STREUVER FIDELCO CAPPELLI, LLC
YONKERS DOWNTOWN DEVELOPMENT – PHASE 1

DRAFT ENVIRONMENTAL IMPACT STATEMENT
For:
PALISADES POINT

Prepared by:
PAULUS, SOKOLOWSKI & SARTOR

STORMWATER MANAGEMENT

1. Methodology

The proposed development of the site will involve the disturbance of more than 1-acre of land, therefore, the Phase II Stormwater regulations of the New York State Department of Environmental Conservation (NYSDEC) require that a State Pollutant Discharge Elimination System (SPDES) permit be obtained. Conformance with the guidelines of the SPDES permit requires that stormwater management practices be designed in accordance with the NYSDEC "Stormwater Management Design Manual" which require water quantity as well as water quality mitigation.

The primary objective of the Stormwater Management Plan is to improve water quality through capture and treatment of 90% of the annual stormwater runoff volume caused by increases in the impervious area of the site. To achieve this objective, a new stormwater collection system is proposed. The collection system will utilize inlets and piping to collect runoff and convey stormwater to water quality treatment units that will discharge treated stormwater into the Hudson River. Stormwater Quantity mitigation (i.e. detention) is not required since all stormwater runoff will be discharged directly into the Hudson River (designated as a 4^{th} order stream or larger by NYSDEC).

The assessment of stormwater runoff has been based upon the Soil Conservation Service Method as described in Technical Release No. 55 (TR-55), "Urban Hydrology for Small Watersheds". Theoretical storms are modeled with the 24 Hour SCS Unit Dimensionless Hydrograph utilizing a Type III rainfall distribution and recurrence intervals of 2, 10, 25

and 100 years, shown on Table 1-1. Hydrograph generations and routings were accomplished via Intelisolve's Hydraflow 2005 Program. The program is tailored to model the SCS Method for hydrograph generations and to perform iterative solutions of the continuity equation (outflow=inflow +/- storage) with the intermediate values of the routing curve obtained through linear interpolation.

Table 1-1 Rainfall Volumes of Design Storms (per Westchester County Best Management Practices for Stormwater Management)

Event (year)	2	10	25	100
Rainfall (in)	3.3	5.0	5.7	7.2

Storm sewers hydraulics have been based upon surface runoff generated by the 10 year storm event according to the General Permit for Construction Activities by NYSDEC for runoff conveyance systems in the closed storm drain system, and the Manning's Equation as defined in the "Handbook of Hydraulics" by Brater and King, sixth edition. The corresponding Manning's "n" value for HDPE pipe utilized in the design is 0.015.

2. Existing Site Conditions and Pre-Development Runoff Analysis

The existing project site is partially developed with a 1.70 -acre asphalt parking lot and asphalt access road. The remaining 3.89-acres of the site are currently vacant. The vacant areas of the property consist of natural vegetation along the shoreline and bare disturbed areas within the interior of the property that include stockpiles of building debris. The adjacent existing 0.65-acre sculpture park has been included in the drainage study area. The total study area including the park is 6.24-acres.

Existing drainage infrastructure on the project site is limited to two (2) catchbasins in the asphalt parking area, which convey stormwater through piping to a headwall structure along the shoreline of the Hudson River.

The topography of the site is flat with elevations ranging from 12 in the northeast to 8 in the southwest and divides the site into 2 drainage sub-areas. Hydrological soil classifications within the project site are predominantly Uf and Uc with the soil group designation of "C" based on Westchester County Soil Survey data. The majority of the site drains to the Hudson River (EX DA-A) and the balance of the site drains to the south east corner of the site onto the adjacent properties (EX DA-B). The pre-development drainage tributary areas including sub-watershed limits and flow paths are indicated on **Figure 1**.

The results of the 2, 10, 25 and 100-year routed hydrographs for pre development can be found in **Appendix A** and are summarized below in Table 2-1.

Table 2-1 - Existing Hydrologic Parameters & Flow

Watershed	Drainage Area (Ac)	SCS Curve Number	Tc (Min.)	2-YR. (CFS)	10-YR. (CFS)	25-YR. (CFS)	100-YR. (CFS)
EX DA - A	5.18	87	30.4	6.98	12.30	14.5	19.20
EX DA – B	1.07	85	107.3	.65	1.19	1.41	1.90

3. Proposed Site Development & Post-Development Runoff Analysis

The proposed development will introduce two (2) new buildings each with an attached multi-story parking structure, new roadways, parking areas and associated walkways. The existing asphalt parking area and roadway will be removed. Impervious coverage will increase to 4.27-acres while pervious coverage will decrease to 1.40-acres.

A new storm drainage system is proposed to collect runoff from the entire project site including building roofs, parking decks, access roadways, other paved surfaces and landscaped areas. The proposed system will include catchbasins, piping, headwalls and water quality treatment units. All of the stormwater collected will be piped to discharge to the Hudson River via three (3) headwall structures (1 existing and 2 new). The proposed plan divides the site into three (3) drainage sub-areas. Area PR DA-A (north end of site) will discharge at the existing headwall. While Area PR DA-B (central) and PR DA-C (south) will each discharge to new headwall structures. The post-development drainage tributary areas including sub-watershed limits and flow paths are indicated on **Figure 2**.

The results of the 2, 10, 25 and 100-year routed hydrographs for post development can be found in **Appendix B** and are summarized below. Water Quality Volume and Water Quality Flow calculations for each respective drainage area are included in **Appendix C**.

Table 3-1 - Proposed Hydrologic Parameters & Flow

Watershed	Drainage Area (Ac)	SCS Curve Number	Tc (Min.)	2-YR. (CFS)	10-YR. (CFS)	25-YR. (CFS)	100-YR. (CFS)
PR DA - A	0.77	98	10	1.79	2.73	3.11	3.94
PR DA - B	2.53	88	19.7	3.99	6.89	8.08	10.64
PR DA - C	2.36	94	11.8	5.07	8.04	9.25	11.82

4. Soil Erosion and Sediment Control

The construction of the proposed development will require the excavation and grading of soils on site. The area of disturbance will include the majority of the site as well as the existing adjacent sculpture park.

During construction of the proposed development, temporary and permanent soil erosion and sediment control measures shall be implemented, to minimize impacts to the surrounding land areas and water bodies.

Soil erosion would be controlled by:

- Keeping disturbed areas to a minimum and providing temporary seeding and mulching if construction operations cease for more than 7 days;
- Keeping topsoil stockpiles less than 35 feet high and keeping the side slopes of these stockpiles at or less than 2:1;
- Constructing a crushed stone tracking pad at the points of egress and ingress for construction vehicles of each phase; and
- Placing stone rip-rap at the outlets of storm drainage pipe networks.

Sedimentation would be controlled by:

- Installing silt fence barriers along the base of slopes and around the perimeter of topsoil stockpiles;
- Placing inlet filters over the grate of each stormwater inlet or catch basin as it is constructed to prevent sedimentation within the storm sewer system;
- Cleaning inlet filters and the upstream sides of all silt fencing after

each erosion producing storm;

- Use of temporary sediment basins;
- Use of temporary division swales.

Soil erosion and sediment control shall be ensured during the construction period through a program of daily observation and maintenance with particular emphasis on inspection and repair following rain storms. All graded areas shall be permanently seeded and landscaped to minimize erosion. All control measures shall be carried out in accordance with NYSDEC Guidelines for Urban Erosion and Sediment Control.

The project has been designed to minimize any potential adverse impacts to surface waters.

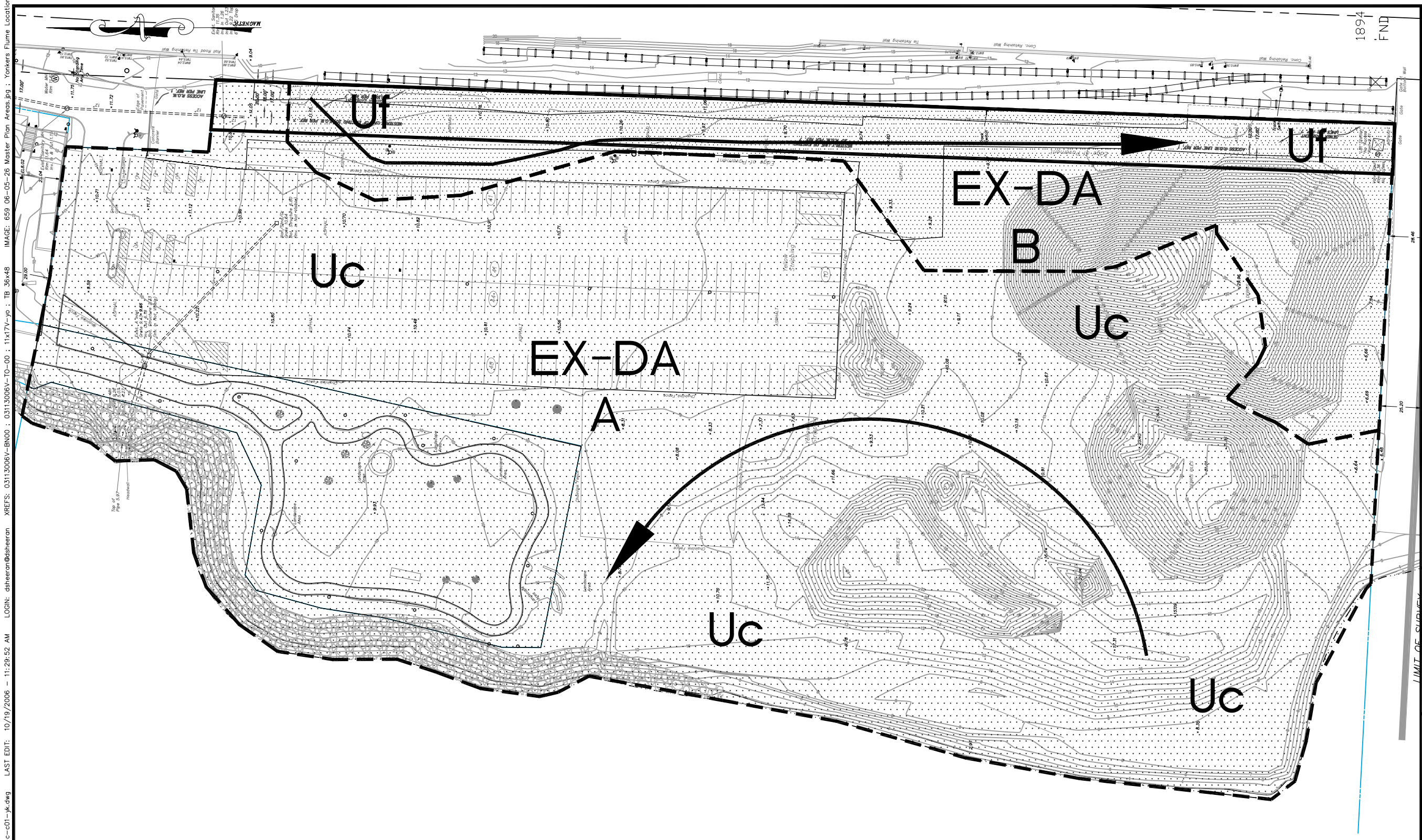
5. Conclusion

The basic design criteria of proposed stormwater facilities, which are (A) to select feasible Storm Water Management, (B) to maximize pre-treatment and minimize collective impervious area, and (C) to limit any adverse hydrological and environmental impacts, have been applied to practices of this project.

As presented within this report, the runoff of stormwater in the post development condition is substantially improved in terms of quality and quantity control. The introduction of water quality treatment as well as managed landscaped areas as compared to pre development condition will have a positive effect on water quality and quantity control.

APPENDIX A

PRE-DEVELOPMENT
DRAINAGE CALCULATIONS



Water Shed	Area		Impervious Area			Pervious Area		
	SF	AC	SF	AC	CN	SF	AC	CN
EX - DA - A	225,677	5.18	89,510	2.05	98	136,167	3.13	79
EX - DA - B	46672	1.07	15,655	0.36	98	31,017	0.71	79
Total	272,349	6.25	105,165	2.41	-	167,184	3.84	-

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PROJECT TITLE

PALISADES POINT

SHEET TITLE

PRE DEVELOPMENT DRAINAGE PLAN

DATE 10/18/06	PROJ. NO. 03113.006
SCALE 1" = 60'	
DRN. BY DJS	FIGURE 1
CHK. BY ALG	

FILE NAME: P:\03113\006\C\Dwgs\Plan Sheets\03113006-c-c01-yk.dwg LAST EDIT: 10/19/2006 - 11:29:52 AM LOGIN: dsheeran@dsheeran XREFS: 03113006V-BN00 ; 03113006V-T0-00 ; 11x17V-yo ; TB 36x48 IMAGE: 659 06-05-26 Master Plan Areas.jpg ; Yonkers Flume Location Plan.tif

TR55 Tc Worksheet

Hyd. No. 1

EX. D.A. - A

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.011		0.011		0.011		
Flow length (ft)	=	35.0		265.0		0.0		
Two-year 24-hr precip. (in)	=	3.30		3.30		0.00		
Land slope (%)	=	0.12		0.02		0.00		
Travel Time (min)	**=**	**1.57**	**+**	**16.16**	**+**	**0.00**	**=**	**17.73**
Shallow Concentrated Flow								
Flow length (ft)	=	202.00		0.00		0.00		
Watercourse slope (%)	=	0.03		0.00		0.00		
Surface description	=	Unpaved		Paved		Paved		
Average velocity (ft/s)	=	0.27		0.00		0.00		
Travel Time (min)	**=**	**12.65**	**+**	**0.00**	**+**	**0.00**	**=**	**12.65**
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		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 30.38 min

TR55 Tc Worksheet

Hyd. No. 2

EX. D.A. - B

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 32.0	268.0	0.0	
Two-year 24-hr precip. (in)	= 3.30	3.30	0.00	
Land slope (%)	= 0.03	0.00	0.00	
Travel Time (min)	**= 2.53**	**+ 40.05**	**+ 0.00**	**= 42.58**
Shallow Concentrated Flow				
Flow length (ft)	= 353.00	0.00	0.00	
Watercourse slope (%)	= 0.00	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	= 0.09	0.00	0.00	
Travel Time (min)	**= 64.72**	**+ 0.00**	**+ 0.00**	**= 64.72**
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	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 107.30 min

