STORMWATER MANAGEMENT, DRAINAGE, EROSION AND SEDIMENT CONTROL CALCULATIONS

FOR

BLAIR PROPERTY

Chatham County, North Carolina

Prepared For:

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Date: December 18, 2005

Project Number: 05-050

STORM DRAINAGE AND EROSION CONTROL CALCULATIONS

Project Name:	**BLAIR PROPERTY**
Project Number:	05-050
Report Date:	December 18, 2005
Purpose:	To provide adequate storm drainage, erosion and sediment control measures for the subject property.

SITE DESCRIPTION:

Project Location:	Southeast Corner of Mt. Gilead Church Road and Hadley Road Chatham County, NC
Site Size:	10 Acres
Site Characteristics:	The site has gently sloping topography with slopes generally 5 to 15% draining southward to a stream located to the southern end of the site. The property is heavily wooded with significant ground litter (pine needles). A small creek is located to the south of the site draining westward to a culvert under Mt. Gilead Church Road. Although an additional stream is noted on USGS maps, this stream could not be located in the field and the Owner is currently working with the USACE to remove this designation. Land use in the vicinity is similar: residential development and rural farms with mixed pasture and wooded areas. Offsite drainage is directed via two drainage ditches located below culverts at Hadley Road to the previously noted stream.
Drainage Characteristics:	As noted above, all drainage is directed to the stream located in the southern portion of the site and exits via the culverts under Mt. Gilead Road.

PROPOSED DEVELOPMENT:

Proposed Usage:	The proposed development consists of a boat and RV storage facility with gravel drives.
Detention Requirements:	Based on discussions with Keith Megginson, Chatham County requires detention for peak discharge increases due to development. Control is recommended for increases in the 2 year storm discharge. Based on an analysis of this site, the proposed development does not result in an increase in runoff in the 2, 10, 25, or 100 year events.
Proposed Drainage Structures:	All onsite drainage is handled via perimeter ditches and driveway culverts. The large volume of offsite runoff entering the site from the north and east is directed to the stream via a proposed grass–lined ditch/swale. Runoff from the western side of the site is directed to the stream via a perimeter ditch and culvert.
Proposed Erosion and Sediment Control Measures:	Sediment and erosion control is managed through traditional measures. Temporary measures: • Perimeter diversions and silt fence which direct runoff to sediment traps located below the area of disturbance.

- Temporary construction entrances at access points
- Straw and net liners in ditchlines

Permanent measures:

- Rip rap aprons at culverts
- Grass lined swales at shallow slopes

ANALYSIS:

Detention Analysis:	Detention was analyzed using Hydraflow Hydrographs. Areas were calculated using ACAD and time of concentration was calculated using the TR-55 calculator in Hydraflow. Based on the analysis performed, development did not result in an increase in runoff during the 2, 10, 25 or 100 year storm events. This appears to be the result of the lengthened time of concentration resulting from the perimeter ditches which direct runoff around the storage facility. Based on this analysis, no detention is required for this site.
Pipe Capacity Requirements:	Calculations for the pipe structures were performed using Haestad's CulvertMaster and the peak flows calculated during the detailed detention analysis using the SCS method from Hydraflow. Capacity was calculated based on a 10yr storm and HW/D or 1.2 or less. Additionally, culverts were checked for overtopping in the 25 yr storm event.
Apron Requirements:	NCDENR guidelines use the 10 year Velocity for apron design. The NY method was used for apron design.
Ditch Calculations:	Temporary ditchline calculations were performed using Haestad's FlowMaster. Ditchlines were checked in accordance with NCDENR guidelines for temporary liner requirements.
Sediment Trap Calculations:	Sediment trap calculations were performed in accordance with NCDENR guidelines. The traps presented exceed the requirements or both surface area and storage.

CONCLUSION:

Based on the attached calculations, the proposed devices adequately meet the requirements of the NCDOT for drainage structures and the NCDENR for erosion and sediment control.

ATTACHMENTS:

Detention Calculations

ACAD Exhibits	Pre and Post development exhibits
Hydraflow Analysis	Overview and Details

Pipe Calculations

Pipe Calculations	Q10 and Q25 Culvert Master Calculations

Apron Calculations

Velocity Zones	Figure 8.06.b.1 from NCDENR Manual (NY method)
Apron Chart	NCDENR Chart

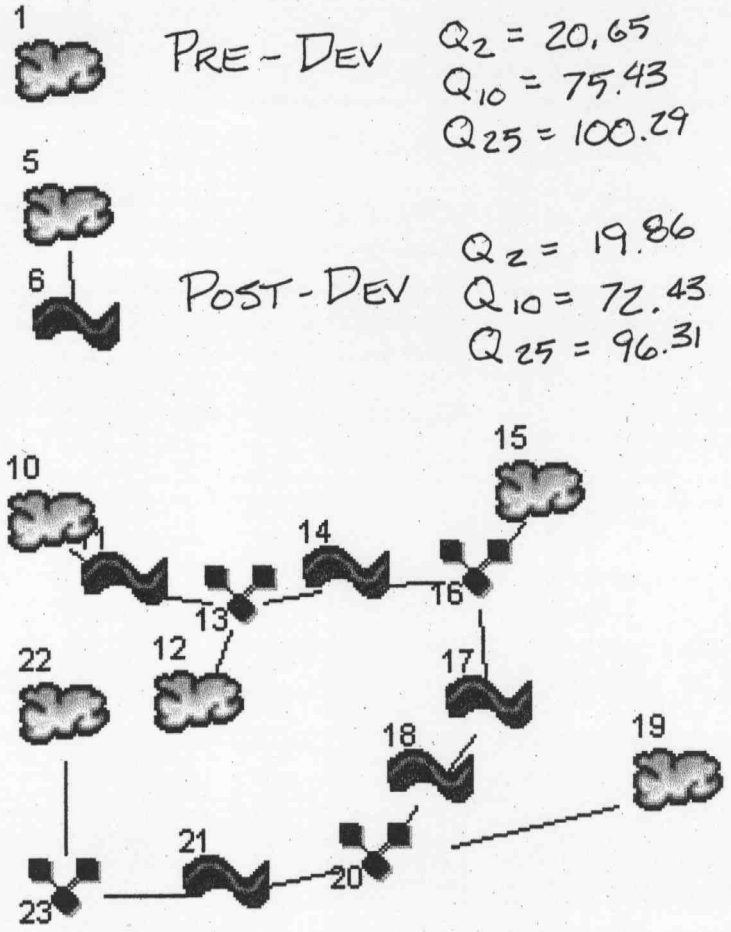
Ditch Calculations

Ditch Calculations	FlowMaster Worksheets
Liner Info	NCDENR Liner Information

Sediment Trap Calculations

Sediment Trap Analysis EXCEL Worksheet of Sediment Trap Calculations

DETENTION DOCUMENTS



PRE-DEV

$Q_2 = 20.65$
$Q_{10} = 75.43$
$Q_{25} = 100.29$

POST-DEV

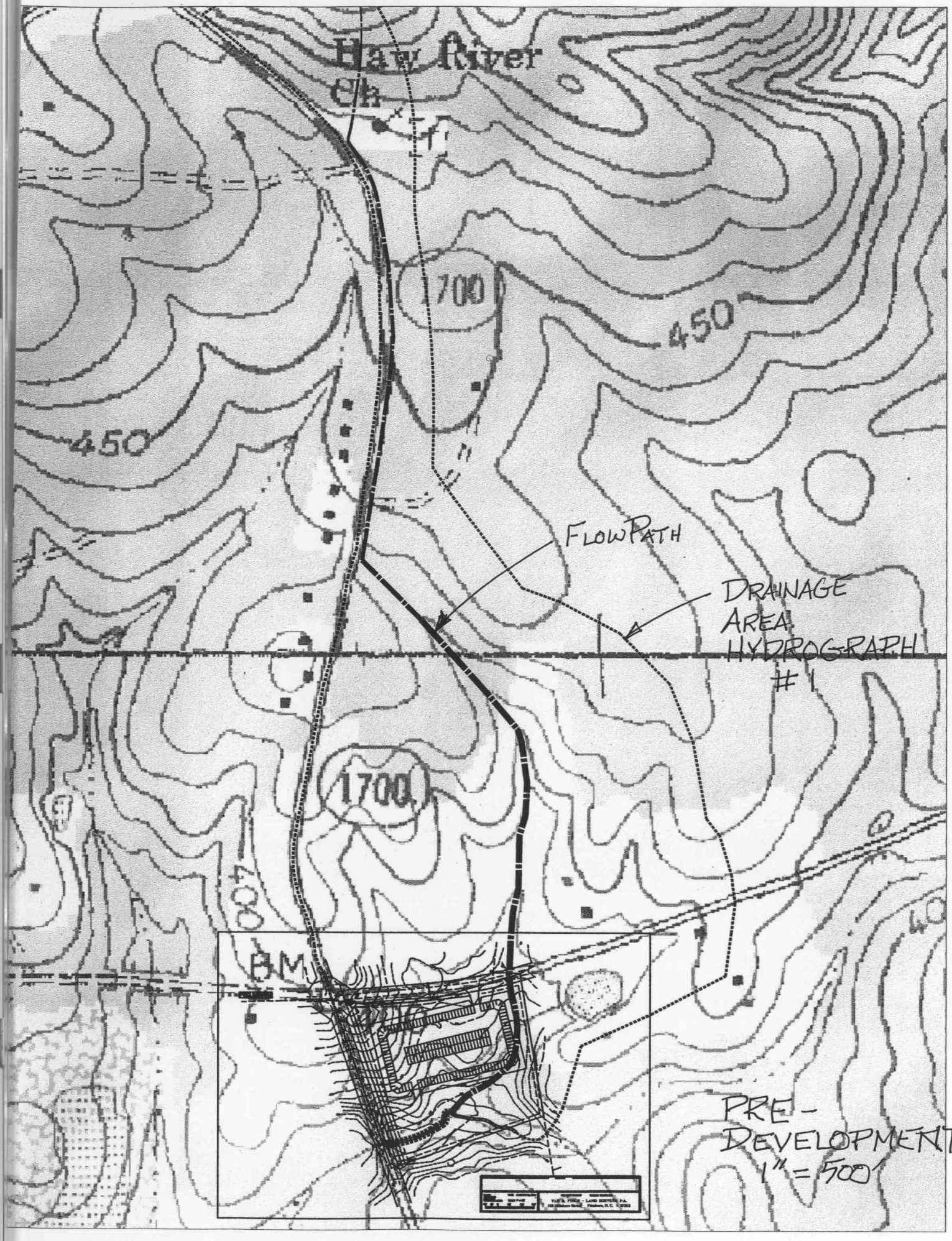
$Q_2 = 19.86$
$Q_{10} = 72.43$
$Q_{25} = 96.31$

POST-DEV (DETAILED)

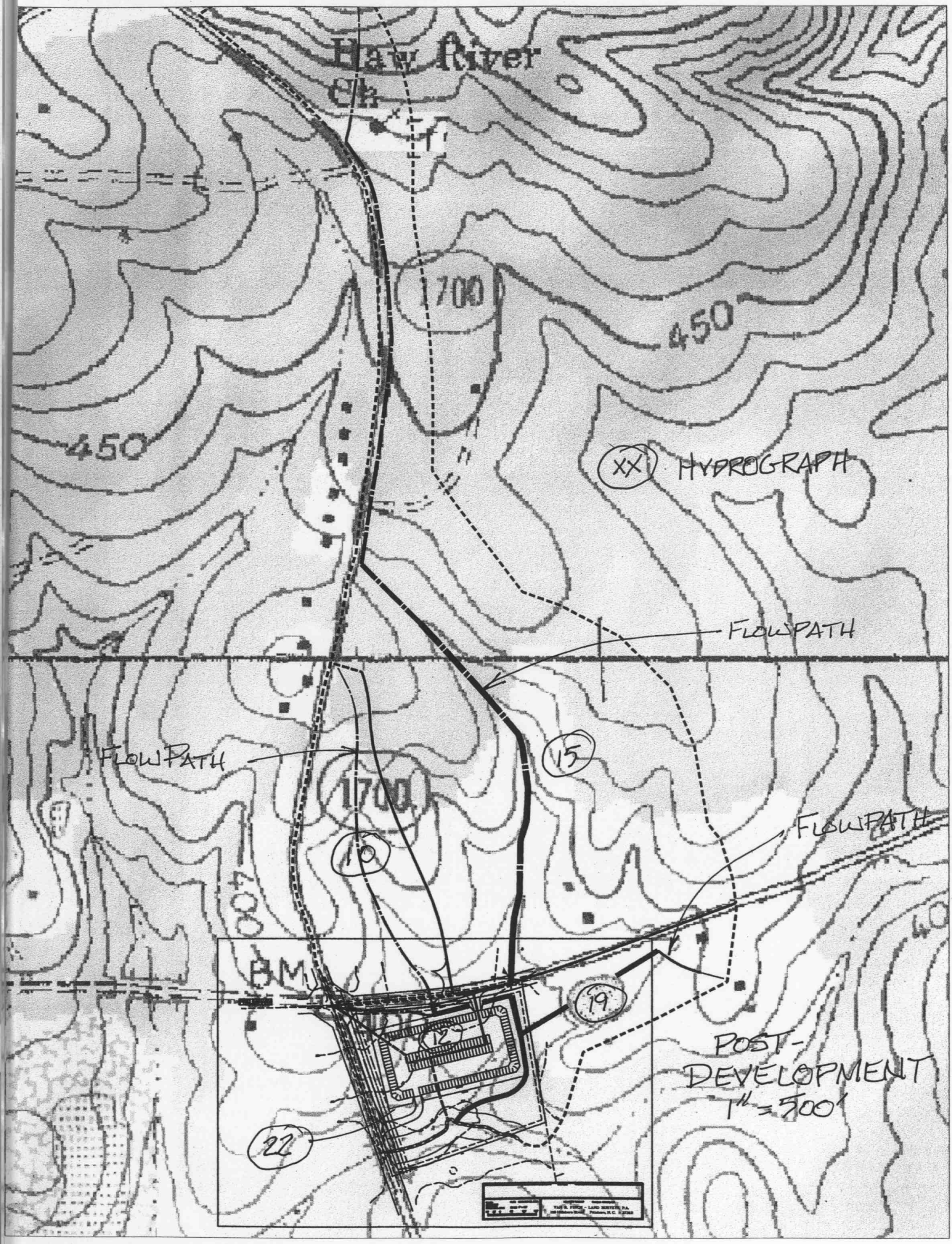
$Q_2 = 19.45$
$Q_{10} = 70.32$
$Q_{25} = 93.59$

Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Dev
5	SCS Runoff	Post-Development
6	Reach	Bend to Outlet
10	SCS Runoff	Post 1 - NW
11	Reach	Ditch - Segment 1
12	SCS Runoff	Post - Parcel NW
13	Combine	New Culvert #1
14	Reach	Ditch - Segment 2
15	SCS Runoff	Post 2 - NE
16	Combine	Outlet of NE Culvert
17	Reach	Intersection to End of Ditch
18	Reach	End of Ditch to Stream
19	SCS Runoff	Post 3 SE Corner
20	Combine	Entrance to Stream
21	Reach	Stream Below Site
22	SCS Runoff	Post 4 - SW
23	Combine	Outlet



PRE-DEVELOPMENT
1" = 500'


Haw River
Ck
1700
450
450
(XX) HYDROGRAPH
FLOWPATH
FLOWPATH
15
1700
10
FLOWPATH
BM
19
12
22
POST-
DEVELOPMENT
1" = 500'

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	----	----	20.65	----	----	75.43	100.29	----	----	Pre-Dev PRE
5	SCS Runoff	----	----	19.87	----	----	72.44	96.34	----	----	Post-Development
6	Reach	5	----	19.86	----	----	72.43	96.31	----	----	Bend to Outlet POST
10	SCS Runoff	----	----	2.81	----	----	10.89	14.60	----	----	Post 1 - NW
11	Reach	10	----	2.80	----	----	10.87	14.58	----	----	Ditch - Segment 1
12	SCS Runoff	----	----	6.78	----	----	13.94	16.72	----	----	Post - Parcel NW
13	Combine	11, 12	----	6.90	----	----	15.40	19.10	----	----	New Culvert #1 POST DETAIL
14	Reach	13	----	6.81	----	----	15.33	19.04	----	----	Ditch - Segment 2
15	SCS Runoff	----	----	13.17	----	----	50.94	68.35	----	----	Post 2 - NE
16	Combine	14, 15	----	16.43	----	----	62.77	84.11	----	----	Outlet of NE Culvert
17	Reach	16	----	16.40	----	----	62.71	83.98	----	----	Intersection to End of Ditch
18	Reach	17	----	16.37	----	----	62.61	83.91	----	----	End of Ditch to Stream
19	SCS Runoff	----	----	12.38	----	----	33.83	42.71	----	----	Post 3 SE Corner
20	Combine	18, 19	----	19.10	----	----	69.48	92.54	----	----	Entrance to Stream
21	Reach	20	----	19.07	----	----	69.46	92.52	----	----	Stream Below Site
22	SCS Runoff	----	----	5.10	----	----	12.81	15.94	----	----	Post 4 - SW (CULV 2)
23	Combine	21, 22	----	19.45	----	----	70.32	93.59	----	----	Outlet

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	20.65	1	756	197,100	—	—	—	Pre-Dev
5	SCS Runoff	19.87	1	758	196,436	—	—	—	Post-Development
6	Reach	19.86	1	760	196,435	5	—	—	Bend to Outlet
10	SCS Runoff	2.81	1	749	24,616	—	—	—	Post 1 - NW
11	Reach	2.80	1	752	24,613	10	—	—	Ditch - Segment 1
12	SCS Runoff	6.78	1	716	11,802	—	—	—	Post - Parcel NW
13	Combine	6.90	1	716	36,415	11, 12	—	—	New Culvert #1
14	Reach	6.81	1	717	36,414	13	—	—	Ditch - Segment 2
15	SCS Runoff	13.17	1	753	123,365	—	—	—	Post 2 - NE
16	Combine	16.43	1	752	159,779	14, 15	—	—	Outlet of NE Culvert
17	Reach	16.40	1	755	159,778	16	—	—	Intersection to End of Ditch
18	Reach	16.37	1	757	159,777	17	—	—	End of Ditch to Stream
19	SCS Runoff	12.38	1	727	46,483	—	—	—	Post 3 SE Corner
20	Combine	19.10	1	755	206,259	18, 19	—	—	Entrance to Stream
21	Reach	19.07	1	757	206,259	20	—	—	Stream Below Site
22	SCS Runoff	5.10	1	716	9,084	—	—	—	Post 4 - SW
23	Combine	19.45	1	756	215,343	21, 22	—	—	Outlet

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	75.43	1	753	555,882	—	—	—	Pre-Dev
5	SCS Runoff	72.44	1	755	554,011	—	—	—	Post-Development
6	Reach	72.43	1	756	554,009	5	—	—	Bend to Outlet
10	SCS Runoff	10.89	1	747	71,374	—	—	—	Post 1 - NW
11	Reach	10.87	1	748	71,372	10	—	—	Ditch - Segment 1
12	SCS Runoff	13.94	1	716	24,796	—	—	—	Post - Parcel NW
13	Combine	15.40	1	716	96,169	11, 12	—	—	New Culvert #1
14	Reach	15.33	1	717	96,169	13	—	—	Ditch - Segment 2
15	SCS Runoff	50.94	1	750	357,700	—	—	—	Post 2 - NE
16	Combine	62.77	1	749	453,869	14, 15	—	—	Outlet of NE Culvert
17	Reach	62.71	1	751	453,868	16	—	—	Intersection to End of Ditch
18	Reach	62.61	1	753	453,867	17	—	—	End of Ditch to Stream
19	SCS Runoff	33.83	1	727	114,108	—	—	—	Post 3 SE Corner
20	Combine	69.48	1	751	567,975	18, 19	—	—	Entrance to Stream
21	Reach	69.46	1	752	567,975	20	—	—	Stream Below Site
22	SCS Runoff	12.81	1	716	22,299	—	—	—	Post 4 - SW
23	Combine	70.32	1	752	590,274	21, 22	—	—	Outlet

Table of Contents

10 - Year

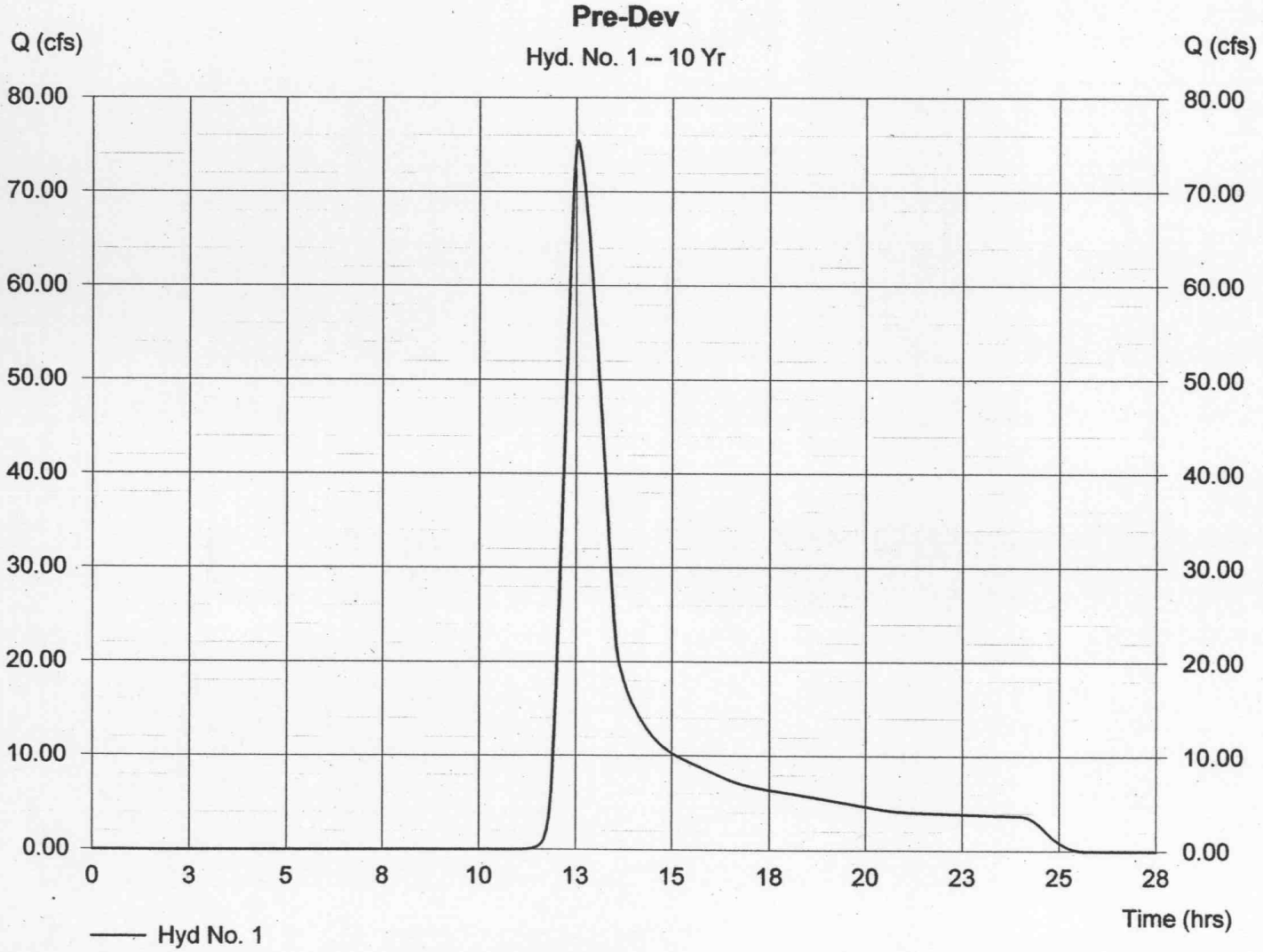
Hydrograph Plot

Hyd. No. 1

Pre-Dev

Hydrograph type	= SCS Runoff	Peak discharge	= 75.43 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 94.480 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 61.30 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 555,882 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Pre-Dev

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.70	0.00	0.00	
Land slope (%)	= 10.00	0.00	0.00	
Travel Time (min)	**= 43.99**	**+ 0.00**	**+ 0.00**	**= 43.99**
Shallow Concentrated Flow				
Flow length (ft)	= 420.00	350.00	0.00	
Watercourse slope (%)	= 10.00	3.00	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 5.10	2.79	0.00	
Travel Time (min)	**= 1.37**	**+ 2.09**	**+ 0.00**	**= 3.46**
Channel Flow				
X sectional flow area (sqft)	= 6.75	4.00	7.50	
Wetted perimeter (ft)	= 9.00	6.00	8.00	
Channel slope (%)	= 3.06	2.55	1.00	
Manning's n-value	= 0.035	0.035	0.035	
Velocity (ft/s)	= 6.14	5.18	4.08	
Flow length (ft)	= 1800.0	2355.0	340.0	
Travel Time (min)	**= 4.88**	**+ 7.58**	**+ 1.39**	**= 13.85**

