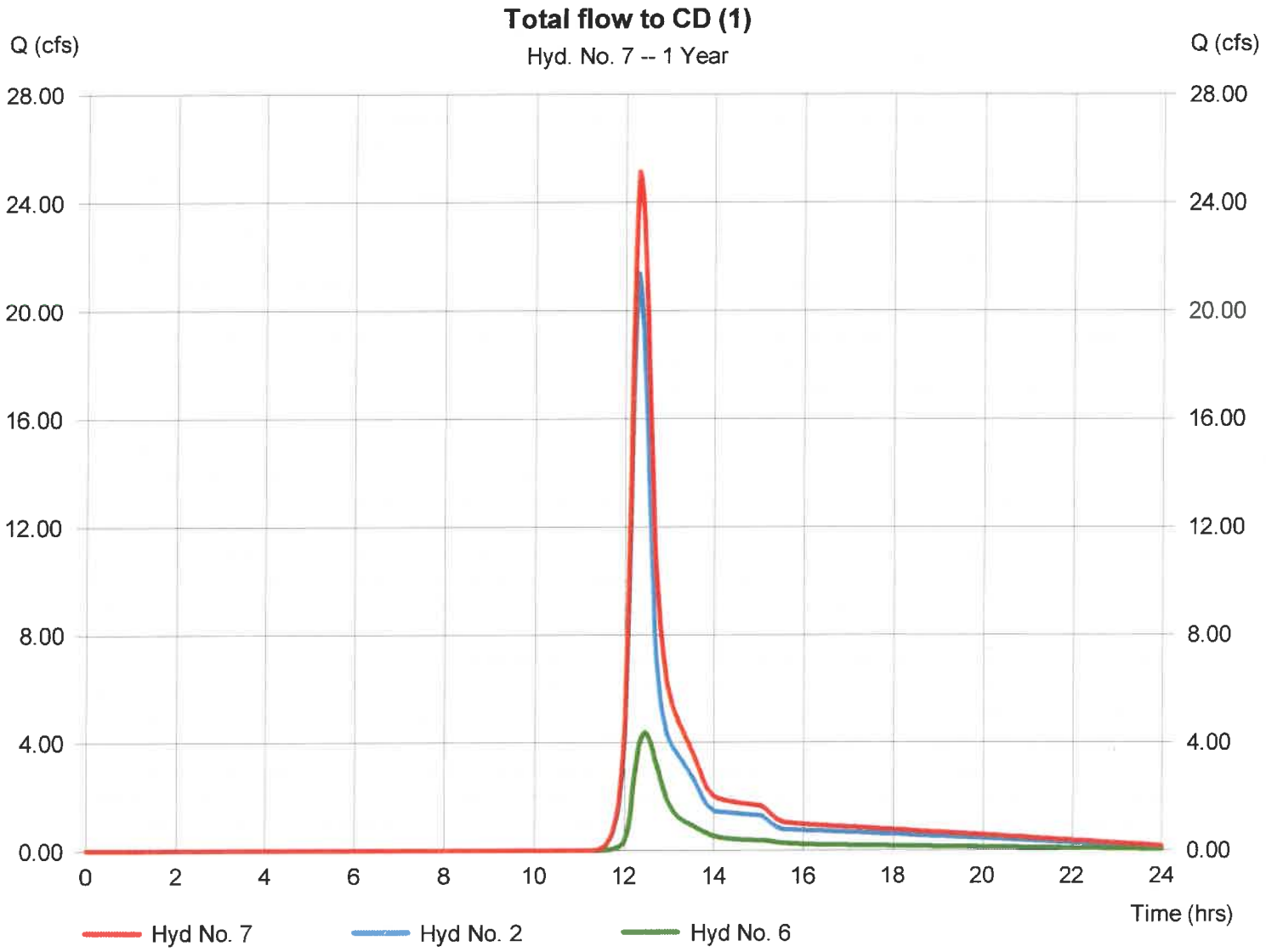
...End

Hydrograph Report

Hyd. No. 7

Total flow to CD (1)

Hydrograph type	= Combine	Peak discharge	= 25.13 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 95,563 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 25.800 ac



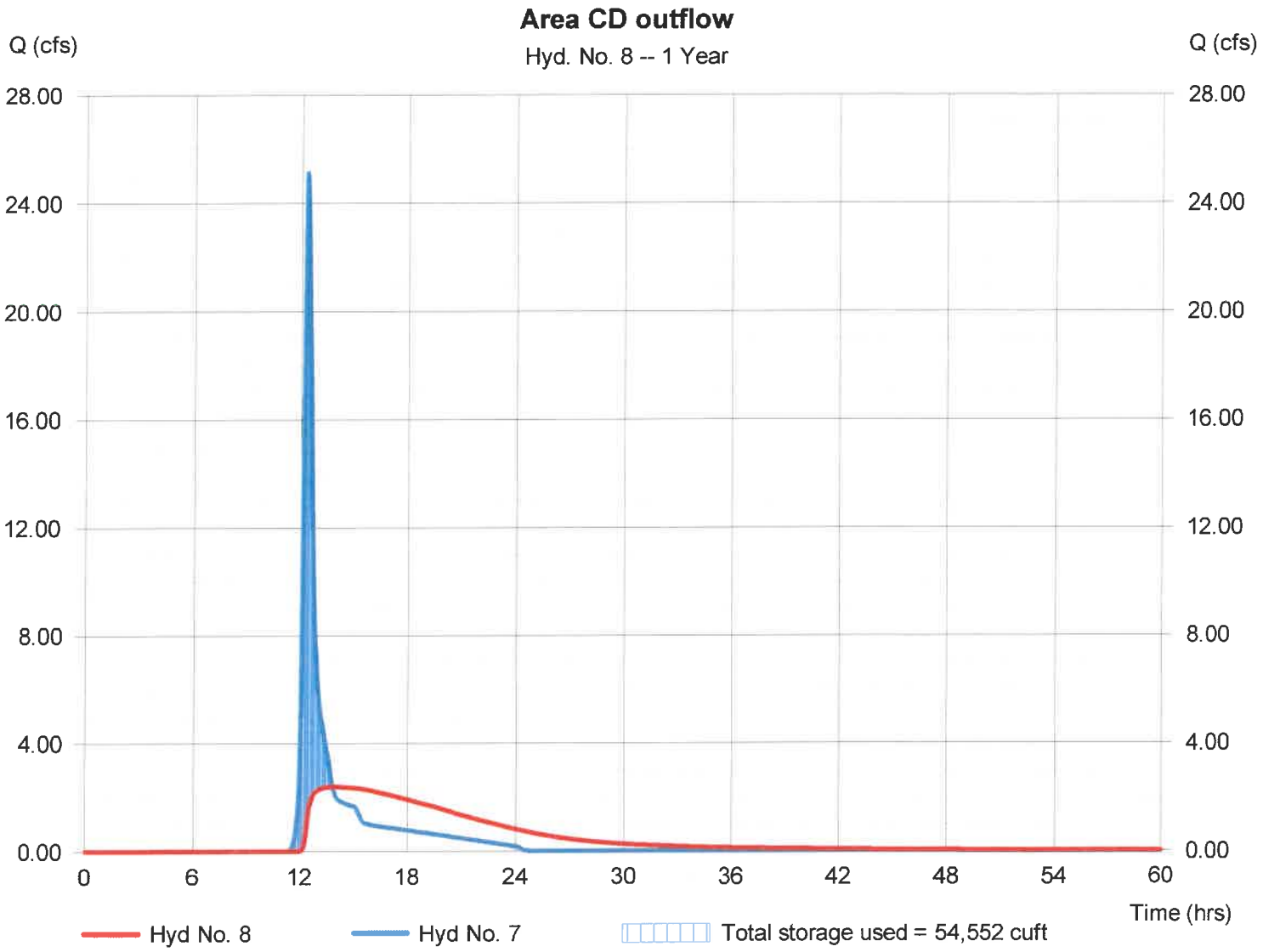
Hydrograph Report

Hyd. No. 8

Area CD outflow

Hydrograph type	= Reservoir	Peak discharge	= 2.406 cfs
Storm frequency	= 1 yrs	Time to peak	= 13.83 hrs
Time interval	= 2 min	Hyd. volume	= 94,754 cuft
Inflow hyd. No.	= 7 - Total flow to CD (1)	Max. Elevation	= 696.26 ft
Reservoir name	= CD (1)	Max. Storage	= 54,552 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - CD (1)

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 694.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	694.75	31,495	0	0
1.00	695.75	36,090	33,763	33,763
2.25	697.00	45,777	51,042	84,805
3.25	698.00	47,000	46,382	131,188
4.25	699.00	59,200	52,978	184,165
5.25	700.00	68,500	63,787	247,952
6.25	701.00	89,000	78,519	326,471

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	12.00	0.00	0.00
Span (in)	= 18.00	12.00	0.00	0.00
No. Barrels	= 1	2	0	0
Invert El. (ft)	= 694.75	694.75	0.00	0.00
Length (ft)	= 60.00	0.00	0.00	0.00
Slope (%)	= 0.12	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)	= 12.56	15.00	0.00	0.00
Crest El. (ft)	= 697.50	700.20	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	694.75	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
0.10	3,376	694.85	0.03 oc	0.03 ic	---	---	0.00	0.00	---	---	---	---	0.030
0.20	6,753	694.95	0.12 oc	0.12 ic	---	---	0.00	0.00	---	---	---	---	0.116
0.30	10,129	695.05	0.24 oc	0.24 ic	---	---	0.00	0.00	---	---	---	---	0.244
0.40	13,505	695.15	0.41 oc	0.41 ic	---	---	0.00	0.00	---	---	---	---	0.411
0.50	16,882	695.25	0.60 oc	0.60 ic	---	---	0.00	0.00	---	---	---	---	0.598
0.60	20,258	695.35	0.79 oc	0.79 ic	---	---	0.00	0.00	---	---	---	---	0.789
0.70	23,634	695.45	1.02 oc	1.02 ic	---	---	0.00	0.00	---	---	---	---	1.022
0.80	27,010	695.55	1.24 oc	1.24 ic	---	---	0.00	0.00	---	---	---	---	1.237
0.90	30,387	695.65	1.45 oc	1.45 ic	---	---	0.00	0.00	---	---	---	---	1.450
1.00	33,763	695.75	1.66 oc	1.66 ic	---	---	0.00	0.00	---	---	---	---	1.655
1.13	38,867	695.88	1.89 oc	1.89 ic	---	---	0.00	0.00	---	---	---	---	1.888
1.25	43,971	696.00	2.10 oc	2.10 ic	---	---	0.00	0.00	---	---	---	---	2.102
1.38	49,076	696.13	2.27 oc	2.27 ic	---	---	0.00	0.00	---	---	---	---	2.273
1.50	54,180	696.25	2.39 oc	2.39 ic	---	---	0.00	0.00	---	---	---	---	2.395
1.63	59,284	696.38	2.55 oc	2.55 ic	---	---	0.00	0.00	---	---	---	---	2.547
1.75	64,388	696.50	3.26 oc	3.26 ic	---	---	0.00	0.00	---	---	---	---	3.257
1.88	69,492	696.63	3.84 oc	3.84 ic	---	---	0.00	0.00	---	---	---	---	3.838
2.00	74,597	696.75	4.34 oc	4.34 ic	---	---	0.00	0.00	---	---	---	---	4.342
2.13	79,701	696.88	4.79 oc	4.79 ic	---	---	0.00	0.00	---	---	---	---	4.793
2.25	84,805	697.00	5.21 oc	5.20 ic	---	---	0.00	0.00	---	---	---	---	5.205
2.35	89,443	697.10	5.51 oc	5.51 ic	---	---	0.00	0.00	---	---	---	---	5.513
2.45	94,082	697.20	5.80 oc	5.80 ic	---	---	0.00	0.00	---	---	---	---	5.804
2.55	98,720	697.30	6.08 oc	6.08 ic	---	---	0.00	0.00	---	---	---	---	6.081
2.65	103,358	697.40	6.35 oc	6.35 ic	---	---	0.00	0.00	---	---	---	---	6.346
2.75	107,996	697.50	6.60 oc	6.60 ic	---	---	0.00	0.00	---	---	---	---	6.601
2.85	112,635	697.60	7.58 oc	6.26 ic	---	---	1.32	0.00	---	---	---	---	7.575
2.95	117,273	697.70	8.99 oc	5.25 ic	---	---	3.74	0.00	---	---	---	---	8.991
3.05	121,911	697.80	10.36 oc	3.72 ic	---	---	6.64 s	0.00	---	---	---	---	10.36
3.15	126,549	697.90	11.06 oc	2.93 ic	---	---	8.13 s	0.00	---	---	---	---	11.06
3.25	131,188	698.00	11.57 oc	2.41 ic	---	---	9.16 s	0.00	---	---	---	---	11.57
3.35	136,485	698.10	12.00 oc	2.04 ic	---	---	9.96 s	0.00	---	---	---	---	11.99
3.45	141,783	698.20	12.37 oc	1.76 ic	---	---	10.61 s	0.00	---	---	---	---	12.37
3.55	147,081	698.30	12.72 oc	1.55 ic	---	---	11.17 s	0.00	---	---	---	---	12.72
3.65	152,379	698.40	13.05 oc	1.38 ic	---	---	11.66 s	0.00	---	---	---	---	13.04
3.75	157,676	698.50	13.36 oc	1.24 ic	---	---	12.12 s	0.00	---	---	---	---	13.36

Continues on next page...

CD (1)

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.85	162,974	698.60	13.66 oc	1.13 ic	---	---	12.52 s	0.00	---	---	---	---	13.64
3.95	168,272	698.70	13.96 oc	1.03 ic	---	---	12.90 s	0.00	---	---	---	---	13.94
4.05	173,570	698.80	14.24 oc	0.95 ic	---	---	13.26 s	0.00	---	---	---	---	14.21
4.15	178,867	698.90	14.52 oc	0.88 ic	---	---	13.59 s	0.00	---	---	---	---	14.47
4.25	184,165	699.00	14.79 oc	0.82 ic	---	---	13.92 s	0.00	---	---	---	---	14.74
4.35	190,544	699.10	15.05 oc	0.77 ic	---	---	14.26 s	0.00	---	---	---	---	15.04
4.45	196,923	699.20	15.31 oc	0.73 ic	---	---	14.58 s	0.00	---	---	---	---	15.31
4.55	203,301	699.30	15.57 oc	0.69 ic	---	---	14.82 s	0.00	---	---	---	---	15.50
4.65	209,680	699.40	15.81 oc	0.65 ic	---	---	15.15 s	0.00	---	---	---	---	15.80
4.75	216,059	699.50	16.06 oc	0.62 ic	---	---	15.38 s	0.00	---	---	---	---	15.99
4.85	222,437	699.60	16.30 oc	0.59 ic	---	---	15.68 s	0.00	---	---	---	---	16.27
4.95	228,816	699.70	16.54 oc	0.56 ic	---	---	15.87 s	0.00	---	---	---	---	16.43
5.05	235,195	699.80	16.78 oc	0.54 ic	---	---	16.22 s	0.00	---	---	---	---	16.76
5.15	241,574	699.90	17.01 oc	0.52 ic	---	---	16.49 s	0.00	---	---	---	---	17.01
5.25	247,952	700.00	17.24 oc	0.49 ic	---	---	16.63 s	0.00	---	---	---	---	17.12
5.35	255,804	700.10	17.46 oc	0.48 ic	---	---	16.89 s	0.00	---	---	---	---	17.37
5.45	263,656	700.20	17.68 oc	0.46 ic	---	---	17.10 s	0.00	---	---	---	---	17.55
5.55	271,508	700.30	17.90 oc	0.44 ic	---	---	17.27 s	1.23	---	---	---	---	18.95
5.65	279,360	700.40	18.12 oc	0.43 ic	---	---	17.55 s	3.49	---	---	---	---	21.46
5.75	287,212	700.50	18.33 oc	0.41 ic	---	---	17.78 s	6.40	---	---	---	---	24.60
5.85	295,063	700.60	18.54 oc	0.40 ic	---	---	17.96 s	9.86	---	---	---	---	28.22
5.95	302,915	700.70	18.75 oc	0.39 ic	---	---	18.35 s	13.78	---	---	---	---	32.52
6.05	310,767	700.80	18.96 oc	0.38 ic	---	---	18.50 s	18.12	---	---	---	---	37.00
6.15	318,619	700.90	19.16 oc	0.36 ic	---	---	18.53 s	22.83	---	---	---	---	41.72
6.25	326,471	701.00	19.37 oc	0.36 ic	---	---	18.96 s	27.91	---	---	---	---	47.22

...End

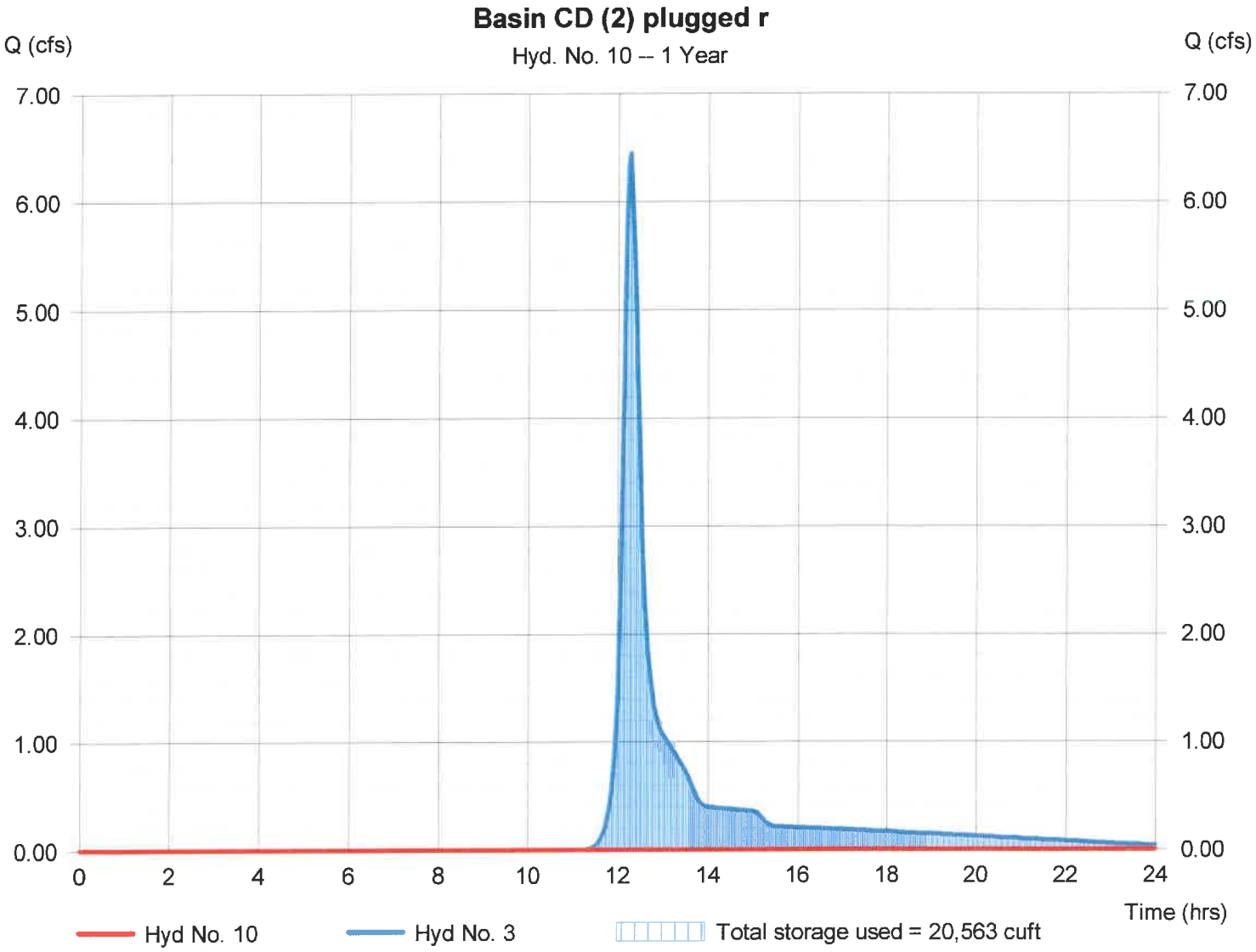
Hydrograph Report

Hyd. No. 10

Basin CD (2) plugged r

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 703.50 ft
Reservoir name	= basin CD (2) plugged	Max. Storage	= 20,563 cuft

Storage Indication method used.



Pond Report

Pond No. 6 - basin CD (2) plugged

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 699.15 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	699.15	2,046	0	0
0.85	700.00	3,000	2,131	2,131
1.85	701.00	4,204	3,585	5,716
2.85	702.00	5,506	4,840	10,556
3.85	703.00	6,903	6,191	16,747
4.85	704.00	8,398	7,638	24,384
5.85	705.00	9,930	9,152	33,537
6.85	706.00	11,523	10,716	44,252

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 705.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	699.15	---	---	---	---	0.00	---	---	---	---	---	0.000
0.09	213	699.23	---	---	---	---	0.00	---	---	---	---	---	0.000
0.17	426	699.32	---	---	---	---	0.00	---	---	---	---	---	0.000
0.25	639	699.41	---	---	---	---	0.00	---	---	---	---	---	0.000
0.34	853	699.49	---	---	---	---	0.00	---	---	---	---	---	0.000
0.43	1,066	699.58	---	---	---	---	0.00	---	---	---	---	---	0.000
0.51	1,279	699.66	---	---	---	---	0.00	---	---	---	---	---	0.000
0.60	1,492	699.75	---	---	---	---	0.00	---	---	---	---	---	0.000
0.68	1,705	699.83	---	---	---	---	0.00	---	---	---	---	---	0.000
0.76	1,918	699.92	---	---	---	---	0.00	---	---	---	---	---	0.000
0.85	2,131	700.00	---	---	---	---	0.00	---	---	---	---	---	0.000
0.95	2,490	700.10	---	---	---	---	0.00	---	---	---	---	---	0.000
1.05	2,848	700.20	---	---	---	---	0.00	---	---	---	---	---	0.000
1.15	3,207	700.30	---	---	---	---	0.00	---	---	---	---	---	0.000
1.25	3,565	700.40	---	---	---	---	0.00	---	---	---	---	---	0.000
1.35	3,924	700.50	---	---	---	---	0.00	---	---	---	---	---	0.000
1.45	4,282	700.60	---	---	---	---	0.00	---	---	---	---	---	0.000
1.55	4,641	700.70	---	---	---	---	0.00	---	---	---	---	---	0.000
1.65	4,999	700.80	---	---	---	---	0.00	---	---	---	---	---	0.000
1.75	5,358	700.90	---	---	---	---	0.00	---	---	---	---	---	0.000
1.85	5,716	701.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.95	6,200	701.10	---	---	---	---	0.00	---	---	---	---	---	0.000
2.05	6,684	701.20	---	---	---	---	0.00	---	---	---	---	---	0.000
2.15	7,168	701.30	---	---	---	---	0.00	---	---	---	---	---	0.000
2.25	7,652	701.40	---	---	---	---	0.00	---	---	---	---	---	0.000
2.35	8,136	701.50	---	---	---	---	0.00	---	---	---	---	---	0.000
2.45	8,620	701.60	---	---	---	---	0.00	---	---	---	---	---	0.000
2.55	9,104	701.70	---	---	---	---	0.00	---	---	---	---	---	0.000
2.65	9,588	701.80	---	---	---	---	0.00	---	---	---	---	---	0.000
2.75	10,072	701.90	---	---	---	---	0.00	---	---	---	---	---	0.000
2.85	10,556	702.00	---	---	---	---	0.00	---	---	---	---	---	0.000
2.95	11,175	702.10	---	---	---	---	0.00	---	---	---	---	---	0.000
3.05	11,794	702.20	---	---	---	---	0.00	---	---	---	---	---	0.000
3.15	12,413	702.30	---	---	---	---	0.00	---	---	---	---	---	0.000
3.25	13,032	702.40	---	---	---	---	0.00	---	---	---	---	---	0.000

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basin CD (2) plugged

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.35	13,651	702.50	---	---	---	---	0.00	---	---	---	---	---	0.000
3.45	14,271	702.60	---	---	---	---	0.00	---	---	---	---	---	0.000
3.55	14,890	702.70	---	---	---	---	0.00	---	---	---	---	---	0.000
3.65	15,509	702.80	---	---	---	---	0.00	---	---	---	---	---	0.000
3.75	16,128	702.90	---	---	---	---	0.00	---	---	---	---	---	0.000
3.85	16,747	703.00	---	---	---	---	0.00	---	---	---	---	---	0.000
3.95	17,511	703.10	---	---	---	---	0.00	---	---	---	---	---	0.000
4.05	18,274	703.20	---	---	---	---	0.00	---	---	---	---	---	0.000
4.15	19,038	703.30	---	---	---	---	0.00	---	---	---	---	---	0.000
4.25	19,802	703.40	---	---	---	---	0.00	---	---	---	---	---	0.000
4.35	20,566	703.50	---	---	---	---	0.00	---	---	---	---	---	0.000
4.45	21,329	703.60	---	---	---	---	0.00	---	---	---	---	---	0.000
4.55	22,093	703.70	---	---	---	---	0.00	---	---	---	---	---	0.000
4.65	22,857	703.80	---	---	---	---	0.00	---	---	---	---	---	0.000
4.75	23,621	703.90	---	---	---	---	0.00	---	---	---	---	---	0.000
4.85	24,384	704.00	---	---	---	---	0.00	---	---	---	---	---	0.000
4.95	25,300	704.10	---	---	---	---	0.00	---	---	---	---	---	0.000
5.05	26,215	704.20	---	---	---	---	0.00	---	---	---	---	---	0.000
5.15	27,130	704.30	---	---	---	---	0.00	---	---	---	---	---	0.000
5.25	28,045	704.40	---	---	---	---	0.00	---	---	---	---	---	0.000
5.35	28,961	704.50	---	---	---	---	0.00	---	---	---	---	---	0.000
5.45	29,876	704.60	---	---	---	---	0.00	---	---	---	---	---	0.000
5.55	30,791	704.70	---	---	---	---	0.00	---	---	---	---	---	0.000
5.65	31,706	704.80	---	---	---	---	0.00	---	---	---	---	---	0.000
5.75	32,622	704.90	---	---	---	---	0.00	---	---	---	---	---	0.000
5.85	33,537	705.00	---	---	---	---	0.00	---	---	---	---	---	0.000
5.95	34,608	705.10	---	---	---	---	2.11	---	---	---	---	---	2.105
6.05	35,680	705.20	---	---	---	---	5.95	---	---	---	---	---	5.955
6.15	36,751	705.30	---	---	---	---	10.94	---	---	---	---	---	10.94
6.25	37,823	705.40	---	---	---	---	16.84	---	---	---	---	---	16.84
6.35	38,895	705.50	---	---	---	---	23.54	---	---	---	---	---	23.54
6.45	39,966	705.60	---	---	---	---	30.94	---	---	---	---	---	30.94
6.55	41,038	705.70	---	---	---	---	38.99	---	---	---	---	---	38.99
6.65	42,109	705.80	---	---	---	---	47.64	---	---	---	---	---	47.64
6.75	43,181	705.90	---	---	---	---	56.84	---	---	---	---	---	56.84
6.85	44,252	706.00	---	---	---	---	66.60	---	---	---	---	---	66.60