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	6.98	5	740	38,851	----	------	------	EX. D.A. - A
2	SCS Runoff	0.65	5	790	7,228	----	------	------	EX. D.A. - B

Hydrograph Plot

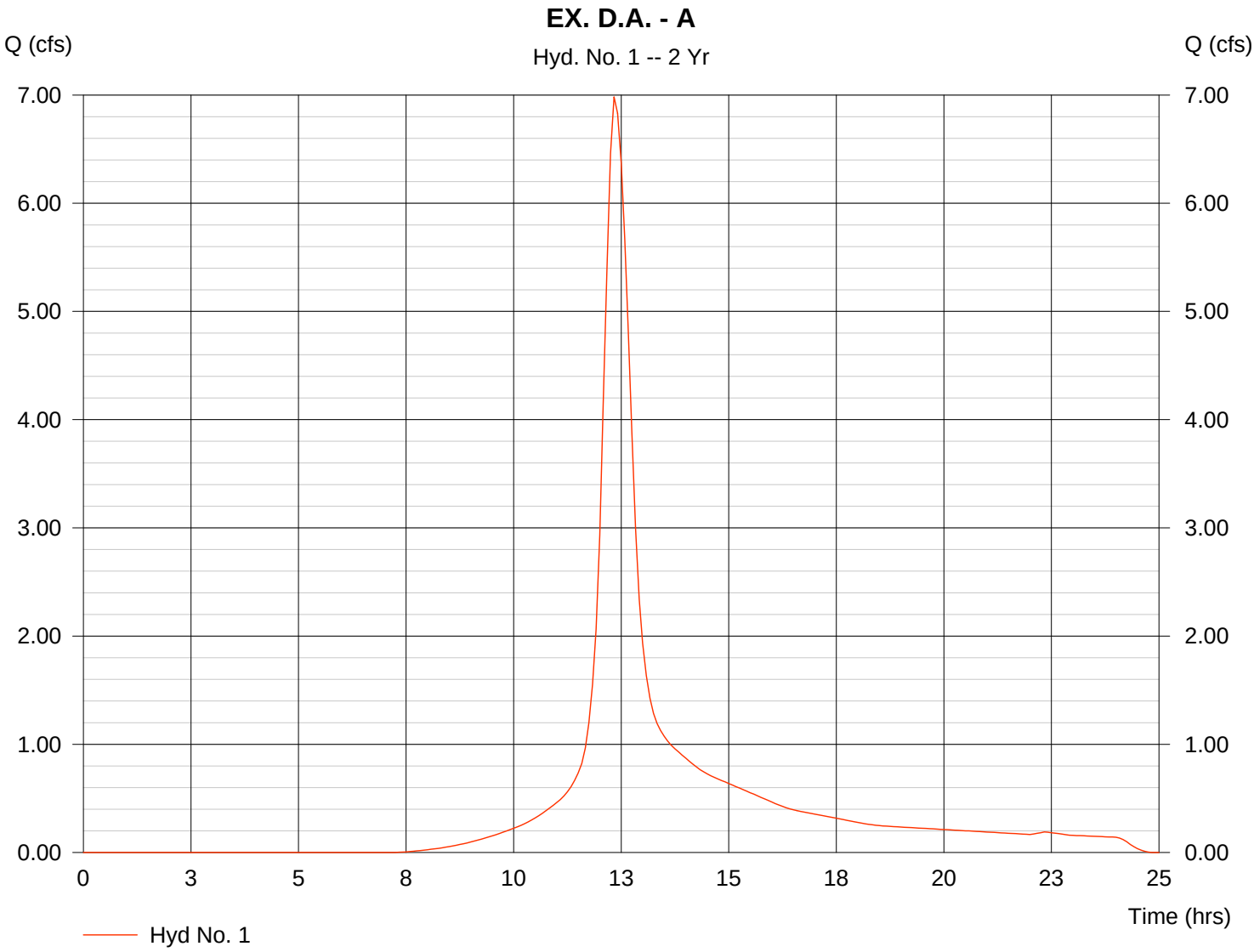
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:15 AM

Hyd. No. 1

EX. D.A. - A

Hydrograph type	= SCS Runoff		Peak discharge	= 6.98 cfs	
Storm frequency	= 2 yrs		Time interval	= 5 min	
Drainage area	= 5.18 ac		Curve number	= 87	
Basin Slope	= 0.0 %		Hydraulic length	= 0 ft	
Tc method	= TR55		Time of conc. (Tc)	= 30.38468	min
Total precip.	= 3.30 in		Distribution	= Type III	
Storm duration	= 24 hrs		Shape factor	= 484	

Hydrograph Volume = 38,851 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	12.30	5	740	69,173	----	------	------	EX. D.A. - A
2	SCS Runoff	1.19	5	790	13,208	----	------	------	EX. D.A. - B

Hydrograph Plot

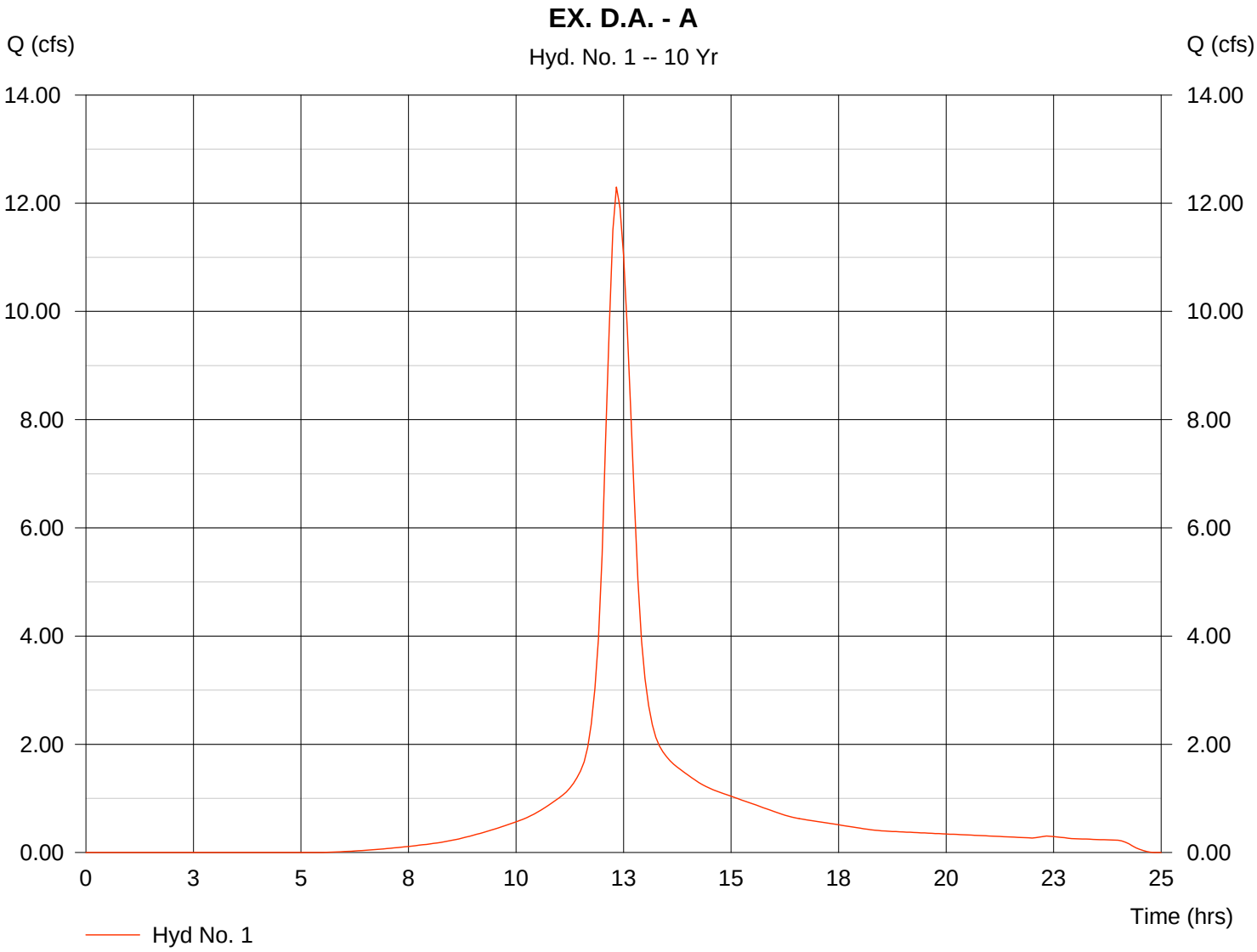
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:16 AM

Hyd. No. 1

EX. D.A. - A

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.30 cfs
Storm frequency	=	10 yrs	Time interval	=	5 min
Drainage area	=	5.18 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	30.38468 min
Total precip.	=	5.00 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 69,173 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.50	5	740	82,038	----	------	------	EX. D.A. - A
2	SCS Runoff	1.41	5	790	15,765	----	------	------	EX. D.A. - B

Hydrograph Plot

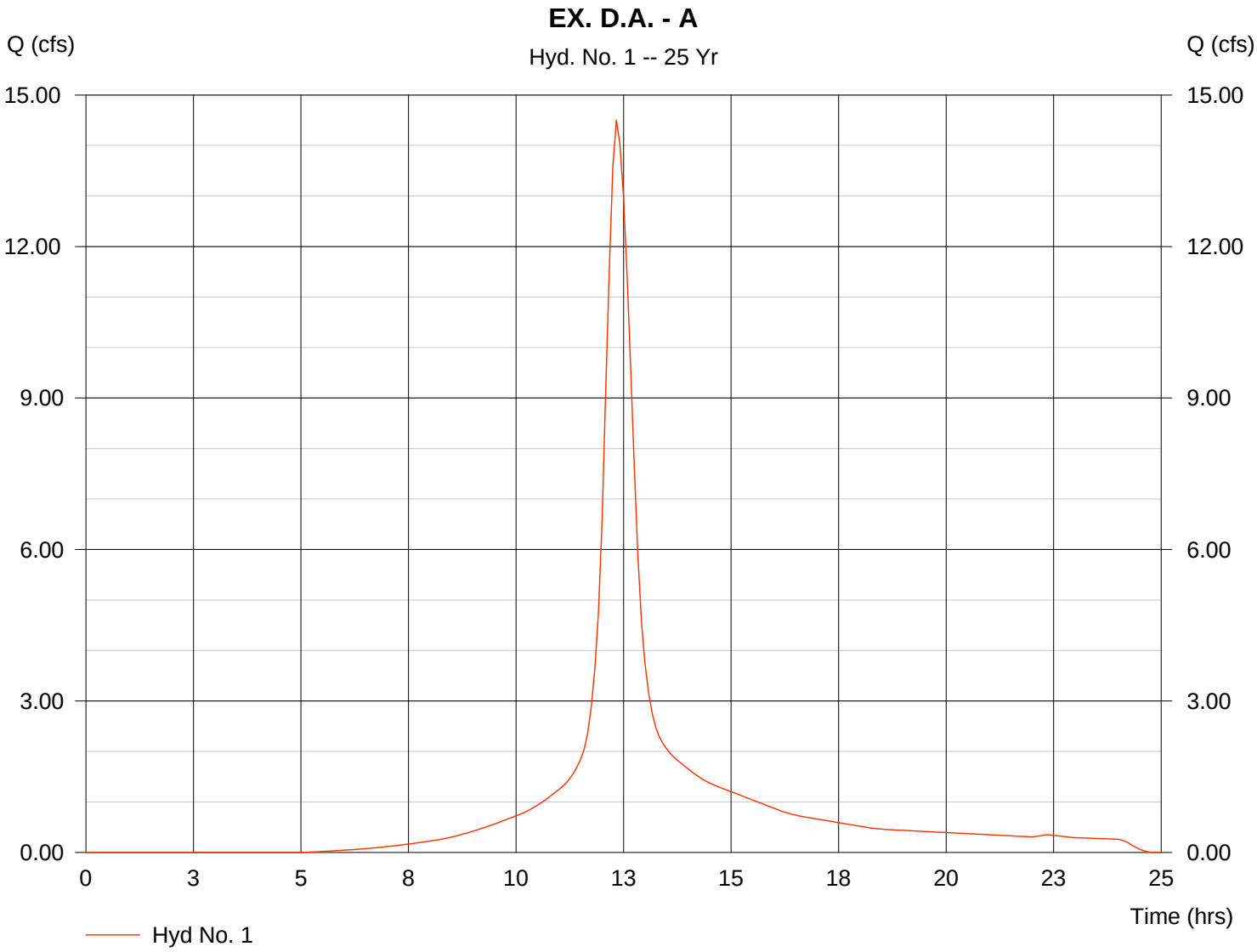
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:16 AM

Hyd. No. 1

EX. D.A. - A

Hydrograph type	= SCS Runoff		Peak discharge	= 14.50 cfs	
Storm frequency	= 25 yrs		Time interval	= 5 min	
Drainage area	= 5.18 ac		Curve number	= 87	
Basin Slope	= 0.0 %		Hydraulic length	= 0 ft	
Tc method	= TR55		Time of conc. (Tc)	= 30.38468	min
Total precip.	= 5.70 in		Distribution	= Type III	
Storm duration	= 24 hrs		Shape factor	= 484	

Hydrograph Volume = 82,038 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	19.20	5	740	110,002	----	------	------	EX. D.A. - A
2	SCS Runoff	1.90	5	785	21,348	----	------	------	EX. D.A. - B