Total Travel Time, Tc ..... 61.30 min

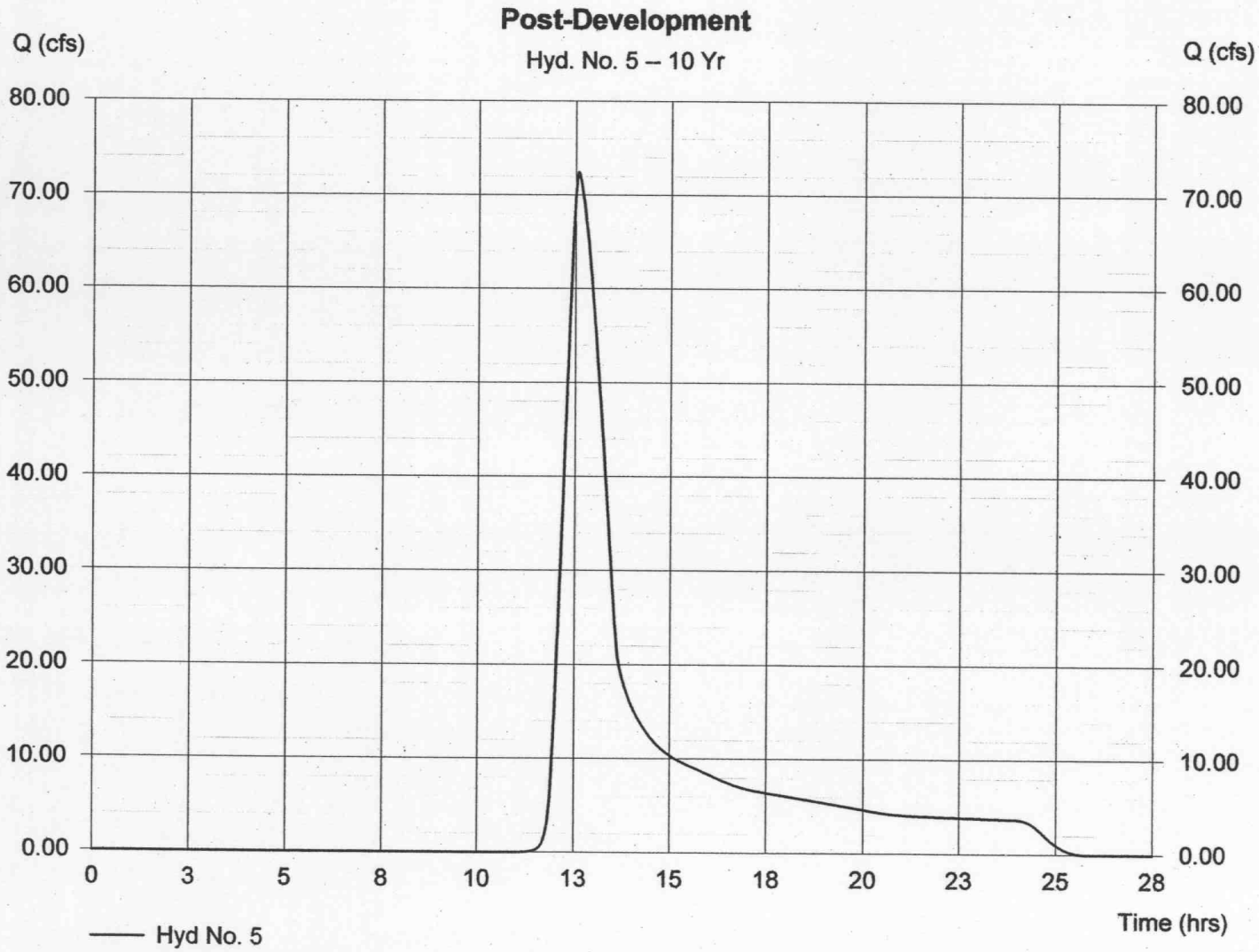
Hydrograph Plot

Hyd. No. 5

Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 72.44 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 94.480 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 65.10 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 554,011 cuft



TR55 Tc Worksheet

Hyd. No. 5

Post-Development

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.70	0.00	0.00	
Land slope (%)	= 10.00	0.00	0.00	
Travel Time (min)	**= 43.99 +**	**0.00 +**	**0.00 =**	**43.99**
Shallow Concentrated Flow				
Flow length (ft)	= 420.00	350.00	255.00	
Watercourse slope (%)	= 10.00	3.00	1.00	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	= 5.10	2.79	1.61	
Travel Time (min)	**= 1.37 +**	**2.09 +**	**2.63 =**	**6.09**
Channel Flow				
X sectional flow area (sqft)	= 6.75	4.00	12.00	
Wetted perimeter (ft)	= 9.00	6.00	12.65	
Channel slope (%)	= 3.06	2.55	0.50	
Manning's n-value	= 0.035	0.035	0.035	
Velocity (ft/s)	= 6.14	5.18	2.91	
Flow length (ft)	= 1800.0	2355.0	450.0	
Travel Time (min)	**= 4.88 +**	**7.58 +**	**2.58 =**	**15.04**

Total Travel Time, Tc ..... 65.10 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Sunday, Dec 18 2005, 9:5 PM

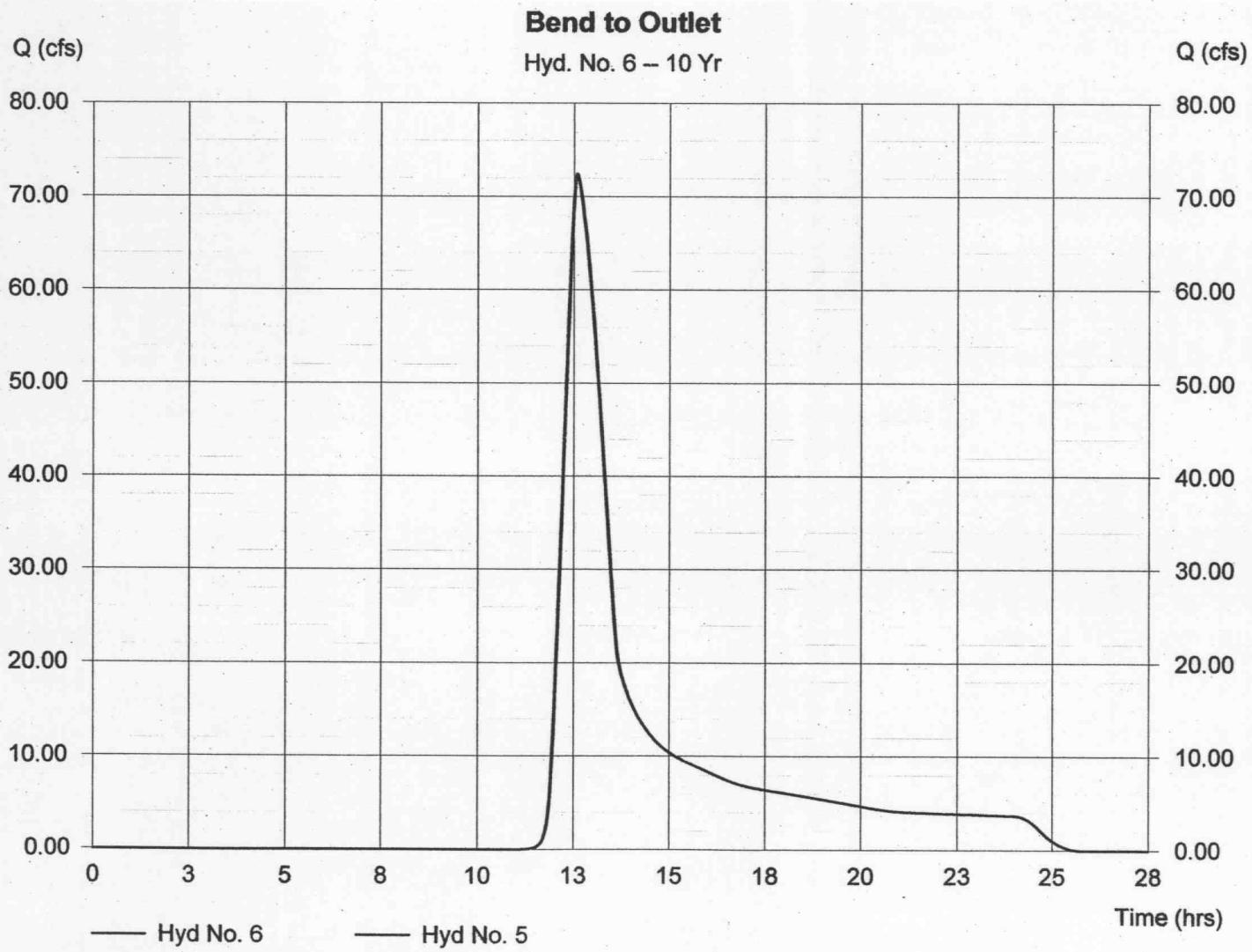
Hyd. No. 6

Bend to Outlet

Hydrograph type	= Reach	Peak discharge	= 72.43 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 5	Section type	= Rectangular
Reach length	= 340.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.035	Bottom width	= 5.0 ft
Side slope	= 0.0:1	Max. depth	= 1.5 ft
Rating curve x	= 1.455	Rating curve m	= 1.511
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.8426

Modified Att-Kin routing method used.

Hydrograph Volume = 554,009 cuft



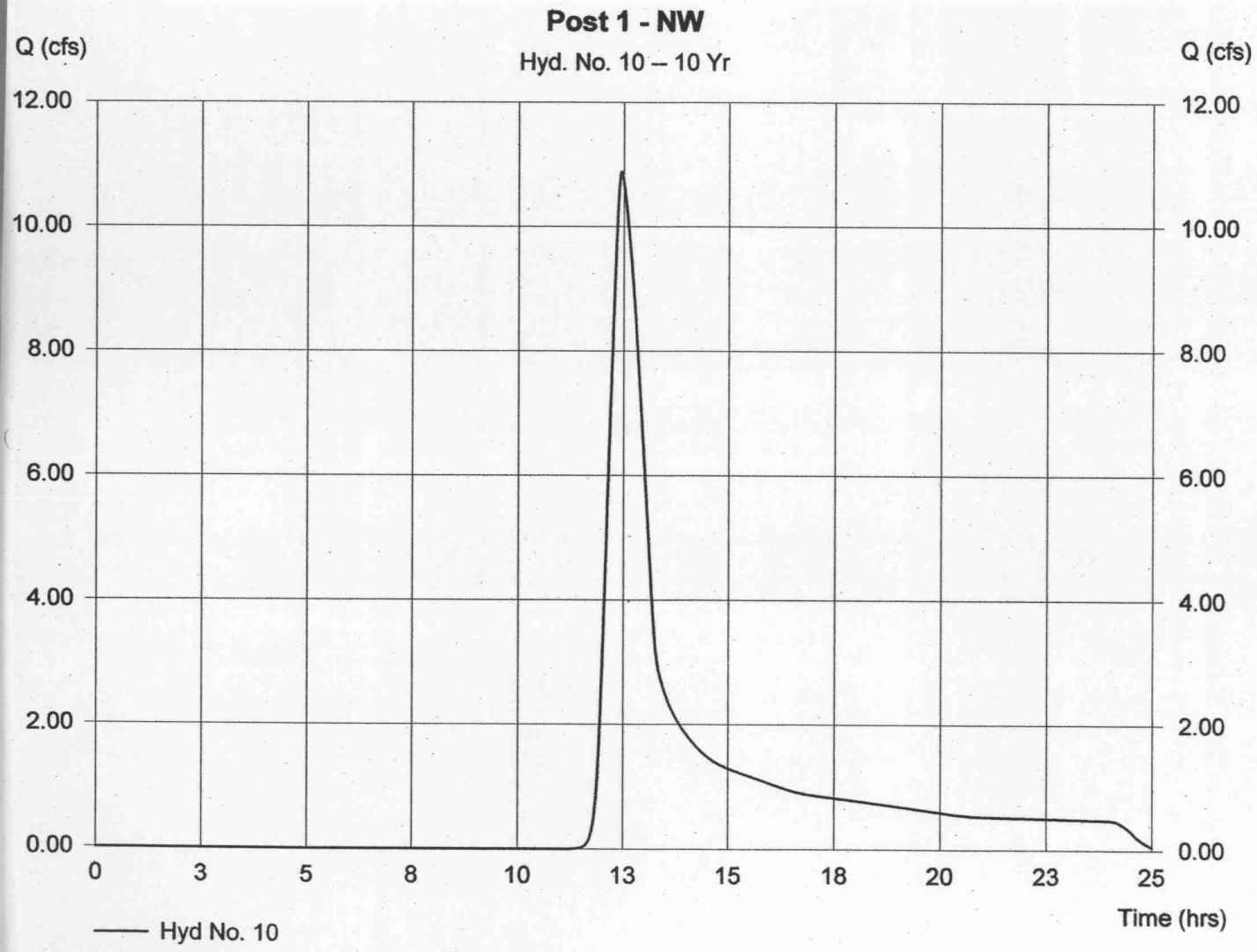
Hydrograph Plot

Hyd. No. 10

Post 1 - NW

Hydrograph type	= SCS Runoff	Peak discharge	= 10.89 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 12.710 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 51.50 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 71,374 cuft