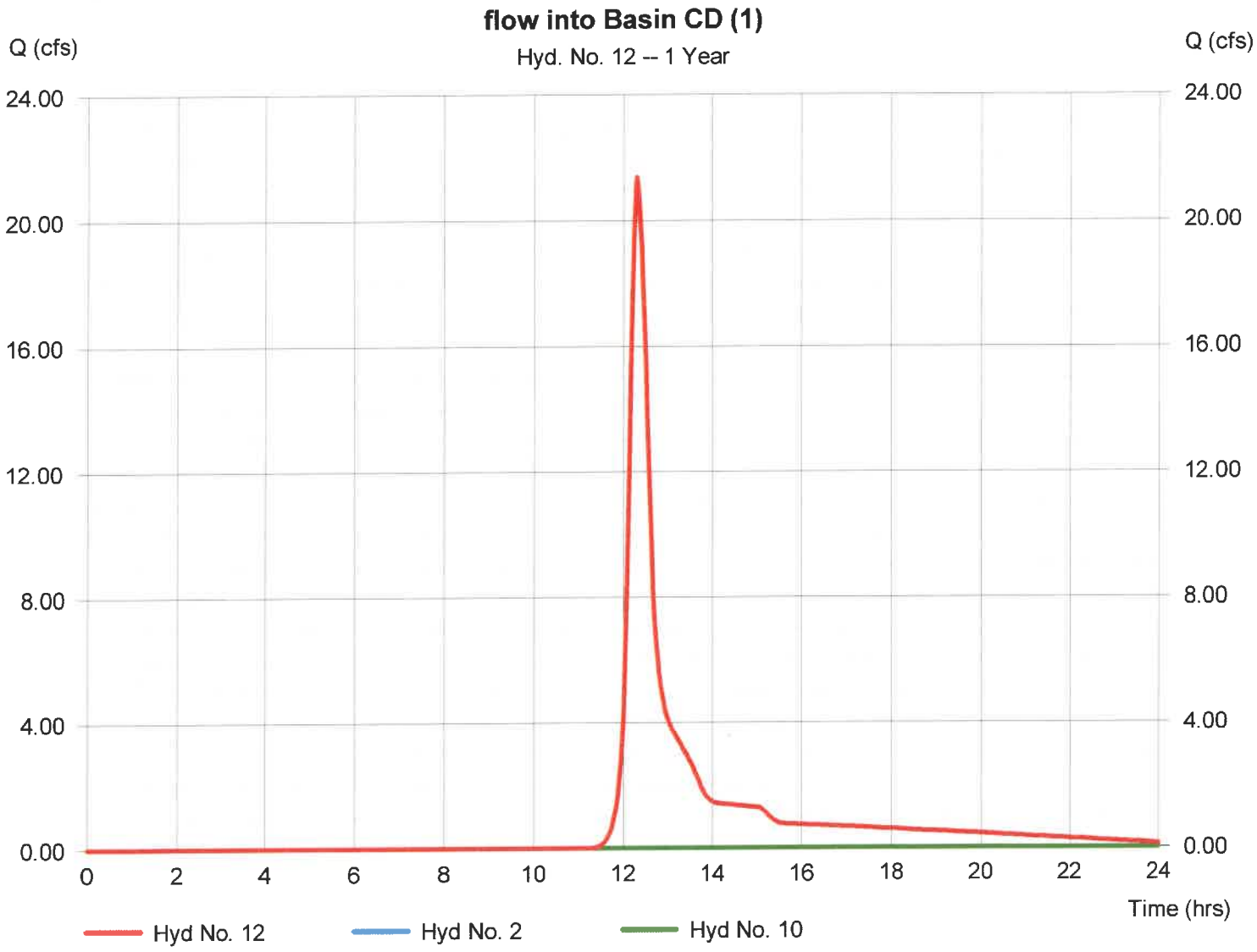
...End

Hydrograph Report

Hyd. No. 12

flow into Basin CD (1)

Hydrograph type	= Combine	Peak discharge	= 21.38 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 75,001 cuft
Inflow hyds.	= 2, 10	Contrib. drain. area	= 25.800 ac



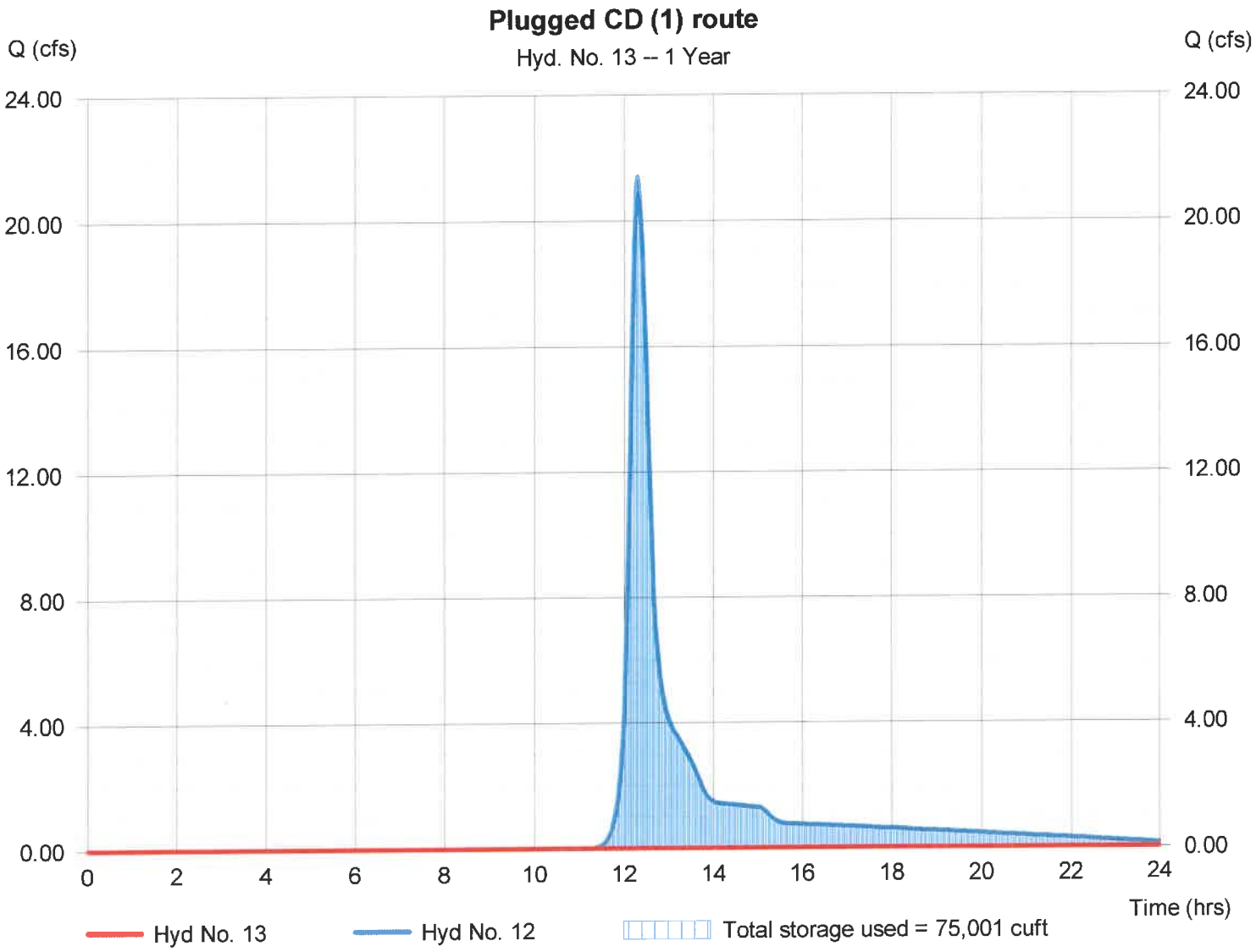
Hydrograph Report

Hyd. No. 13

Plugged CD (1) route

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - flow into Basin CD (1)	Max. Elevation	= 696.76 ft
Reservoir name	= CD (1) plugged	Max. Storage	= 75,001 cuft

Storage Indication method used.



Pond Report

Pond No. 5 - CD (1) plugged

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 694.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	694.75	31,495	0	0
1.00	695.75	36,090	33,763	33,763
2.25	697.00	45,777	51,042	84,805
3.25	698.00	47,000	46,382	131,188
4.25	699.00	59,200	52,978	184,165
5.25	700.00	68,500	63,787	247,952
6.25	701.00	89,000	78,519	326,471

Culvert / Orifice Structures

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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.00	0.00	0.00	0.00
Crest El. (ft)	= 700.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	694.75	---	---	---	---	0.00	---	---	---	---	---	0.000
0.10	3,376	694.85	---	---	---	---	0.00	---	---	---	---	---	0.000
0.20	6,753	694.95	---	---	---	---	0.00	---	---	---	---	---	0.000
0.30	10,129	695.05	---	---	---	---	0.00	---	---	---	---	---	0.000
0.40	13,505	695.15	---	---	---	---	0.00	---	---	---	---	---	0.000
0.50	16,882	695.25	---	---	---	---	0.00	---	---	---	---	---	0.000
0.60	20,258	695.35	---	---	---	---	0.00	---	---	---	---	---	0.000
0.70	23,634	695.45	---	---	---	---	0.00	---	---	---	---	---	0.000
0.80	27,010	695.55	---	---	---	---	0.00	---	---	---	---	---	0.000
0.90	30,387	695.65	---	---	---	---	0.00	---	---	---	---	---	0.000
1.00	33,763	695.75	---	---	---	---	0.00	---	---	---	---	---	0.000
1.13	38,867	695.88	---	---	---	---	0.00	---	---	---	---	---	0.000
1.25	43,971	696.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.38	49,076	696.13	---	---	---	---	0.00	---	---	---	---	---	0.000
1.50	54,180	696.25	---	---	---	---	0.00	---	---	---	---	---	0.000
1.63	59,284	696.38	---	---	---	---	0.00	---	---	---	---	---	0.000
1.75	64,388	696.50	---	---	---	---	0.00	---	---	---	---	---	0.000
1.88	69,492	696.63	---	---	---	---	0.00	---	---	---	---	---	0.000
2.00	74,597	696.75	---	---	---	---	0.00	---	---	---	---	---	0.000
2.13	79,701	696.88	---	---	---	---	0.00	---	---	---	---	---	0.000
2.25	84,805	697.00	---	---	---	---	0.00	---	---	---	---	---	0.000
2.35	89,443	697.10	---	---	---	---	0.00	---	---	---	---	---	0.000
2.45	94,082	697.20	---	---	---	---	0.00	---	---	---	---	---	0.000
2.55	98,720	697.30	---	---	---	---	0.00	---	---	---	---	---	0.000
2.65	103,358	697.40	---	---	---	---	0.00	---	---	---	---	---	0.000
2.75	107,996	697.50	---	---	---	---	0.00	---	---	---	---	---	0.000
2.85	112,635	697.60	---	---	---	---	0.00	---	---	---	---	---	0.000
2.95	117,273	697.70	---	---	---	---	0.00	---	---	---	---	---	0.000
3.05	121,911	697.80	---	---	---	---	0.00	---	---	---	---	---	0.000
3.15	126,549	697.90	---	---	---	---	0.00	---	---	---	---	---	0.000
3.25	131,188	698.00	---	---	---	---	0.00	---	---	---	---	---	0.000
3.35	136,485	698.10	---	---	---	---	0.00	---	---	---	---	---	0.000
3.45	141,783	698.20	---	---	---	---	0.00	---	---	---	---	---	0.000
3.55	147,081	698.30	---	---	---	---	0.00	---	---	---	---	---	0.000
3.65	152,379	698.40	---	---	---	---	0.00	---	---	---	---	---	0.000
3.75	157,676	698.50	---	---	---	---	0.00	---	---	---	---	---	0.000

Continues on next page...

CD (1) plugged

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.85	162,974	698.60	---	---	---	---	0.00	---	---	---	---	---	0.000
3.95	168,272	698.70	---	---	---	---	0.00	---	---	---	---	---	0.000
4.05	173,570	698.80	---	---	---	---	0.00	---	---	---	---	---	0.000
4.15	178,867	698.90	---	---	---	---	0.00	---	---	---	---	---	0.000
4.25	184,165	699.00	---	---	---	---	0.00	---	---	---	---	---	0.000
4.35	190,544	699.10	---	---	---	---	0.00	---	---	---	---	---	0.000
4.45	196,923	699.20	---	---	---	---	0.00	---	---	---	---	---	0.000
4.55	203,301	699.30	---	---	---	---	0.00	---	---	---	---	---	0.000
4.65	209,680	699.40	---	---	---	---	0.00	---	---	---	---	---	0.000
4.75	216,059	699.50	---	---	---	---	0.00	---	---	---	---	---	0.000
4.85	222,437	699.60	---	---	---	---	0.00	---	---	---	---	---	0.000
4.95	228,816	699.70	---	---	---	---	0.00	---	---	---	---	---	0.000
5.05	235,195	699.80	---	---	---	---	0.00	---	---	---	---	---	0.000
5.15	241,574	699.90	---	---	---	---	0.00	---	---	---	---	---	0.000
5.25	247,952	700.00	---	---	---	---	0.00	---	---	---	---	---	0.000
5.35	255,804	700.10	---	---	---	---	0.00	---	---	---	---	---	0.000
5.45	263,656	700.20	---	---	---	---	0.00	---	---	---	---	---	0.000
5.55	271,508	700.30	---	---	---	---	1.58	---	---	---	---	---	1.578
5.65	279,360	700.40	---	---	---	---	4.46	---	---	---	---	---	4.464
5.75	287,212	700.50	---	---	---	---	8.20	---	---	---	---	---	8.202
5.85	295,063	700.60	---	---	---	---	12.63	---	---	---	---	---	12.63
5.95	302,915	700.70	---	---	---	---	17.65	---	---	---	---	---	17.65
6.05	310,767	700.80	---	---	---	---	23.20	---	---	---	---	---	23.20
6.15	318,619	700.90	---	---	---	---	29.24	---	---	---	---	---	29.24
6.25	326,471	701.00	---	---	---	---	35.74	---	---	---	---	---	35.74

...End

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

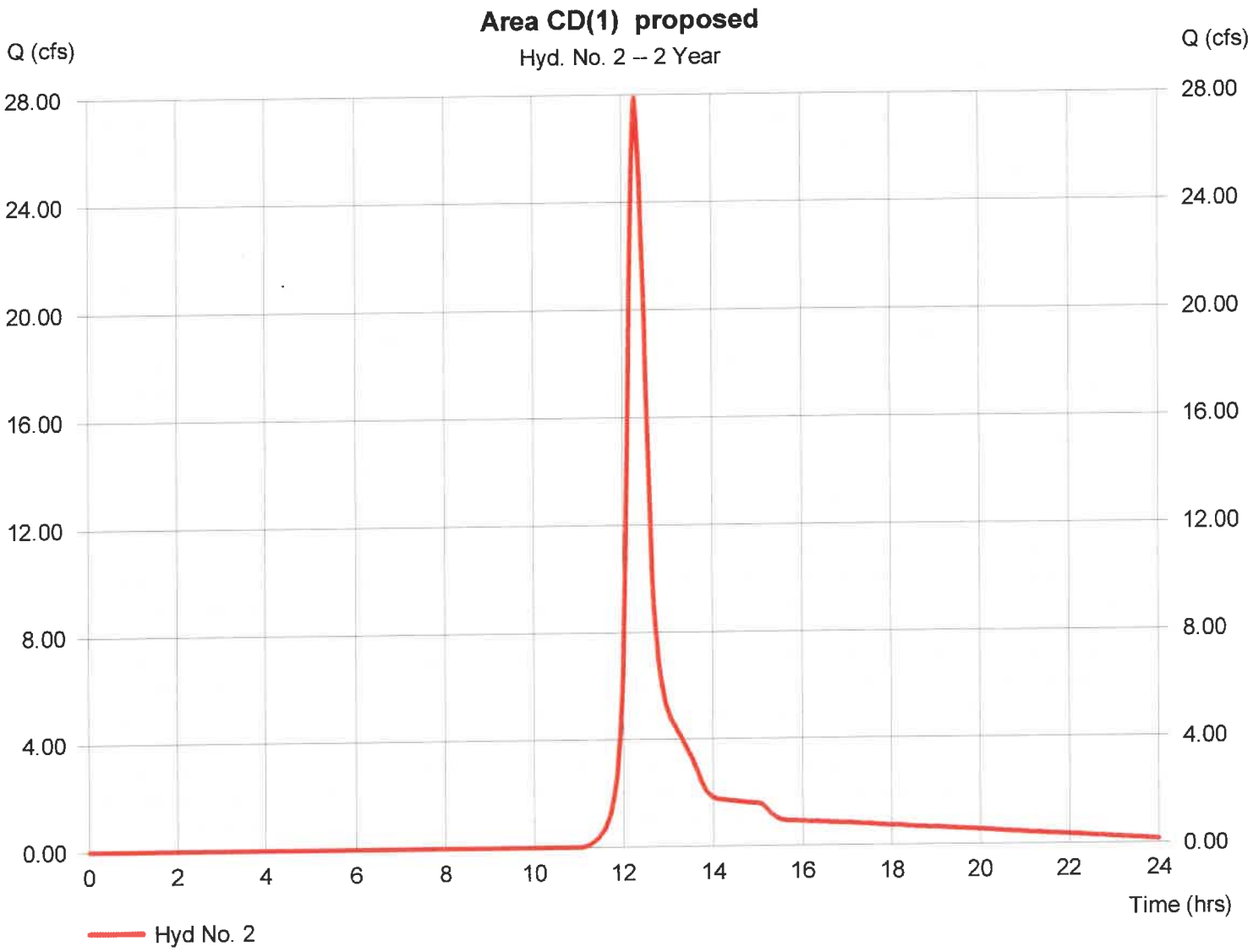
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	15.03	2	736	47,217	-----	-----	-----	Area B proposed
2	SCS Runoff	27.87	2	738	96,120	-----	-----	-----	Area CD(1) proposed
3	SCS Runoff	8.388	2	736	26,354	-----	-----	-----	Area CD (2) proposed
4	SCS Runoff	2.610	2	748	12,519	-----	-----	-----	Area B Existing
5	SCS Runoff	18.54	2	748	88,897	-----	-----	-----	Area CD Existing
6	Reservoir	5.426	2	748	26,352	3	700.88	5,380	Basin CD (2) route
7	Combine	32.66	2	738	122,472	2, 6	-----	-----	Total flow to CD (1)
8	Reservoir	3.851	2	818	121,633	7	696.63	69,616	Area CD outflow
9	Reservoir	0.252	2	1220	44,954	1	717.40	37,864	Area B outflow
10	Reservoir	0.000	2	n/a	0	3	704.22	26,354	Basin CD (2) plugged r
11	SCS Runoff	32.76	2	730	85,271	-----	-----	-----	Area B proposed construction
12	Combine	27.87	2	738	96,120	2, 10,	-----	-----	flow into Basin CD (1)
13	Reservoir	0.000	2	n/a	0	12	697.24	96,120	Plugged CD (1) route
14	Reservoir	0.000	2	n/a	0	1	717.63	47,217	CD (1) plugged route
16	Reservoir	0.321	2	1224	75,505	11	718.15	72,689	during construction

Hydrograph Report

Hyd. No. 2

Area CD(1) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 27.87 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 96,120 cuft
Drainage area	= 25.800 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.50 min
Total precip.	= 2.67 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2.cds	Shape factor	= 484

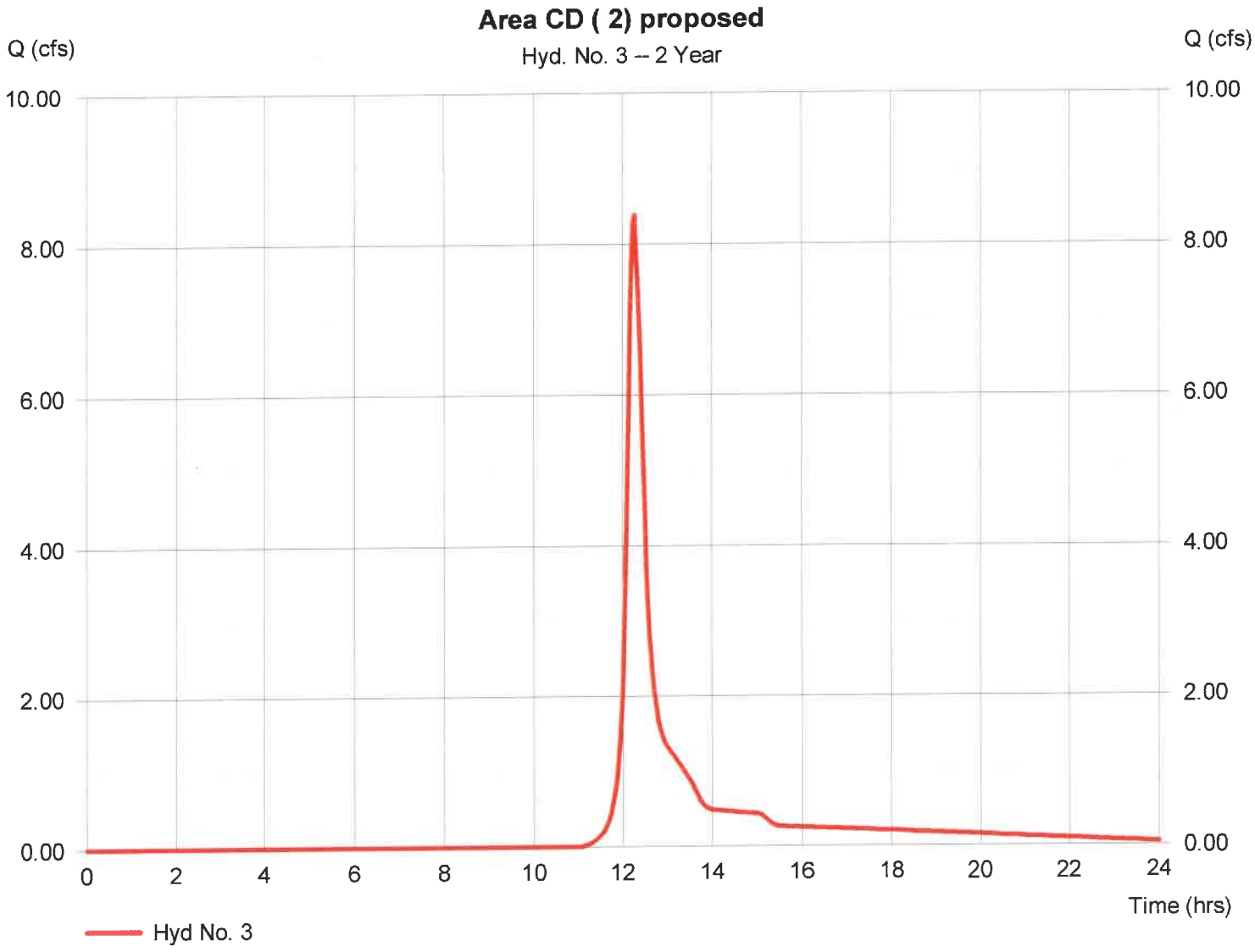


Hydrograph Report

Hyd. No. 3

Area CD (2) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 8.388 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 26,354 cuft
Drainage area	= 7.200 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.70 min
Total precip.	= 2.67 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2cds	Shape factor	= 484

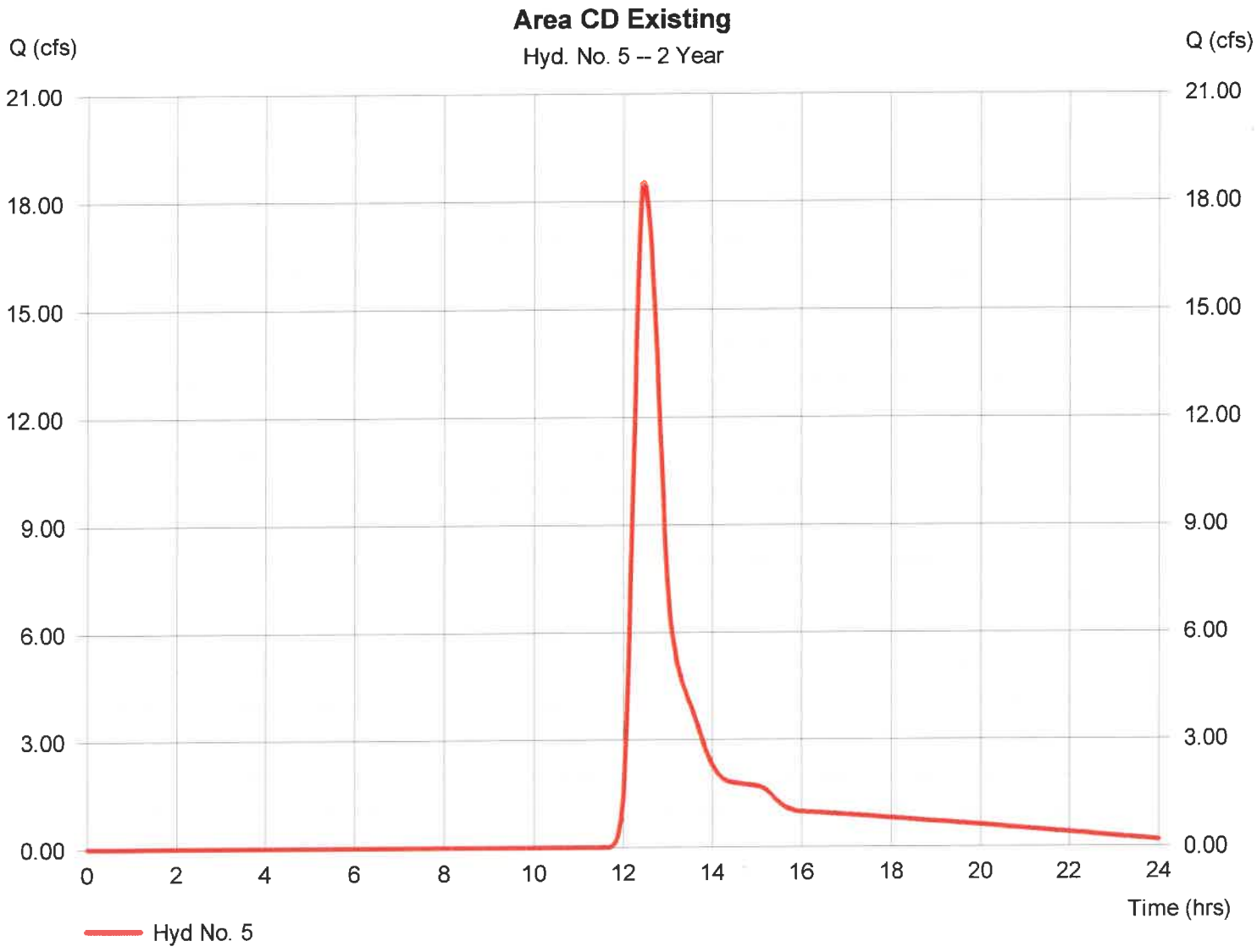


Hydrograph Report

Hyd. No. 5

Area CD Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 18.54 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 88,897 cuft
Drainage area	= 35.080 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.40 min
Total precip.	= 2.67 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distribution.cds	Shape factor	= 484



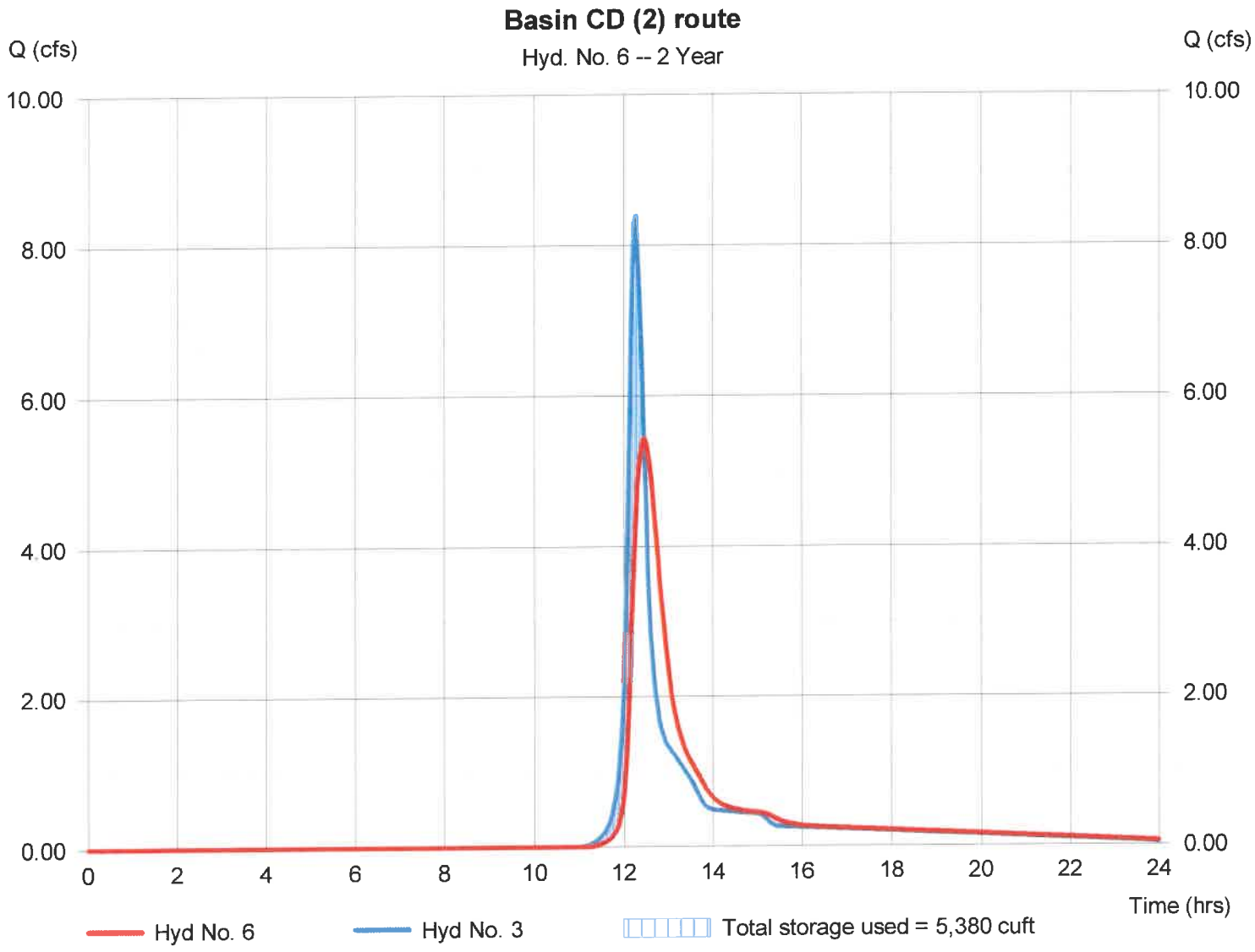
Hydrograph Report

Hyd. No. 6

Basin CD (2) route

Hydrograph type	= Reservoir	Peak discharge	= 5.426 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 26,352 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 700.88 ft
Reservoir name	= basin CD (2)	Max. Storage	= 5,380 cuft

Storage Indication method used.