Hydrograph Plot

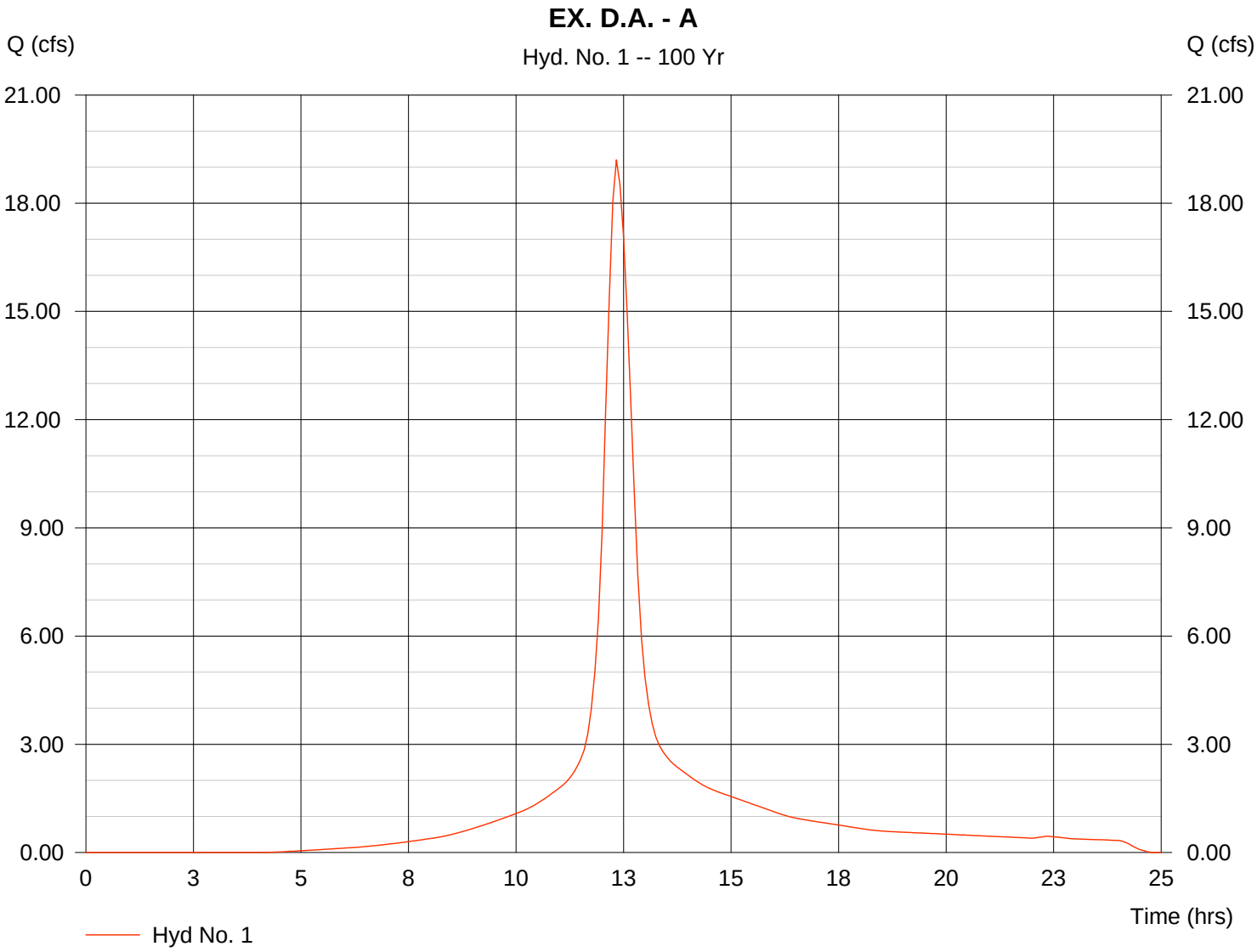
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:16 AM

Hyd. No. 1

EX. D.A. - A

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.20 cfs
Storm frequency	=	100 yrs	Time interval	=	5 min
Drainage area	=	5.18 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	30.38468 min
Total precip.	=	7.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 110,002 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	6.98	5	740	38,851	----	------	------	EX. D.A. - A
2	SCS Runoff	0.65	5	790	7,228	----	------	------	EX. D.A. - B

Hydrograph Plot

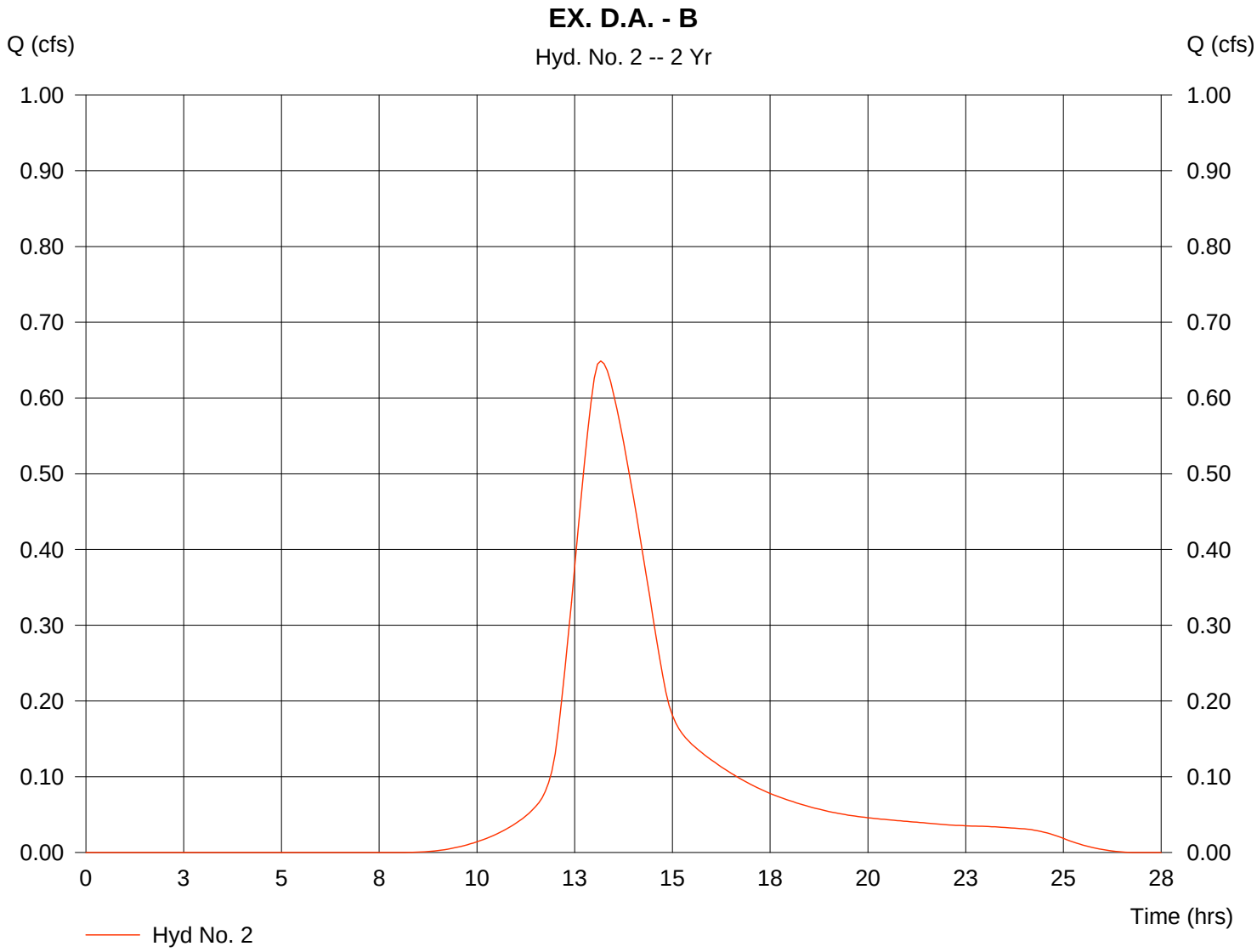
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:19 AM

Hyd. No. 2

EX. D.A. - B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.65 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 1.07 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 107.3 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 7,228 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	12.30	5	740	69,173	----	------	------	EX. D.A. - A
2	SCS Runoff	1.19	5	790	13,208	----	------	------	EX. D.A. - B

Hydrograph Plot

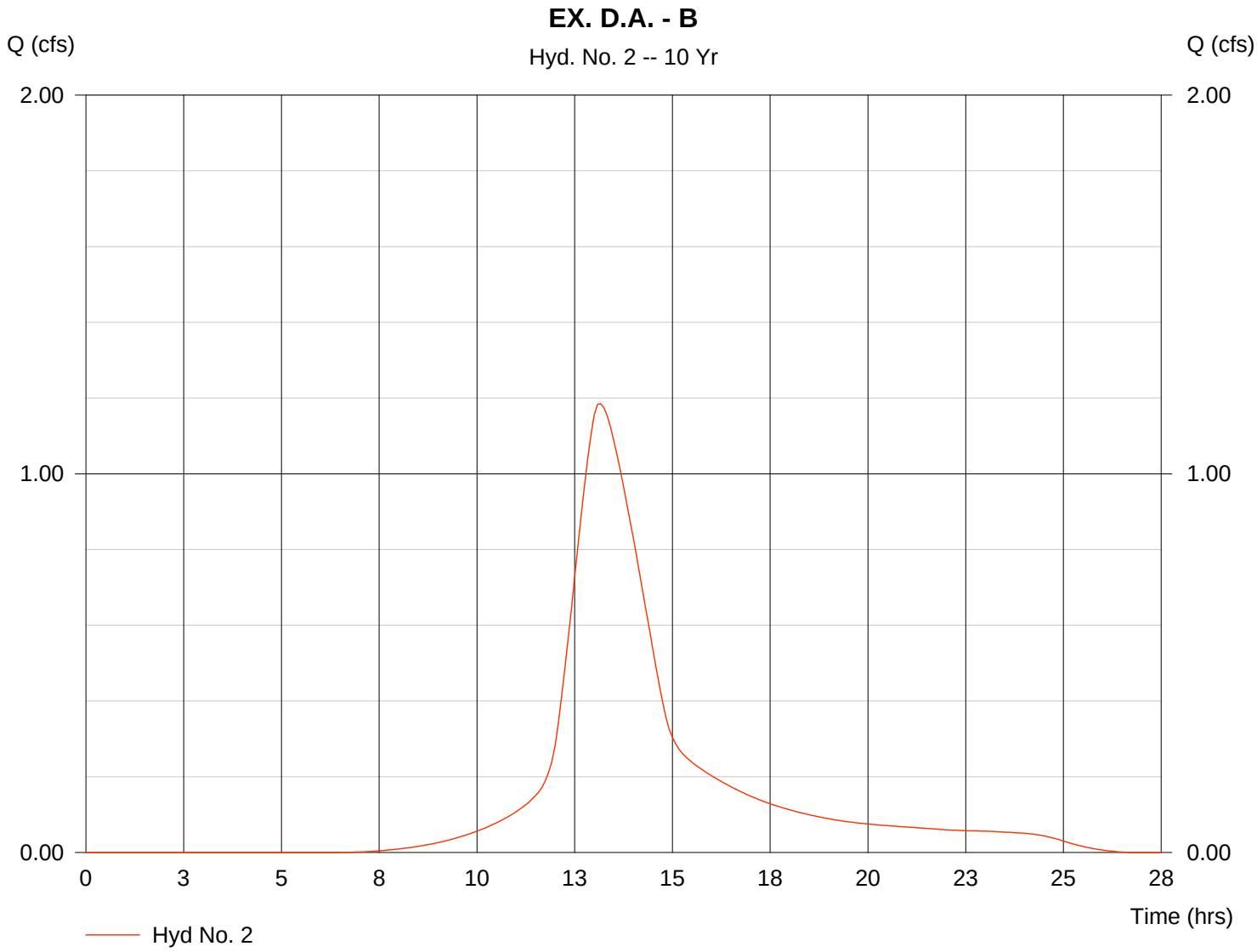
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:20 AM

Hyd. No. 2

EX. D.A. - B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.19 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 1.07 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 107.3 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 13,208 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.50	5	740	82,038	----	------	------	EX. D.A. - A
2	SCS Runoff	1.41	5	790	15,765	----	------	------	EX. D.A. - B

Hydrograph Plot

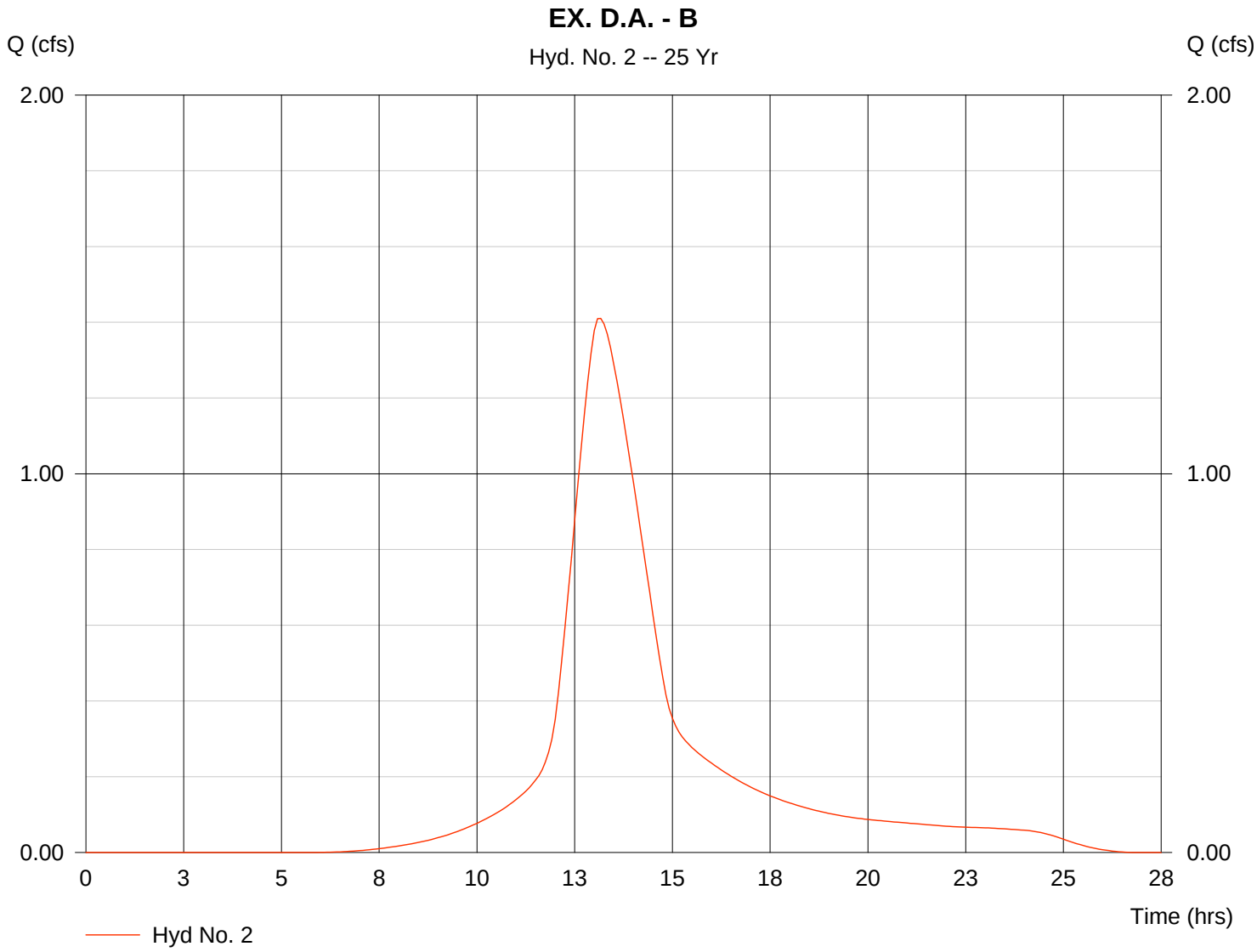
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:20 AM