TR55 Tc Worksheet

Hyd. No. 10

Post 1 - NW

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 220.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.70	0.00	0.00	
Land slope (%)	= 5.00	0.00	0.00	
Travel Time (min)	**= 45.29**	**+ 0.00**	**+ 0.00**	**= 45.29**
Shallow Concentrated Flow				
Flow length (ft)	= 1215.00	0.00	0.00	
Watercourse slope (%)	= 4.11	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.27	0.00	0.00	
Travel Time (min)	**= 6.19**	**+ 0.00**	**+ 0.00**	**= 6.19**
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 ..... 51.50 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Sunday, Dec 18 2005, 9:5 PM

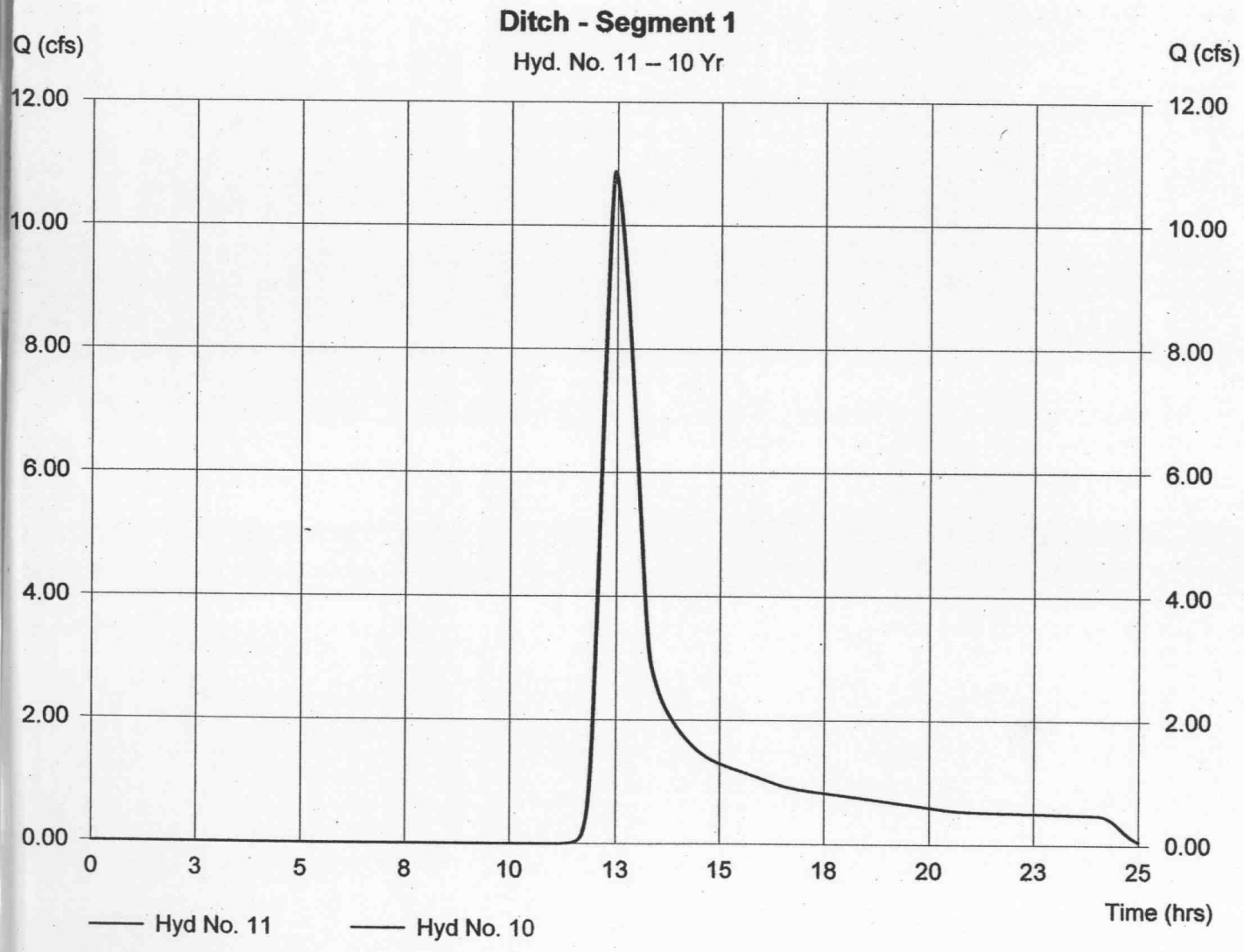
Hyd. No. 11

Ditch - Segment 1

Hydrograph type	= Reach	Peak discharge	= 10.87 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 10	Section type	= Triangular
Reach length	= 200.0 ft	Channel slope	= 0.5 %
Manning's n	= 0.035	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 1.317	Rating curve m	= 1.333
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.6175

Modified Att-Kin routing method used.

Hydrograph Volume = 71,372 cuft



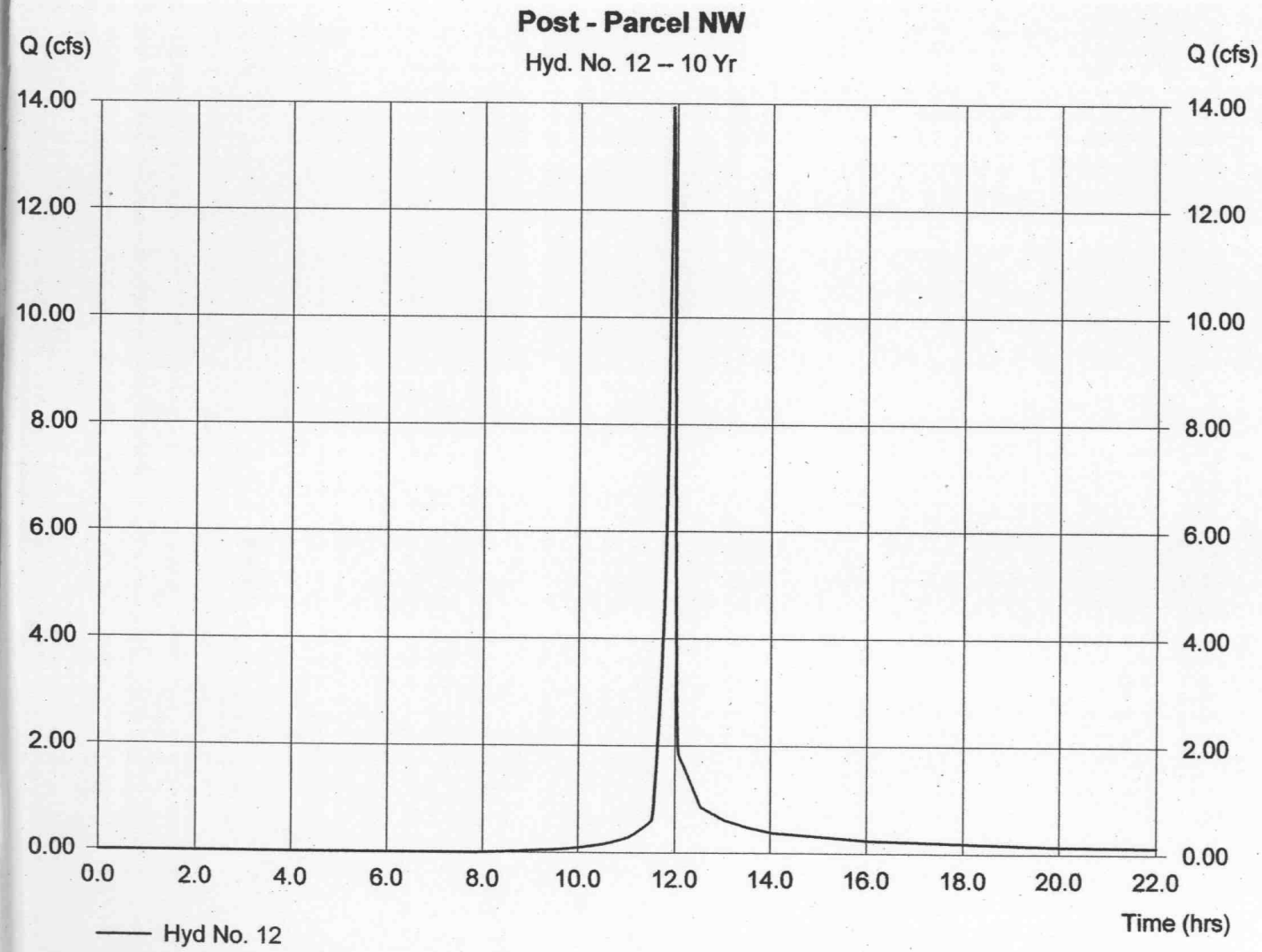
Hydrograph Plot

Hyd. No. 12

Post - Parcel NW

Hydrograph type	= SCS Runoff	Peak discharge	= 13.94 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 2.540 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.90 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 24,796 cuft



TR55 Tc Worksheet

Hyd. No. 12

Post - Parcel NW

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 375.00		0.00		0.00		
Watercourse slope (%)	= 5.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 3.61		0.00		0.00		
Travel Time (min)	**= 1.73**	**+**	**0.00**	**+**	**0.00**	**=**	**1.73**
Channel Flow							
X sectional flow area (sqft)	= 12.00		0.00		0.00		
Wetted perimeter (ft)	= 12.65		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.035		0.015		0.015		
Velocity (ft/s)	= 2.91		0.00		0.00		
Flow length (ft)	= 200.0		0.0		0.0		
Travel Time (min)	**= 1.15**	**+**	**0.00**	**+**	**0.00**	**=**	**1.15**