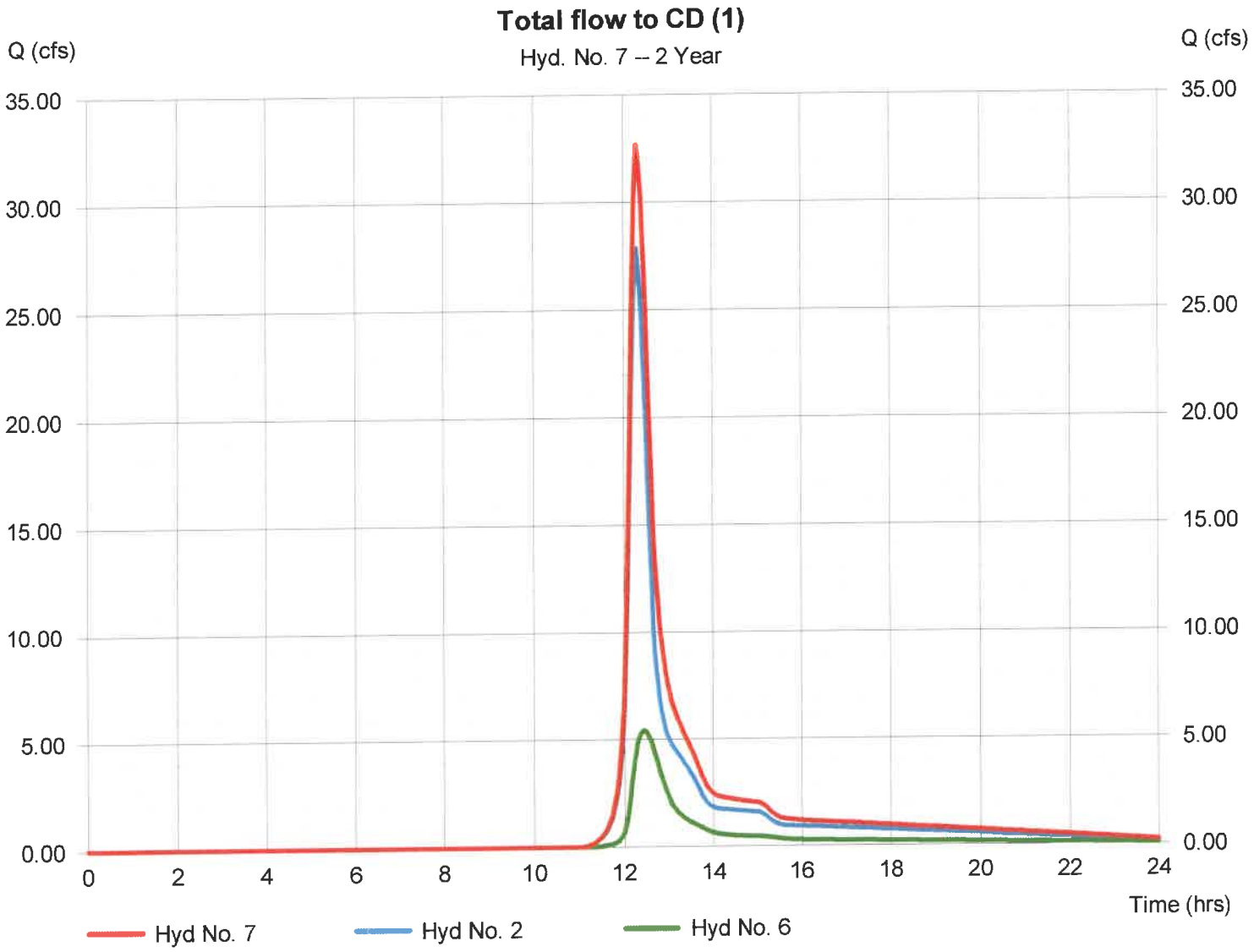


Hydrograph Report

Hyd. No. 7

Total flow to CD (1)

Hydrograph type	= Combine	Peak discharge	= 32.66 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 122,472 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 25.800 ac



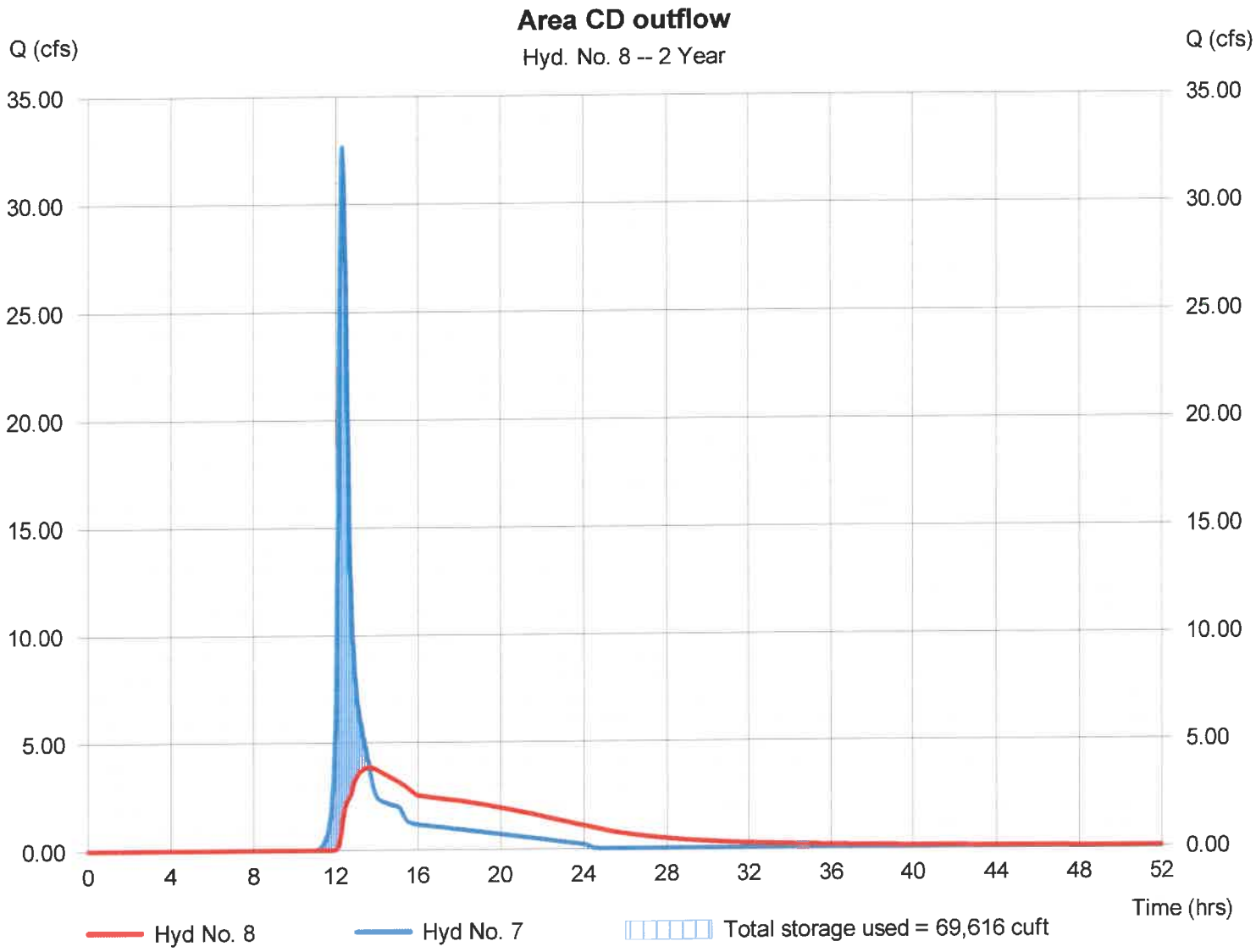
Hydrograph Report

Hyd. No. 8

Area CD outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.851 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.63 hrs
Time interval	= 2 min	Hyd. volume	= 121,633 cuft
Inflow hyd. No.	= 7 - Total flow to CD (1)	Max. Elevation	= 696.63 ft
Reservoir name	= CD (1)	Max. Storage	= 69,616 cuft

Storage Indication method used.



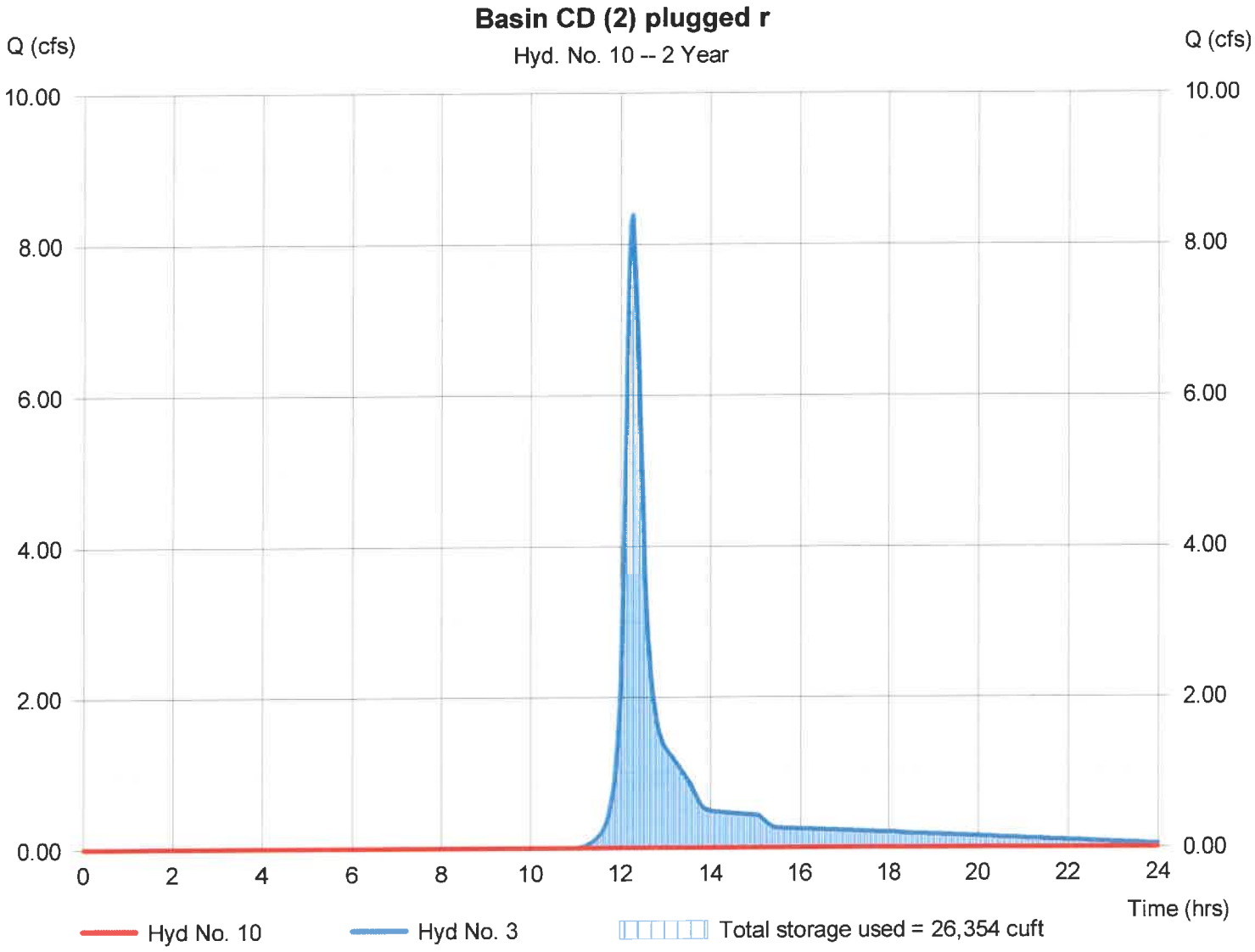
Hydrograph Report

Hyd. No. 10

Basin CD (2) plugged r

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 704.22 ft
Reservoir name	= basin CD (2) plugged	Max. Storage	= 26,354 cuft

Storage Indication method used.

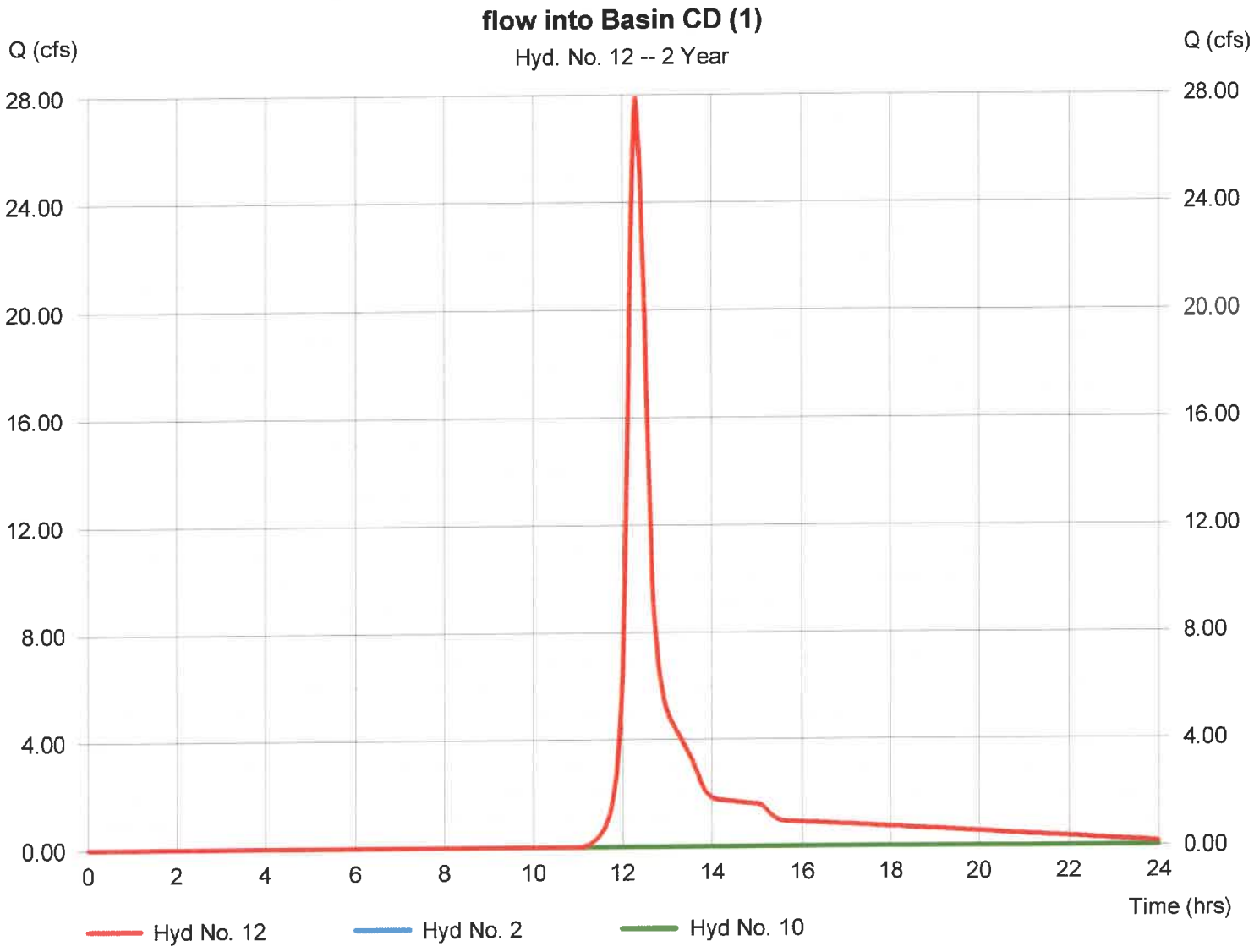


Hydrograph Report

Hyd. No. 12

flow into Basin CD (1)

Hydrograph type	= Combine	Peak discharge	= 27.87 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 96,120 cuft
Inflow hyds.	= 2, 10	Contrib. drain. area	= 25.800 ac



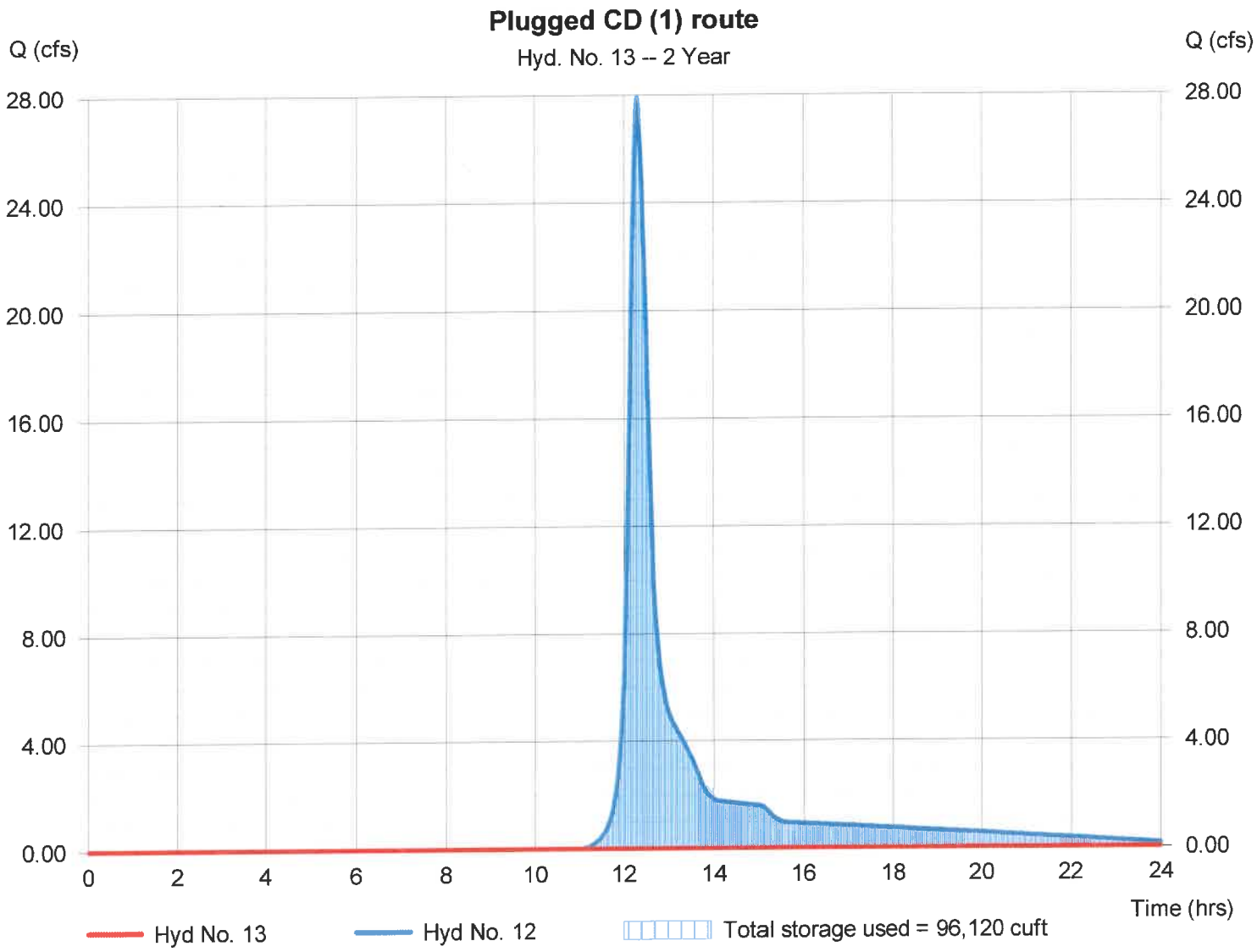
Hydrograph Report

Hyd. No. 13

Plugged CD (1) route

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - flow into Basin CD (1)	Max. Elevation	= 697.24 ft
Reservoir name	= CD (1) plugged	Max. Storage	= 96,120 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

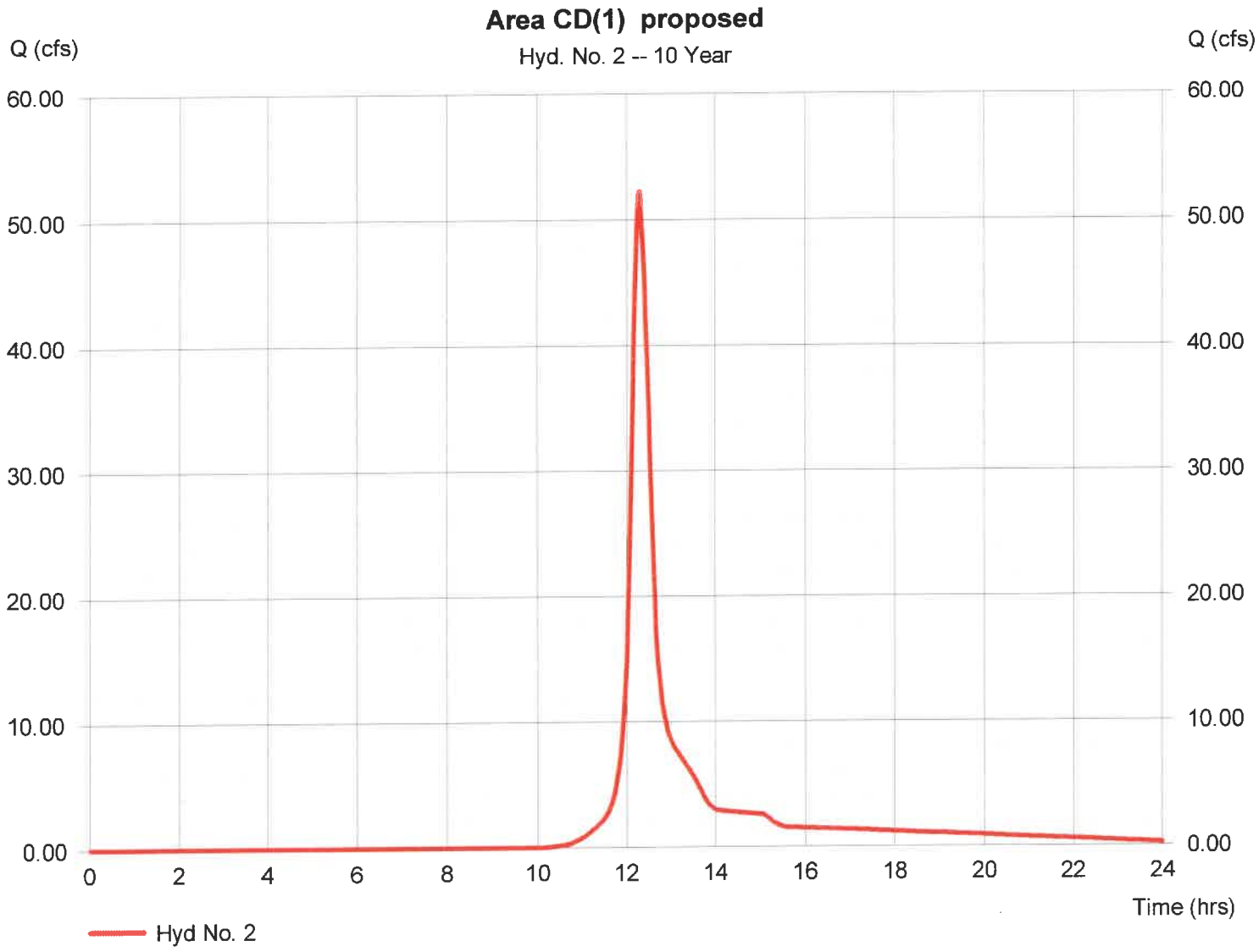
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	28.02	2	736	86,779	-----	-----	-----	Area B proposed
2	SCS Runoff	52.19	2	738	176,658	-----	-----	-----	Area CD(1) proposed
3	SCS Runoff	15.64	2	736	48,435	-----	-----	-----	Area CD (2) proposed
4	SCS Runoff	5.730	2	746	25,346	-----	-----	-----	Area B Existing
5	SCS Runoff	40.69	2	746	179,984	-----	-----	-----	Area CD Existing
6	Reservoir	8.772	2	748	48,433	3	702.17	11,743	Basin CD (2) route
7	Combine	59.42	2	738	225,091	2, 6	-----	-----	Total flow to CD (1)
8	Reservoir	10.50	2	796	224,189	7	697.82	122,858	Area CD outflow
9	Reservoir	0.323	2	1286	76,279	1	718.17	74,029	Area B outflow
10	Reservoir	1.392	2	812	14,898	3	705.07	34,245	Basin CD (2) plugged r
11	SCS Runoff	50.91	2	730	135,099	-----	-----	-----	Area B proposed construction
12	Combine	52.19	2	738	191,555	2, 10,	-----	-----	flow into Basin CD (1)
13	Reservoir	0.000	2	n/a	0	12	699.12	191,555	Plugged CD (1) route
14	Reservoir	0.000	2	n/a	0	1	718.36	86,779	CD (1) plugged route
16	Reservoir	1.678	2	868	113,268	11	718.61	103,498	during construction

Hydrograph Report

Hyd. No. 2

Area CD(1) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 52.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 176,658 cuft
Drainage area	= 25.800 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.50 min
Total precip.	= 3.77 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2.cds	Shape factor	= 484

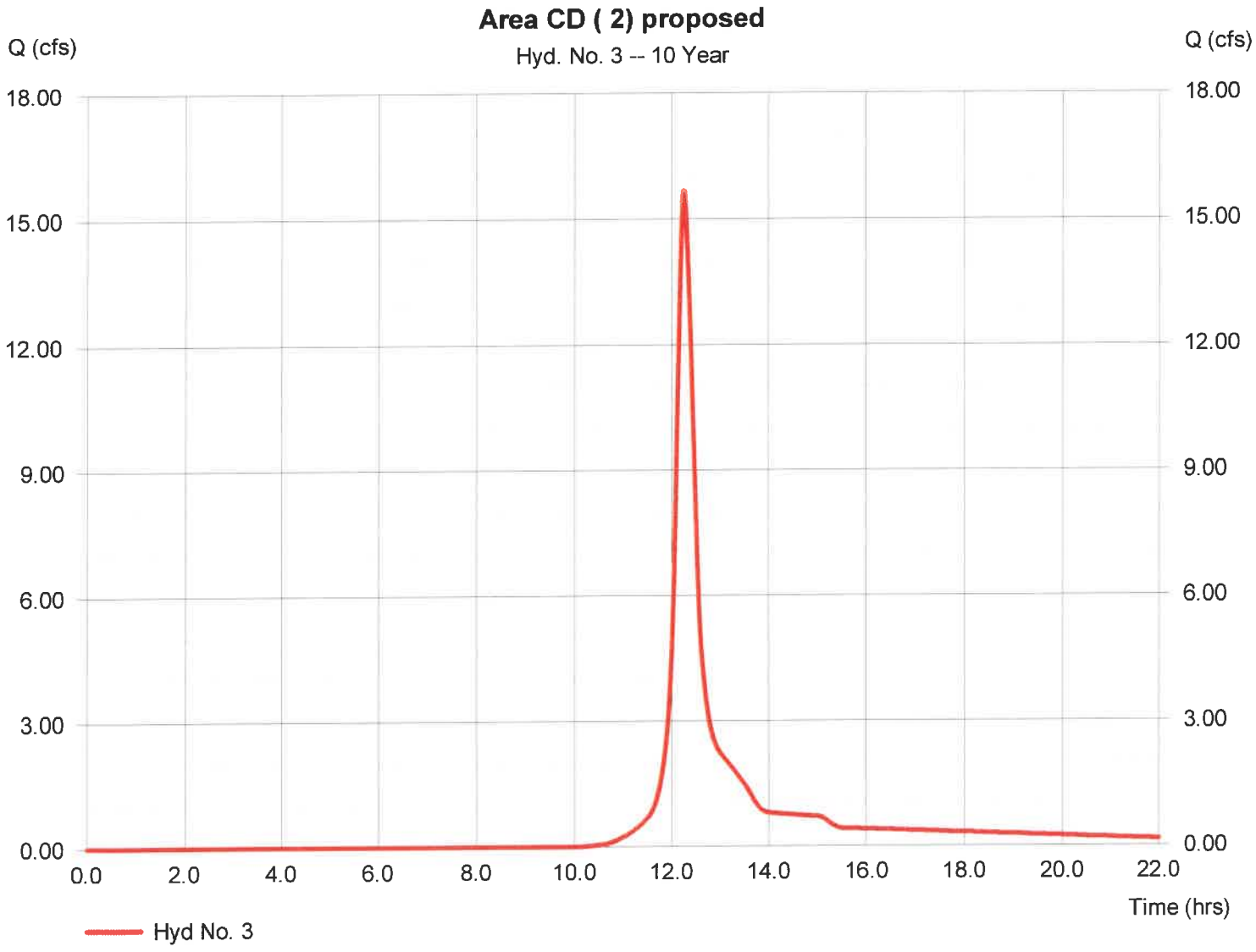


Hydrograph Report

Hyd. No. 3

Area CD (2) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 15.64 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 48,435 cuft
Drainage area	= 7.200 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.70 min
Total precip.	= 3.77 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions.cds	Shape factor	= 484