Hyd. No. 2

EX. D.A. - B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.41 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 1.07 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 107.3 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 15,765 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	19.20	5	740	110,002	----	------	------	EX. D.A. - A
2	SCS Runoff	1.90	5	785	21,348	----	------	------	EX. D.A. - B

Hydrograph Plot

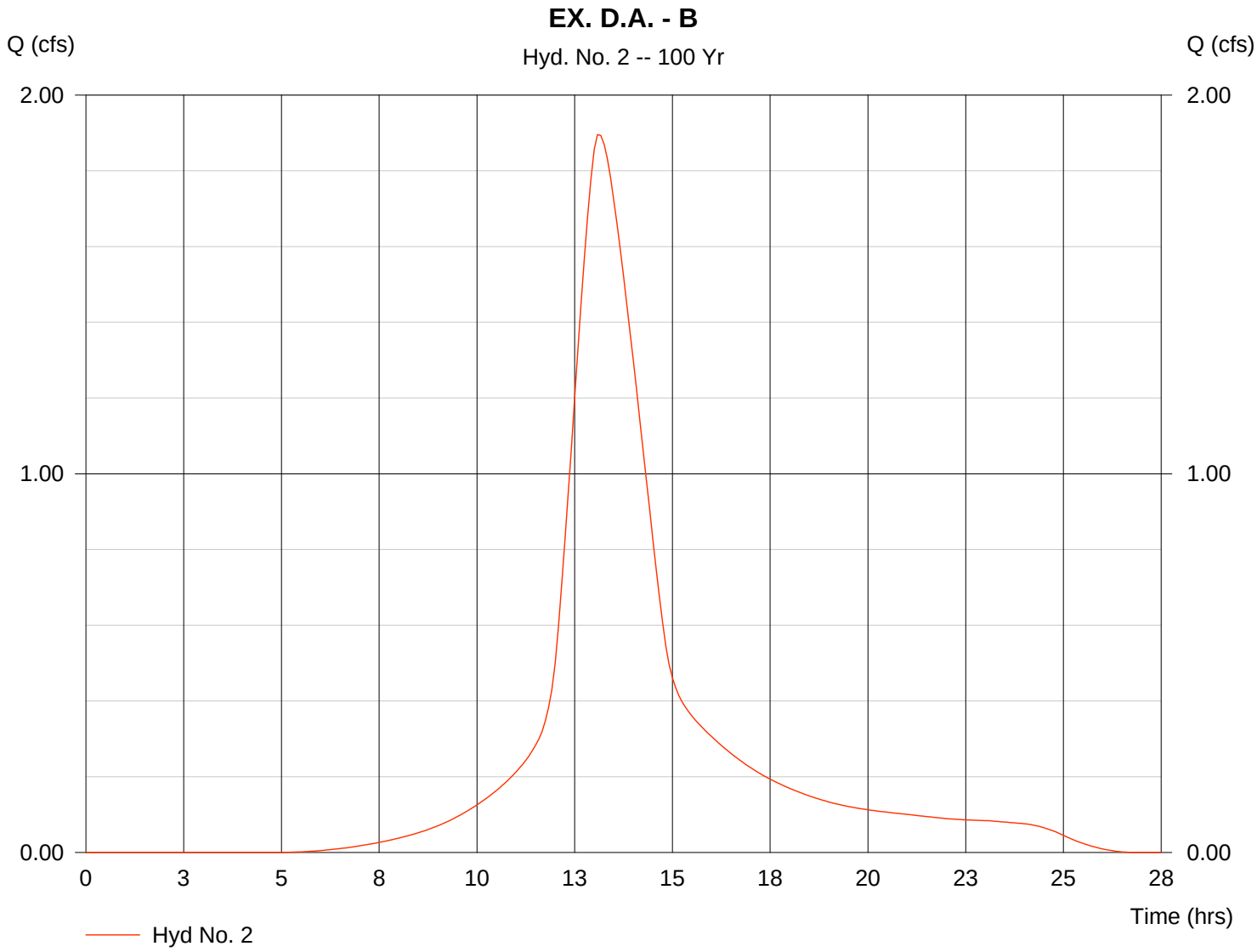
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:21 AM

Hyd. No. 2

EX. D.A. - B

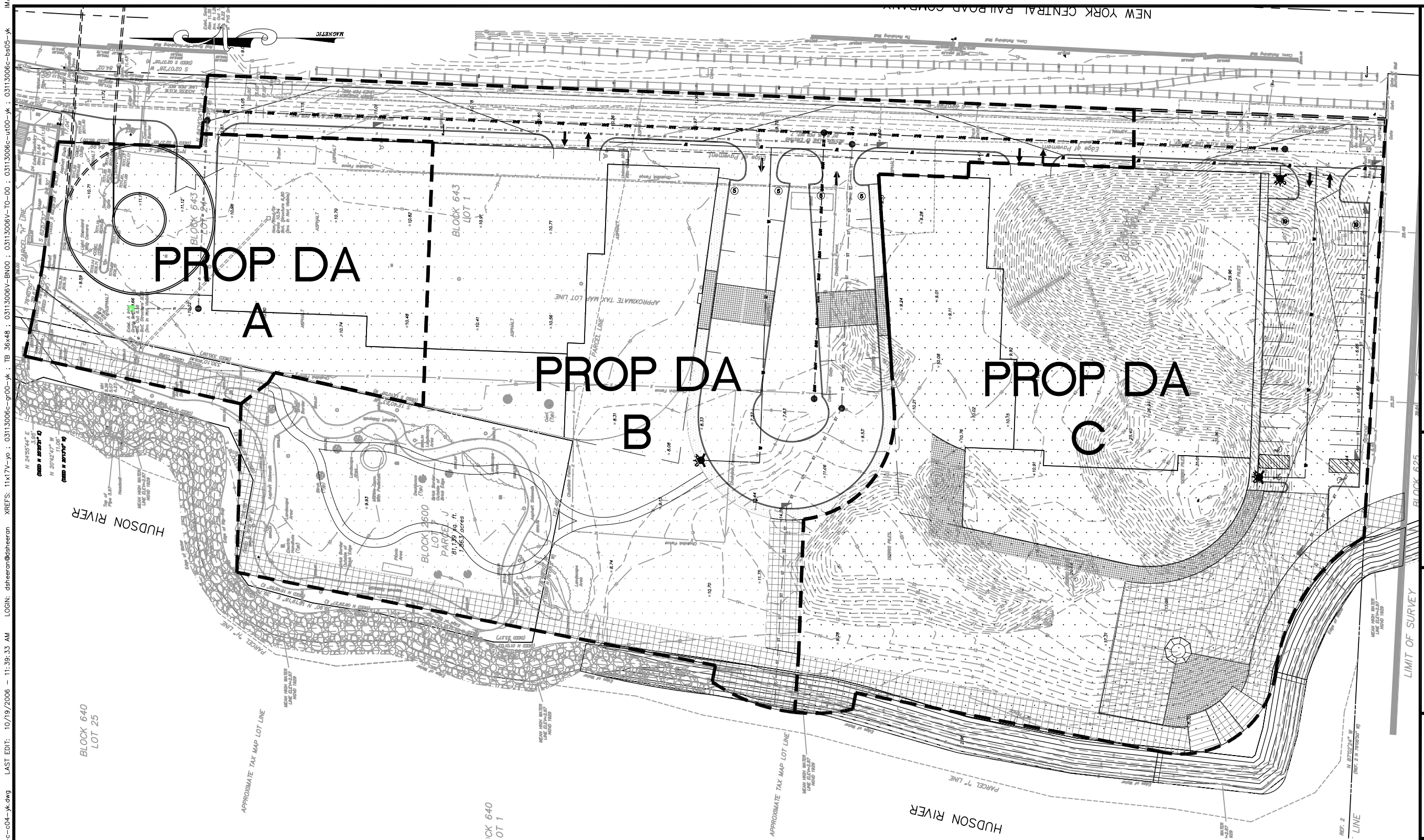
Hydrograph type	= SCS Runoff	Peak discharge	= 1.90 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 1.07 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 107.3 min
Total precip.	= 7.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 21,348 cuft



APPENDIX B

POST-DEVELOPMENT
DRAINAGE CALCULATIONS



Water Shed	Area		Impervious Area			Pervious Area		
	SF	AC	SF	AC	CN	SF	AC	CN
PROP D.A. - A	33,550	0.77	32,829	0.75	98	721	0.02	69
PROP D.A. - B	110,402	2.53	71,633	1.64	98	38,769	0.89	69
PROP D.A. - C	102,741.00	2.36	81,407	1.87	98	21,334	0.49	69
Total	246,693	5.66	185,869	4.27	-	60,824	1.40	-

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PROJECT TITLE

PALISADES POINT

SHEET TITLE

POST DEVELOPMENT DRAINAGE PLAN

DATE 10/18/06	PROJ. NO. 03113.006
SCALE 1" = 60'	
DRN. BY DJS	FIGURE 2
CHK. BY ALG	

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TR55 Tc Worksheet

Hyd. No. 2

PROP D.A. - B

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 21.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.30		0.00		0.00		
Land slope (%)	= 0.01		0.00		0.00		
Travel Time (min)	**= 2.85**	**+**	**0.00**	**+**	**0.00**	**=**	**2.85**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 0.01		0.00		0.00		
Manning's n-value	= 0.011		0.015		0.015		
Velocity (ft/s)	= 0.70		0.00		0.00		
Flow length (ft)	= 711.0		0.0		0.0		
Travel Time (min)	**= 16.85**	**+**	**0.00**	**+**	**0.00**	**=**	**16.85**

Total Travel Time, Tc ..... 19.70 min

TR55 Tc Worksheet

Hyd. No. 3

PROP D.A. - C

Description		A		B		C		Totals
Sheet Flow								
Manning's n-value	=	0.011		0.011		0.011		
Flow length (ft)	=	28.0		0.0		0.0		
Two-year 24-hr precip. (in)	=	3.30		0.00		0.00		
Land slope (%)	=	0.03		0.00		0.00		
Travel Time (min)	**=**	**2.31**	**+**	**0.00**	**+**	**0.00**	**=**	**2.31**
Shallow Concentrated Flow								
Flow length (ft)	=	0.00		0.00		0.00		
Watercourse slope (%)	=	0.00		0.00		0.00		
Surface description	=	Paved		Paved		Paved		
Average velocity (ft/s)	=	0.00		0.00		0.00		
Travel Time (min)	**=**	**0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow								
X sectional flow area (sqft)	=	1.77		0.00		0.00		
Wetted perimeter (ft)	=	4.71		0.00		0.00		
Channel slope (%)	=	0.01		0.00		0.00		
Manning's n-value	=	0.011		0.015		0.015		
Velocity (ft/s)	=	0.70		0.00		0.00		
Flow length (ft)	=	402.0		0.0		0.0		
Travel Time (min)	**=**	**9.53**	**+**	**0.00**	**+**	**0.00**	**=**	**9.53**

Total Travel Time, Tc ..... 11.84 min

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.79	5	730	8,037	----	------	------	PROP D.A. - A
2	SCS Runoff	3.99	5	735	19,168	----	------	------	PROP D.A. - B
3	SCS Runoff	5.07	5	730	21,211	----	------	------	PROP D.A. - C