Total Travel Time, Tc ..... 2.90 min

Hydrograph Plot

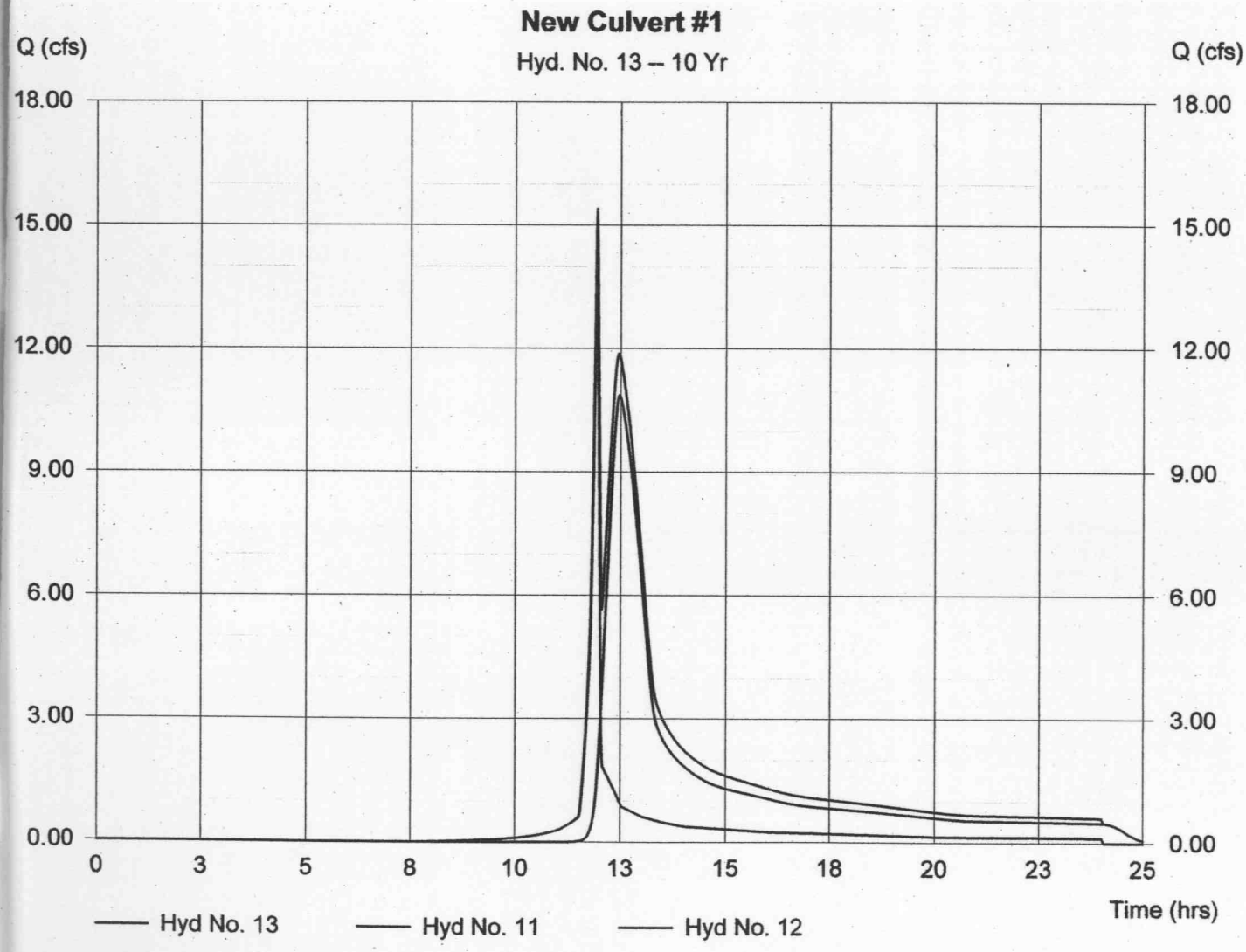
Hyd. No. 13

New Culvert #1

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 11, 12

Peak discharge = 15.40 cfs
Time interval = 1 min

Hydrograph Volume = 96,169 cuft



Hydrograph Plot

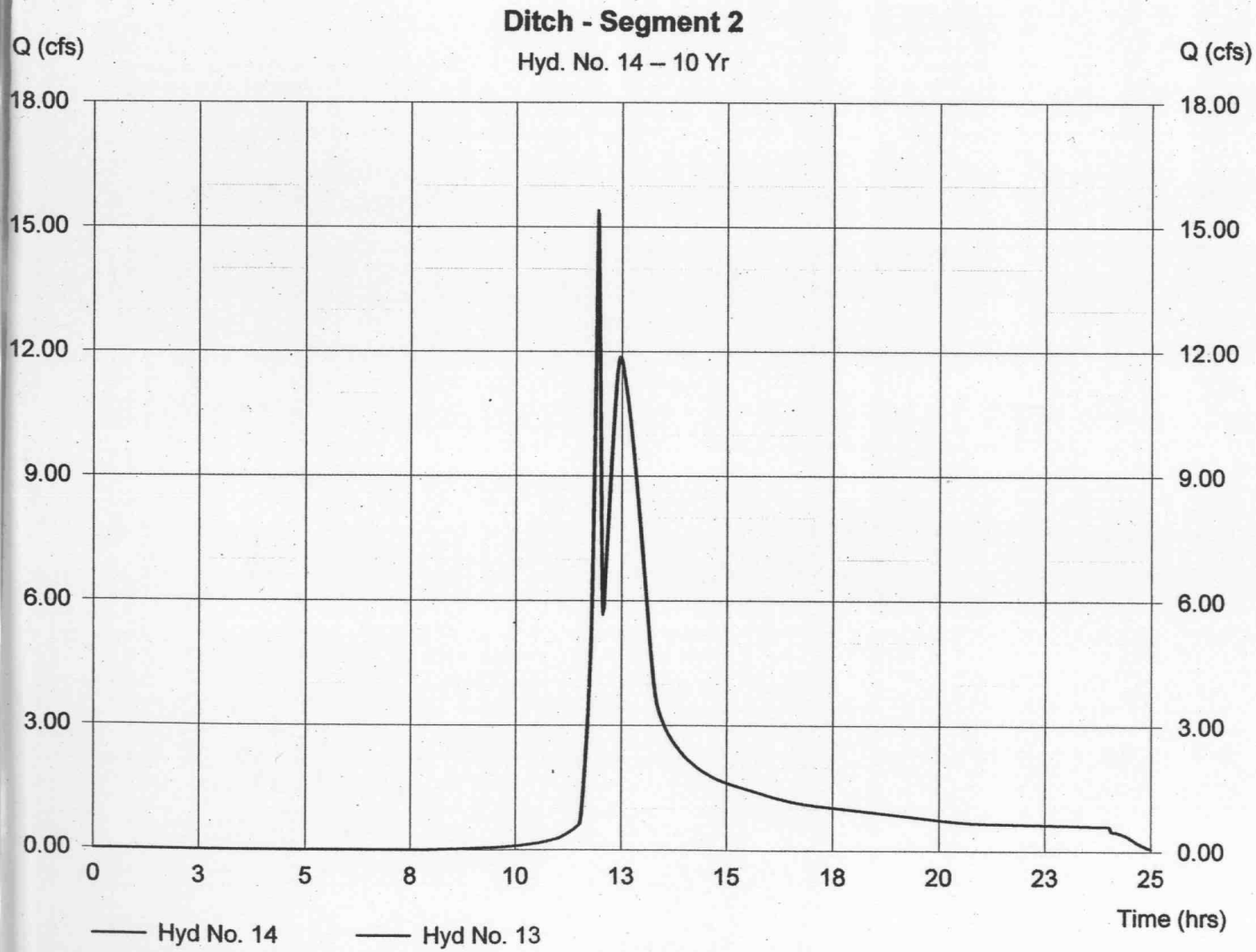
Hydraflow Hydrographs by Intelisolve — Sunday, Dec 18 2005, 9:5 PM

Hyd. No. 14

Ditch - Segment 2

Hydrograph type	= Reach	Peak discharge	= 15.33 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 13	Section type	= Triangular
Reach length	= 130.0 ft	Channel slope	= 0.5 %
Manning's n	= 0.035	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 1.317	Rating curve m	= 1.333
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.8568

Modified Att-Kin routing method used. — Hydrograph Volume = 96,169 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

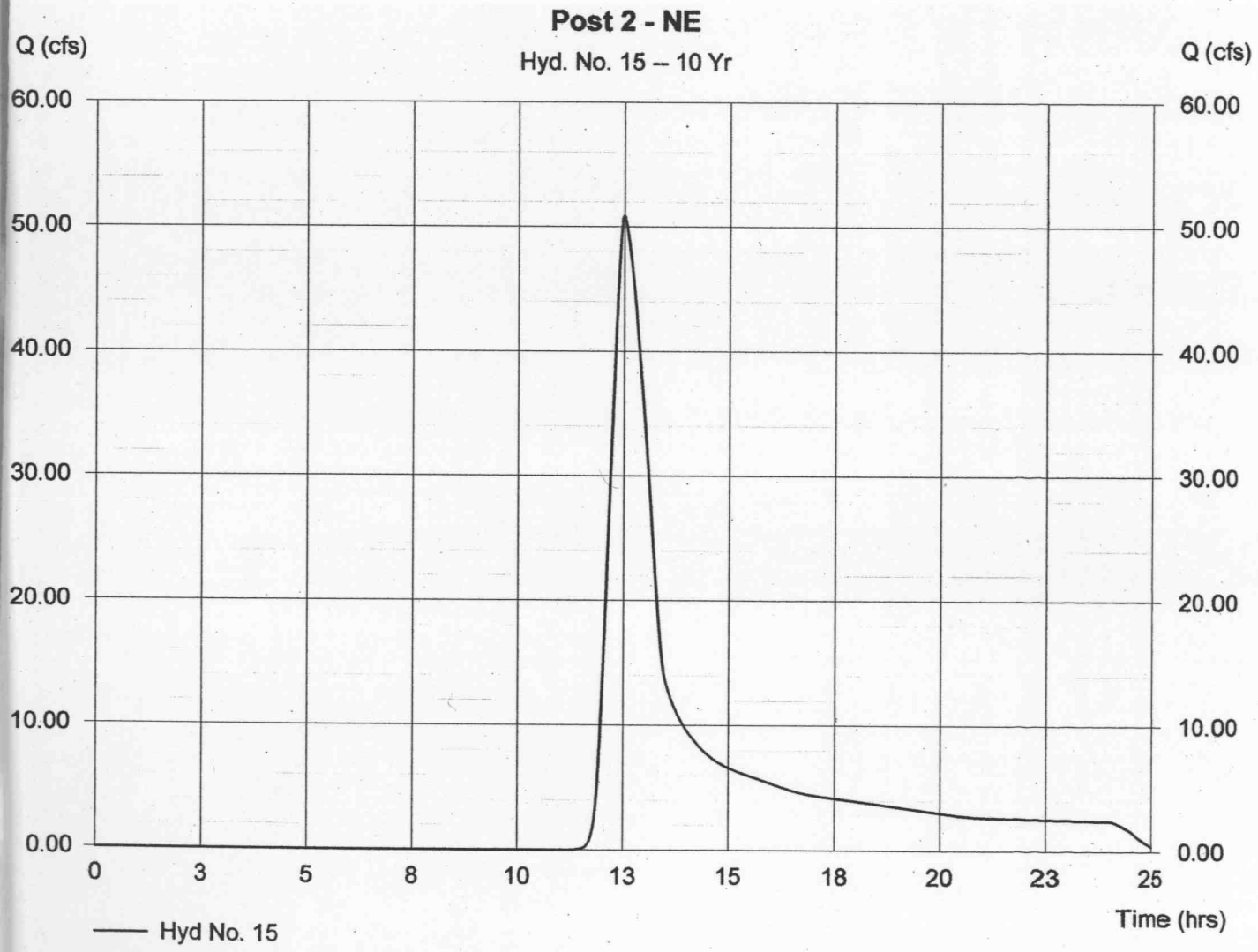
Sunday, Dec 18 2005, 9:5 PM

Hyd. No. 15

Post 2 - NE

Hydrograph type	= SCS Runoff	Peak discharge	= 50.94 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 63.720 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 57.60 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 357,700 cuft



TR55 Tc Worksheet

Hyd. No. 15

Post 2 - NE

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.70	0.00	0.00	
Land slope (%)	= 10.00	0.00	0.00	
Travel Time (min)	**= 43.99 +**	**0.00 +**	**0.00 =**	**43.99**
Shallow Concentrated Flow				
Flow length (ft)	= 420.00	350.00	0.00	
Watercourse slope (%)	= 10.00	3.00	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 5.10	2.79	0.00	
Travel Time (min)	**= 1.37 +**	**2.09 +**	**0.00 =**	**3.46**
Channel Flow				
X sectional flow area (sqft)	= 6.75	4.00	0.00	
Wetted perimeter (ft)	= 9.00	6.00	0.00	
Channel slope (%)	= 3.06	2.55	0.00	
Manning's n-value	= 0.035	0.035	0.015	
Velocity (ft/s)	= 6.14	5.18	0.00	
Flow length (ft)	= 1800.0	1645.0	0.0	
Travel Time (min)	**= 4.88 +**	**5.29 +**	**0.00 =**	**10.18**

Total Travel Time, Tc ..... 57.60 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Sunday, Dec 18 2005, 9:5 PM

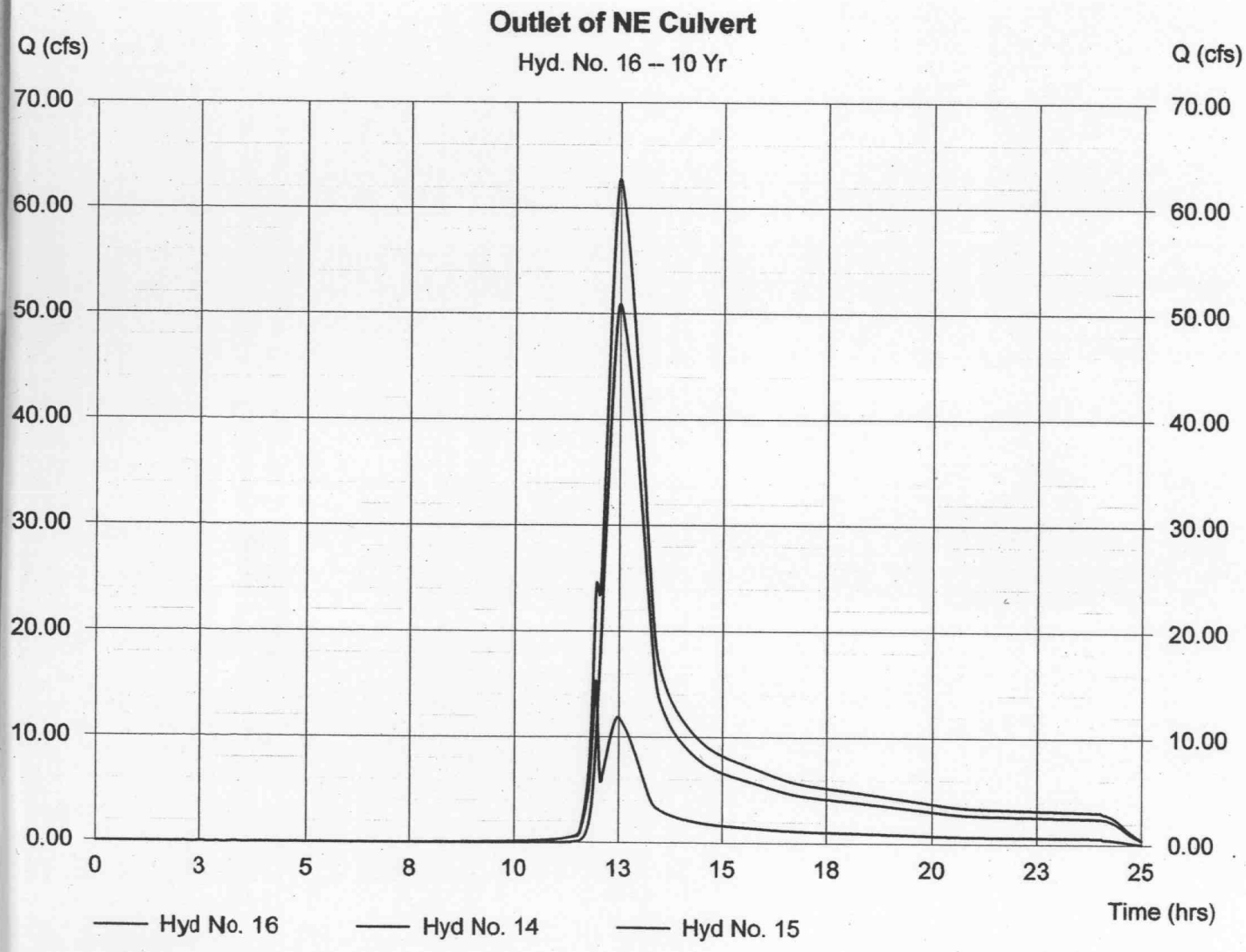
Hyd. No. 16

Outlet of NE Culvert

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 14, 15

Peak discharge = 62.77 cfs
Time interval = 1 min

Hydrograph Volume = 453,869 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Sunday, Dec 18 2005, 9:5 PM