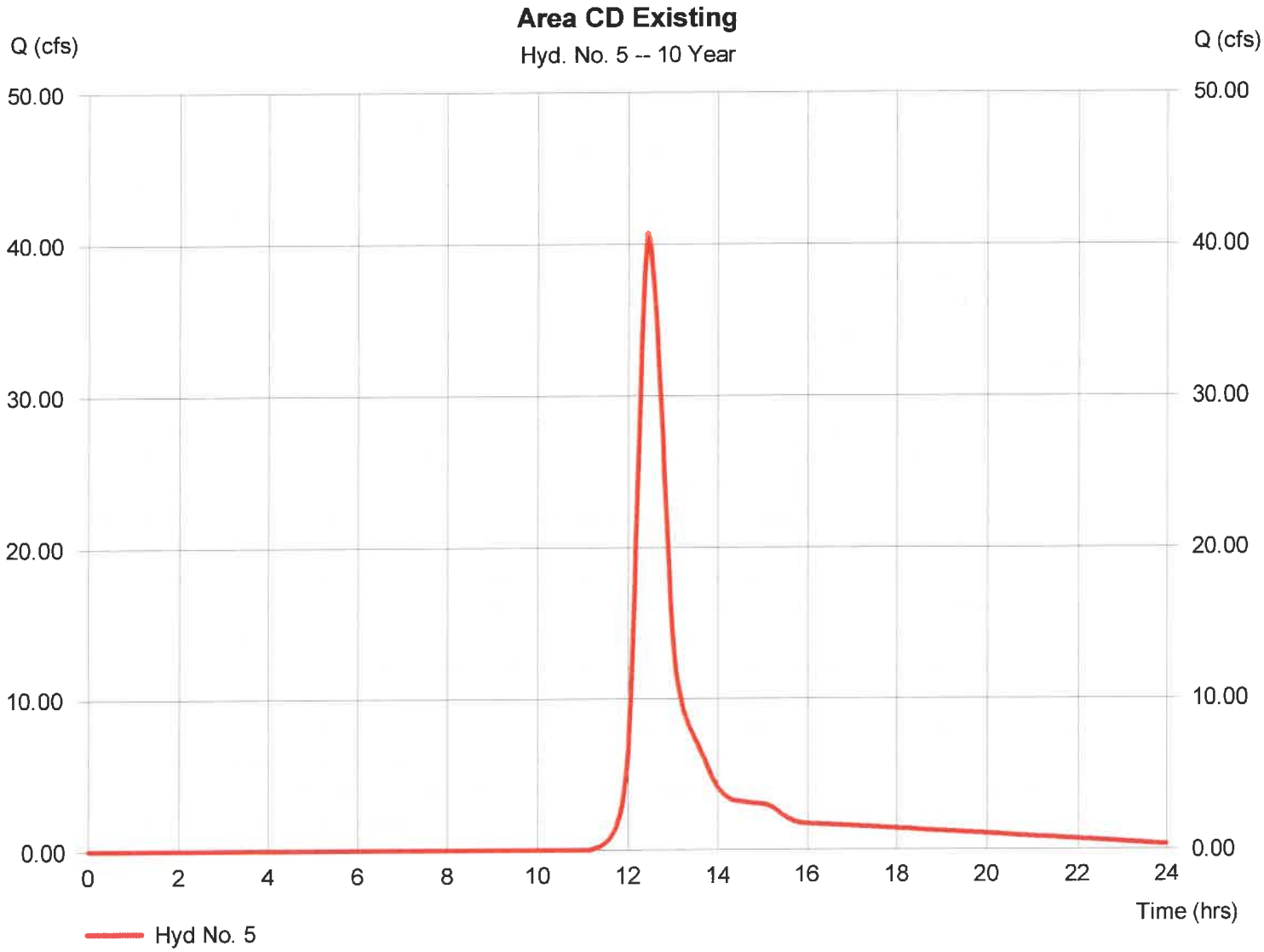


Hydrograph Report

Hyd. No. 5

Area CD Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 40.69 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 179,984 cuft
Drainage area	= 35.080 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.40 min
Total precip.	= 3.77 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions.cds	Shape factor	= 484



Hydrograph Report

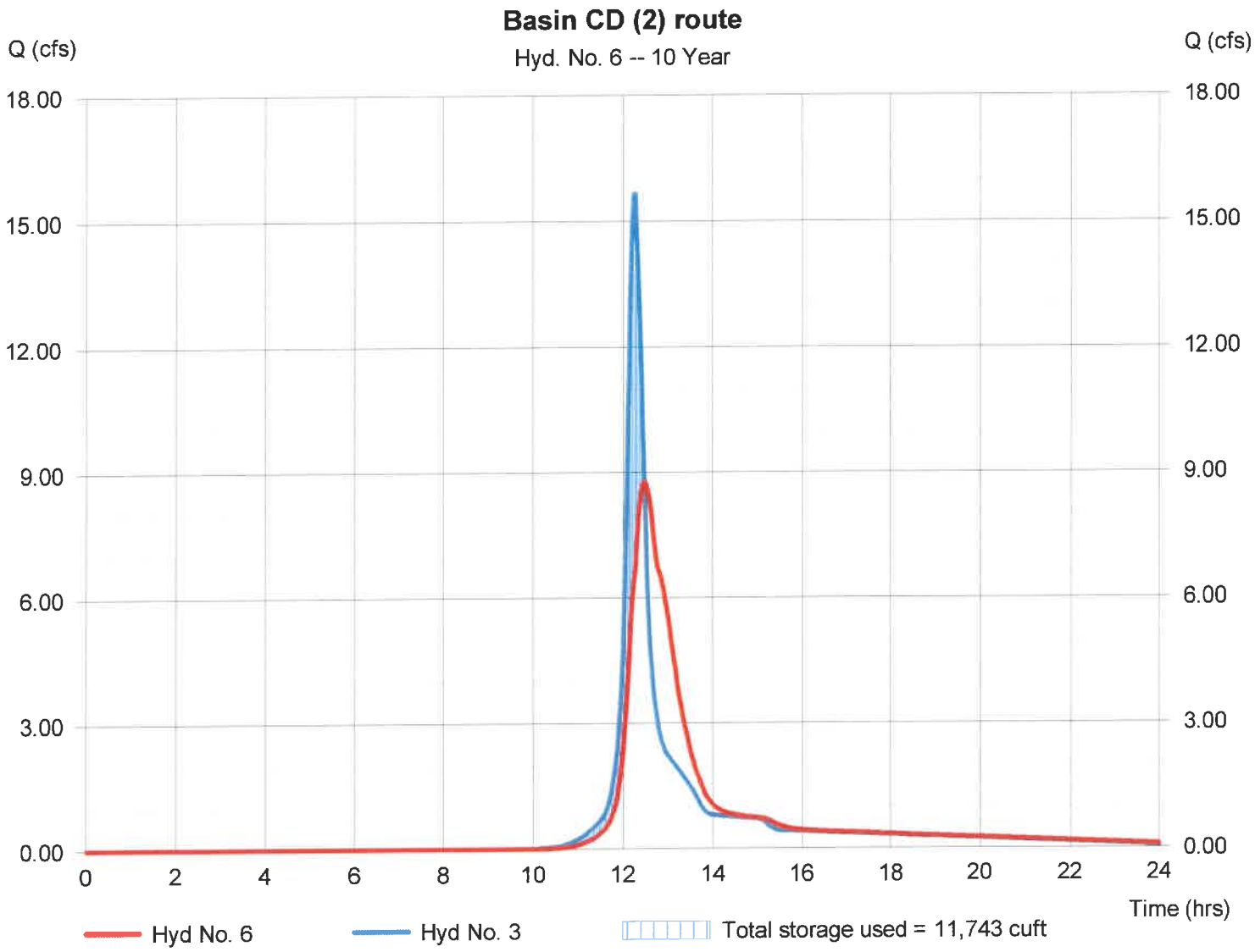
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 12 / 21 / 2017

Hyd. No. 6

Basin CD (2) route

Hydrograph type	= Reservoir	Peak discharge	= 8.772 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 48,433 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 702.17 ft
Reservoir name	= basin CD (2)	Max. Storage	= 11,743 cuft

Storage Indication method used.

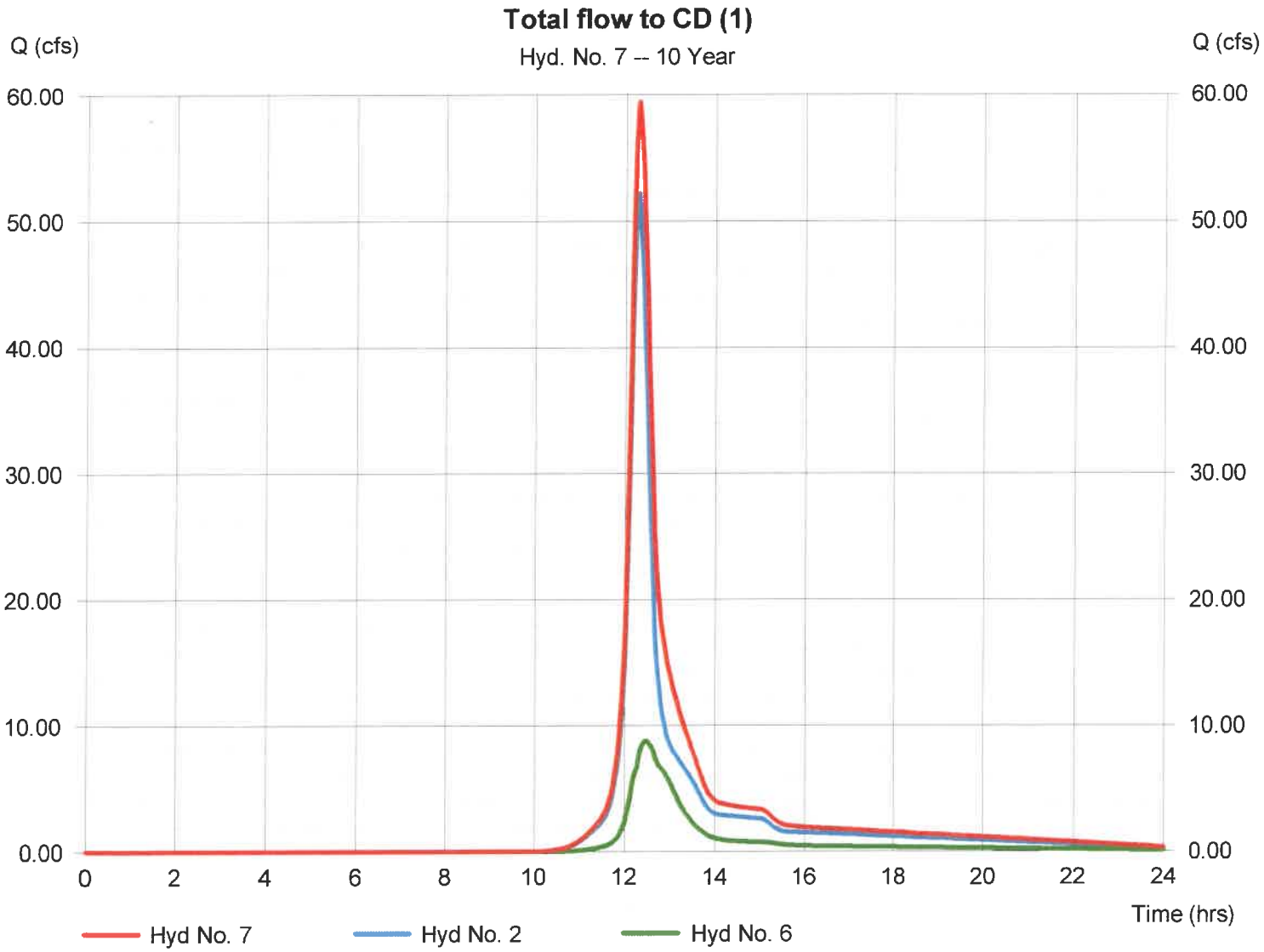


Hydrograph Report

Hyd. No. 7

Total flow to CD (1)

Hydrograph type	= Combine	Peak discharge	= 59.42 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 225,091 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 25.800 ac



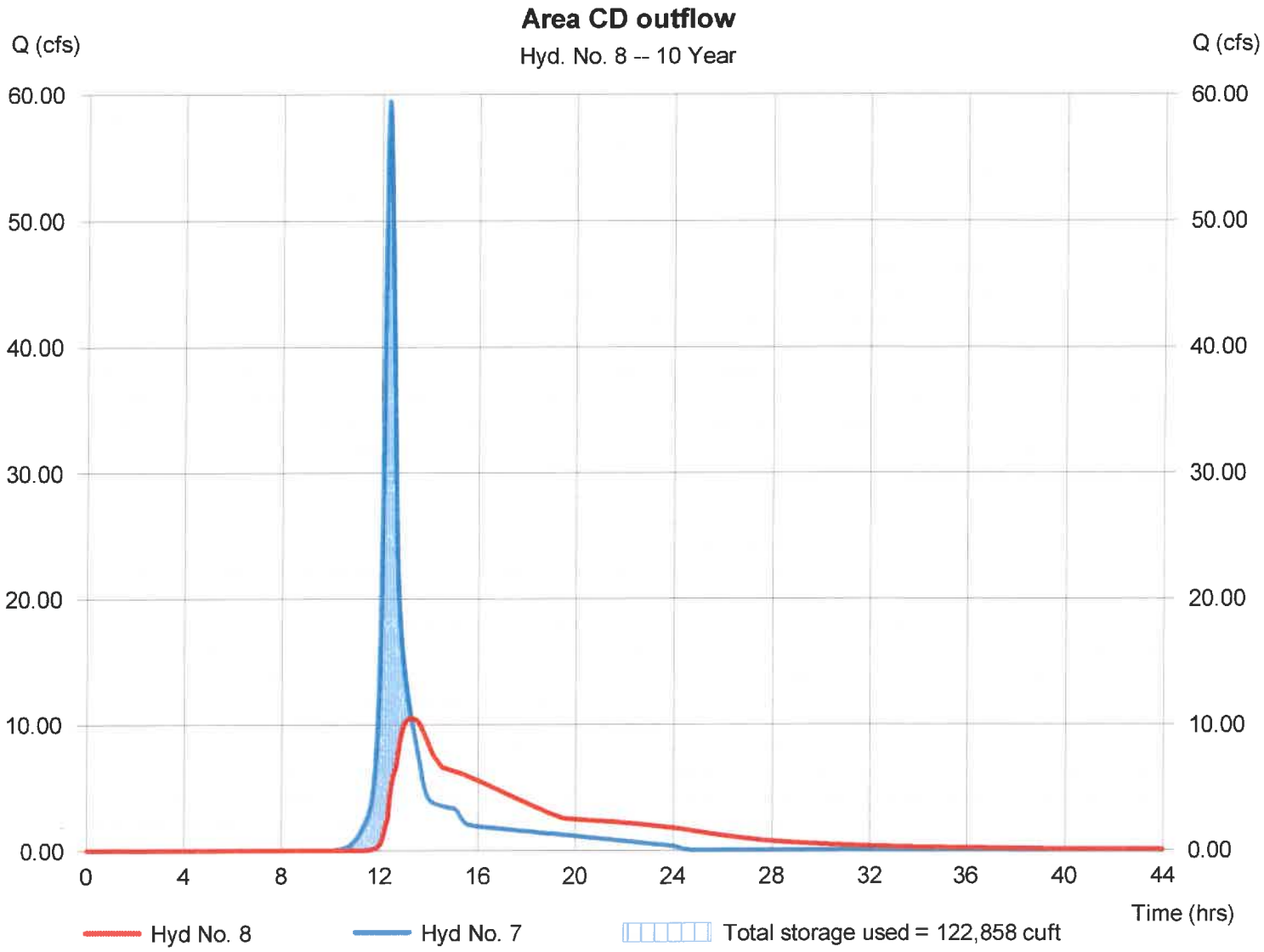
Hydrograph Report

Hyd. No. 8

Area CD outflow

Hydrograph type	= Reservoir	Peak discharge	= 10.50 cfs
Storm frequency	= 10 yrs	Time to peak	= 13.27 hrs
Time interval	= 2 min	Hyd. volume	= 224,189 cuft
Inflow hyd. No.	= 7 - Total flow to CD (1)	Max. Elevation	= 697.82 ft
Reservoir name	= CD (1)	Max. Storage	= 122,858 cuft

Storage Indication method used.



Hydrograph Report

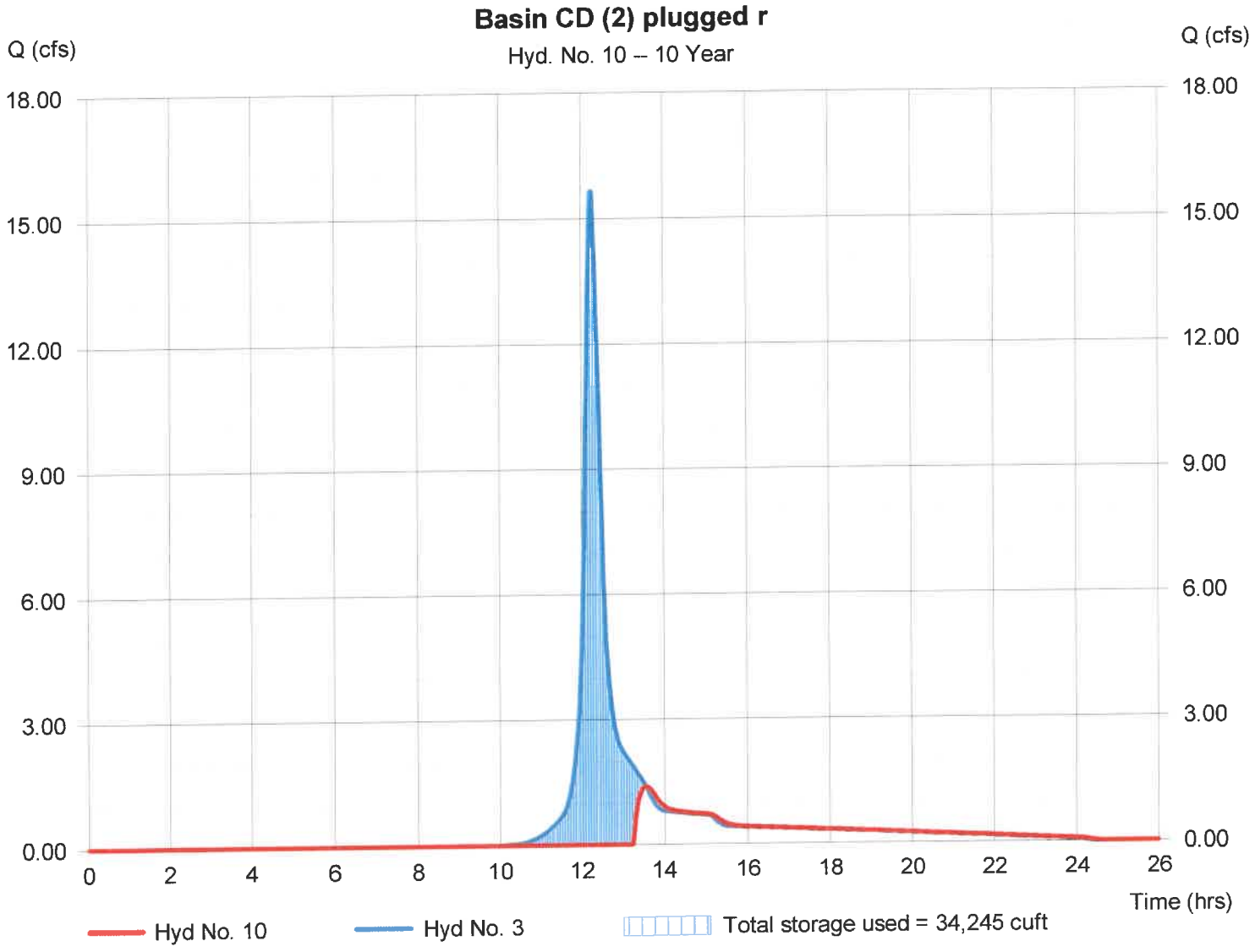
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 12 / 21 / 2017

Hyd. No. 10

Basin CD (2) plugged r

Hydrograph type	= Reservoir	Peak discharge	= 1.392 cfs
Storm frequency	= 10 yrs	Time to peak	= 13.53 hrs
Time interval	= 2 min	Hyd. volume	= 14,898 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 705.07 ft
Reservoir name	= basin CD (2) plugged	Max. Storage	= 34,245 cuft

Storage Indication method used.

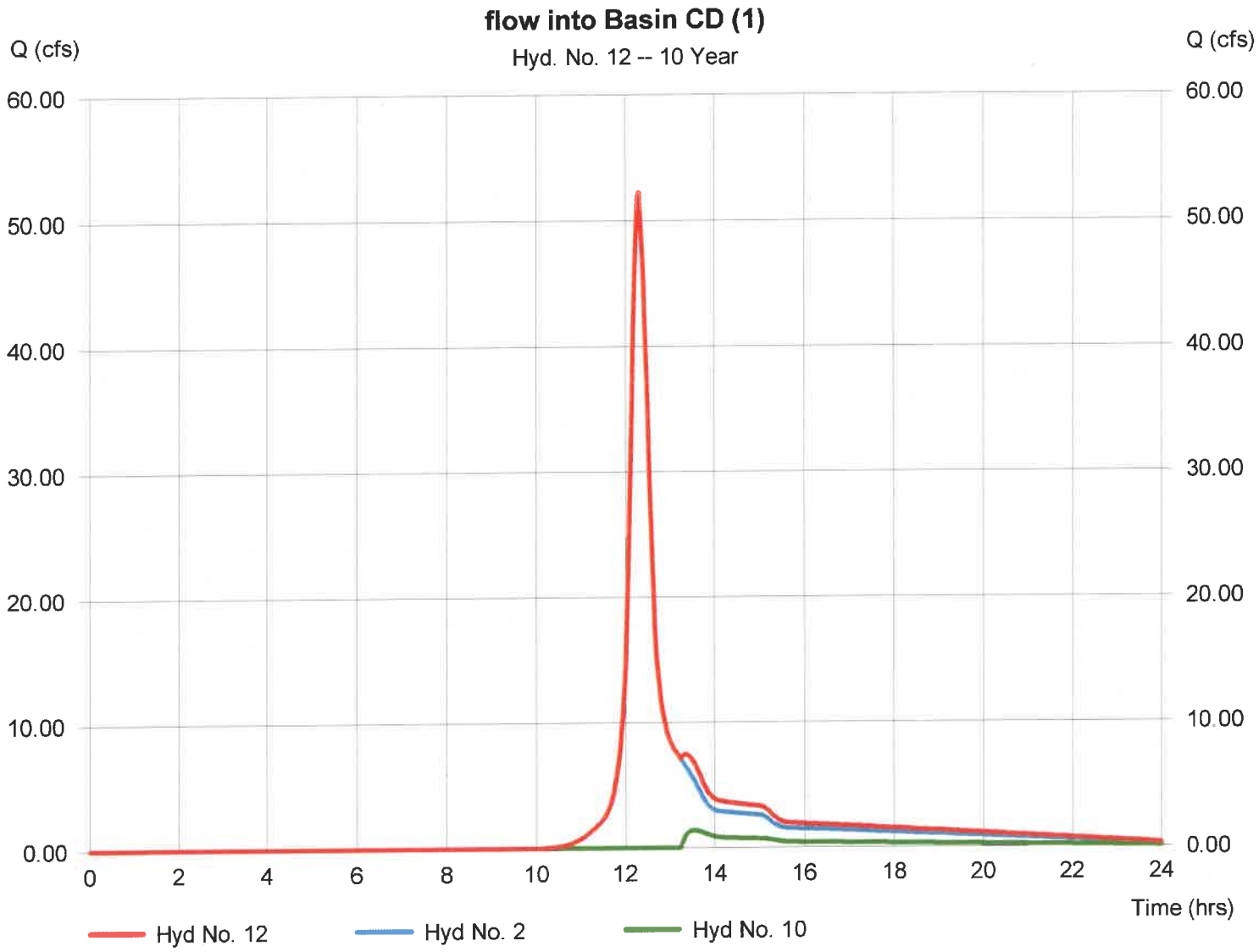


Hydrograph Report

Hyd. No. 12

flow into Basin CD (1)

Hydrograph type	= Combine	Peak discharge	= 52.19 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 191,555 cuft
Inflow hyds.	= 2, 10	Contrib. drain. area	= 25.800 ac



Hydrograph Report

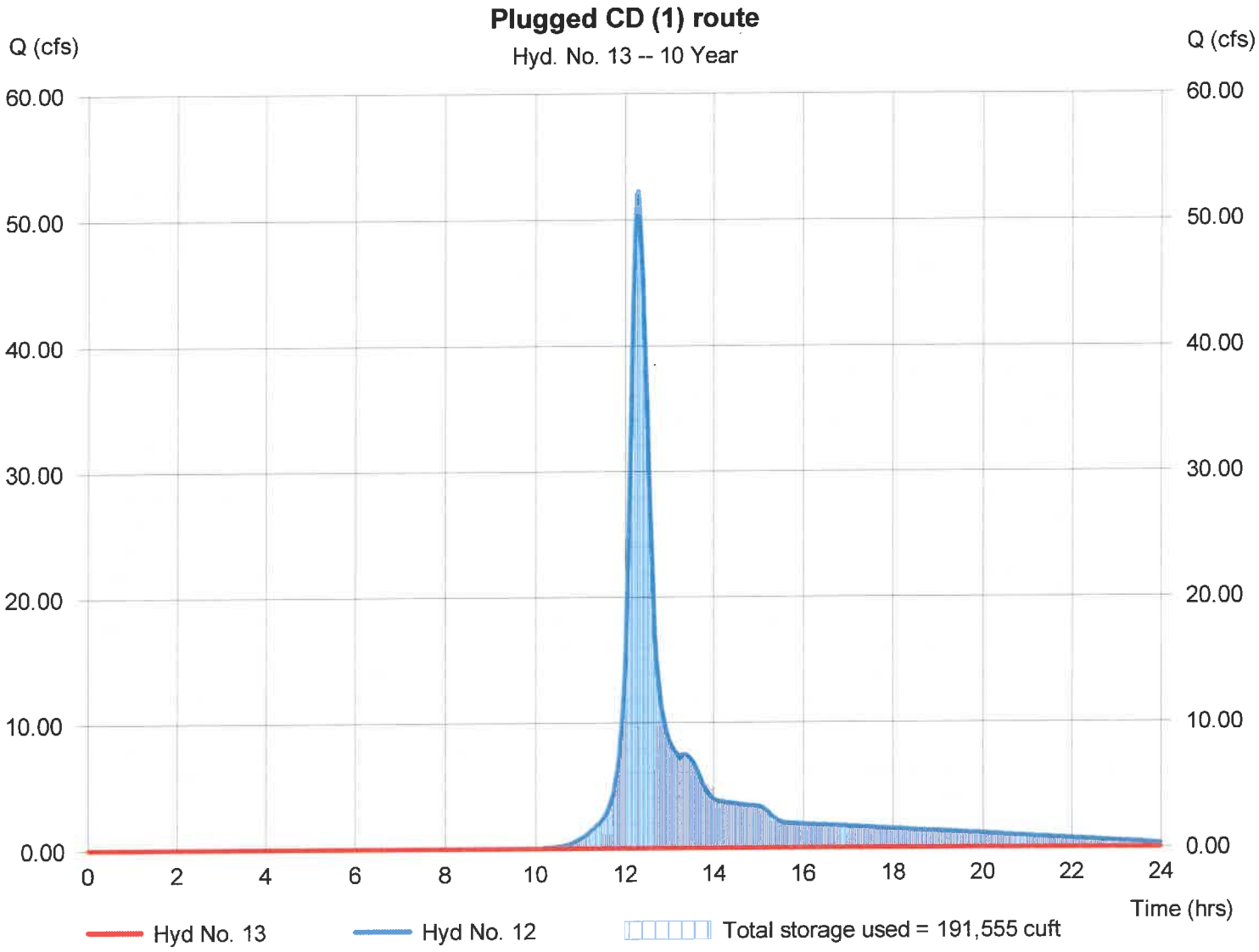
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Thursday, 12 / 21 / 2017