Hydrograph Plot

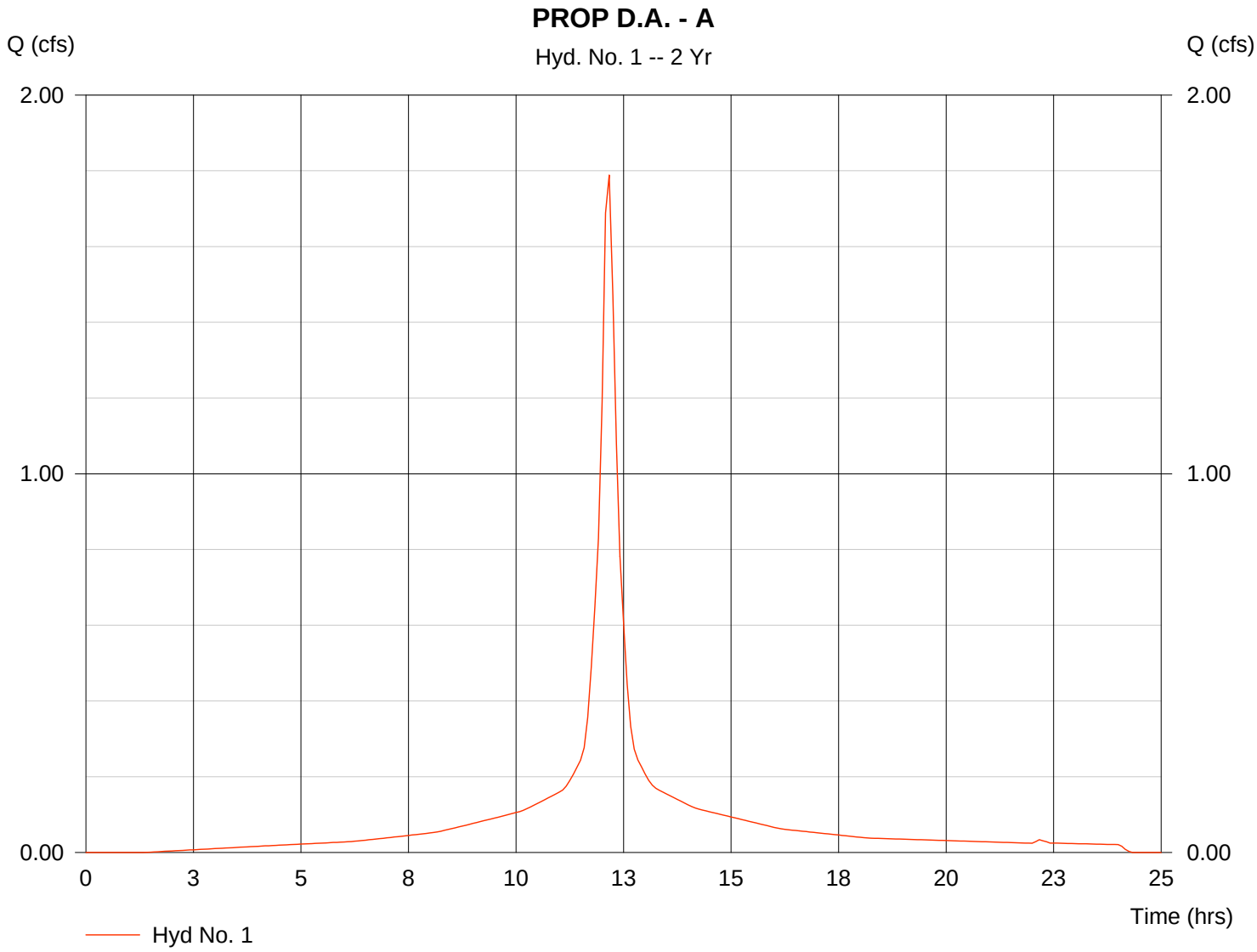
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:26 AM

Hyd. No. 1

PROP D.A. - A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.79 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 0.77 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 3.30 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 8,037 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.73	5	730	12,481	----	------	------	PROP D.A. - A
2	SCS Runoff	6.89	5	735	33,695	----	------	------	PROP D.A. - B
3	SCS Runoff	8.04	5	730	34,599	----	------	------	PROP D.A. - C

Hydrograph Plot

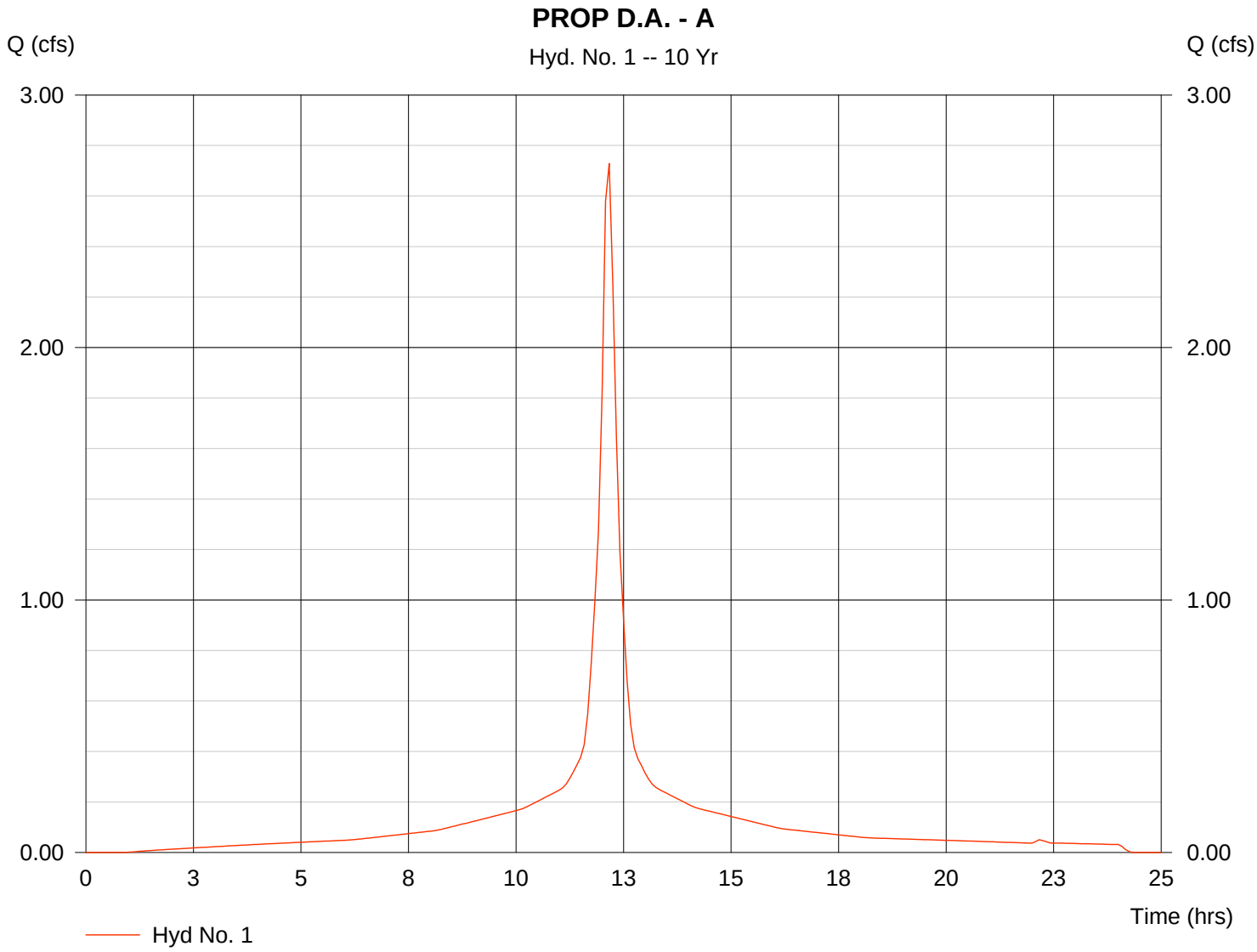
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:27 AM

Hyd. No. 1

PROP D.A. - A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.73 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 0.77 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 12,481 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.11	5	730	14,313	----	------	------	PROP D.A. - A
2	SCS Runoff	8.08	5	735	39,835	----	------	------	PROP D.A. - B
3	SCS Runoff	9.25	5	730	40,154	----	------	------	PROP D.A. - C

Hydrograph Plot

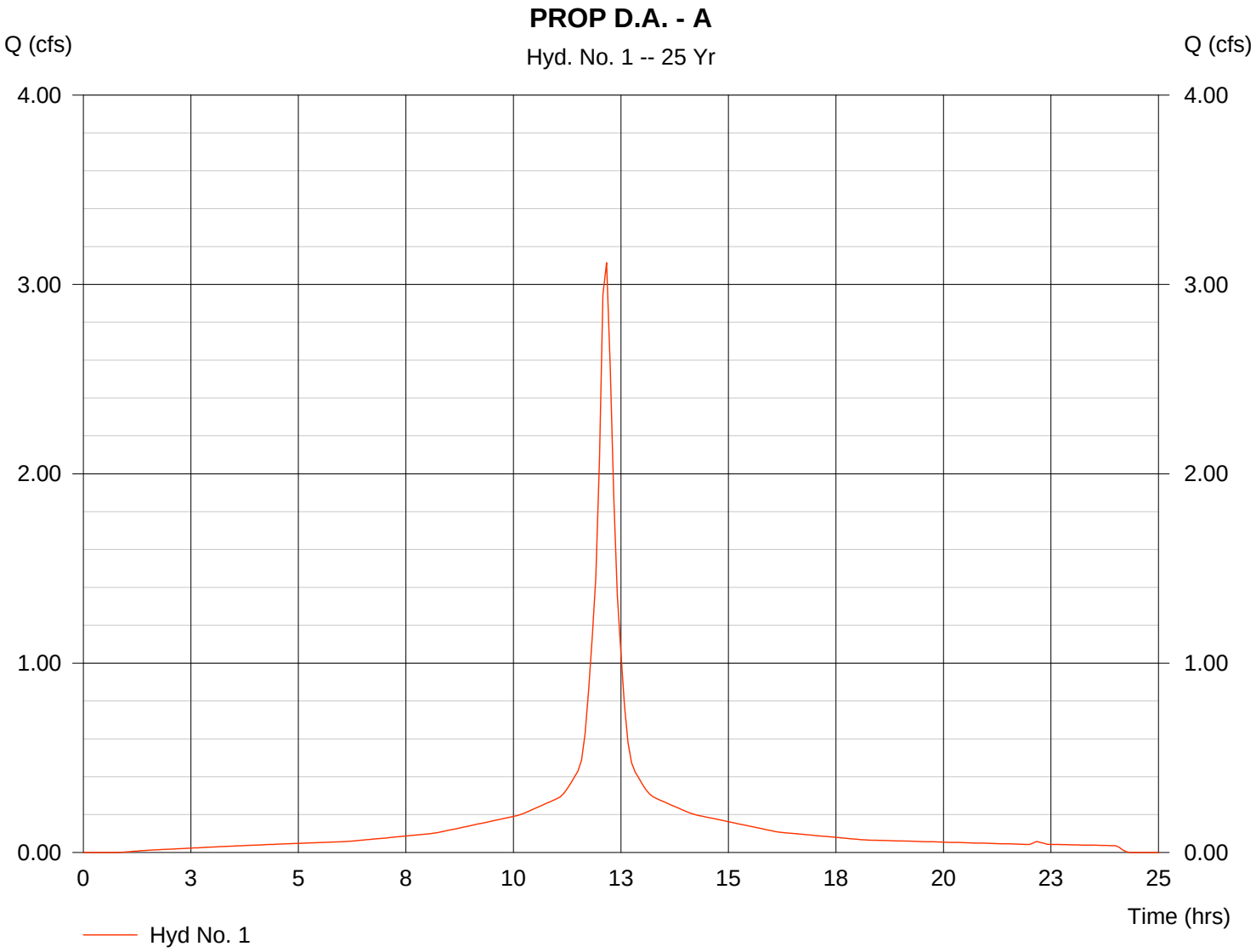
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:27 AM

Hyd. No. 1

PROP D.A. - A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.11 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 0.77 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 5.70 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 14,313 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.94	5	730	18,240	----	------	------	PROP D.A. - A
2	SCS Runoff	10.64	5	735	53,156	----	------	------	PROP D.A. - B
3	SCS Runoff	11.82	5	730	52,099	----	------	------	PROP D.A. - C

Hydrograph Plot

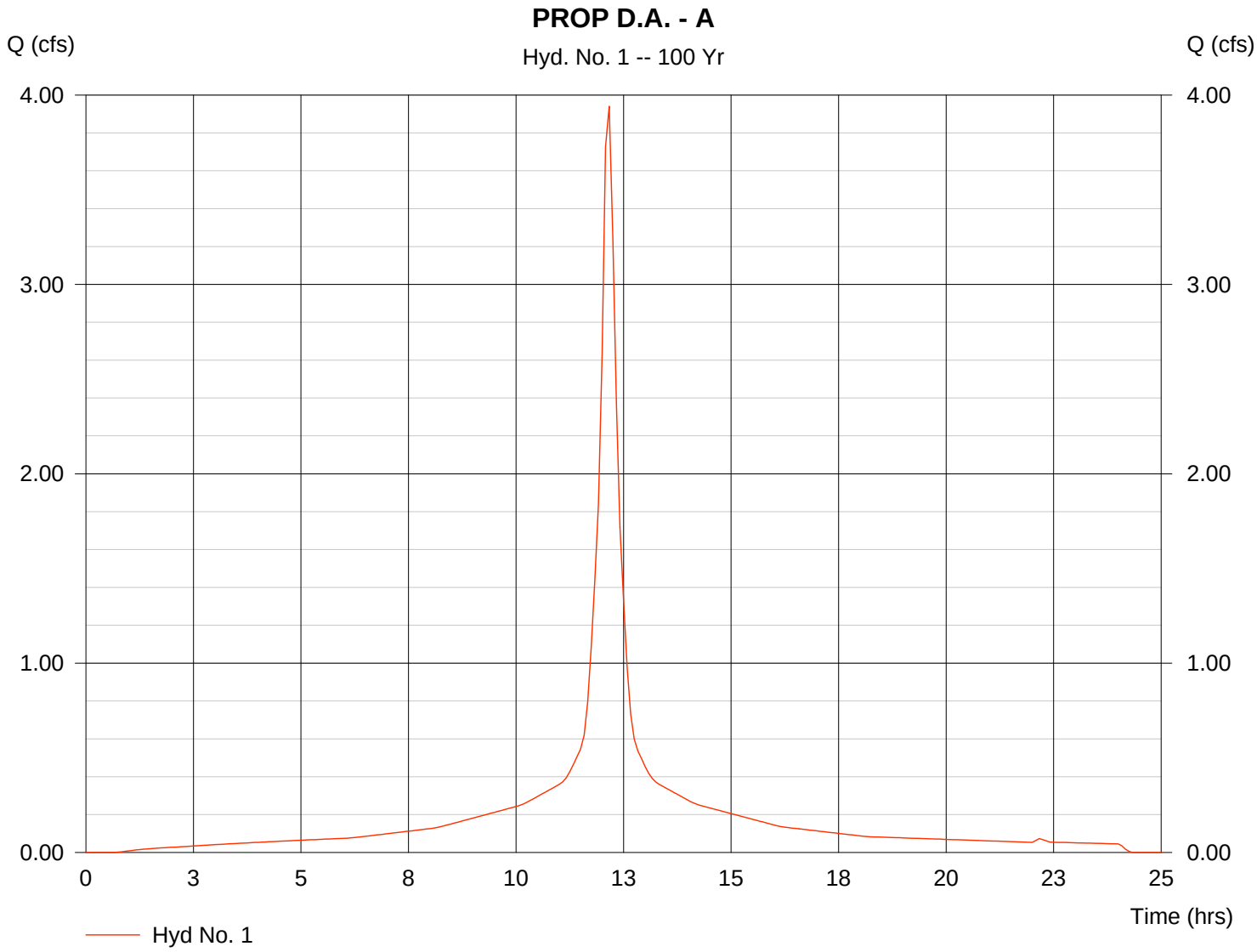
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:27 AM