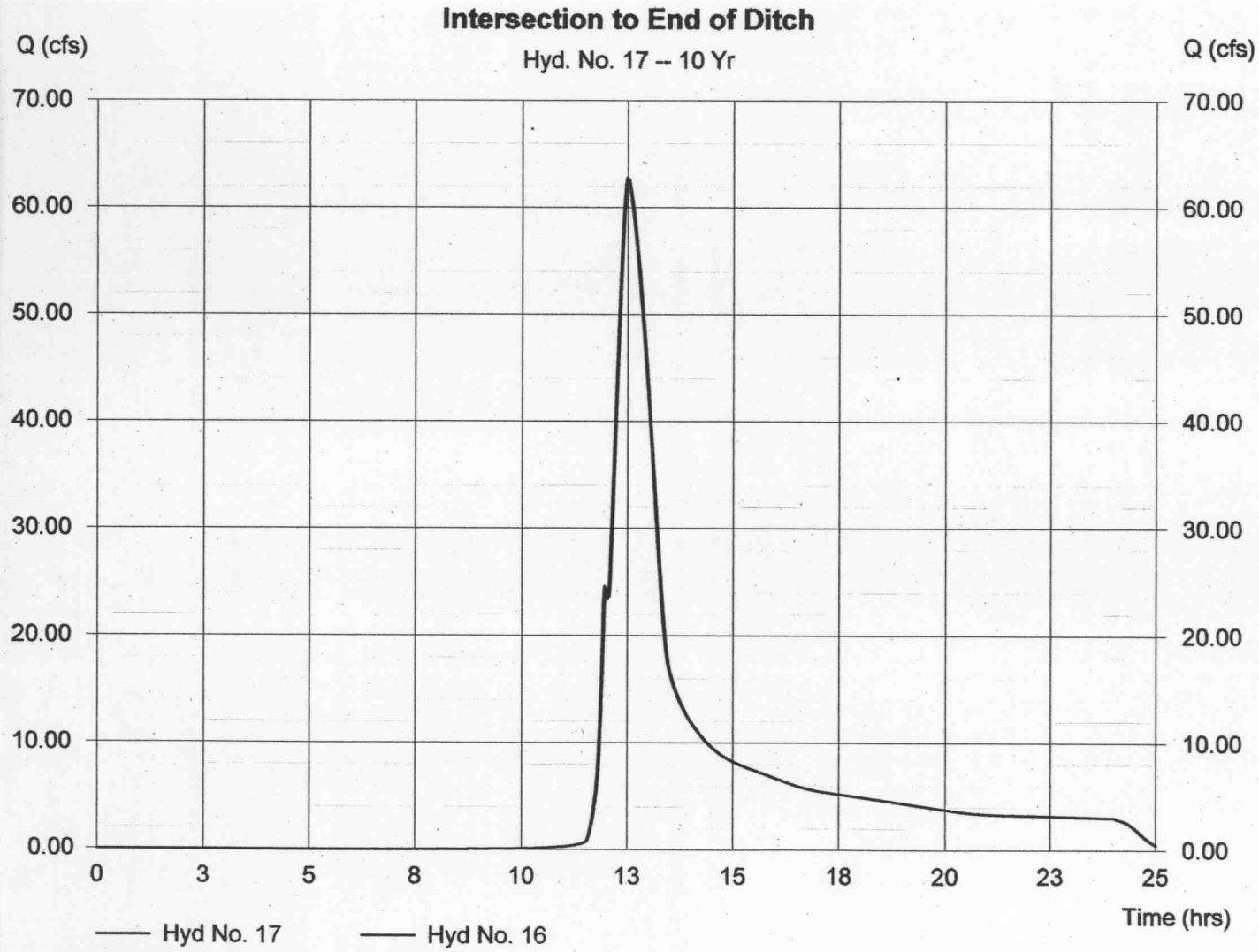
Hyd. No. 17

Intersection to End of Ditch

Hydrograph type	= Reach	Peak discharge	= 62.71 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 16	Section type	= Triangular
Reach length	= 284.0 ft	Channel slope	= 0.5 %
Manning's n	= 0.035	Bottom width	= 0.0 ft
Side slope	= 3.0:1	Max. depth	= 0.0 ft
Rating curve x	= 1.317	Rating curve m	= 1.333
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.6554

Modified Att-Kin routing method used.

Hydrograph Volume = 453,868 cuft



Hydrograph Plot

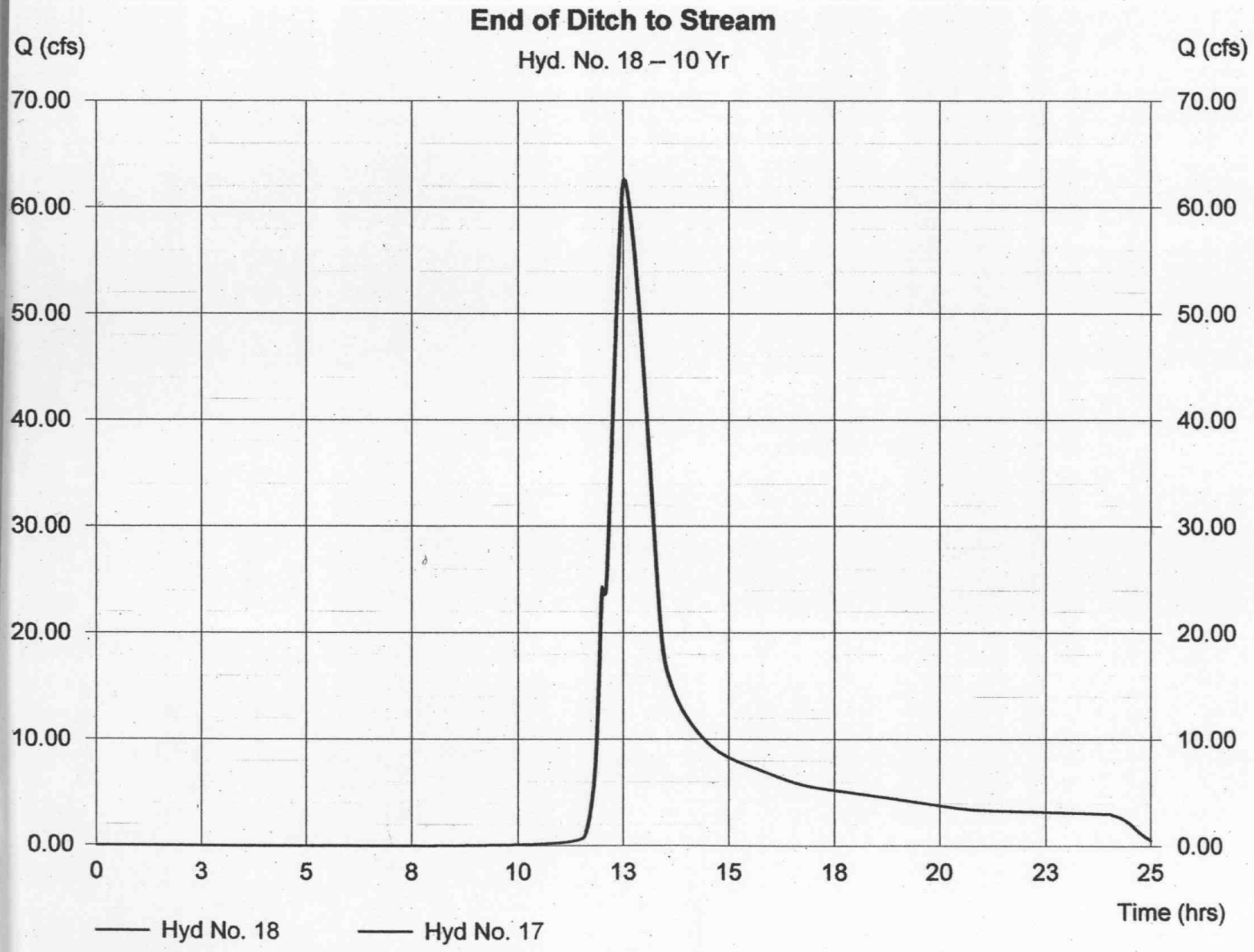
Hydraflow Hydrographs by Intelisolve — Sunday, Dec 18 2005, 9:5 PM

Hyd. No. 18

End of Ditch to Stream

Hydrograph type	= Reach	Peak discharge	= 62.61 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 17	Section type	= Triangular
Reach length	= 255.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.035	Bottom width	= 0.0 ft
Side slope	= 15.0:1	Max. depth	= 0.0 ft
Rating curve x	= 1.090	Rating curve m	= 1.333
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.6403

Modified Att-Kin routing method used. — Hydrograph Volume = 453,867 cuft



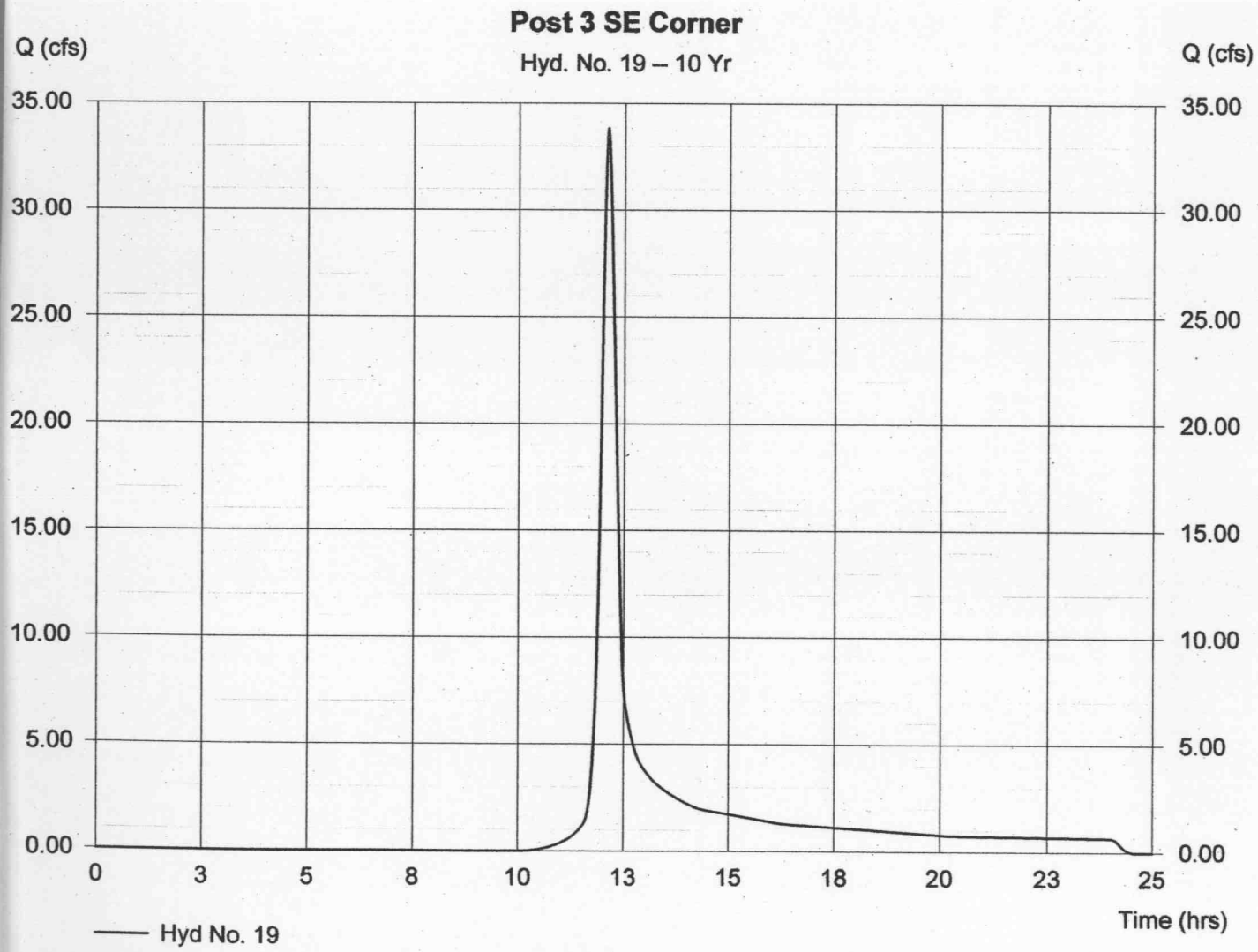
Hydrograph Plot

Hyd. No. 19

Post 3 SE Corner

Hydrograph type	= SCS Runoff	Peak discharge	= 33.83 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 14.920 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 20.80 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 114,108 cuft