Hyd. No. 13

Plugged CD (1) route

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 12 - flow into Basin CD (1)	Max. Elevation	= 699.12 ft
Reservoir name	= CD (1) plugged	Max. Storage	= 191,555 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

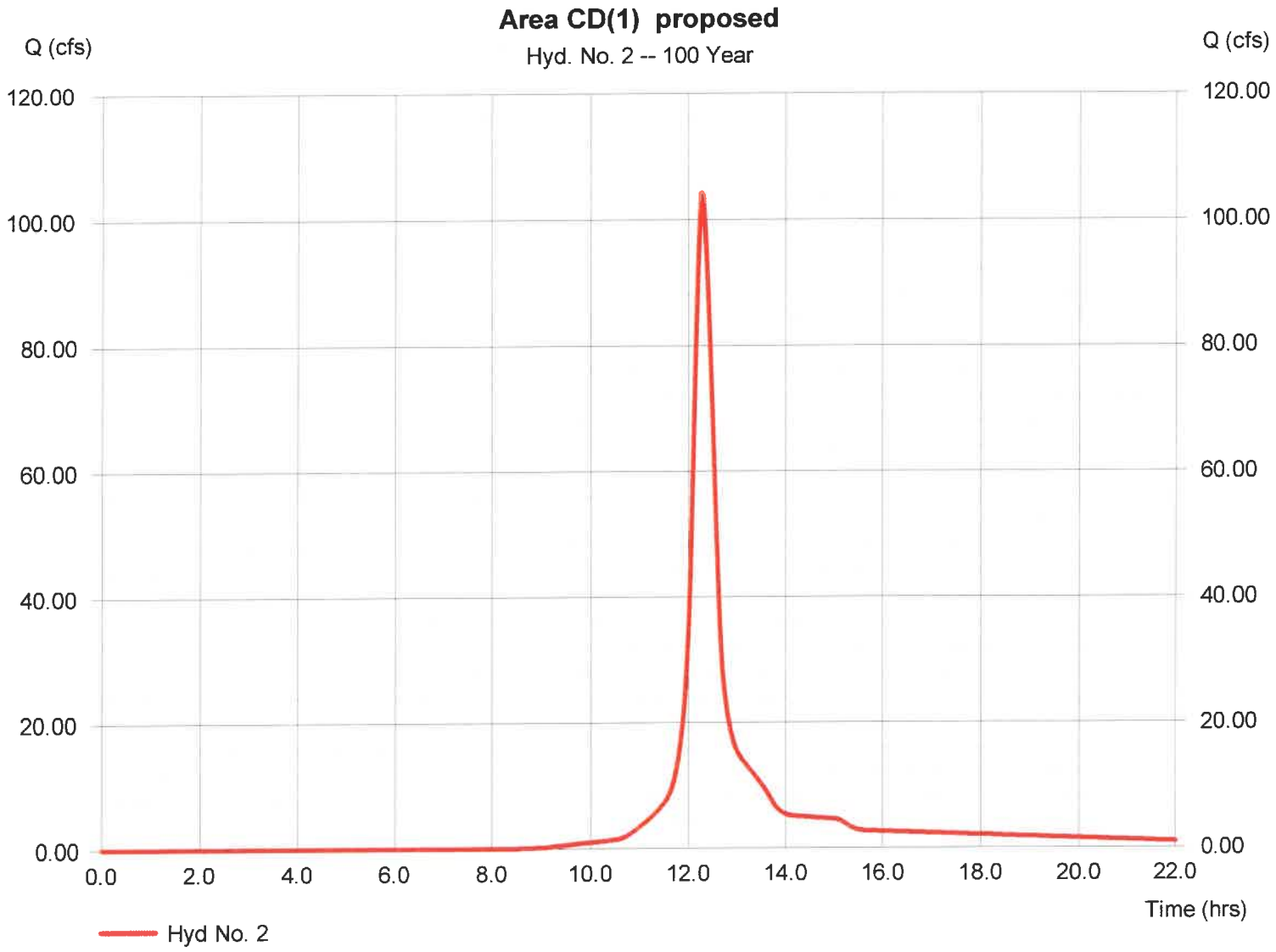
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	56.03	2	734	173,688	-----	-----	-----	Area B proposed
2	SCS Runoff	104.12	2	736	353,579	-----	-----	-----	Area CD(1) proposed
3	SCS Runoff	31.27	2	734	96,942	-----	-----	-----	Area CD (2) proposed
4	SCS Runoff	12.86	2	746	55,272	-----	-----	-----	Area B Existing
5	SCS Runoff	91.33	2	746	392,500	-----	-----	-----	Area CD Existing
6	Reservoir	25.17	2	742	96,940	3	703.14	17,892	Basin CD (2) route
7	Combine	128.42	2	738	450,519	2, 6	-----	-----	Total flow to CD (1)
8	Reservoir	17.34	2	800	449,553	7	700.09	254,765	Area CD outflow
9	Reservoir	2.571	2	838	151,273	1	718.91	123,521	Area B outflow
10	Reservoir	24.62	2	742	63,405	3	705.52	39,052	Basin CD (2) plugged r
11	SCS Runoff	86.11	2	730	235,605	-----	-----	-----	Area B proposed construction
12	Combine	122.13	2	740	416,984	2, 10,	-----	-----	flow into Basin CD (1)
13	Reservoir	10.75	2	818	153,323	12	700.56	291,736	Plugged CD (1) route
14	Reservoir	1.854	2	912	43,961	1	719.13	140,034	CD (1) plugged route
16	Reservoir	9.433	2	766	212,872	11	719.31	154,661	during construction

Hydrograph Report

Hyd. No. 2

Area CD(1) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 104.12 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 353,579 cuft
Drainage area	= 25.800 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 21.50 min
Total precip.	= 5.92 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distribution2.cds	Shape factor	= 484

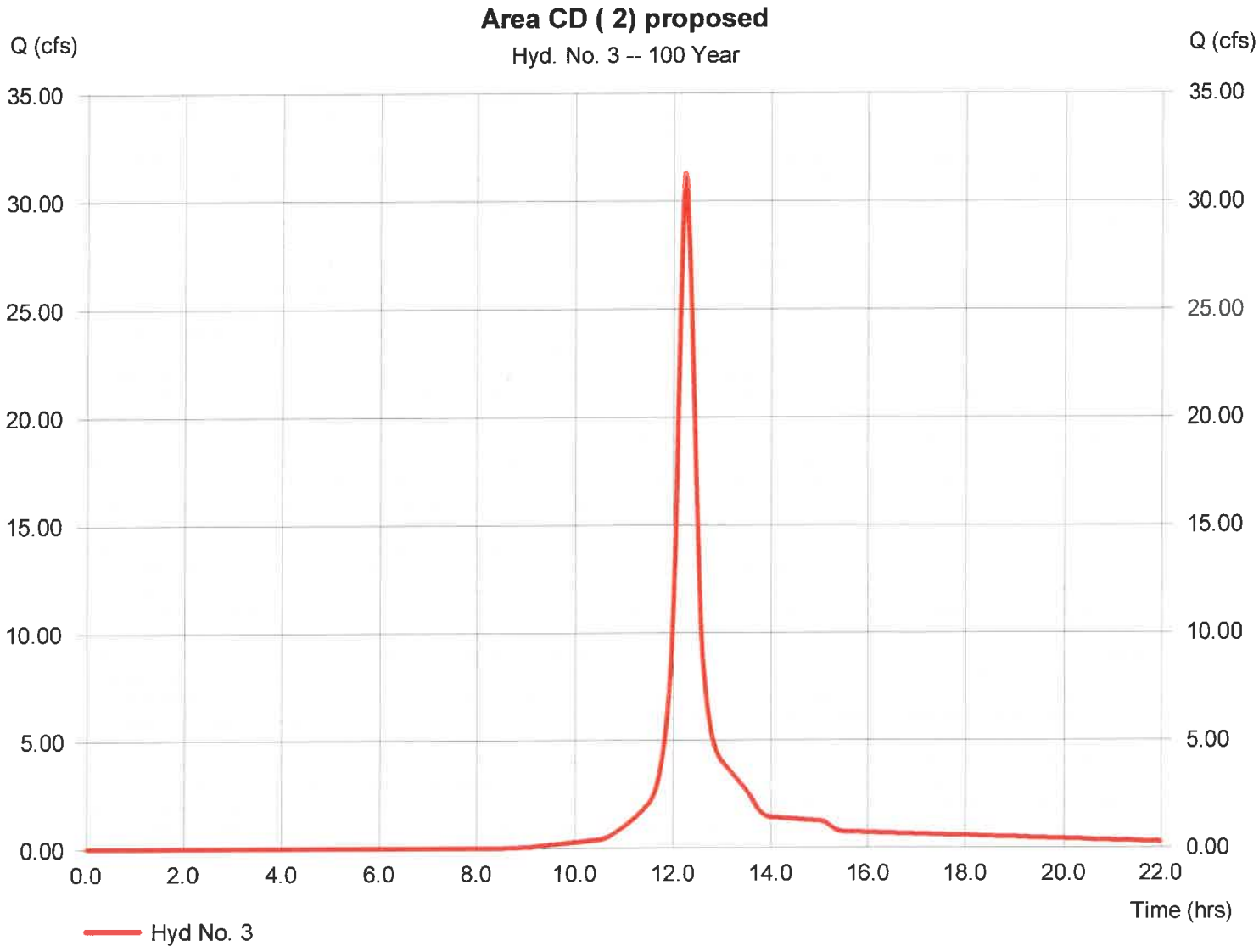


Hydrograph Report

Hyd. No. 3

Area CD (2) proposed

Hydrograph type	= SCS Runoff	Peak discharge	= 31.27 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 96,942 cuft
Drainage area	= 7.200 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.70 min
Total precip.	= 5.92 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2.cds	Shape factor	= 484

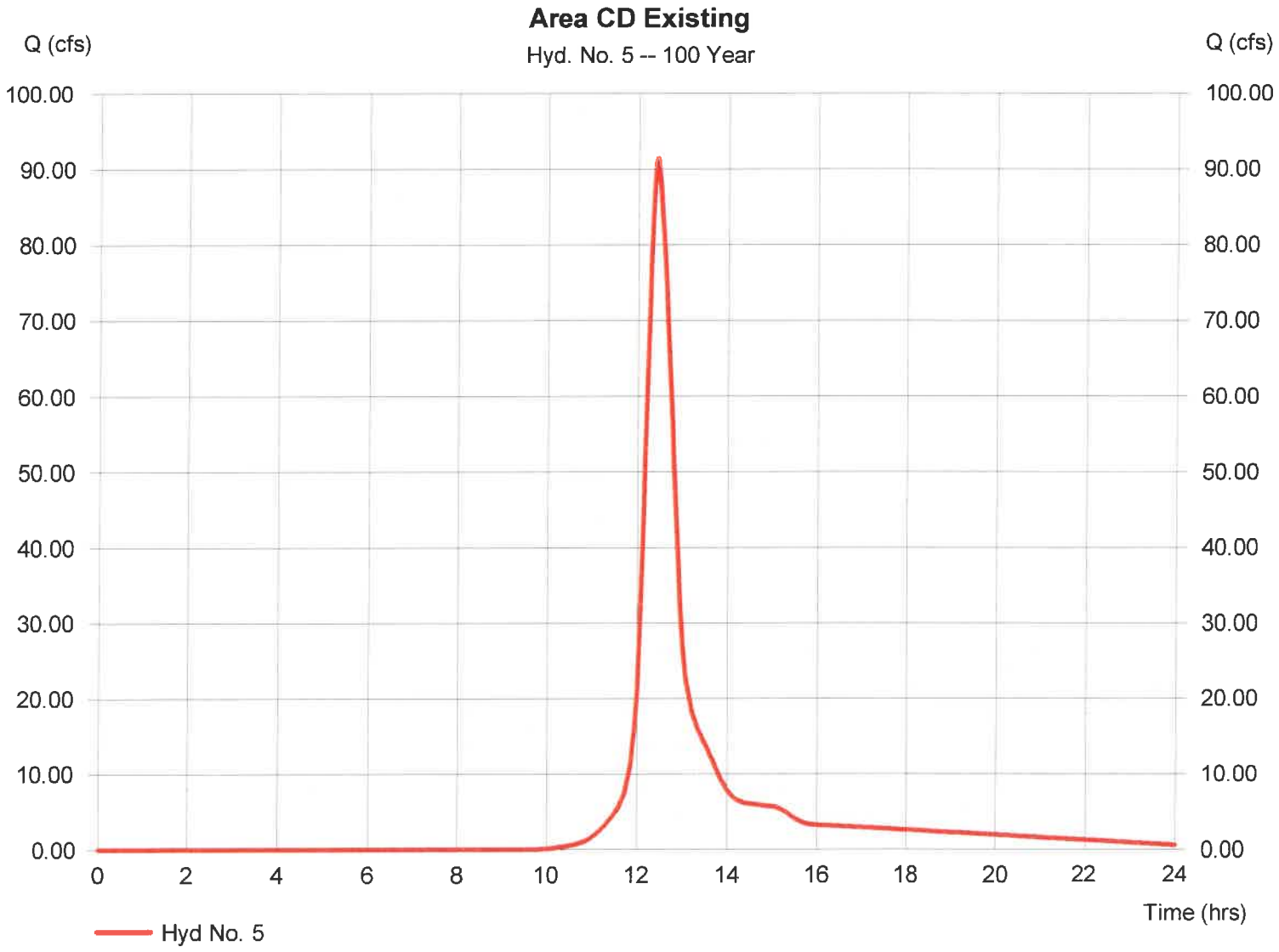


Hydrograph Report

Hyd. No. 5

Area CD Existing

Hydrograph type	= SCS Runoff	Peak discharge	= 91.33 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.43 hrs
Time interval	= 2 min	Hyd. volume	= 392,500 cuft
Drainage area	= 35.080 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.40 min
Total precip.	= 5.92 in	Distribution	= Custom
Storm duration	= K:\Hydraflow\MSE3-Distributions\2.pcs	Shape factor	= 484



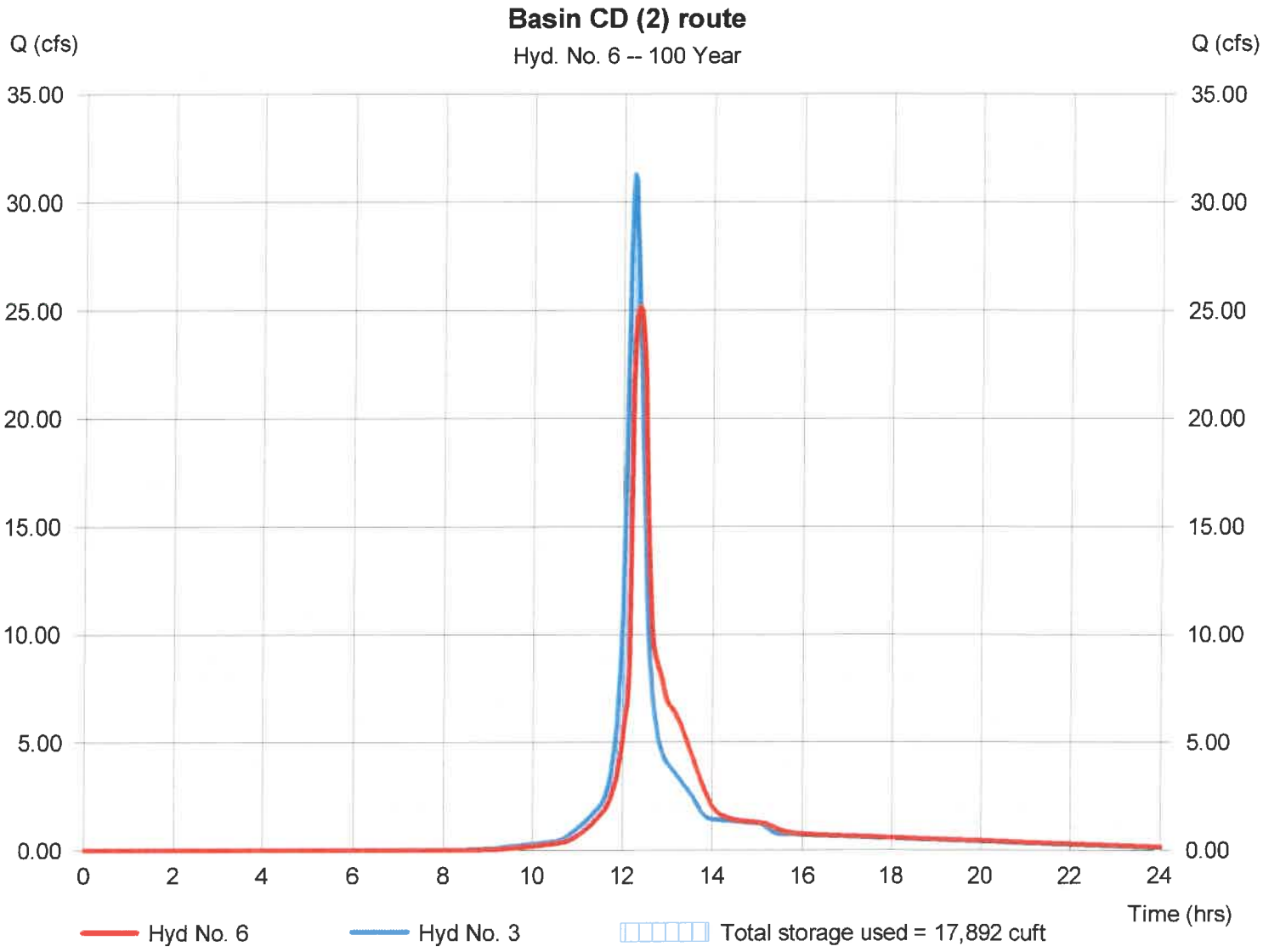
Hydrograph Report

Hyd. No. 6

Basin CD (2) route

Hydrograph type	= Reservoir	Peak discharge	= 25.17 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 96,940 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 703.14 ft
Reservoir name	= basin CD (2)	Max. Storage	= 17,892 cuft

Storage Indication method used.

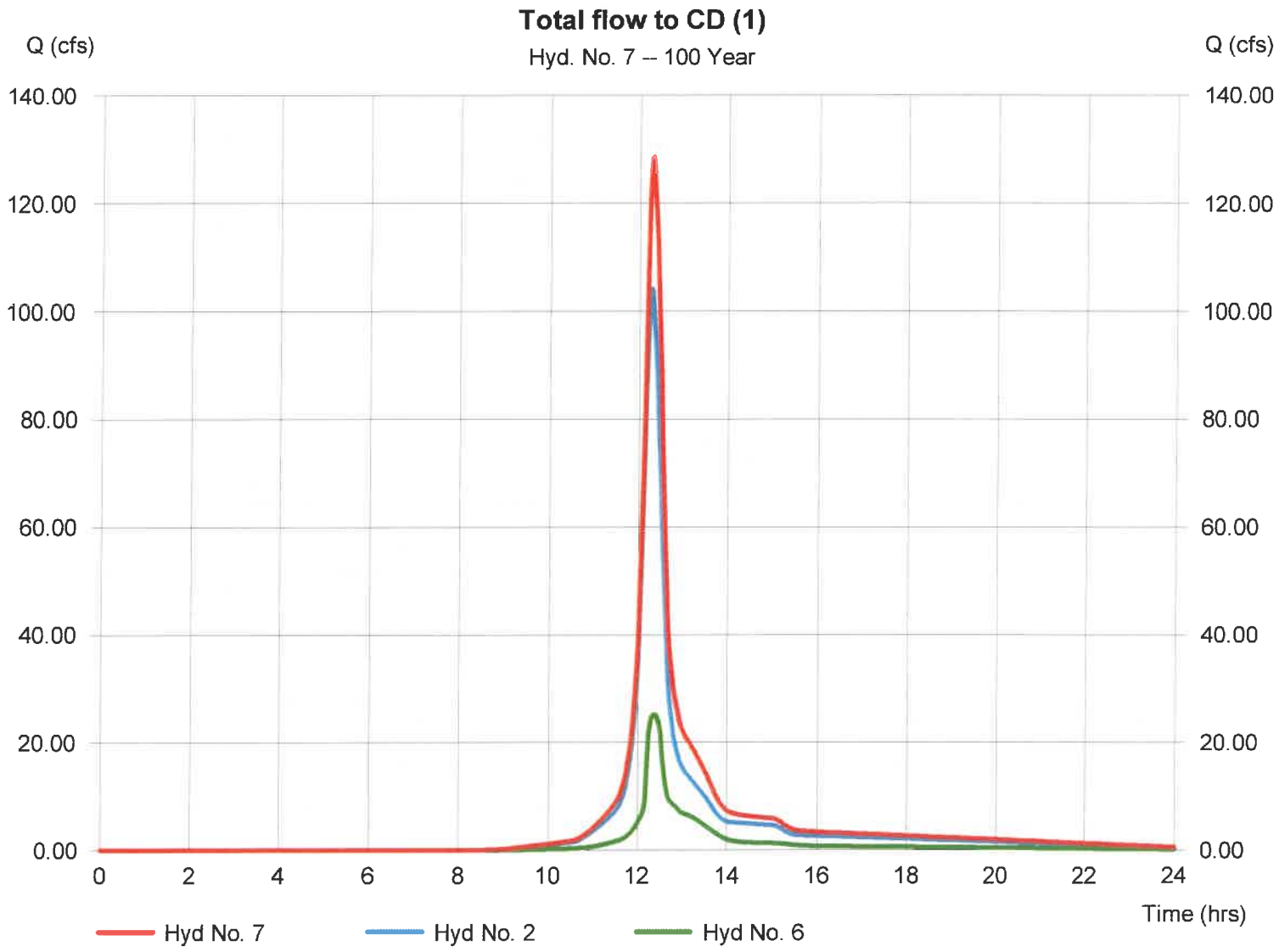


Hydrograph Report

Hyd. No. 7

Total flow to CD (1)

Hydrograph type	= Combine	Peak discharge	= 128.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 450,519 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 25.800 ac



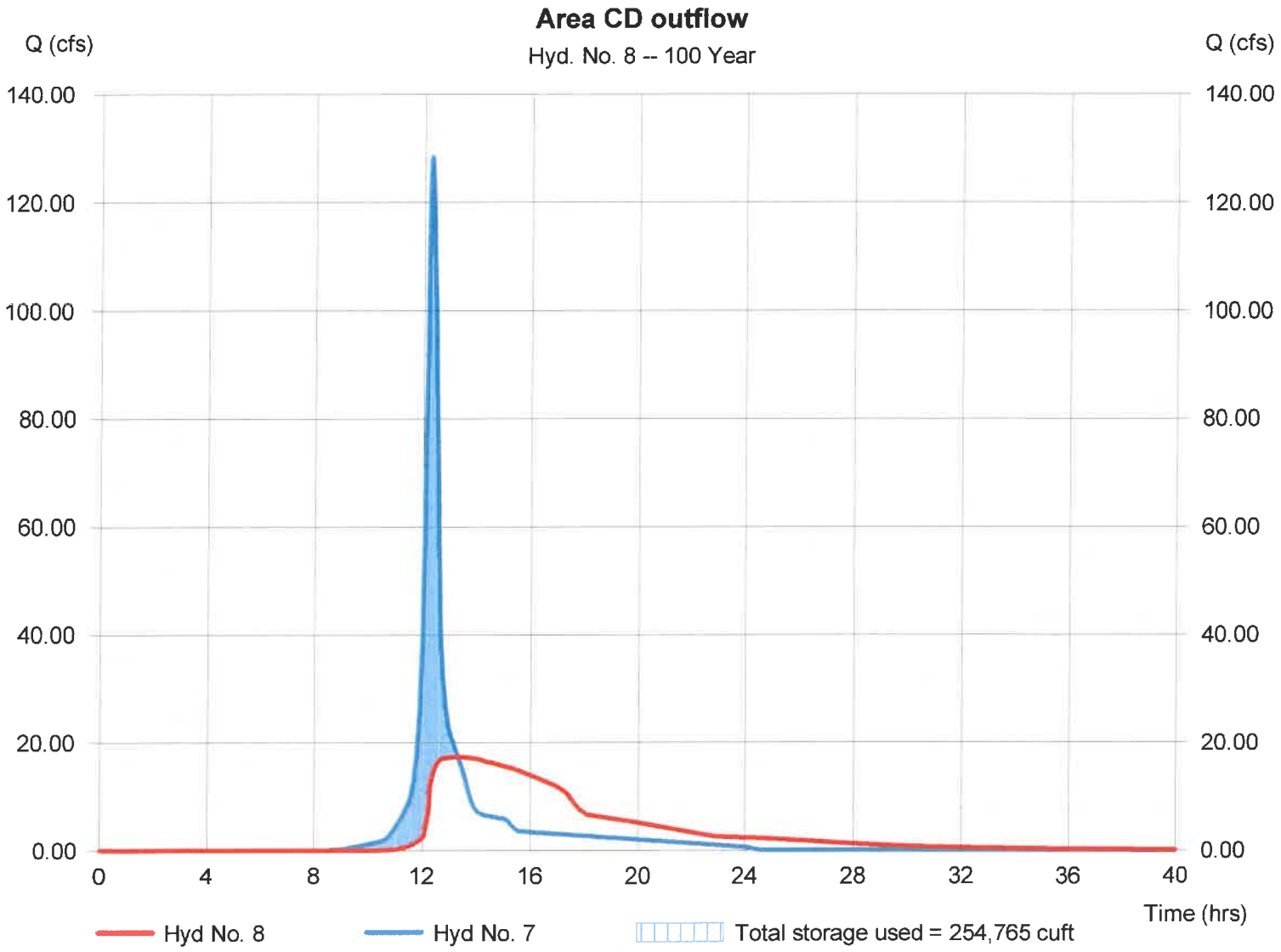
Hydrograph Report

Hyd. No. 8

Area CD outflow

Hydrograph type	= Reservoir	Peak discharge	= 17.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.33 hrs
Time interval	= 2 min	Hyd. volume	= 449,553 cuft
Inflow hyd. No.	= 7 - Total flow to CD (1)	Max. Elevation	= 700.09 ft
Reservoir name	= CD (1)	Max. Storage	= 254,765 cuft

Storage Indication method used.



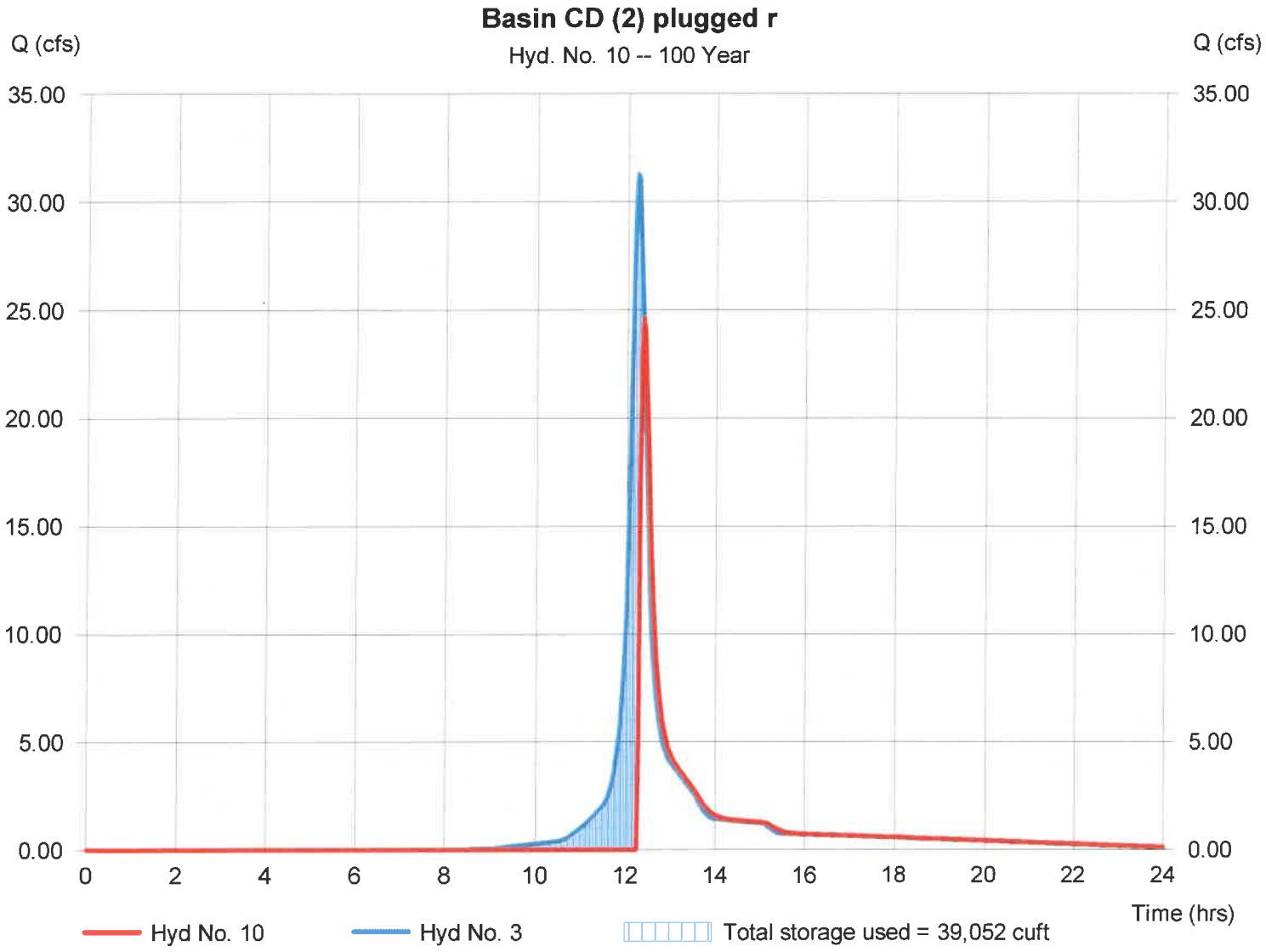
Hydrograph Report

Hyd. No. 10

Basin CD (2) plugged r

Hydrograph type	= Reservoir	Peak discharge	= 24.62 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 63,405 cuft
Inflow hyd. No.	= 3 - Area CD (2) proposed	Max. Elevation	= 705.52 ft
Reservoir name	= basin CD (2) plugged	Max. Storage	= 39,052 cuft

Storage Indication method used.