Hyd. No. 1

PROP D.A. - A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.94 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 0.77 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10 min
Total precip.	= 7.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 18,240 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.79	5	730	8,037	----	------	------	PROP D.A. - A
2	SCS Runoff	3.99	5	735	19,168	----	------	------	PROP D.A. - B
3	SCS Runoff	5.07	5	730	21,211	----	------	------	PROP D.A. - C

Hydrograph Plot

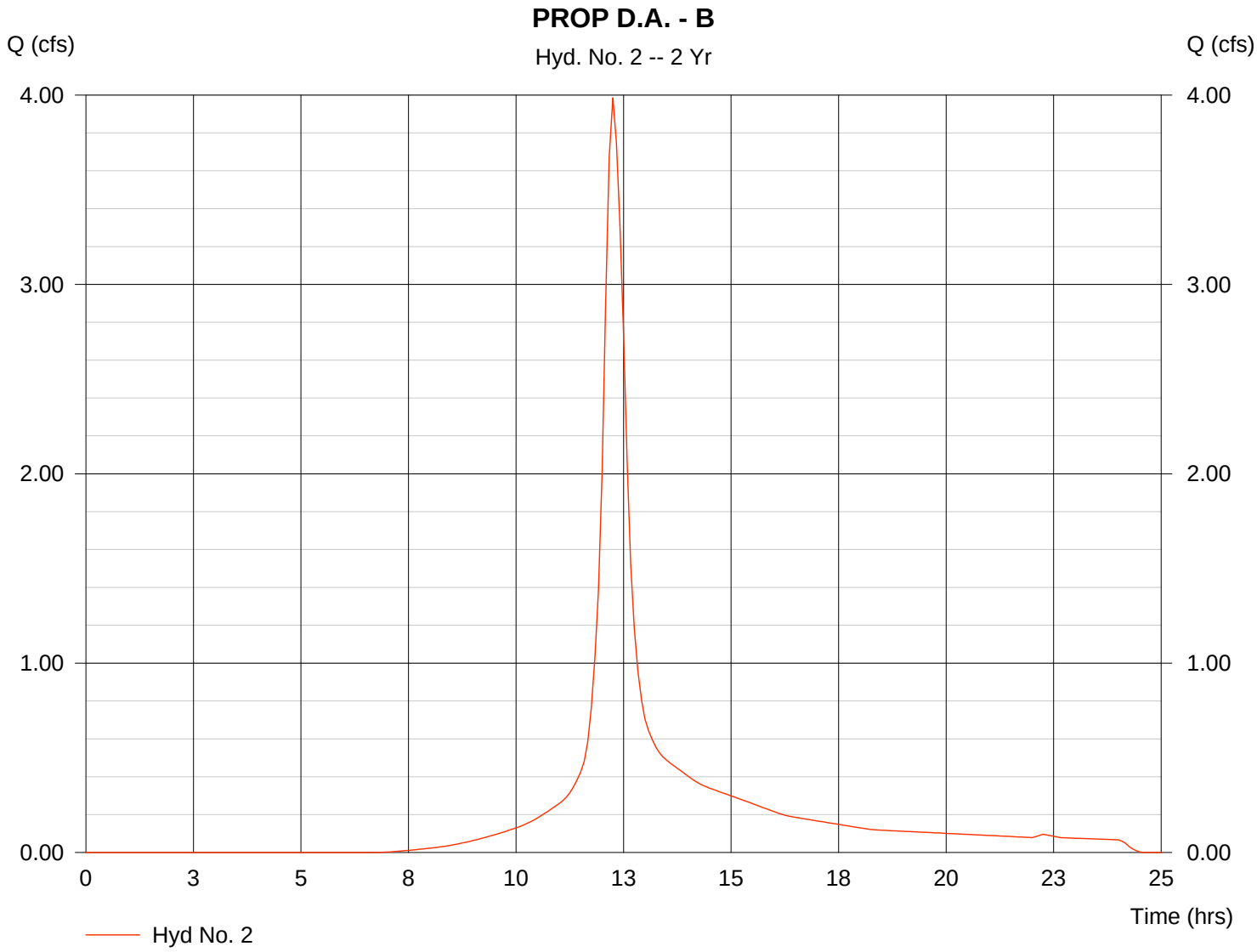
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:31 AM

Hyd. No. 2

PROP D.A. - B

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.99 cfs
Storm frequency	=	2 yrs	Time interval	=	5 min
Drainage area	=	2.53 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70439 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 19,168 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.73	5	730	12,481	----	------	------	PROP D.A. - A
2	SCS Runoff	6.89	5	735	33,695	----	------	------	PROP D.A. - B
3	SCS Runoff	8.04	5	730	34,599	----	------	------	PROP D.A. - C

Hydrograph Plot

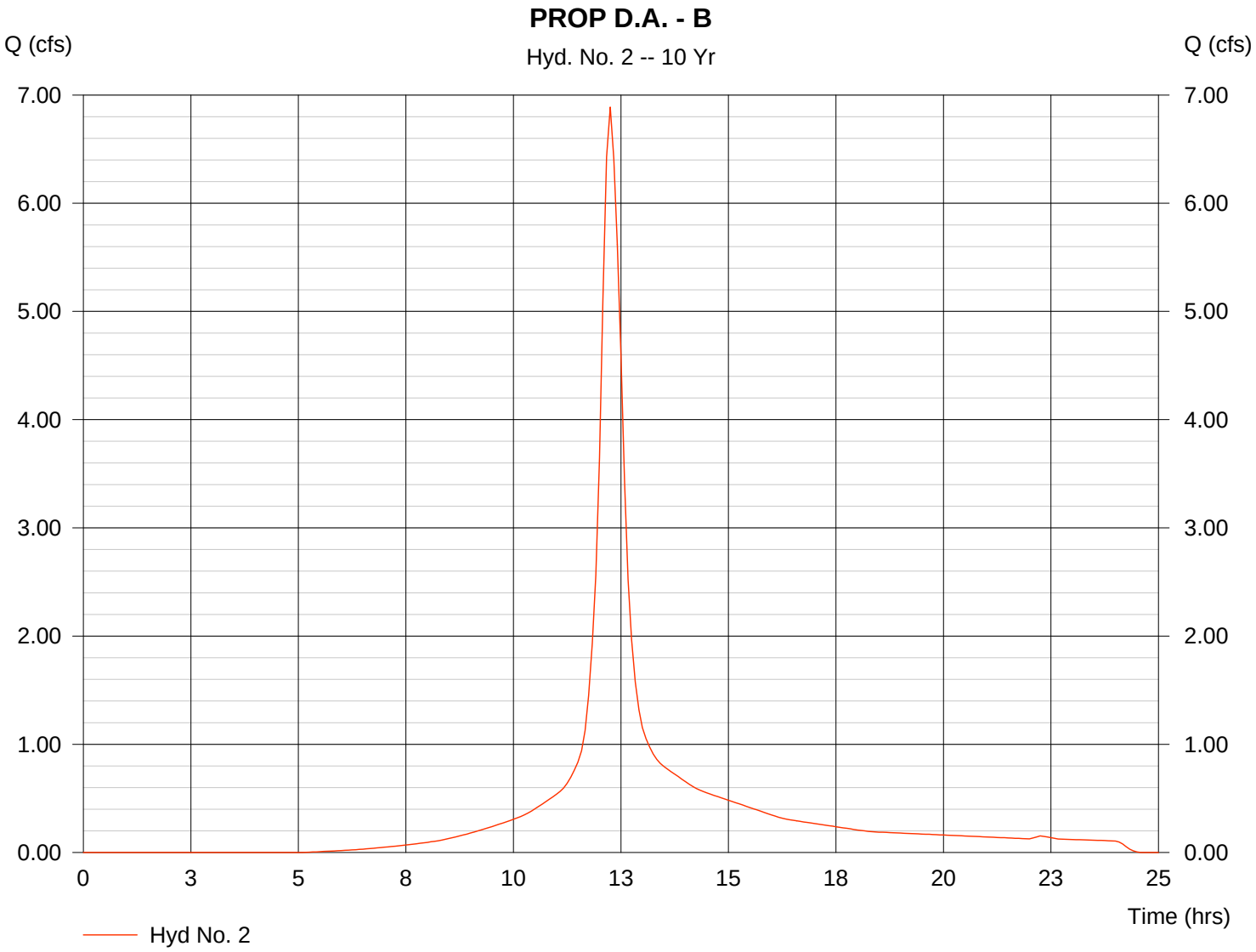
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:31 AM

Hyd. No. 2

PROP D.A. - B

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.89 cfs
Storm frequency	=	10 yrs	Time interval	=	5 min
Drainage area	=	2.53 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70439 min
Total precip.	=	5.00 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 33,695 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.11	5	730	14,313	----	------	------	PROP D.A. - A
2	SCS Runoff	8.08	5	735	39,835	----	------	------	PROP D.A. - B
3	SCS Runoff	9.25	5	730	40,154	----	------	------	PROP D.A. - C

Hydrograph Plot

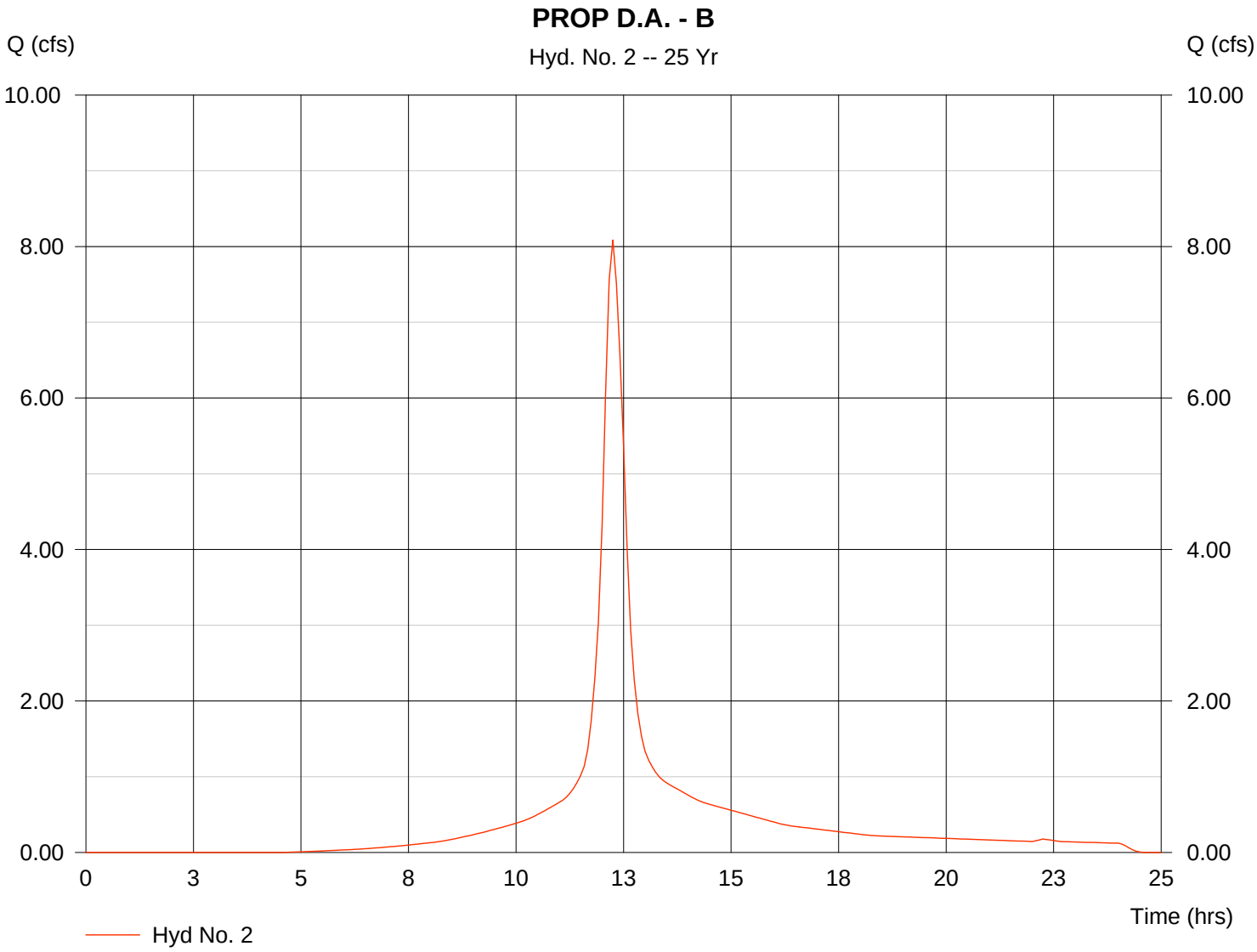
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:31 AM

Hyd. No. 2

PROP D.A. - B

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.08 cfs
Storm frequency	=	25 yrs	Time interval	=	5 min
Drainage area	=	2.53 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70439 min
Total precip.	=	5.70 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 39,835 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.94	5	730	18,240	----	------	------	PROP D.A. - A
2	SCS Runoff	10.64	5	735	53,156	----	------	------	PROP D.A. - B
3	SCS Runoff	11.82	5	730	52,099	----	------	------	PROP D.A. - C