TR55 Tc Worksheet

Hydraflow Hydrographs by Intelisolve

Hyd. No. 19

Post 3 SE Corner

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.70	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	**= 13.27 +**	**0.00 +**	**0.00 =**	**13.27**
Shallow Concentrated Flow				
Flow length (ft)	= 200.00	430.00	255.00	
Watercourse slope (%)	= 5.00	3.50	1.00	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	= 3.61	3.02	1.61	
Travel Time (min)	**= 0.92 +**	**2.37 +**	**2.63 =**	**5.93**
Channel Flow				
X sectional flow area (sqft)	= 12.00	0.00	0.00	
Wetted perimeter (ft)	= 12.65	0.00	0.00	
Channel slope (%)	= 0.50	0.00	0.00	
Manning's n-value	= 0.035	0.015	0.015	
Velocity (ft/s)	= 2.91	0.00	0.00	
Flow length (ft)	= 285.0	0.0	0.0	
Travel Time (min)	**= 1.63 +**	**0.00 +**	**0.00 =**	**1.63**

Total Travel Time, Tc ..... 20.80 min

Hydrograph Plot

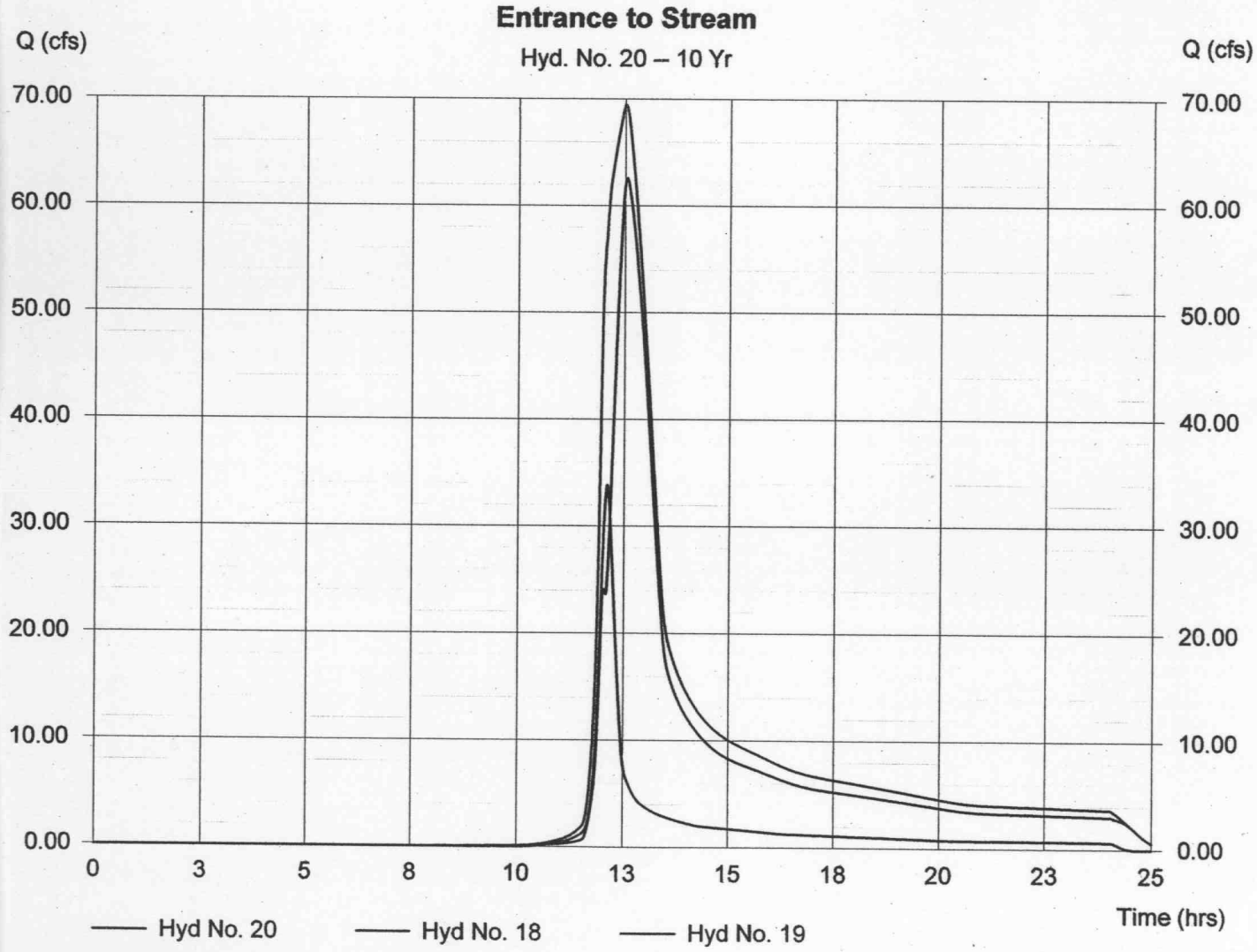
Hyd. No. 20

Entrance to Stream

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 18, 19

Peak discharge = 69.48 cfs
Time interval = 1 min

Hydrograph Volume = 567,975 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Sunday, Dec 18 2005, 9:5 PM

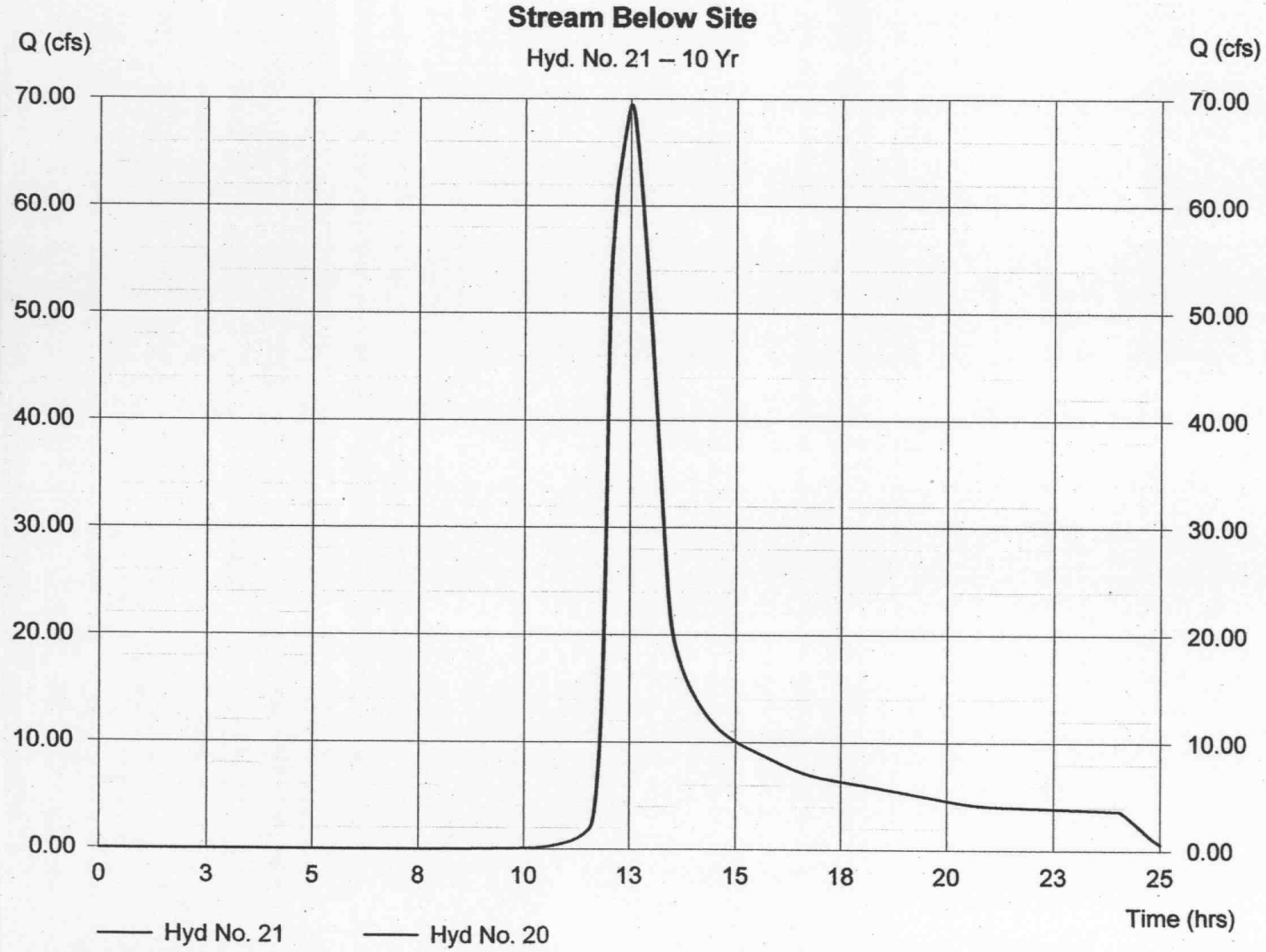
Hyd. No. 21

Stream Below Site

Hydrograph type	= Reach	Peak discharge	= 69.46 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 20	Section type	= Rectangular
Reach length	= 340.0 ft	Channel slope	= 1.0 %
Manning's n	= 0.035	Bottom width	= 5.0 ft
Side slope	= 0.0:1	Max. depth	= 1.5 ft
Rating curve x	= 1.455	Rating curve m	= 1.511
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.8357

Modified Att-Kin routing method used.

Hydrograph Volume = 567,975 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

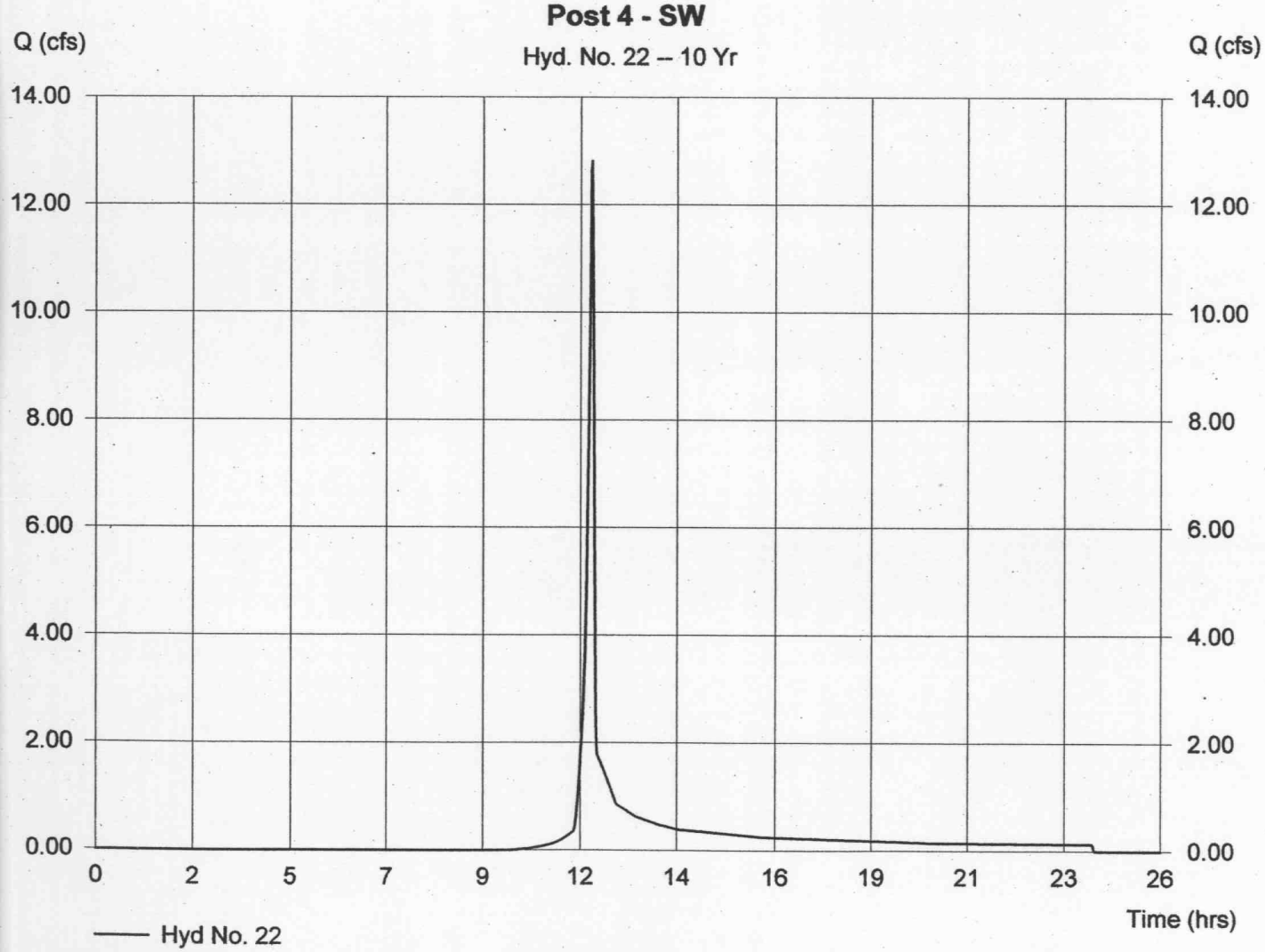
Sunday, Dec 18 2005, 9:5 PM

Hyd. No. 22

Post 4 - SW

Hydrograph type	= SCS Runoff	Peak discharge	= 12.81 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 3.140 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.60 min
Total precip.	= 5.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 22,299 cuft