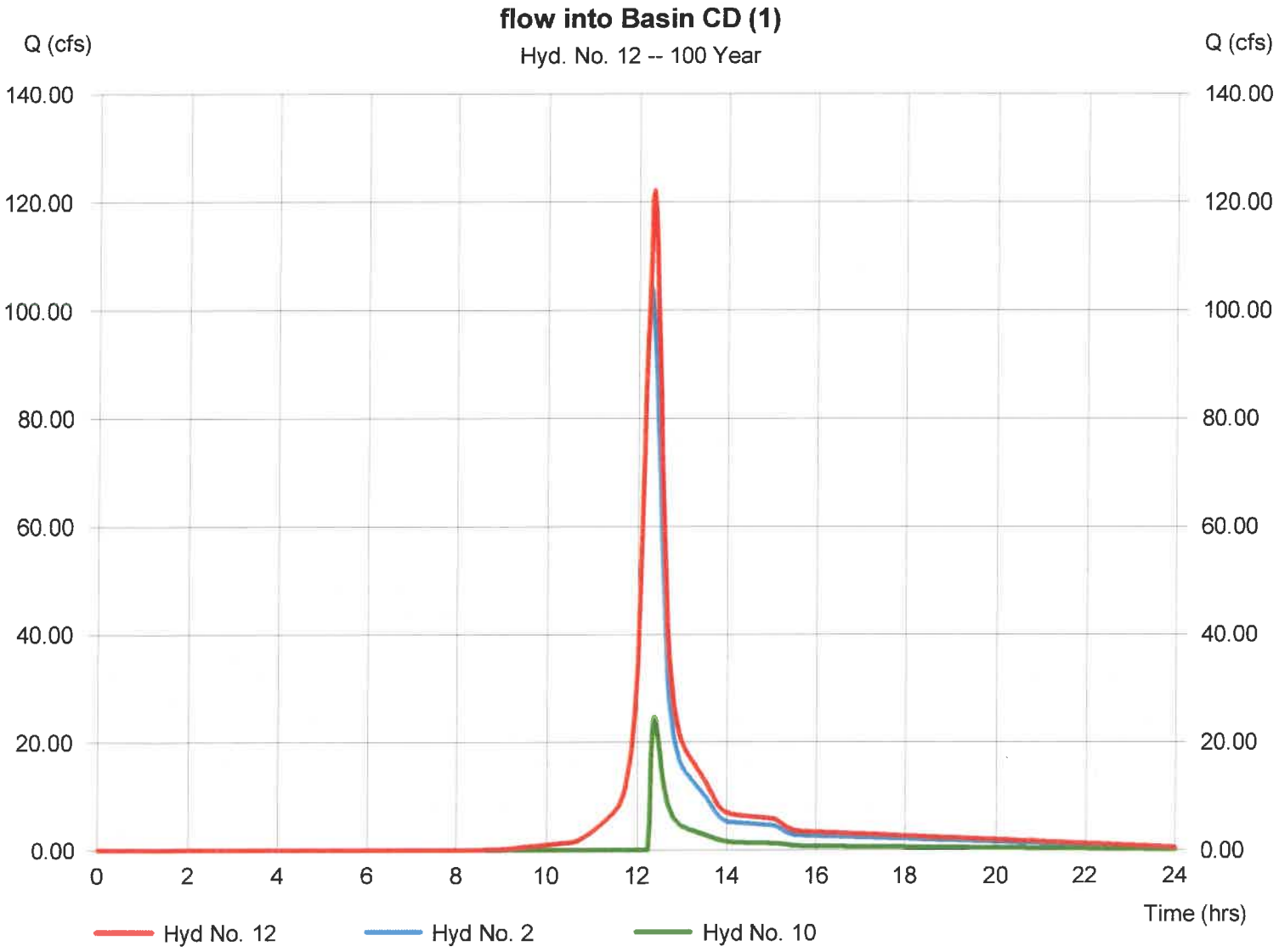


Hydrograph Report

Hyd. No. 12

flow into Basin CD (1)

Hydrograph type	= Combine	Peak discharge	= 122.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 416,984 cuft
Inflow hyds.	= 2, 10	Contrib. drain. area	= 25.800 ac



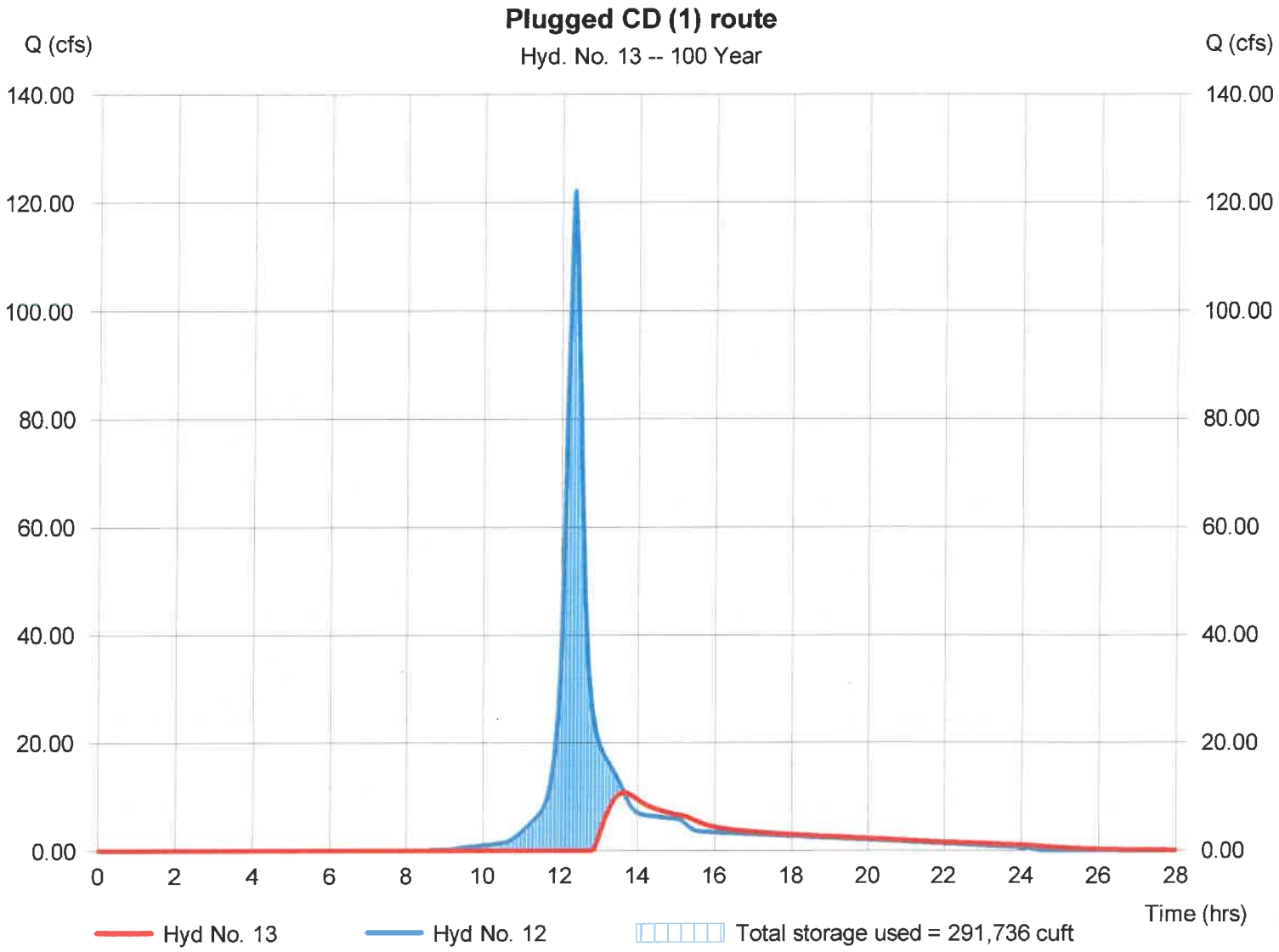
Hydrograph Report

Hyd. No. 13

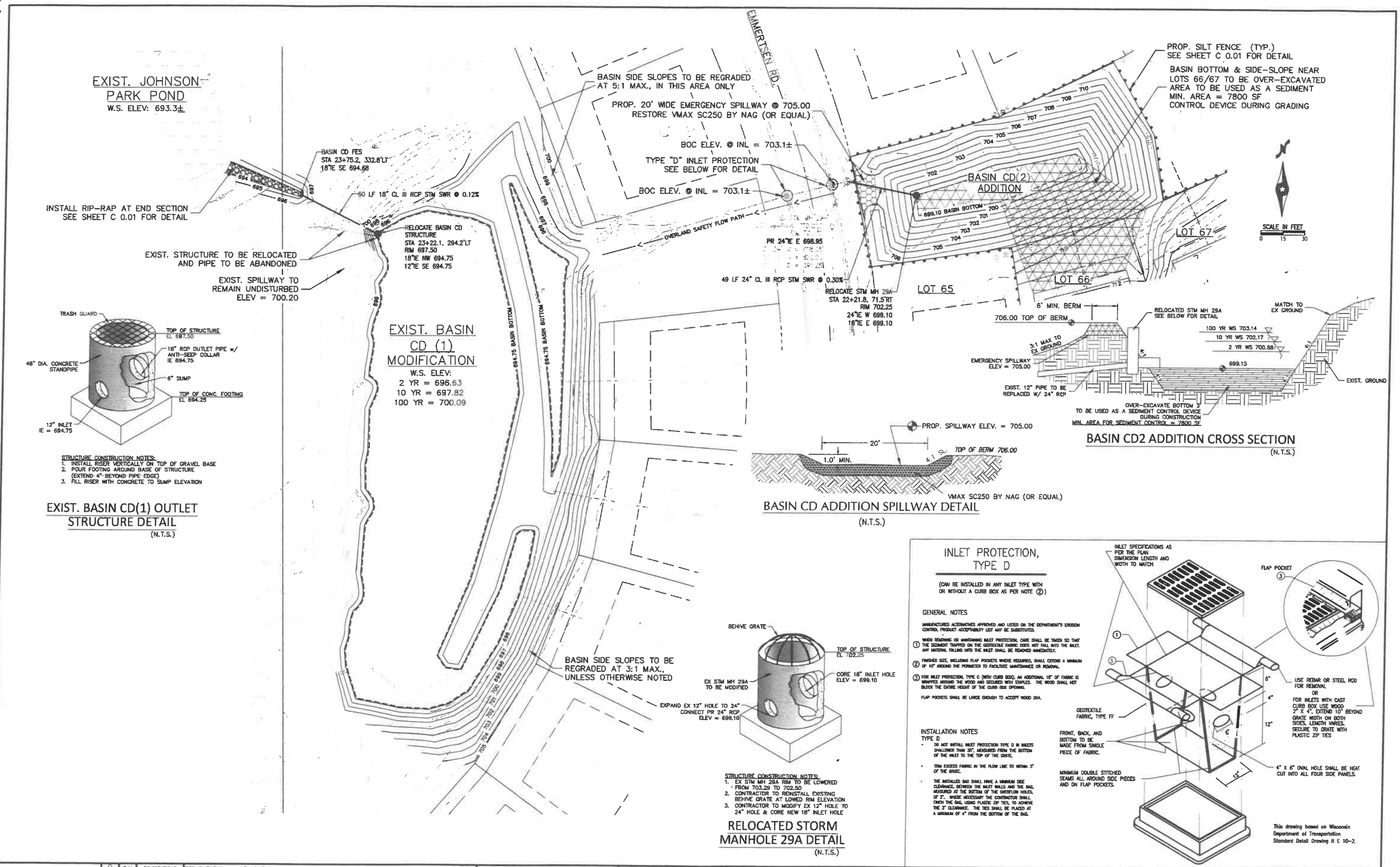
Plugged CD (1) route

Hydrograph type	= Reservoir	Peak discharge	= 10.75 cfs
Storm frequency	= 100 yrs	Time to peak	= 13.63 hrs
Time interval	= 2 min	Hyd. volume	= 153,323 cuft
Inflow hyd. No.	= 12 - flow into Basin CD (1)	Max. Elevation	= 700.56 ft
Reservoir name	= CD (1) plugged	Max. Storage	= 291,736 cuft

Storage Indication method used.



Hydraflow Table of Contents



DRAWN BY:	ZJH
DESIGNER:	I. VAYNBERG
CHECKED BY:	---
DESIGN TEAM	

NO.	BY	DATE	REVISIONS
1	ZJH	09/27/2017	PER CLIENT & VILLAGE REVIEW
2	ZJH	12/22/2017	REVISED PER 11/27/2017 VILLAGE COMMENTS

SEH
PHONE: 414.949.8962
501 MAPLE AVENUE
DELAFIELD, WI 53018-9351
www.sehinc.com

AUBURN HILLS PHASE III - A & B
VILLAGE OF CALEDONIA, WI

BASIN CD MODIFICATIO AND EXPANSION
GRADING & EROSION CONT DETAIL

FILE NO. 141157
DATE 05/10/2017

C 1.02

G:\PTYR\RVRSV\141157\5-final-dsgn\51-drawings\10-Civil\cad\dwg\pinshta\141157_BASIN GRD & ERC.dwg 12/21/2017 8:35 AM zhochevar

TOTAL AREA CD
2 Yr = 32.66 cfs
10 Yr = 59.42 cfs
100 Yr = 128.42 cfs

AREA CD(1)
25.2 Acres
Tc=21.5 min.
CN=80
2 Yr = 27.87 cfs
10 Yr = 52.19 cfs
100 Yr = 104.12 cfs

EXIST. BASIN CD(1)
2 Yr = 3.85 cfs – 696.63 ft
10 Yr = 10.50 cfs – 697.82 ft
100 Yr = 17.34 cfs – 700.09 ft

EXIST. BASIN E
10 Yr = 3.43 cfs – 708.31 ft
25 Yr = 5.10 cfs – 708.65 ft
50 Yr = 6.96 cfs – 708.91 ft
100 Yr = 8.59 cfs – 709.14 ft

AREA E
14.40 Acres
Tc= 24.0 min.
CN=81
2 Yr = 15.02 cfs
10 Yr = 30.29 cfs
25 Yr = 37.76 cfs
50 Yr = 44.09 cfs
100 Yr = 50.49 cfs

EX. BASIN B + PR. BASIN B1
2 Yr = 0.25 cfs – 717.40 ft
10 Yr = 0.32 cfs – 718.17 ft
100 Yr = 2.57 cfs – 718.91 ft

AREA F
Tc=11 min.
CN=74 (open space)
0.84 Acres
2 Yr = 0.60 cfs
10 Yr = 1.42 cfs
25 Yr = 1.83 cfs
50 Yr = 2.19 cfs
100 Yr = 2.55 cfs

AREA B
12.9 Acres
Tc=19.6 min.
CN=80
2 Yr = 15.03 cfs
10 Yr = 28.02 cfs
100 Yr = 56.03 cfs

AREA A
2.45 Acres
Tc=24.7 min.
CN=74 (open space)
2 Yr = 1.33 cfs
10 Yr = 3.21 cfs
25 Yr = 4.17 cfs
50 Yr = 5.01 cfs
100 Yr = 5.86 cfs

AREA K
Tc=18.5 min.
CN=74 (open space)
0.65 Acres
2 Yr = 0.47 cfs
10 Yr = 1.10 cfs
25 Yr = 1.42 cfs
50 Yr = 1.69 cfs
100 Yr = 1.98 cfs

AREA CD(2)
7.2 Acres
Tc=17.7 min.
CN=80
2 Yr = 8.39 cfs
10 Yr = 15.64 cfs
100 Yr = 31.27 cfs

BASIN CD (2)
2 Yr = 5.43 cfs – 701.51 ft
10 Yr = 8.77 cfs – 702.89 ft
100 Yr = 25.17 cfs – 704.67 ft

EXIST. BASIN G
10 Yr = 2.55 cfs – 715.04 ft
25 Yr = 3.70 cfs – 715.25 ft
50 Yr = 4.73 cfs – 715.44 ft
100 Yr = 5.74 cfs – 715.64 ft

AREA G
14.75 Acres
Tc=26.7 min.
CN=75
2 Yr = 9.30 cfs
10 Yr = 21.42 cfs
25 Yr = 27.56 cfs
50 Yr = 32.94 cfs
100 Yr = 38.56 cfs

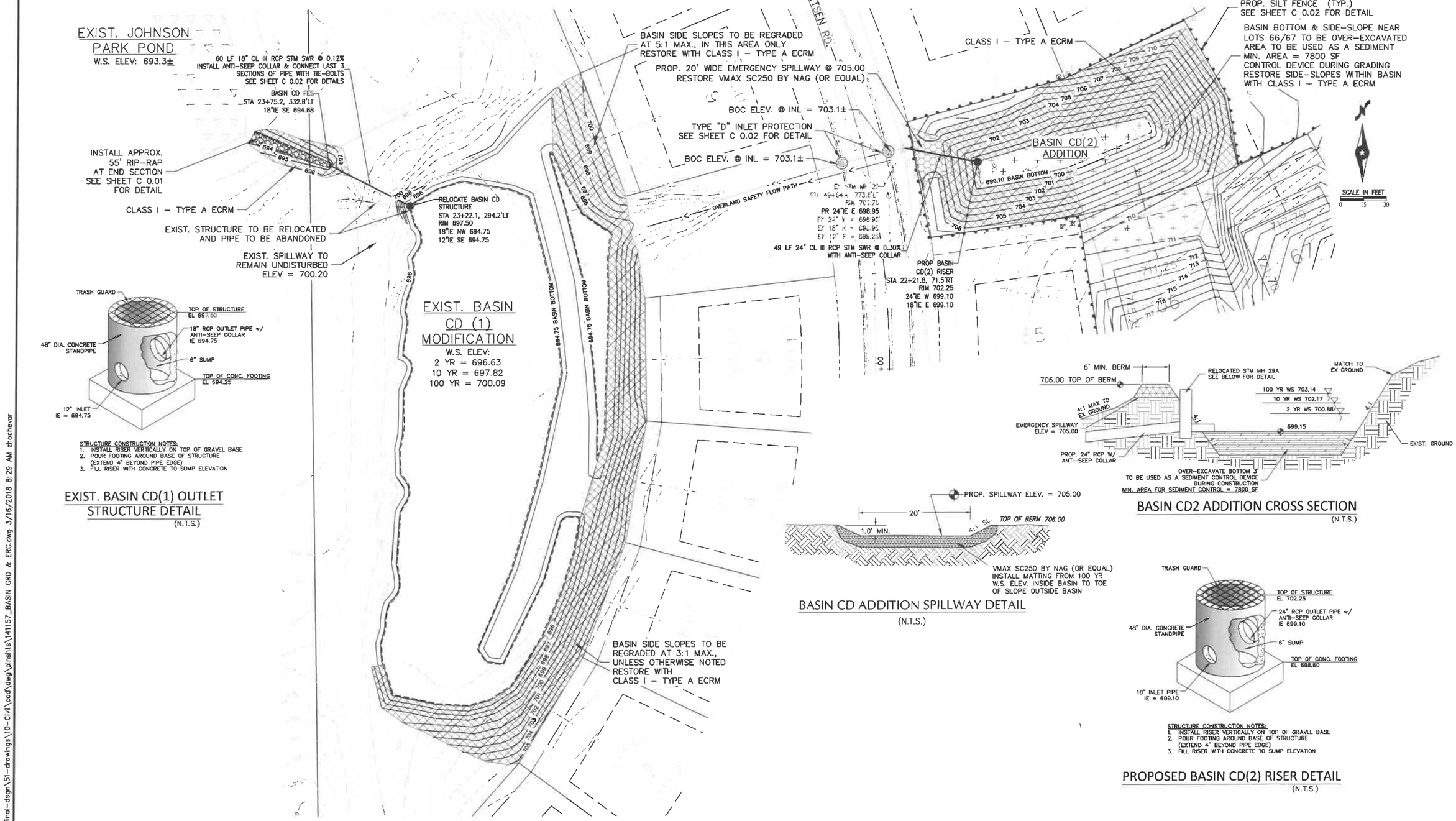
AREA H
7.9 Acres
Tc=15.5 min.
CN=78
2 Yr = 7.50 cfs
10 Yr = 16.29 cfs
25 Yr = 20.88 cfs
50 Yr = 24.43 cfs
100 Yr = 28.25 cfs

EXIST. BASIN H
10 Yr = 0 cfs – 714.58 ft
100 Yr = 0 cfs – 715.18 ft

NORTHWESTERN AVE.
BLAZING STAR DR.
EMMERTSEN DR.
TREEFOIL CIR.
WILD IRIS CIR.
INDIGO DR.
ALBURG AVE.
BERGAMOT DR.
EX. BASIN CD(1)
EX. BASIN B
BASIN B1
BASIN CD(2)
EX. BASIN E
EX. BASIN H
EX. BASIN G

SCALE IN FEET
0 75 150

DRAWN BY: ZJH DESIGNER: I. VAYNBERG CHECKED BY: _____ DESIGN TEAM	NO.	BY	DATE	REVISIONS	SEH PHONE: 414.949.8962 501 MAPLE AVENUE DELAFIELD, WI 53018-9351 www.sehinc.com	AUBURN HILLS PHASE III - A & B VILLAGE OF CALEDONIA, WI	PROPOSED DRAINAGE AREAS	FILE NO. 141157 DATE 09/27/2017	1 OF 2



NO.	BY	DATE	REVISIONS
1	ZJH	09/27/2017	PER CLIENT & VILLAGE REVIEW
2	ZJH	01/04/2018	REVISED PER 11/27/2017 VILLAGE COMMENTS
3	ZJH	03/16/2018	REVISED PER 01/19/2018 VILLAGE COMMENTS

DRAWN BY: ZJH
DESIGNER: I. VAYNBERG
CHECKED BY: --
DESIGN TEAM

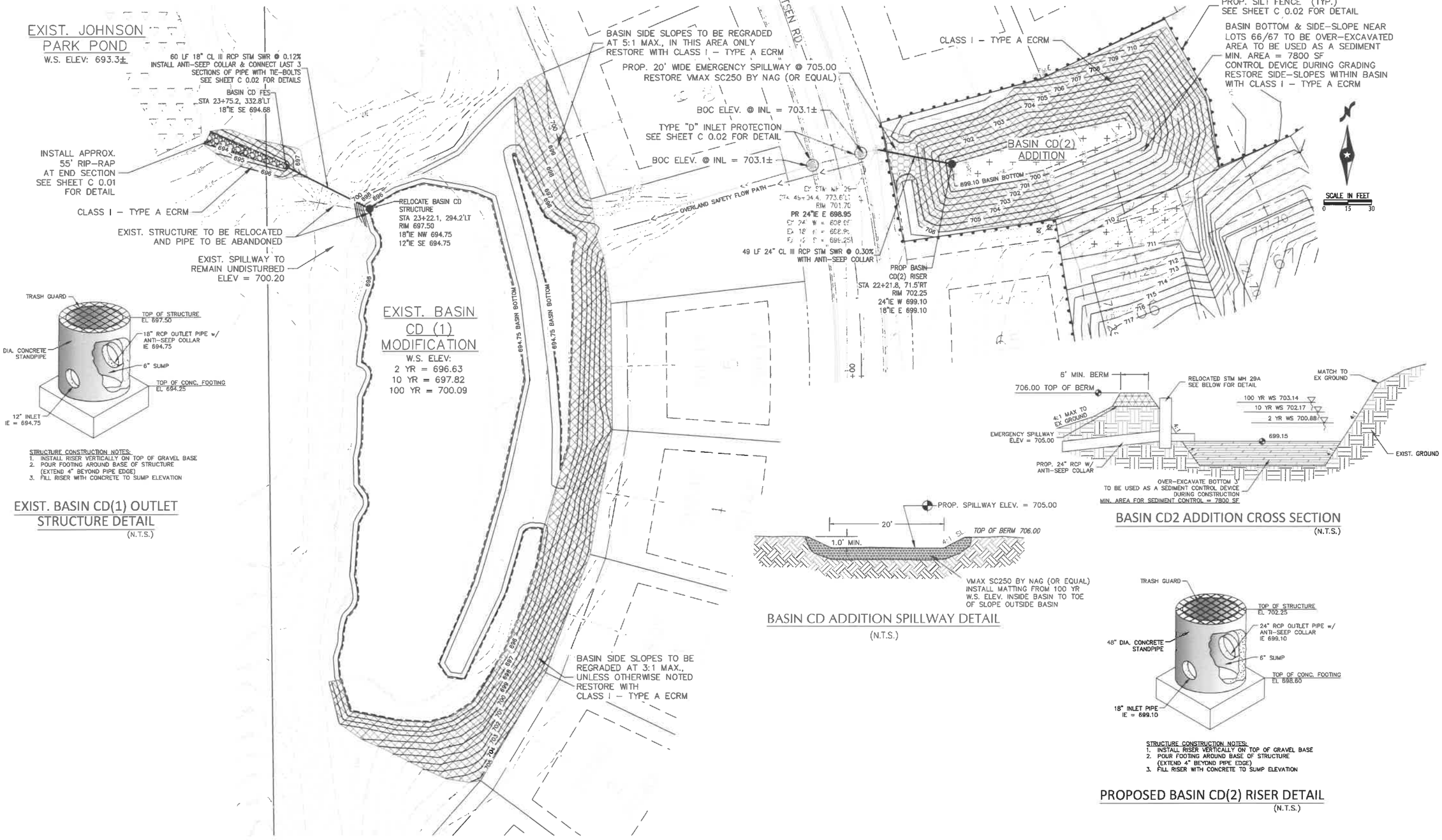
SEH
PHONE: 414.949.8952
501 MAPLE AVENUE
DELAFIELD, WI 53018-9351
www.sehinc.com

AUBURN HILLS PHASE III - A & B
VILLAGE OF CALEDONIA, WI

BASIN CD MODIFICATION-EXPANSION
GRADING & EROSION CONTROL DETAIL

FILE NO. 141157
DATE 05/10/2017

C 1.03



STRUCTURE CONSTRUCTION NOTES:
1. INSTALL RISER VERTICALLY ON TOP OF GRAVEL BASE
2. POUR FOOTING AROUND BASE OF STRUCTURE (EXTEND 4" BEYOND PIPE EDGE)
3. FILL RISER WITH CONCRETE TO SUMP ELEVATION

EXIST. BASIN CD(1) OUTLET STRUCTURE DETAIL
(N.T.S.)

BASIN CD2 ADDITION CROSS SECTION
(N.T.S.)

BASIN CD ADDITION SPILLWAY DETAIL
(N.T.S.)

STRUCTURE CONSTRUCTION NOTES:
1. INSTALL RISER VERTICALLY ON TOP OF GRAVEL BASE
2. POUR FOOTING AROUND BASE OF STRUCTURE (EXTEND 4" BEYOND PIPE EDGE)
3. FILL RISER WITH CONCRETE TO SUMP ELEVATION

PROPOSED BASIN CD(2) RISER DETAIL
(N.T.S.)