Hydrograph Plot

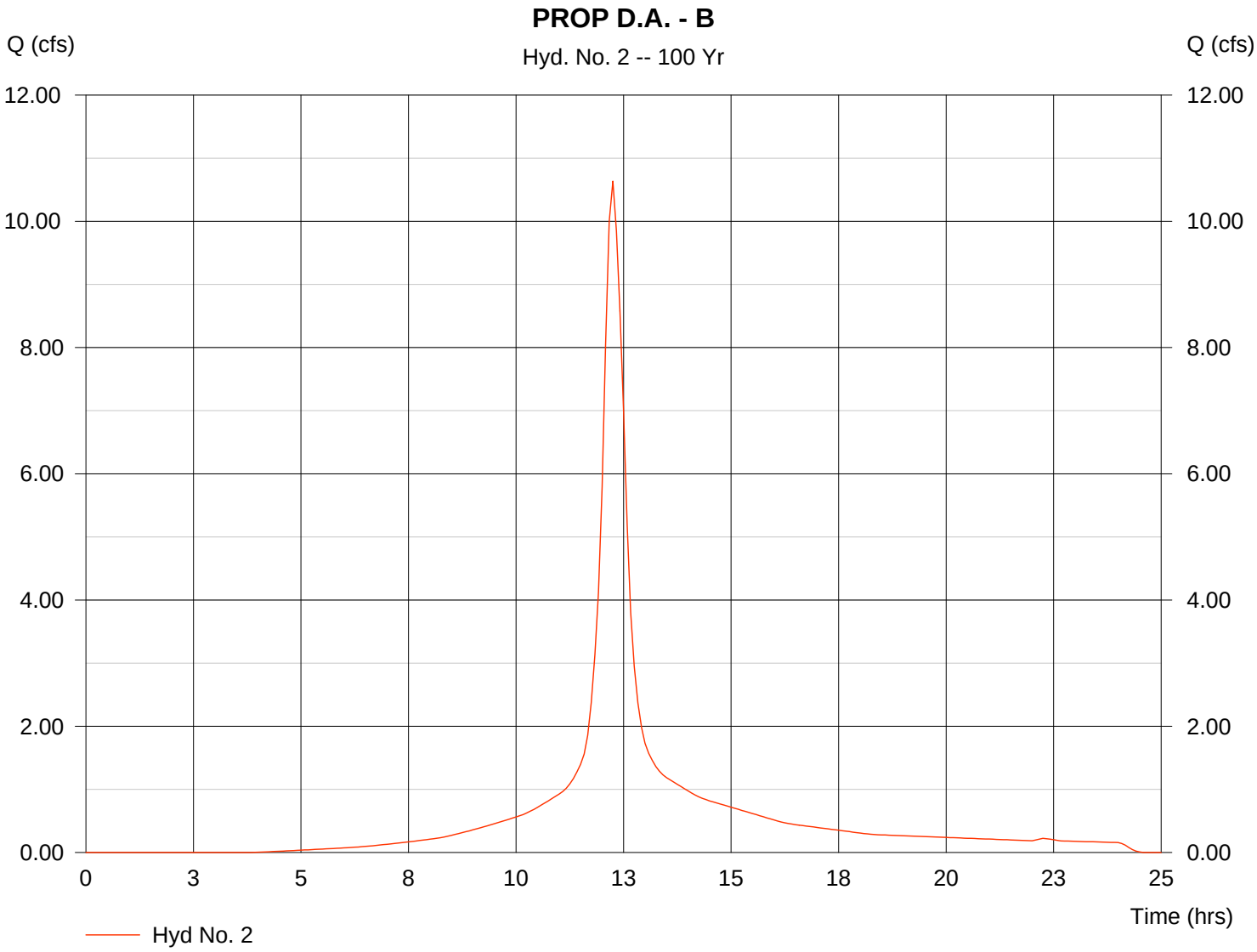
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:31 AM

Hyd. No. 2

PROP D.A. - B

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.64 cfs
Storm frequency	=	100 yrs	Time interval	=	5 min
Drainage area	=	2.53 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.70439 min
Total precip.	=	7.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 53,156 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.79	5	730	8,037	----	------	------	PROP D.A. - A
2	SCS Runoff	3.99	5	735	19,168	----	------	------	PROP D.A. - B
3	SCS Runoff	5.07	5	730	21,211	----	------	------	PROP D.A. - C

Hydrograph Plot

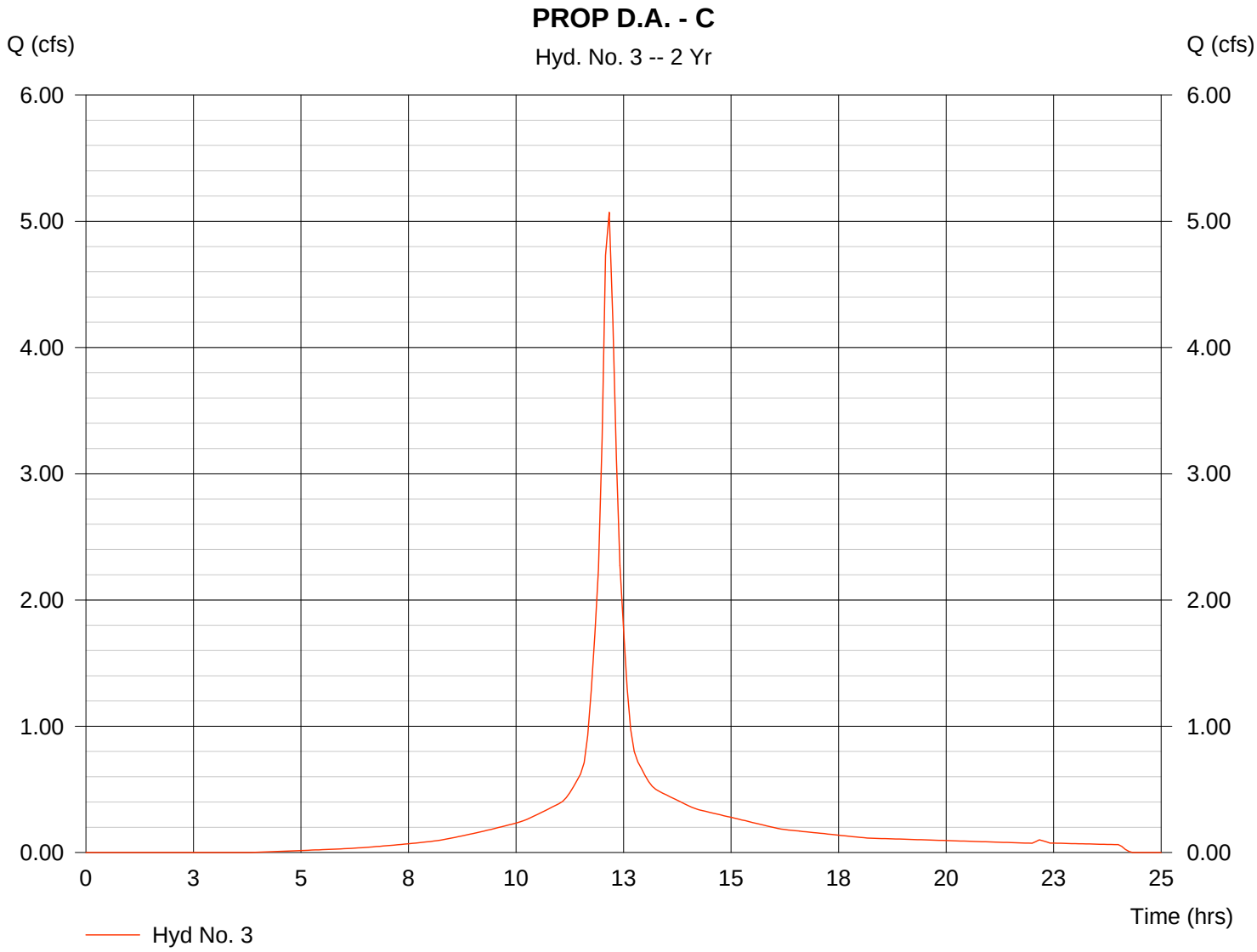
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:36 AM

Hyd. No. 3

PROP D.A. - C

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.07 cfs
Storm frequency	=	2 yrs	Time interval	=	5 min
Drainage area	=	2.36 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.84133 min
Total precip.	=	3.30 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 21,211 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	2.73	5	730	12,481	----	------	------	PROP D.A. - A
2	SCS Runoff	6.89	5	735	33,695	----	------	------	PROP D.A. - B
3	SCS Runoff	8.04	5	730	34,599	----	------	------	PROP D.A. - C

Hydrograph Plot

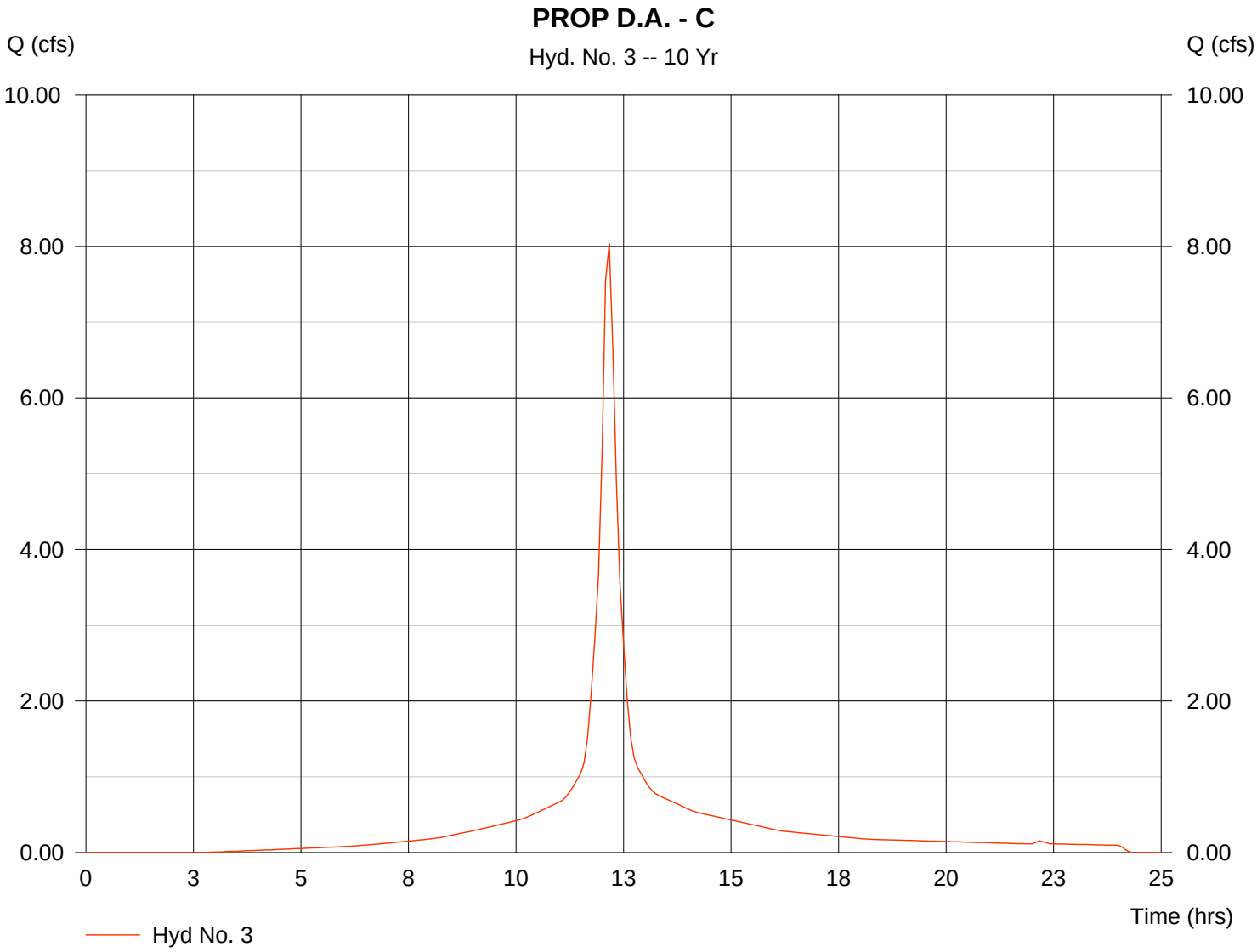
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:36 AM

Hyd. No. 3

PROP D.A. - C

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.04 cfs
Storm frequency	=	10 yrs	Time interval	=	5 min
Drainage area	=	2.36 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.84133 min
Total precip.	=	5.00 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 34,599 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.11	5	730	14,313	----	------	------	PROP D.A. - A
2	SCS Runoff	8.08	5	735	39,835	----	------	------	PROP D.A. - B
3	SCS Runoff	9.25	5	730	40,154	----	------	------	PROP D.A. - C

Hydrograph Plot

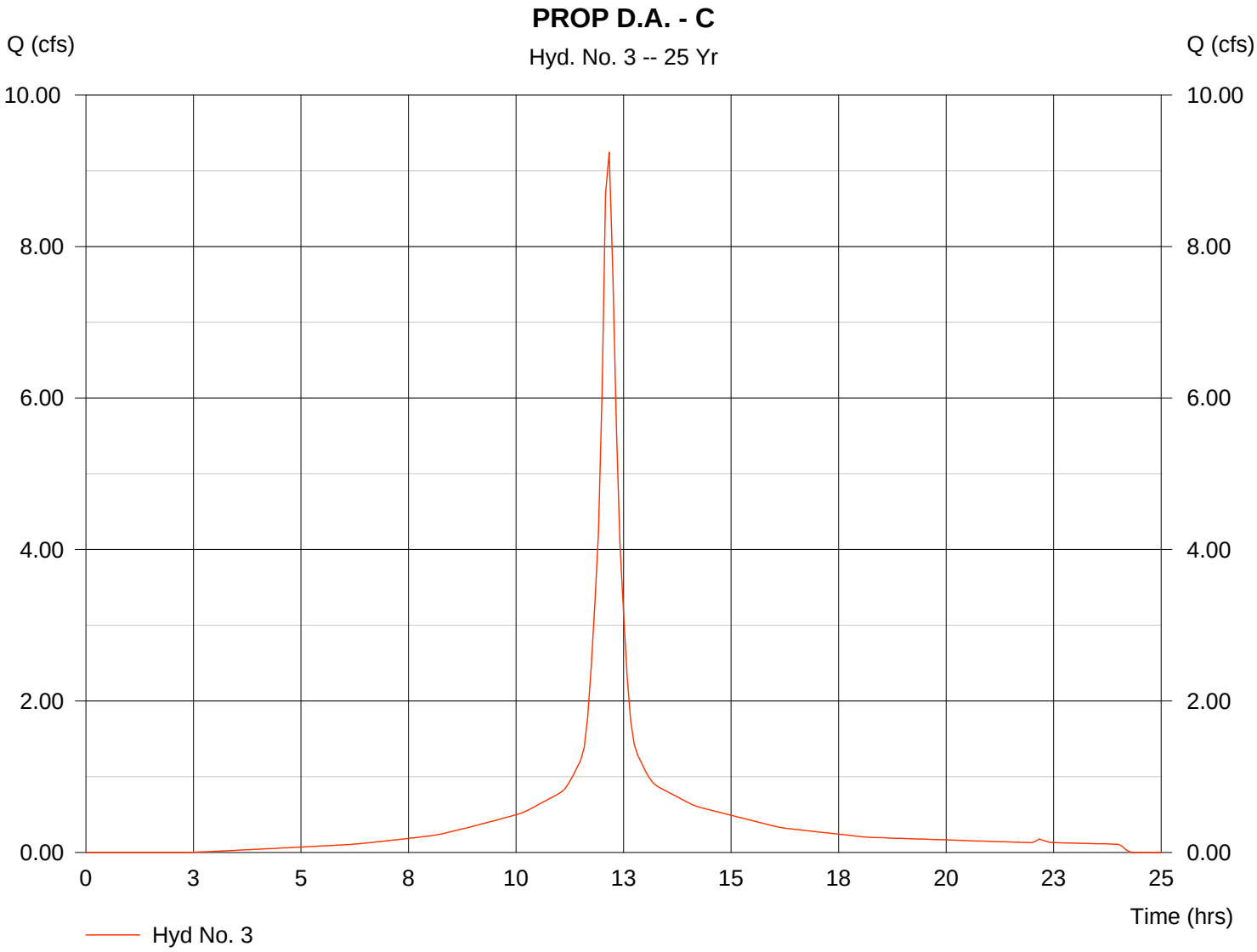
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:36 AM

Hyd. No. 3

PROP D.A. - C

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.25 cfs
Storm frequency	=	25 yrs	Time interval	=	5 min
Drainage area	=	2.36 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.84133 min
Total precip.	=	5.70 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 40,154 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.94	5	730	18,240	----	------	------	PROP D.A. - A
2	SCS Runoff	10.64	5	735	53,156	----	------	------	PROP D.A. - B
3	SCS Runoff	11.82	5	730	52,099	----	------	------	PROP D.A. - C

Hydrograph Plot

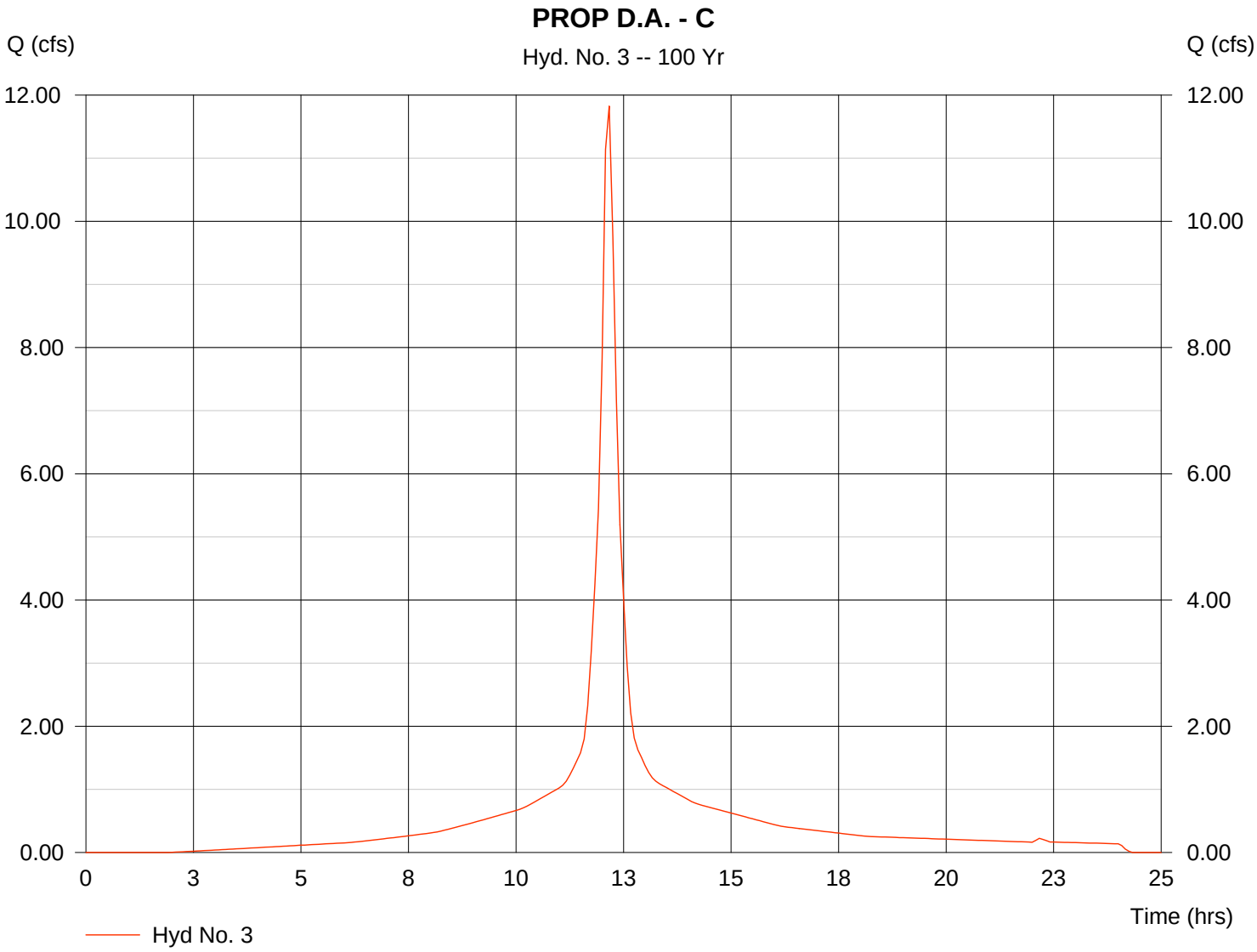
Hydraflow Hydrographs by Intelisolve | Thursday, Oct 19 2006, 11:36 AM

Hyd. No. 3

PROP D.A. - C

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.82 cfs
Storm frequency	=	100 yrs	Time interval	=	5 min
Drainage area	=	2.36 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.84133 min
Total precip.	=	7.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 52,099 cuft



APPENDIX C

WATER QUALITY CALCULATIONS

PALISADES POINT
YONKERS, NEW YORK

Prepared by: PS & S Engineering
Date: 10-18-06

WATER QUALITY VOLUME CALCULATION

POST DEVELOPMENT
DRAINAGE AREA "A"

DATA:

Drainage Area, A =	0.77	**ac**
Rainfall, P=	1.20	**in**
Impervious %, I =	97	**%**

WQv = ((P) * (Rv) *(A)) / 12

WQv = water quality volume (acre-feet)

P = 90% rainfall event number
(See Fig 4.1 in NYS Stomrwater Management Design Manual)

Rv = runoff volume = 0.05 + .009 (I) , where I is the percent impervious cover

Rv = 0.05 + 0.009 (I)

Rv = 0.92

A = site area (acres)

WQv = P * Rv * A / 12

WQv = 0.071 acre-feet

WQv	=	3096	CF
10% WQv	=	310	CF
25% WQv	=	774	CF
50% WQv	=	1548	CF
75% WQv	=	2322	CF

PALISADE POINT
YONKERS, NEW YORK

Prepared by: PS & S Engineering
Date: 10-18-06

WATER QUALITY VOLUME - PEAK FLOW CALCULATION

POST DEVELOMENT
DRAINAGE AREA "A"

Qp = qu * A * WQv

qu = unit peak discharge (cfs/sq mi/inch)

A = drainage area (sq mi)

WQv = water quality volume (watershed inches)

CN = 1000/(10 + 5P + 10Q - 10(Q^2 + 1.25 QP)^0.5)

CN = adjusted curve number

P = 90% rainfall event (inches) = 1.20 in

Q = runoff volume (inches) = WQv (af) / A (ac) * 12

= 0.071 0.77 * 12

= 1.11 inches

CN = 99

tc = 10 min = 0.17 hrs

(Ia) = 0.041 (from Table 4.1 TR 55)

Ia/P = 0.03

qu = 580 From Exibit 4-III TR 55)

Qp = qu * Ac * Q

Qp = 580 * 0.001 * 1.11

Qp = 0.77 cfs

PALISADES POINT
YONKERS, NEW YORK

Prepared by: PS & S Engineering
Date: 10-18-06

WATER QUALITY VOLUME CALCULATION

POST DEVELOPMENT
DRAINAGE AREA "B"

DATA:

Drainage Area, A =	2.53	**ac**
Rainfall, P=	1.20	**in**
Impervious %, I =	65	**%**

WQv = ((P) * (Rv) *(A)) / 12

WQv = water quality volume (acre-feet)

P = 90% rainfall event number
(See Fig 4.1 in NYS Stomrwater Management Design Manual)

Rv = runoff volume = 0.05 + .009 (I) , where I is the percent impervious cover

Rv = 0.05 + 0.009 (I)

Rv = 0.64

A = site area (acres)

WQv = P * Rv * A / 12

WQv = 0.161 acre-feet

WQv	=	6998	CF
10% WQv	=	700	CF
25% WQv	=	1750	CF
50% WQv	=	3499	CF
75% WQv	=	5249	CF

PALISADE POINT
YONKERS, NEW YORK

Prepared by: PS & S Engineering
Date: 10-18-06

WATER QUALITY VOLUME - PEAK FLOW CALCULATION

POST DEVELOMENT
DRAINAGE AREA "B"

Qp = qu * A * WQv

qu = unit peak discharge (cfs/sq mi/inch)

A = drainage area (sq mi)

WQv = water quality volume (watershed inches)

CN = 1000/(10 + 5P + 10Q - 10(Q^2 + 1.25 QP)^0.5)

CN = adjusted curve number

P = 90% rainfall event (inches) = 1.20 in

Q = runoff volume (inches) = WQv (af) / A (ac) * 12

= 0.161 2.53 * 12

= 0.76 inches

CN = 95

tc = 19.7 min = 0.33 hrs

(Ia) = 0.105 (from Table 4.1 TR 55)

Ia/P = 0.09

qu = 475 From Exibit 4-III TR 55)

Qp = qu * Ac * Q

Qp = 475 * 0.004 * 0.76

Qp = 1.43 cfs

PALISADES POINT
YONKERS, NEW YORK

Prepared by: PS & S Engineering
Date: 10-18-06

WATER QUALITY VOLUME CALCULATION

POST DEVELOPMENT
DRAINAGE AREA "C"

DATA:

Drainage Area, A =	2.36	**ac**
Rainfall, P=	1.20	**in**
Impervious %, I =	79	**%**

WQv = ((P) * (Rv) *(A)) / 12

WQv = water quality volume (acre-feet)

P = 90% rainfall event number
(See Fig 4.1 in NYS Stomrwater Management Design Manual)

Rv = runoff volume = 0.05 + .009 (I) , where I is the percent impervious cover

Rv = 0.05 + 0.009 (I)

Rv = 0.76

A = site area (acres)

WQv = P * Rv * A / 12

WQv = 0.180 acre-feet

WQv	=	7823	CF
10% WQv	=	782	CF
25% WQv	=	1956	CF
50% WQv	=	3912	CF
75% WQv	=	5867	CF

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Date: 10-18-06

WATER QUALITY VOLUME - PEAK FLOW CALCULATION

POST DEVELOMENT
DRAINAGE AREA "C"

Qp = qu * A * WQv

qu = unit peak discharge (cfs/sq mi/inch)

A = drainage area (sq mi)

WQv = water quality volume (watershed inches)

CN = 1000/(10 + 5P + 10Q - 10(Q^2 + 1.25 QP)^0.5)

CN = adjusted curve number

P = 90% rainfall event (inches) = 1.20 in

Q = runoff volume (inches) = WQv (af) / A (ac) * 12

= 0.180 2.36 * 12

= 0.91 inches

CN = 97

tc = 11.84 min = 0.20 hrs

(Ia) = 0.062 (from Table 4.1 TR 55)

Ia/P = 0.05

qu = 560 From Exibit 4-III TR 55)

Qp = qu * Ac * Q

Qp = 560 * 0.004 * 0.91

Qp = 1.89 cfs

Chapter 4: Graphical Peak Discharge method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation–Hydrology" (SCS 1983). The peak discharge equation used is

$$q_p = q_u A_m Q F_p \qquad \text{[Eq. 4-1]}$$

where

q_p = peak discharge (cfs);
q_u = unit peak discharge (csm/in);
A_m = drainage area (mi^2);
Q = runoff (in); and
F_p = pond and swamp adjustment factor.

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a/P is then computed.

If the computed I_a/P ratio is outside the range shown in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a/P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a/P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

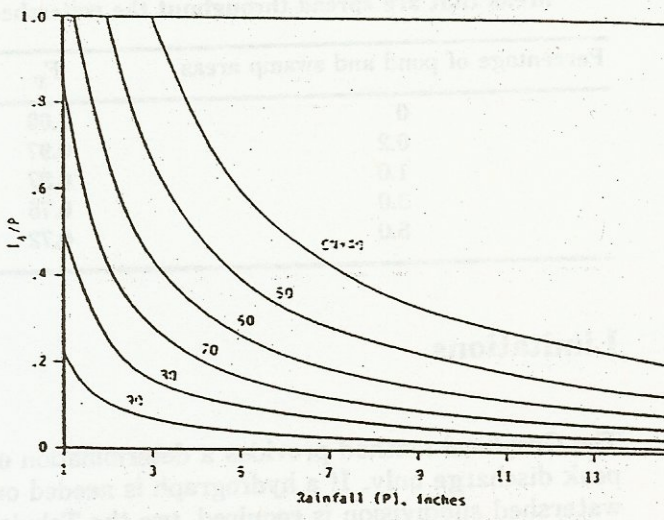

Figure 4-1.—Variation of I_a/P for P and CN.

Table 4-1.—I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Exhibit 4-III: Unit peak discharge (q_u) for SCS type III rainfall distribution