DRAWN BY:	ZJH
DESIGNER:	I. VAYNBERG
CHECKED BY:	--
	DESIGN TEAM

NO.	BY	DATE	REVISIONS
1	ZJH	09/27/2017	PER CLIENT & VILLAGE REVIEW
2	ZJH	01/04/2018	REVISED PER 11/27/2017 VILLAGE COMMENTS
3	ZJH	03/16/2018	REVISED PER 01/19/2018 VILLAGE COMMENTS

SEH
PHONE: 414.949.8962
501 MAPLE AVENUE
DELAFIELD, WI 53018-9351
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AUBURN HILLS PHASE III - A & B
VILLAGE OF CALEDONIA, WI

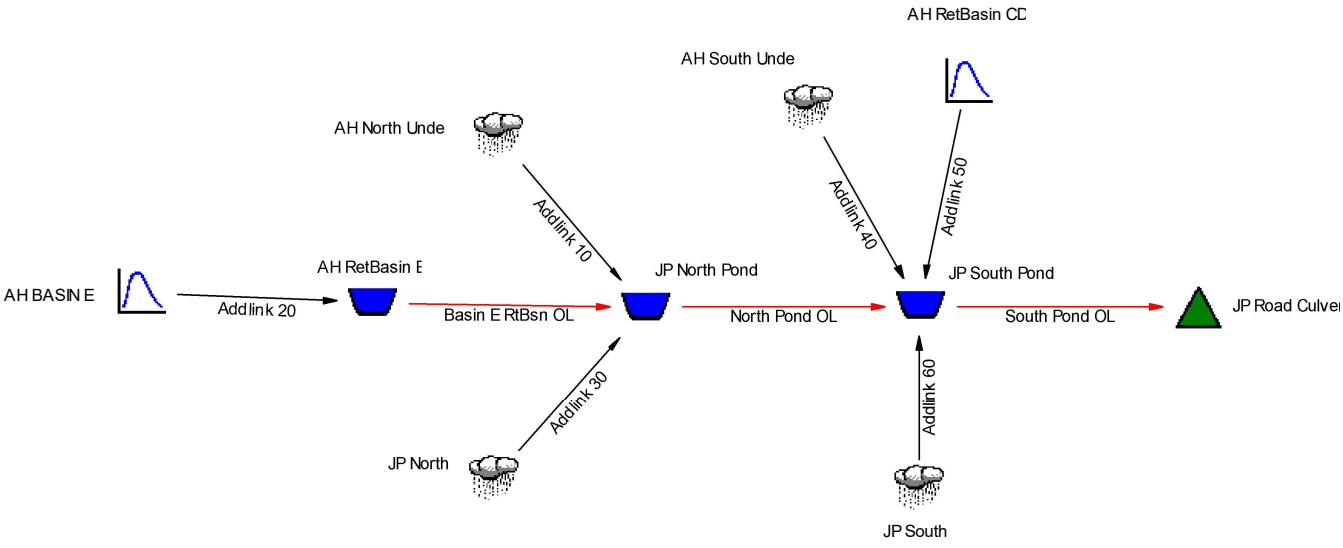
BASIN CD MODIFICATION-EXPANSION
GRADING & EROSION CONTROL DETAIL

FILE NO. 141157
DATE 05/10/2017

C 1.03

APPENDIX
"C"

DEVELOPED CONDITIONS


AH RetBasin CD
AH South Unde
AH North Unde
Addlink 10
Addlink 40
Addlink 50
AH RetBasin E
JP North Pond
JP South Pond
AH BASIN E
Addlink 20
Basin E RtBsn OL
North Pond OL
South Pond OL
JP Road Culve
Addlink 30
Addlink 60
JP North
JP South

==========
JOB TITLE
==========

Project Date: 8/21/2018
Project Engineer: Mark R. Madsen, P.E.
Project Title: Racine Parks Department - Johnson Park Drainage Study
Project Comments:
Johnson Park South Ponds & Aurburn Hills Subdivision Drainage Report

Table of Contents

Table of Contents (continued)

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Racine County

Return Event	Total Depth in	Rainfall Type	RNF ID
2 yr	2.6700	Synthetic Curve	MSE3
10 yr	3.7700	Synthetic Curve	MSE3
100 yr	5.9200	Synthetic Curve	MSE3

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0200 hrs
Output Time Step = .0200 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AH BASIN E	HYG	2	.971	LR	12.1000	15.02		
AH BASIN E	HYG	10	1.834	LR	12.1000	30.29		
AH BASIN E	HYG	100	2.982	LR	12.1000	50.49		
AH NORTH UNDET	AREA	2	.023		12.1600	.39		
AH NORTH UNDET	AREA	10	.047		12.1600	.86		
AH NORTH UNDET	AREA	100	.104		12.1600	1.93		

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0200 hrs
Output Time Step = .0200 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AH RETBASIN CD	HYG	2	2.392	R	13.5000	5.72		
AH RETBASIN CD	HYG	10	4.614	R	13.0000	10.63		
AH RETBASIN CD	HYG	100	9.513	R	13.5000	17.21		
AH RETBASIN E	POND	2	.971		12.1000	15.02		
AH RETBASIN E	POND	10	1.836		12.1000	30.29		
AH RETBASIN E	POND	100	2.986		12.1000	50.49		
AH RETBASIN EOUT	POND	2	.971		12.7400	2.28	707.25	.542
AH RETBASIN EOUT	POND	10	1.836		13.0400	3.22	708.30	1.220
AH RETBASIN EOUT	POND	100	2.983		12.7200	7.48	709.12	1.987
AH SOUTH UNDET	AREA	2	.145		12.1600	2.57		
AH SOUTH UNDET	AREA	10	.289		12.1600	5.35		
AH SOUTH UNDET	AREA	100	.621		12.1600	11.54		
JP NORTH	AREA	2	.646		12.2800	7.91		
JP NORTH	AREA	10	1.264		12.2600	16.29		
JP NORTH	AREA	100	2.675		12.2600	35.05		
JP NORTH POND	POND	2	1.639		12.2800	10.29		
JP NORTH POND	POND	10	3.146		12.2600	19.46		
JP NORTH POND	POND	100	5.761		12.2600	40.98		

```
--------------------------------
ICPM CALCULATION TOLERANCES
--------------------------------
Target Convergence=     .000 cfs +/-
Max. Iterations   =       35 loops
ICPM   Time Step  =    .0200 hrs
Output Time Step  =    .0200 hrs
ICPM Ending Time  =  35.0000 hrs
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MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
JP NORTH PONDOUT	POND	2	2.243	LR	.0200	1.02	696.25	2.754
JP NORTH PONDOUT	POND	10	2.707	LR	20.5000	1.16	697.33	3.985
JP NORTH PONDOUT	POND	100	5.056	LR	14.4600	6.92	697.80	4.519
*JP ROAD CULVERT	JCT	2	3.894	R	18.1600	2.87		
*JP ROAD CULVERT	JCT	10	7.050	R	17.3200	6.08		
*JP ROAD CULVERT	JCT	100	15.743	R	17.7600	14.43		
JP SOUTH	AREA	2	.839		12.2400	11.55		
JP SOUTH	AREA	10	1.519		12.2400	21.26		
JP SOUTH	AREA	100	3.000		12.2400	41.68		
JP SOUTH POND	POND	2	5.619	LR	12.2400	15.93		
JP SOUTH POND	POND	10	9.130	LR	12.2400	29.94		
JP SOUTH POND	POND	100	18.192	LR	12.2200	59.94		
JP SOUTH PONDOUT	POND	2	3.894	R	18.1600	2.87	695.16	7.752
JP SOUTH PONDOUT	POND	10	7.050	R	17.3200	6.08	695.62	9.184
JP SOUTH PONDOUT	POND	100	15.743	R	17.7600	14.43	696.54	12.892

CUMULATIVE RAINFALL FRACTIONS
Output Time increment = .1000 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
.0000	.000	.000	.001	.001	.001
.5000	.002	.002	.002	.003	.003
1.0000	.004	.004	.005	.005	.006
1.5000	.006	.007	.007	.008	.008
2.0000	.009	.010	.010	.011	.012
2.5000	.013	.013	.014	.015	.016
3.0000	.017	.017	.018	.019	.020
3.5000	.021	.022	.023	.024	.025
4.0000	.026	.027	.028	.029	.030
4.5000	.032	.033	.034	.035	.036
5.0000	.038	.039	.040	.041	.043
5.5000	.044	.045	.047	.048	.050
6.0000	.051	.052	.054	.055	.057
6.5000	.058	.060	.062	.063	.065
7.0000	.066	.068	.070	.071	.073
7.5000	.075	.077	.078	.080	.082
8.0000	.084	.086	.087	.089	.091
8.5000	.093	.095	.097	.099	.101
9.0000	.103	.106	.110	.113	.116
9.5000	.120	.123	.127	.130	.134
10.0000	.137	.141	.145	.149	.152
10.5000	.156	.162	.169	.176	.184
11.0000	.193	.202	.213	.224	.235
11.5000	.248	.266	.291	.324	.372
12.0000	.463	.628	.676	.709	.734
12.5000	.752	.765	.776	.787	.798
13.0000	.807	.816	.824	.831	.838
13.5000	.844	.848	.851	.855	.859
14.0000	.863	.866	.870	.873	.877
14.5000	.880	.884	.887	.890	.894
15.0000	.897	.899	.901	.903	.905
15.5000	.907	.909	.911	.913	.914
16.0000	.916	.918	.920	.922	.923
16.5000	.925	.927	.929	.930	.932
17.0000	.934	.935	.937	.938	.940
17.5000	.942	.943	.945	.946	.948
18.0000	.949	.950	.952	.953	.955
18.5000	.956	.957	.959	.960	.961
19.0000	.962	.964	.965	.966	.967
19.5000	.968	.970	.971	.972	.973
20.0000	.974	.975	.976	.977	.978
20.5000	.979	.980	.981	.982	.983
21.0000	.983	.984	.985	.986	.987
21.5000	.987	.988	.989	.990	.990

CUMULATIVE RAINFALL FRACTIONS
Output Time increment = .1000 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
22.0000	.991	.992	.992	.993	.993
22.5000	.994	.994	.995	.995	.996
23.0000	.996	.997	.997	.998	.998
23.5000	.998	.999	.999	.999	1.000
24.0000	1.000				

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	43.00 ft
2yr, 24hr P	2.6700 in
Slope	.058100 ft/ft
Avg.Velocity	.14 ft/sec

Segment #1 Time: .0865 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	45.00 ft
Slope	.133300 ft/ft
Unpaved	
Avg.Velocity	5.89 ft/sec

Segment #2 Time: .0021 hrs

==========
Total Tc: .0886 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1667 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	60.00 ft
2yr, 24hr P	2.6700 in
Slope	.066700 ft/ft

Avg.Velocity .16 ft/sec

Segment #1 Time: .1069 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	102.00 ft
Slope	.049000 ft/ft
Unpaved	

Avg.Velocity 3.57 ft/sec

Segment #2 Time: .0079 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	42.00 ft
Slope	.023800 ft/ft
Unpaved	

Avg.Velocity 2.49 ft/sec

Segment #3 Time: .0047 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 207.00 ft
Slope .019300 ft/ft
Unpaved

Avg.Velocity 2.24 ft/sec

Segment #4 Time: .0257 hrs

Total Tc: .1451 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1667 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	77.00 ft
2yr, 24hr P	2.6700 in
Slope	.025900 ft/ft

Avg.Velocity .11 ft/sec

Segment #1 Time: .1905 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	110.00 ft
Slope	.059100 ft/ft

Paved

Avg.Velocity 4.94 ft/sec

Segment #2 Time: .0062 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	309.00 ft
Slope	.003100 ft/ft

Unpaved

Avg.Velocity .90 ft/sec

Segment #3 Time: .0955 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 119.00 ft
Slope .025200 ft/ft
Unpaved

Avg.Velocity 2.56 ft/sec

Segment #4 Time: .0129 hrs

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 77.00 ft
Slope .039000 ft/ft
Unpaved

Avg.Velocity 3.19 ft/sec

Segment #5 Time: .0067 hrs

Segment #6: Tc: TR-55 Shallow

Hydraulic Length 159.00 ft
Slope .037700 ft/ft
Unpaved

Avg.Velocity 3.13 ft/sec

Segment #6 Time: .0141 hrs

Segment #7: Tc: TR-55 Shallow

Hydraulic Length 182.00 ft
Slope .021900 ft/ft
Unpaved

Avg.Velocity 2.39 ft/sec

Segment #7 Time: .0212 hrs

==========
Total Tc: .3471 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	145.00 ft
2yr, 24hr P	2.6700 in
Slope	.041400 ft/ft
Avg.Velocity	.15 ft/sec

Segment #1 Time: .2620 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	173.00 ft
Slope	.035300 ft/ft
Unpaved	
Avg.Velocity	3.03 ft/sec

Segment #2 Time: .0159 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	83.00 ft
Slope	.024100 ft/ft
Unpaved	
Avg.Velocity	2.50 ft/sec

Segment #3 Time: .0092 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 39.00 ft
Slope .025700 ft/ft
Unpaved

Avg.Velocity 2.59 ft/sec

Segment #4 Time: .0042 hrs

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 123.00 ft
Slope .020300 ft/ft
Unpaved

Avg.Velocity 2.30 ft/sec

Segment #5 Time: .0149 hrs

Total Tc: .3061 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Woods - fair	73	.411			73.00
COMPOSITE AREA & WEIGHTED CN --->		.411			73.00 (73)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pavement & Roofs	98	.153			98.00
Woods - fair	73	1.132			73.00
Open space (Lawns,parks etc.) - Goo	74	1.035			74.00
COMPOSITE AREA & WEIGHTED CN --->		2.320			75.09 (75)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pond	98	.845			98.00
Impervious Areas - Pavement	98	.309			98.00
Woods - fair	73	8.540			73.00
COMPOSITE AREA & WEIGHTED CN --->		9.694			75.98 (76)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pond	98	2.608			98.00
Impervious Areas - Pavement	98	.265			98.00
Open space (Lawns,parks etc.) - Goo	74	2.099			74.00
Woods - fair	73	4.474			73.00
COMPOSITE AREA & WEIGHTED CN --->		9.446			80.83 (81)

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
705.00	-----	.1148	.0000	.000	.000
706.00	-----	.1525	.3996	.133	.133
707.00	-----	.4093	.8116	.271	.404
708.00	-----	.7210	1.6735	.558	.962
709.00	-----	1.0382	2.6244	.875	1.836
710.00	-----	1.4091	3.6568	1.219	3.055
711.00	-----	1.7068	4.6667	1.556	4.611
712.00	-----	1.8365	5.3138	1.771	6.382

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
693.00	-----	.5000	.0000	.000	.000
695.00	-----	.8450	1.9950	1.330	1.330
698.00	-----	1.4629	3.4197	3.420	4.750
699.00	-----	1.9056	5.0381	1.679	6.429

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
692.00	-----	1.8000	.0000	.000	.000
694.25	-----	2.6078	6.5744	4.931	4.931
696.00	-----	3.6326	9.3182	5.436	10.366
698.00	-----	5.7597	13.9664	9.311	19.677
699.00	-----	6.6968	18.6671	6.222	25.900

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 693.00 ft
Increment = .20 ft
Max. Elev.= 699.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular	C0	--->	TW	693.000	699.000
Weir-XY Points	W0	--->	TW	697.250	699.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	.6700 ft
Upstream Invert	=	693.00 ft
Dnstream Invert	=	692.00 ft
Horiz. Length	=	320.00 ft
Barrel Length	=	320.00 ft
Barrel Slope	=	.00313 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0110	
Ke	=	.2000	(forward entrance loss)
Kb	=	.038192	(per ft of full flow)
Kr	=	.2000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0045
Inlet Control M	=	2.0000
Inlet Control c	=	.03170
Inlet Control Y	=	.6900
T1 ratio (HW/D)	=	1.093
T2 ratio (HW/D)	=	1.196
Slope Factor	=	-.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 693.73 ft ---> Flow = 1.01 cfs
At T2 Elev = 693.80 ft ---> Flow = 1.15 cfs

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
-14.00	699.00
.00	698.00
8.50	697.25
17.00	698.00
21.00	699.00

Lowest Elev. = 697.25 ft

Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 705.00 ft
Increment = .20 ft
Max. Elev.= 712.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O1	--->	C0	708.000	712.000
Stand Pipe	R0	--->	C0	709.500	712.000
Orifice-Circular	O0	--->	C0	705.000	712.000
Culvert-Circular	C0	--->	TW	705.000	712.000
TW SETUP, DS Channel					

OUTLET STRUCTURE INPUT DATA

Structure ID = O1
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 708.00 ft
Diameter = 1.5000 ft
Orifice Coeff. = .600

Structure ID = R0
Structure Type = Stand Pipe

# of Openings = 1
Invert Elev. = 709.50 ft
Diameter = 2.5000 ft
Orifice Area = 4.9087 sq.ft
Orifice Coeff. = .600
Weir Length = 7.85 ft
Weir Coeff. = 3.330
K, Reverse = 1.000
Mannings n = .0000
Kev,Charged Riser = .000
Weir Submergence = No

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 705.00 ft
Diameter = .6700 ft
Orifice Coeff. = .600

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	15.0000	ft
Upstream Invert	=	705.00	ft
Dnstream Invert	=	703.81	ft
Horiz. Length	=	88.00	ft
Barrel Length	=	88.01	ft
Barrel Slope	=	.01352	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0110	
Ke	=	.2000	(forward entrance loss)
Kb	=	.000605	(per ft of full flow)
Kr	=	.2000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0045	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03170	
Inlet Control Y	=	.6900	
T1 ratio (HW/D)	=	1.089	
T2 ratio (HW/D)	=	1.190	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 721.33 ft ---> Flow = 2395.44 cfs
At T2 Elev = 722.86 ft ---> Flow = 2737.65 cfs

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 692.00 ft
Increment = .20 ft
Max. Elev.= 699.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular	C0	--->	TW	694.250	699.000
TW SETUP, DS Channel					

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	2.0000	ft
Upstream Invert	=	694.25	ft
Dnstream Invert	=	693.51	ft
Horiz. Length	=	40.00	ft
Barrel Length	=	40.01	ft
Barrel Slope	=	.01850	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.012411	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0098	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03980	
Inlet Control Y	=	.6700	
T1 ratio (HW/D)	=	1.151	
T2 ratio (HW/D)	=	1.298	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 696.55 ft ---> Flow = 15.55 cfs
At T2 Elev = 696.85 ft ---> Flow = 17.77 cfs

OUTLET STRUCTURE INPUT DATA

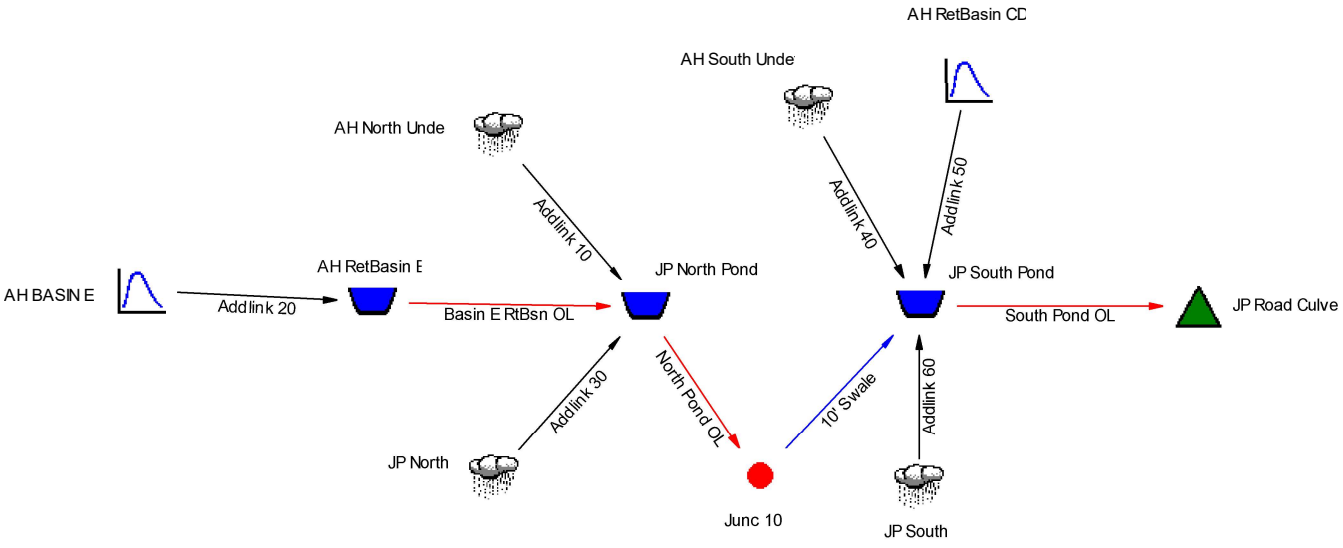
Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

Index of Starting Page Numbers for ID Names

DEVELOPED CONDITIONS
with Swale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AH South Unde
AH North Unde
Addlink 10
Addlink 40
Addlink 50
AH BASIN E
AH RetBasin E
JP North Pond
JP South Pond
Addlink 20
Basin E RtBsn OL
South Pond OL
JP Road Culve
Addlink 30
North Pond OL
10' Swale
Addlink 60
JP North
Junc 10
JP South

==========
JOB TITLE
==========

Project Date: 8/21/2018
Project Engineer: Mark R. Madsen, P.E.
Project Title: Racine Parks Department - Johnson Park Drainage Study
Project Comments:
Johnson Park South Ponds & Aurburn Hills Subdivision Drainage Report with new swale between JP North and JP South Ponds

Table of Contents

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Table of Contents (continued)

MASTER DESIGN STORM SUMMARY

Network Storm Collection: Racine County

Return Event	Total Depth in	Rainfall Type	RNF ID
2 yr	2.6700	Synthetic Curve	MSE3
10 yr	3.7700	Synthetic Curve	MSE3
100 yr	5.9200	Synthetic Curve	MSE3

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0200 hrs
Output Time Step = .0200 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AH BASIN E	HYG	2	.971	LR	12.1000	15.02		
AH BASIN E	HYG	10	1.834	LR	12.1000	30.29		
AH BASIN E	HYG	100	2.982	LR	12.1000	50.49		
AH NORTH UNDET	AREA	2	.023		12.1600	.39		
AH NORTH UNDET	AREA	10	.047		12.1600	.86		
AH NORTH UNDET	AREA	100	.104		12.1600	1.93		

ICPM CALCULATION TOLERANCES

Target Convergence= .000 cfs +/-
Max. Iterations = 35 loops
ICPM Time Step = .0200 hrs
Output Time Step = .0200 hrs
ICPM Ending Time = 35.0000 hrs

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
AH RETBASIN CD	HYG	2	2.392	R	13.5000	5.72		
AH RETBASIN CD	HYG	10	4.614	R	13.0000	10.63		
AH RETBASIN CD	HYG	100	9.513	R	13.5000	17.21		
AH RETBASIN E	POND	2	.971		12.1000	15.02		
AH RETBASIN E	POND	10	1.836		12.1000	30.29		
AH RETBASIN E	POND	100	2.986		12.1000	50.49		
AH RETBASIN EOUT	POND	2	.971		12.7400	2.28	707.25	.542
AH RETBASIN EOUT	POND	10	1.836		13.0400	3.22	708.30	1.220
AH RETBASIN EOUT	POND	100	2.983		12.7200	7.48	709.12	1.987
AH SOUTH UNDET	AREA	2	.145		12.1600	2.57		
AH SOUTH UNDET	AREA	10	.289		12.1600	5.35		
AH SOUTH UNDET	AREA	100	.621		12.1600	11.54		
JP NORTH	AREA	2	.646		12.2800	7.91		
JP NORTH	AREA	10	1.264		12.2600	16.29		
JP NORTH	AREA	100	2.675		12.2600	35.05		
JP NORTH POND	POND	2	1.639		12.2800	10.29		
JP NORTH POND	POND	10	3.146		12.2600	19.46		
JP NORTH POND	POND	100	5.761		12.2600	40.98		

```
--------------------------------
ICPM CALCULATION TOLERANCES
--------------------------------
Target Convergence=     .000 cfs +/-
Max. Iterations   =       35 loops
ICPM   Time Step  =    .0200 hrs
Output Time Step  =    .0200 hrs
ICPM Ending Time  =  35.0000 hrs
--------------------------------
```

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 2 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
JP NORTH PONDOUT	POND	2	3.177	LR	.0200	1.21	696.00	2.470
JP NORTH PONDOUT	POND	10	4.078	LR	16.3200	2.98	696.38	2.900
JP NORTH PONDOUT	POND	100	6.568	LR	13.0400	12.94	696.71	3.275
*JP ROAD CULVERT	JCT	2	6.539		17.6200	3.47		
*JP ROAD CULVERT	JCT	10	10.486		17.7800	7.30		
*JP ROAD CULVERT	JCT	100	19.690		17.0200	16.23		
JP SOUTH	AREA	2	.839		12.2400	11.55		
JP SOUTH	AREA	10	1.519		12.2400	21.26		
JP SOUTH	AREA	100	3.000		12.2400	41.68		
JP SOUTH PONDIN	POND	2	6.553		12.2400	16.28		
JP SOUTH PONDIN	POND	10	10.500		12.2400	30.28		
JP SOUTH PONDIN	POND	100	19.704		12.2200	60.29		
JP SOUTH PONDOUT	POND	2	6.539		17.6200	3.47	695.25	7.830
JP SOUTH PONDOUT	POND	10	10.486		17.7800	7.30	695.77	9.543
JP SOUTH PONDOUT	POND	100	19.690		17.0200	16.23	696.73	13.280
JUNC 10	JCT	2	3.177	LR	.0200	1.21		
JUNC 10	JCT	10	4.078	LR	16.3200	2.98		
JUNC 10	JCT	100	6.568	LR	13.0400	12.94		

Title... Project Date: 8/21/2018
Project Engineer: Mark R. Madsen, P.E.
Project Title: Racine Parks Department - Johnson Park
Drainage Study
Project Comments:
Johnson Park South Ponds & Aurburn Hills Subdivision
Drainage Report with new swale between JP North and
JP South Ponds

DESIGN STORMS SUMMARY

Design Storm File,ID = Racine County

Storm Tag Name = 2 yr

Data Type, File, ID = Synthetic Storm MSE3
Storm Frequency = 2 yr
Total Rainfall Depth= 2.6700 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 10 yr

Data Type, File, ID = Synthetic Storm MSE3
Storm Frequency = 10 yr
Total Rainfall Depth= 3.7700 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100 yr

Data Type, File, ID = Synthetic Storm MSE3
Storm Frequency = 100 yr
Total Rainfall Depth= 5.9200 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	43.00 ft
2yr, 24hr P	2.6700 in
Slope	.058100 ft/ft
Avg.Velocity	.14 ft/sec

Segment #1 Time: .0865 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	45.00 ft
Slope	.133300 ft/ft
Unpaved	
Avg.Velocity	5.89 ft/sec

Segment #2 Time: .0021 hrs

==========
Total Tc: .0886 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1667 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	60.00 ft
2yr, 24hr P	2.6700 in
Slope	.066700 ft/ft
Avg.Velocity	.16 ft/sec

Segment #1 Time: .1069 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	102.00 ft
Slope	.049000 ft/ft
Unpaved	
Avg.Velocity	3.57 ft/sec

Segment #2 Time: .0079 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	42.00 ft
Slope	.023800 ft/ft
Unpaved	
Avg.Velocity	2.49 ft/sec

Segment #3 Time: .0047 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 207.00 ft
Slope .019300 ft/ft
Unpaved

Avg.Velocity 2.24 ft/sec

Segment #4 Time: .0257 hrs

Total Tc: .1451 hrs

Calculated Tc < Min.Tc:
Use Minimum Tc...
Use Tc = .1667 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	77.00 ft
2yr, 24hr P	2.6700 in
Slope	.025900 ft/ft

Avg.Velocity .11 ft/sec

Segment #1 Time: .1905 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	110.00 ft
Slope	.059100 ft/ft

Paved

Avg.Velocity 4.94 ft/sec

Segment #2 Time: .0062 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	309.00 ft
Slope	.003100 ft/ft

Unpaved

Avg.Velocity .90 ft/sec

Segment #3 Time: .0955 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 119.00 ft
Slope .025200 ft/ft
Unpaved

Avg.Velocity 2.56 ft/sec

Segment #4 Time: .0129 hrs

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 77.00 ft
Slope .039000 ft/ft
Unpaved

Avg.Velocity 3.19 ft/sec

Segment #5 Time: .0067 hrs

Segment #6: Tc: TR-55 Shallow

Hydraulic Length 159.00 ft
Slope .037700 ft/ft
Unpaved

Avg.Velocity 3.13 ft/sec

Segment #6 Time: .0141 hrs

Segment #7: Tc: TR-55 Shallow

Hydraulic Length 182.00 ft
Slope .021900 ft/ft
Unpaved

Avg.Velocity 2.39 ft/sec

Segment #7 Time: .0212 hrs

==========
Total Tc: .3471 hrs
==========

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: TR-55 Sheet

Mannings n	.2400
Hydraulic Length	145.00 ft
2yr, 24hr P	2.6700 in
Slope	.041400 ft/ft
Avg.Velocity	.15 ft/sec

Segment #1 Time: .2620 hrs

Segment #2: Tc: TR-55 Shallow

Hydraulic Length	173.00 ft
Slope	.035300 ft/ft
Unpaved	
Avg.Velocity	3.03 ft/sec

Segment #2 Time: .0159 hrs

Segment #3: Tc: TR-55 Shallow

Hydraulic Length	83.00 ft
Slope	.024100 ft/ft
Unpaved	
Avg.Velocity	2.50 ft/sec

Segment #3 Time: .0092 hrs

Segment #4: Tc: TR-55 Shallow

Hydraulic Length 39.00 ft
Slope .025700 ft/ft
Unpaved

Avg.Velocity 2.59 ft/sec

Segment #4 Time: .0042 hrs

Segment #5: Tc: TR-55 Shallow

Hydraulic Length 123.00 ft
Slope .020300 ft/ft
Unpaved

Avg.Velocity 2.30 ft/sec

Segment #5 Time: .0149 hrs

Total Tc: .3061 hrs

Tc Equations used...

==== SCS TR-55 Sheet Flow ==========

Tc = (.007 * ((n * Lf)**0.8)) / ((P**.5) * (Sf**.4))

Where: Tc = Time of concentration, hrs
n = Mannings n
Lf = Flow length, ft
P = 2yr, 24hr Rain depth, inches
Sf = Slope, %

==== SCS TR-55 Shallow Concentrated Flow ==========

Unpaved surface:
V = 16.1345 * (Sf**0.5)

Paved surface:
V = 20.3282 * (Sf**0.5)

Tc = (Lf / V) / (3600sec/hr)

Where: V = Velocity, ft/sec
Sf = Slope, ft/ft
Tc = Time of concentration, hrs
Lf = Flow length, ft

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Woods - fair	73	.411			73.00
COMPOSITE AREA & WEIGHTED CN --->		.411			73.00 (73)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pavement & Roofs	98	.153			98.00
Woods - fair	73	1.132			73.00
Open space (Lawns,parks etc.) - Goo	74	1.035			74.00
COMPOSITE AREA & WEIGHTED CN --->		2.320			75.09 (75)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pond	98	.845			98.00
Impervious Areas - Pavement	98	.309			98.00
Woods - fair	73	8.540			73.00
COMPOSITE AREA & WEIGHTED CN --->		9.694			75.98 (76)

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
Impervious Areas - Pond	98	2.608			98.00
Impervious Areas - Pavement	98	.265			98.00
Open space (Lawns,parks etc.) - Goo	74	2.099			74.00
Woods - fair	73	4.474			73.00
COMPOSITE AREA & WEIGHTED CN --->		9.446			80.83 (81)

Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

TRAPEZOIDAL CROSS SECTION

Slope = .008000 ft/ft
Mannings n = 0.03500
Invert Elev. = 696.25 ft
Top of Channel = 699.00 ft
Base width = 10.00 ft
Rt Side slope = 4.000 horizontal :1 vert.
Lt Side slope = 4.000 horizontal :1 vert.

Elev. (ft)	Depth (ft)	Flow (cfs)	Vel. (ft/sec)	Area (sq.ft)	Top W. (ft)	Wet.P. (ft)	Hd (ft)	Froude No.
696.250	.00	.00	.00	.0000	.00	.00	.00	0.00
696.260	.01	.02	.18	.1005	10.08	10.08	.01	0.31
696.310	.06	.35	.57	.6144	10.48	10.49	.06	0.42
696.370	.12	1.13	.90	1.2575	10.96	10.99	.11	0.47
696.430	.18	2.23	1.16	1.9295	11.44	11.48	.17	0.50
696.490	.24	3.64	1.38	2.6303	11.92	11.98	.22	0.52
696.550	.30	5.32	1.58	3.3598	12.40	12.47	.27	0.54
696.610	.36	7.28	1.77	4.1182	12.88	12.97	.32	0.55
696.670	.42	9.50	1.94	4.9054	13.36	13.46	.37	0.56
696.730	.48	11.99	2.10	5.7213	13.84	13.96	.41	0.57
696.790	.54	14.73	2.24	6.5661	14.32	14.45	.46	0.58
696.850	.60	17.74	2.38	7.4396	14.80	14.95	.50	0.59
696.910	.66	21.01	2.52	8.3420	15.28	15.44	.55	0.60
696.970	.72	24.54	2.65	9.2731	15.76	15.94	.59	0.61
697.030	.78	28.34	2.77	10.2341	16.24	16.43	.63	0.62
697.090	.84	32.40	2.89	11.2229	16.72	16.93	.67	0.62
697.150	.90	36.73	3.00	12.2404	17.20	17.42	.71	0.63
697.210	.96	41.34	3.11	13.2868	17.68	17.92	.75	0.63
697.270	1.02	46.21	3.22	14.3620	18.16	18.41	.79	0.64
697.330	1.08	51.37	3.32	15.4659	18.64	18.91	.83	0.64
697.390	1.14	56.80	3.42	16.5987	19.12	19.40	.87	0.65
697.450	1.20	62.52	3.52	17.7602	19.60	19.90	.91	0.65
697.510	1.26	68.53	3.62	18.9506	20.08	20.39	.94	0.66
697.570	1.32	74.83	3.71	20.1698	20.56	20.89	.98	0.66
697.630	1.38	81.42	3.80	21.4177	21.04	21.38	1.02	0.66
697.690	1.44	88.32	3.89	22.6945	21.52	21.87	1.05	0.67
697.750	1.50	95.51	3.98	24.0000	22.00	22.37	1.09	0.67
697.810	1.56	103.01	4.07	25.3343	22.48	22.86	1.13	0.68
697.870	1.62	110.82	4.15	26.6975	22.96	23.36	1.16	0.68
697.930	1.68	118.94	4.23	28.0894	23.44	23.85	1.20	0.68
697.990	1.74	127.38	4.32	29.5102	23.92	24.35	1.23	0.69
698.050	1.80	136.14	4.40	30.9597	24.40	24.84	1.27	0.69
698.110	1.86	145.23	4.48	32.4380	24.88	25.34	1.30	0.69
698.170	1.92	154.64	4.56	33.9452	25.36	25.83	1.34	0.69
698.230	1.98	164.39	4.63	35.4811	25.84	26.33	1.37	0.70

Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

TRAPEZOIDAL CROSS SECTION

Slope = .008000 ft/ft
Mannings n = 0.03500
Invert Elev. = 696.25 ft
Top of Channel = 699.00 ft
Base width = 10.00 ft
Rt Side slope = 4.000 horizontal :1 vert.
Lt Side slope = 4.000 horizontal :1 vert.

Elev. (ft)	Depth (ft)	Flow (cfs)	Vel. (ft/sec)	Area (sq.ft)	Top W. (ft)	Wet.P. (ft)	Hd (ft)	Froude No.
698.290	2.04	174.47	4.71	37.0458	26.32	26.82	1.41	0.70
698.350	2.10	184.88	4.78	38.6394	26.80	27.32	1.44	0.70
698.410	2.16	195.65	4.86	40.2617	27.28	27.81	1.48	0.71
698.470	2.22	206.76	4.93	41.9128	27.76	28.31	1.51	0.71
698.530	2.28	218.23	5.01	43.5944	28.24	28.80	1.54	0.71
698.590	2.34	230.04	5.08	45.3032	28.72	29.30	1.58	0.71
698.650	2.40	242.22	5.15	47.0407	29.20	29.79	1.61	0.72
698.710	2.46	254.75	5.22	48.8071	29.68	30.29	1.64	0.72
698.770	2.52	267.65	5.29	50.6022	30.16	30.78	1.68	0.72
698.830	2.58	280.92	5.36	52.4261	30.64	31.28	1.71	0.72
698.890	2.64	294.56	5.43	54.2789	31.12	31.77	1.74	0.72
698.950	2.70	308.58	5.49	56.1604	31.60	32.26	1.78	0.73
699.000	2.75	320.55	5.55	57.7500	32.00	32.68	1.80	0.73

MODIFIED PULS REACH ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = work_pad.hyg - JUNC 10 2 yr
Outflow HYG file = work_pad.hyg - 10' SWALE 2 yr

Reach Link Data = 10' SWALE
Reach Length = 250.00 ft
Approx. Total Tt = .0780 hrs (based on Wtd.Q = 1.10 cfs)
Reach Channel = CHANNEL TO POND (Chn-Trapz.)
Overflow Elev. = 699.00 ft
Overflow Channel = NONE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	696.25 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	1.21 cfs	at	.0200 hrs
Peak Outflow	=	1.21 cfs	at	.3200 hrs

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	3.177
- Infiltration	=	.000
- HYG Vol OUT	=	3.177
- Retained Vol	=	.000
Unrouted Vol	=	-.000 ac-ft (.000% of Inflow Volume)

MODIFIED PULS REACH ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = work_pad.hyg - JUNC 10 10 yr
Outflow HYG file = work_pad.hyg - 10' SWALE 10 yr

Reach Link Data = 10' SWALE
Reach Length = 250.00 ft
Approx. Total Tt = .0664 hrs (based on Wtd.Q = 1.64 cfs)
Reach Channel = CHANNEL TO POND (Chn-Trapz.)
Overflow Elev. = 699.00 ft
Overflow Channel = NONE

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	696.25 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	2.98 cfs	at	16.3200 hrs
Peak Outflow	=	2.98 cfs	at	16.4000 hrs

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	4.078
- Infiltration	=	.000
- HYG Vol OUT	=	4.078
- Retained Vol	=	.000
Unrouted Vol	=	.000 ac-ft (.000% of Inflow Volume)

MODIFIED PULS REACH ROUTING SUMMARY

```
HYG Dir          = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow  HYG file = work_pad.hyg - JUNC 10          100 yr
Outflow HYG file = work_pad.hyg - 10' SWALE        100 yr

Reach Link Data  = 10' SWALE
Reach Length     = 250.00 ft
Approx. Total Tt = .0450 hrs  (based on Wtd.Q = 4.91 cfs)
Reach Channel    = CHANNEL TO POND  (Chn-Trapz.)
Overflow Elev.   = 699.00 ft
Overflow Channel = NONE

No Infiltration

INITIAL CONDITIONS
----------------------------------
Starting WS Elev   =   696.25 ft
Starting Volume    =     .000 ac-ft
Starting Outflow   =      .00 cfs
Starting Infiltr.  =      .00 cfs
Starting Total Qout=      .00 cfs
Time Increment     =    .0200 hrs


INFLOW/OUTFLOW HYDROGRAPH SUMMARY
=====================================================
Peak Inflow       =     12.94 cfs    at   13.0400 hrs
Peak Outflow      =     12.94 cfs    at   13.0600 hrs
=====================================================


MASS BALANCE (ac-ft)
--------------------------
+ Initial Vol  =        .000
+ HYG Vol IN   =       6.568
- Infiltration =        .000
- HYG Vol OUT  =       6.568
- Retained Vol =        .000
               ----------
Unrouted Vol =        .000 ac-ft  (.000% of Inflow Volume)
```

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
705.00	-----	.1148	.0000	.000	.000
706.00	-----	.1525	.3996	.133	.133
707.00	-----	.4093	.8116	.271	.404
708.00	-----	.7210	1.6735	.558	.962
709.00	-----	1.0382	2.6244	.875	1.836
710.00	-----	1.4091	3.6568	1.219	3.055
711.00	-----	1.7068	4.6667	1.556	4.611
712.00	-----	1.8365	5.3138	1.771	6.382

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
693.00	-----	.5000	.0000	.000	.000
695.00	-----	.8450	1.9950	1.330	1.330
698.00	-----	1.4629	3.4197	3.420	4.750
699.00	-----	1.9056	5.0381	1.679	6.429

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
692.00	-----	1.8000	.0000	.000	.000
694.25	-----	2.6078	6.5744	4.931	4.931
696.00	-----	3.6326	9.3182	5.436	10.366
698.00	-----	5.7597	13.9664	9.311	19.677
699.00	-----	6.6968	18.6671	6.222	25.900

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 693.00 ft
Increment = .20 ft
Max. Elev.= 699.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular	C0	--->	TW	693.000	699.000
Weir-XY Points	W0	--->	TW	696.250	699.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	.6700 ft
Upstream Invert	=	693.00 ft
Dnstream Invert	=	692.00 ft
Horiz. Length	=	320.00 ft
Barrel Length	=	320.00 ft
Barrel Slope	=	.00313 ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.053343	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	2
Inlet Control K	=	.5340
Inlet Control M	=	.5550
Inlet Control c	=	.01960
Inlet Control Y	=	.9000
T1 ratio (HW/D)	=	1.070
T2 ratio (HW/D)	=	1.212
Slope Factor	=	-.500

Use unsubmerged inlet control Form 2 equ. below T1 elev.
Use submerged inlet control Form 2 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 693.72 ft ---> Flow = 1.01 cfs
At T2 Elev = 693.81 ft ---> Flow = 1.15 cfs

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
-9.00	699.00
.00	696.25
10.00	696.25
19.00	699.00

Lowest Elev. = 696.25 ft

Weir Coeff. = 3.330000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 705.00 ft
Increment = .20 ft
Max. Elev.= 712.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O1	--->	C0	708.000	712.000
Stand Pipe	R0	--->	C0	709.500	712.000
Orifice-Circular	O0	--->	C0	705.000	712.000
Culvert-Circular	C0	--->	TW	705.000	712.000
TW SETUP, DS Channel					

OUTLET STRUCTURE INPUT DATA

Structure ID = O1
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 708.00 ft
Diameter = 1.5000 ft
Orifice Coeff. = .600

Structure ID = R0
Structure Type = Stand Pipe

# of Openings = 1
Invert Elev. = 709.50 ft
Diameter = 2.5000 ft
Orifice Area = 4.9087 sq.ft
Orifice Coeff. = .600
Weir Length = 7.85 ft
Weir Coeff. = 3.330
K, Reverse = 1.000
Mannings n = .0000
Kev,Charged Riser = .000
Weir Submergence = No

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 705.00 ft
Diameter = .6700 ft
Orifice Coeff. = .600

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	15.0000	ft
Upstream Invert	=	705.00	ft
Dnstream Invert	=	703.81	ft
Horiz. Length	=	88.00	ft
Barrel Length	=	88.01	ft
Barrel Slope	=	.01352	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0110	
Ke	=	.2000	(forward entrance loss)
Kb	=	.000605	(per ft of full flow)
Kr	=	.2000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0045	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03170	
Inlet Control Y	=	.6900	
T1 ratio (HW/D)	=	1.089	
T2 ratio (HW/D)	=	1.190	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 721.33 ft ---> Flow = 2395.44 cfs
At T2 Elev = 722.86 ft ---> Flow = 2737.65 cfs

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 692.00 ft
Increment = .20 ft
Max. Elev.= 699.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Culvert-Circular	C0	--->	TW	694.250	699.000
TW SETUP, DS Channel					

OUTLET STRUCTURE INPUT DATA

Structure ID = C0
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	2.0000	ft
Upstream Invert	=	694.25	ft
Dnstream Invert	=	693.51	ft
Horiz. Length	=	40.00	ft
Barrel Length	=	40.01	ft
Barrel Slope	=	.01850	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0130	
Ke	=	.5000	(forward entrance loss)
Kb	=	.012411	(per ft of full flow)
Kr	=	.5000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1	
Inlet Control K	=	.0098	
Inlet Control M	=	2.0000	
Inlet Control c	=	.03980	
Inlet Control Y	=	.6700	
T1 ratio (HW/D)	=	1.151	
T2 ratio (HW/D)	=	1.298	
Slope Factor	=	-.500	

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 696.55 ft ---> Flow = 15.55 cfs
At T2 Elev = 696.85 ft ---> Flow = 17.77 cfs

OUTLET STRUCTURE INPUT DATA

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = AH RETBASIN E IN 2 yr
Outflow HYG file = AH RETBASIN EOUT 2 yr

Pond Node Data = AH RETBASIN E
Pond Volume Data = AH RETBASIN E
Pond Outlet Data = E MS OUTLET

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	705.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	.000 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	.00 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
12.8400	707.25	.542

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.1000	15.02	.0000	.00
Pond Outflow....	12.7400	2.28	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	.971	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	.971	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	.000
+	Total Vol IN....	.971
-	Total Vol OUT...	.971
-	Ending Pond Vol.	.001 <-- (At 35.0000 hrs Elev.= 705.00 ft)
	Difference.....	-.000 ac-ft (.021% of Inflow Volume)

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = AH RETBASIN E IN 10 yr
Outflow HYG file = AH RETBASIN EOUT 10 yr

Pond Node Data = AH RETBASIN E
Pond Volume Data = AH RETBASIN E
Pond Outlet Data = E MS OUTLET

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	705.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	.000 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	.00 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
13.0800	708.30	1.220

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.1000	30.29	.0000	.00
Pond Outflow....	13.0400	3.22	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	1.836	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	1.836	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	.000
+	Total Vol IN....	1.836
-	Total Vol OUT...	1.836
-	Ending Pond Vol.	.001 <-- (At 35.0000 hrs Elev.= 705.00 ft)
	Difference.....	.000 ac-ft (.013% of Inflow Volume)

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = AH RETBASIN E IN 100 yr
Outflow HYG file = AH RETBASIN EOUT 100 yr

Pond Node Data = AH RETBASIN E
Pond Volume Data = AH RETBASIN E
Pond Outlet Data = E MS OUTLET

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	705.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	.000 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	.00 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
12.7200	709.12	1.987

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.1000	50.49	.0000	.00
Pond Outflow....	12.7200	7.48	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	2.986	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	2.983	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	.000
+	Total Vol IN....	2.986
-	Total Vol OUT...	2.983
-	Ending Pond Vol.	.001 <-- (At 35.0000 hrs Elev.= 705.01 ft)
	Difference.....	.002 ac-ft (.080% of Inflow Volume)

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = JP NORTH POND IN 2 yr
Outflow HYG file = JP NORTH PONDOUT 2 yr

Pond Node Data = JP NORTH POND
Pond Volume Data = JP NORTH POND
Pond Outlet Data = 8" PVC & SWALE

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	696.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	2.470 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	1.21 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
.0000	696.00	2.470

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.2800	10.29	.0000	.00
Pond Outflow....	.0200	1.21	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	1.639	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	3.177	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	2.470
+	Total Vol IN....	1.639
-	Total Vol OUT...	3.177
-	Ending Pond Vol.	.933 <-- (At 35.0000 hrs Elev.= 694.40 ft)
	Difference.....	-.000 ac-ft (.002% of Outflow Volume)

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = JP NORTH POND IN 10 yr
Outflow HYG file = JP NORTH PONDOUT 10 yr

Pond Node Data = JP NORTH POND
Pond Volume Data = JP NORTH POND
Pond Outlet Data = 8" PVC & SWALE

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	696.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	2.470 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	1.21 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
16.3800	696.38	2.900

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.2600	19.46	.0000	.00
Pond Outflow....	16.3200	2.98	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	3.146	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	4.078	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	2.470
+	Total Vol IN....	3.146
-	Total Vol OUT...	4.078
-	Ending Pond Vol.	1.539 <-- (At 35.0000 hrs Elev.= 695.18 ft)
	Difference.....	-.001 ac-ft (.017% of Outflow Volume)

ICPM POND ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = JP NORTH POND IN 100 yr
Outflow HYG file = JP NORTH PONDOUT 100 yr

Pond Node Data = JP NORTH POND
Pond Volume Data = JP NORTH POND
Pond Outlet Data = 8" PVC & SWALE

No Infiltration

INITIAL CONDITIONS		CALCULATION TOLERANCES	
Starting WS Elev =	696.00 ft	Target Convergence=	.000 cfs +/-
Starting Volume =	2.470 ac-ft	Max. Iterations =	35 loops
Starting Outflow =	1.21 cfs	ICPM Time Step =	.0200 hrs
		Output Time Step =	.0200 hrs
		ICPM Ending Time =	35.0000 hrs

MAXIMUM STORAGE

Tp, hrs	Elev, ft	Vol, ac-ft
13.0400	696.71	3.275

	FORWARD FLOW PEAKS		REVERSE FLOW PEAKS	
	Tp, hrs	Qp, cfs	Tp, hrs	Qp, cfs
Pond Inflow.....	12.2600	40.98	.0000	.00
Pond Outflow....	13.0400	12.94	.0000	.00

	TOTAL VOLUME IN		TOTAL VOLUME OUT	
	Vol, ac-ft	Direction	Vol, ac-ft	Direction
Pond Inflow.....	5.761	Forward	.000	Reverse
Pond Outflow....	.000	Reverse	6.568	Forward

MASS BALANCE (ac-ft)

+	Initial Vol.....	2.470
+	Total Vol IN....	5.761
-	Total Vol OUT...	6.568
-	Ending Pond Vol.	1.659 <-- (At 35.0000 hrs Elev.= 695.29 ft)
	Difference.....	.004 ac-ft (.055% of Outflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = work_pad.hyg - JP SOUTH PONDIN 2 yr
Outflow HYG file = work_pad.hyg - JP SOUTH PONDOUT 2 yr

Pond Node Data = JP SOUTH POND
Pond Volume Data = JP SOUTH POND
Pond Outlet Data = JP Road Culvert

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	694.25 ft
Starting Volume	=	4.931 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	16.28 cfs	at	12.2400 hrs
Peak Outflow	=	3.47 cfs	at	17.6200 hrs
Peak Elevation	=	695.25 ft		
Peak Storage	=	7.830 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	4.931
+ HYG Vol IN	=	6.553
- Infiltration	=	.000
- HYG Vol OUT	=	6.539
- Retained Vol	=	4.944
Unrouted Vol	=	-.000 ac-ft (.003% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = work_pad.hyg - JP SOUTH PONDIN 10 yr
Outflow HYG file = work_pad.hyg - JP SOUTH PONDOUT 10 yr

Pond Node Data = JP SOUTH POND
Pond Volume Data = JP SOUTH POND
Pond Outlet Data = JP Road Culvert

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	694.25 ft
Starting Volume	=	4.931 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	30.28 cfs	at	12.2400 hrs
Peak Outflow	=	7.30 cfs	at	17.7800 hrs
Peak Elevation	=	695.77 ft		
Peak Storage	=	9.543 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	4.931
+ HYG Vol IN	=	10.500
- Infiltration	=	.000
- HYG Vol OUT	=	10.486
- Retained Vol	=	4.944
Unrouted Vol	=	-.000 ac-ft (.002% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\Storm Water Software\Pondpack Data\2018.0231.01\
Inflow HYG file = work_pad.hyg - JP SOUTH PONDIN 100 yr
Outflow HYG file = work_pad.hyg - JP SOUTH PONDOUT 100 yr

Pond Node Data = JP SOUTH POND
Pond Volume Data = JP SOUTH POND
Pond Outlet Data = JP Road Culvert

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	694.25 ft
Starting Volume	=	4.931 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0200 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

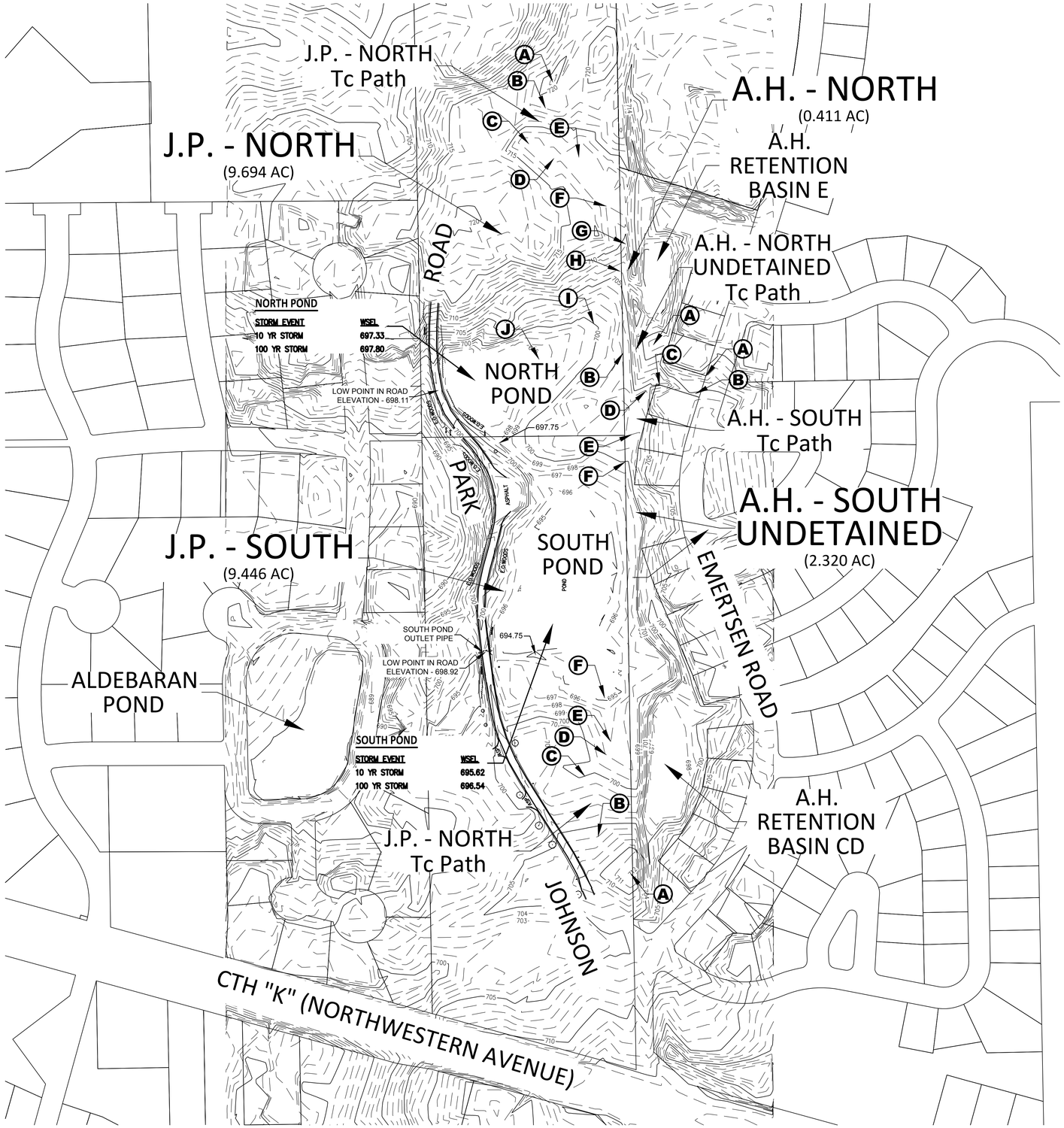
Peak Inflow	=	60.29 cfs	at	12.2200 hrs
Peak Outflow	=	16.24 cfs	at	17.0200 hrs
Peak Elevation	=	696.73 ft		
Peak Storage	=	13.280 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	4.931
+ HYG Vol IN	=	19.704
- Infiltration	=	.000
- HYG Vol OUT	=	19.690
- Retained Vol	=	4.944
Unrouted Vol	=	-.000 ac-ft (.001% of Inflow Volume)

Index of Starting Page Numbers for ID Names

APPENDIX
“D”



N

300' 150' 0' 150' 300'

SCALE 1" = 150'

LEGEND

- - - PROPOSED DRAINAGE AREAS

JOHNSON PARK NORTH POND BASIN

SURFACE DESCRIPTION	AREA
WATER SURFACE (POND)	36,816 S.F. (0.845 AC)
PAVEMENT	13,475 S.F. (0.309 AC)
WOODS	371,992 S.F. (8.540 AC)

AUBURN HILLS NORTH UNDETAINED BASIN

SURFACE DESCRIPTION	AREA
WOODS	17,895 S.F. (0.411 AC)

JOHNSON PARK SOUTH POND BASIN

SURFACE DESCRIPTION	AREA
WATER SURFACE (POND)	113,592 S.F. (2.608 AC)
PAVEMENT	11,550 S.F. (0.265 AC)
LAWN	91,432 S.F. (2.099 AC)
WOODS	194,907 S.F. (4.474 AC)

AUBURN HILLS SOUTH UNDETAINED BASIN

SURFACE DESCRIPTION	AREA
PAVEMENT	6,685 S.F. (0.153 AC)
LAWN	45,092 S.F. (1.035 AC)
WOODS	49,325 S.F. (1.132 AC)

UTILITY NOTE:

EXISTING UTILITIES ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY AND ARE NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE TYPE, LOCATION, SIZE AND ELEVATION OF UNDERGROUND UTILITIES AS THEY DEEM NECESSARY FOR PROPOSED UTILITY CONNECTIONS AND / OR TO AVOID DAMAGE THERETO, CONTRACTOR SHALL CALL "DIGGER'S HOTLINE" PRIOR TO ANY CONSTRUCTION.

DIGGERS HOTLINE
Call 811 or (800) 242-8511
www.DiggersHotline.com

Nielsen Madsen + Barber
CIVIL ENGINEERS AND LAND SURVEYORS
1458 Horizon Blvd. Suite 200, Racine, WI. 53406
Tele: (262)634-5588 Website: www.nmbsc.net

AUBURN HILLS / JOHNSON PARK
DRAINAGE EXHIBIT
FOR
CITY OF RACINE
VILLAGE OF CALEDONIA, RACINE COUNTY, WISCONSIN

NO.	REVISION	BY	DATE

PROJ. MGR:	MRM
DRAFTED:	JWR
DATE:	8-1-2018
CHECKED:	ALJ
DATE:	9-12-2018

2018.0231.01

SHEET
DEV-1

ISSUE FOR REVIEW - 9-14-2018

Friday, September 14, 2018 7:18:38 AM