TR55 Tc Worksheet

Hyd. No. 22

Post 4 - SW

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.011	0.011	0.011	
Flow length (ft)	= 0.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 0.00	0.00	0.00	
Land slope (%)	= 0.00	0.00	0.00	
Travel Time (min)	**= 0.00 +**	**0.00 +**	**0.00 =**	**0.00**
Shallow Concentrated Flow				
Flow length (ft)	= 625.00	0.00	0.00	
Watercourse slope (%)	= 6.10	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.98	0.00	0.00	
Travel Time (min)	**= 2.61 +**	**0.00 +**	**0.00 =**	**2.61**
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 ..... 2.60 min

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

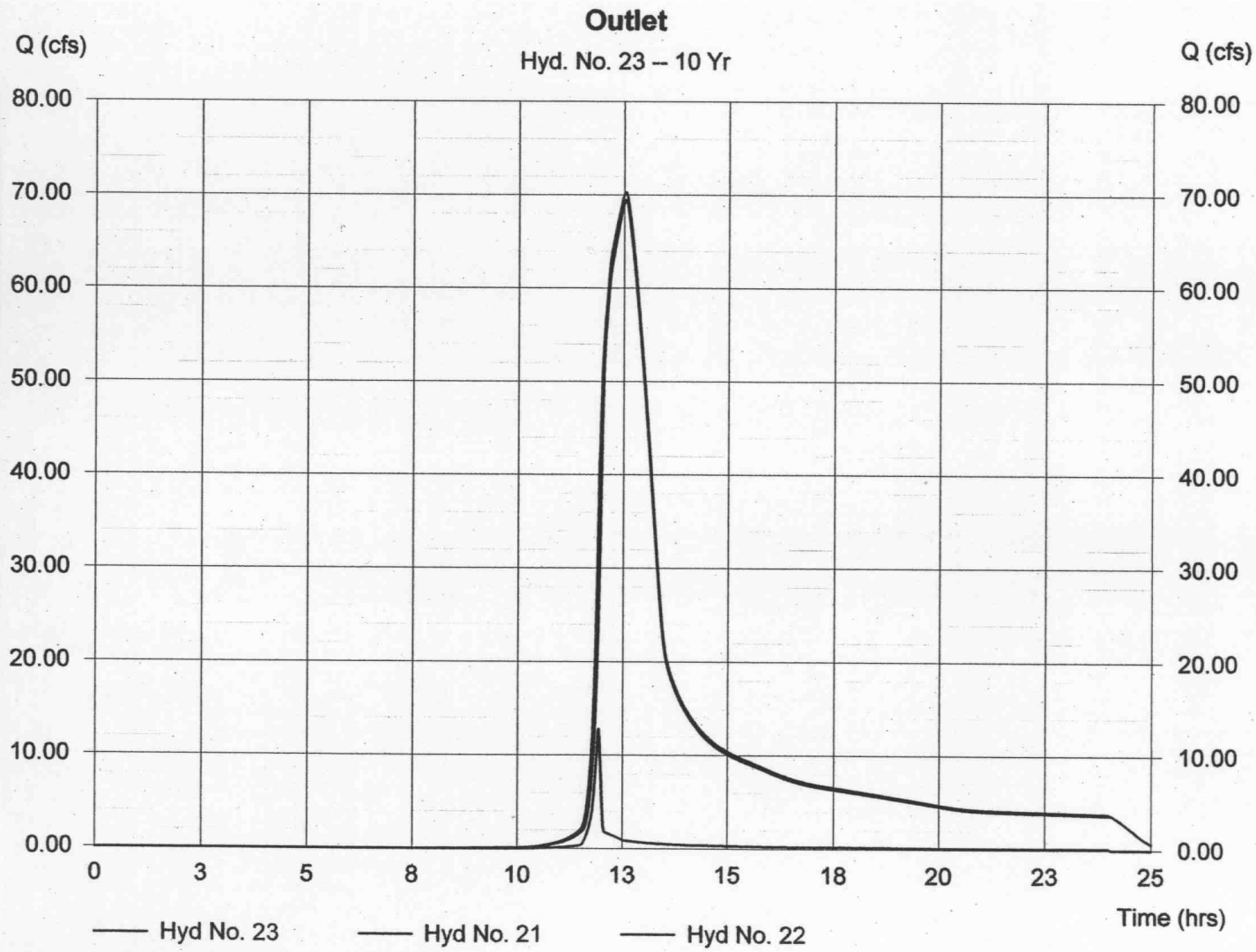
Sunday, Dec 18 2005, 9:5 PM

Hyd. No. 23

Outlet

Hydrograph type	= Combine	Peak discharge	= 70.32 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyds.	= 21, 22		

Hydrograph Volume = 590,274 cuft



PIPE CALCULATIONS

(Detailed Pipe Calculations using CulvertMaster)

Culvert Designer/Analyzer Report
Culvert #1

Peak Discharge Method: User-Specified			
Design Discharge	15.40 cfs	Check Discharge	19.10 cfs

Grades Model: Inverts			
Invert Upstream	374.28 ft	Invert Downstream	373.85 ft
Length	85.00 ft	Slope	0.005000 ft/ft
Drop	0.43 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/ Height	1.20

Tailwater properties: Triangular Channel			
Slope	0.005000 ft/ft	Mannings Coefficient	0.035
Depth	1.60 ft	Left Side Slope	3 H : V
Right Side Slope	3 H : V		

Tailwater conditions for Design Storm.			
Discharge	15.40 cfs	Bottom Elevation	373.85 ft
Depth	1.47 ft	Velocity	2.36 ft/s

Tailwater conditions for Check Storm.			
Discharge	19.10 cfs	Bottom Elevation	373.85 ft
Depth	1.60 ft	Velocity	2.50 ft/s

	Name	Desc	Discharge	HW Elev	Velocity
x	Trial-1	1-24 inch Circular	15.40 cfs	376.63 ft	6.21 ft/s
	Trial-2	1-24 inch Circular	19.10 cfs	377.08 ft	7.10 ft/s

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Culvert Designer/Analyzer Report
Culvert #1

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	376.68 ft	Storm Event	Design
Computed Headwater Elevation	376.63 ft	Discharge	15.40 cfs
Headwater Depth/ Height	1.18	Tailwater Elevation	375.32 ft
Inlet Control HW Elev	376.57 ft	Control Type	Outlet Control
Outlet Control HW Elev	376.63 ft		

Grades			
Upstream Invert	374.28 ft	Downstream Invert	373.85 ft
Length	85.00 ft	Constructed Slope	0.005000 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.47 ft
Slope Type	Mild	Normal Depth	1.58 ft
Flow Regime	Subcritical	Critical Depth	1.41 ft
Velocity Downstream	6.21 ft/s	Critical Slope	0.006433 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	376.63 ft	Upstream Velocity Head	0.53 ft
Ke	0.50	Entrance Loss	0.27 ft

Inlet Control Properties			
Inlet Control HW Elev	376.57 ft	Flow Control	N/A
Inlet Type	End-Section Conforming to fill slope	Area Full	3.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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Culvert Designer/Analyzer Report
Culvert #1

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	376.68 ft	Storm Event	Check
Computed Headwater Elevation	377.08 ft	Discharge	19.10 cfs
Headwater Depth/ Height	1.40	Tailwater Elevation	375.45 ft
Inlet Control HW Elev	377.08 ft	Control Type	Inlet Control
Outlet Control HW Elev	377.07 ft		

Grades			
Upstream Invert	374.28 ft	Downstream Invert	373.85 ft
Length	85.00 ft	Constructed Slope	0.005000 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.60 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	1.57 ft
Velocity Downstream	7.10 ft/s	Critical Slope	0.007731 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	377.07 ft	Upstream Velocity Head	0.60 ft
Ke	0.50	Entrance Loss	0.30 ft

Inlet Control Properties			
Inlet Control HW Elev	377.08 ft	Flow Control	Submerged
Inlet Type	End-Section Conforming to fill slope	Area Full	3.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

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Culvert Designer/Analyzer Report
Culvert #2

Peak Discharge Method: User-Specified			
Design Discharge	12.81 cfs	Check Discharge	15.94 cfs

Grades Model: Inverts			
Invert Upstream	369.00 ft	Invert Downstream	368.00 ft
Length	66.00 ft	Slope	0.015152 ft/ft
Drop	1.00 ft		

Headwater Model: Allowable HW/Height	
Headwater Depth/ Height	1.20

Tailwater Conditions: Constant Tailwater	
Tailwater Elevation	N/A ft

	Name	Desc	Discharge	HW Elev	Velocity
x	Trial-1	1-24 inch Circular	12.81 cfs	371.12 ft	8.44 ft/s
	Trial-2	1-24 inch Circular	15.94 cfs	371.45 ft	8.88 ft/s

Culvert Designer/Analyzer Report
Culvert #2

Design:Trial-1

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	371.40 ft	Storm Event	Design
Computed Headwater Elevation	371.12 ft	Discharge	12.81 cfs
Headwater Depth/ Height	1.06	Tailwater Elevation	N/A ft
Inlet Control HW Elev	370.99 ft	Control Type	Outlet Control
Outlet Control HW Elev	371.12 ft		

Grades			
Upstream Invert	369.00 ft	Downstream Invert	368.00 ft
Length	66.00 ft	Constructed Slope	0.015152 ft/ft

Hydraulic Profile			
Profile	S2	Depth, Downstream	0.97 ft
Slope Type	Steep	Normal Depth	0.95 ft
Flow Regime	Supercritical	Critical Depth	1.29 ft
Velocity Downstream	8.44 ft/s	Critical Slope	0.005760 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	371.12 ft	Upstream Velocity Head	0.56 ft
Ke	0.50	Entrance Loss	0.28 ft

Inlet Control Properties			
Inlet Control HW Elev	370.99 ft	Flow Control	N/A
Inlet Type	Square edge w/headwall	Area Full	3.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Designer/Analyzer Report
Culvert #2

Design:Trial-2

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	371.40	ft	Storm Event	Check	
Computed Headwater Elevation	371.45	ft	Discharge	15.94	cfs
Headwater Depth/ Height	1.23		Tailwater Elevation	N/A	ft
Inlet Control HW Elev	371.36	ft	Control Type	Outlet Control	
Outlet Control HW Elev	371.45	ft			

Grades					
Upstream Invert	369.00	ft	Downstream Invert	368.00	ft
Length	66.00	ft	Constructed Slope	0.015152	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.11	ft
Slope Type	Steep		Normal Depth	1.08	ft
Flow Regime	Supercritical		Critical Depth	1.44	ft
Velocity Downstream	8.88	ft/s	Critical Slope	0.006596	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	371.45	ft	Upstream Velocity Head	0.67	ft
Ke	0.50		Entrance Loss	0.34	ft

Inlet Control Properties					
Inlet Control HW Elev	371.36	ft	Flow Control	Transition	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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APRON CALCULATIONS
(Aprons based on 10-year Storm)

NEW YORK DOT DISSIPATOR METHOD FOR USE IN DEFINED CHANNELS

(Source: "Bank and channel lining procedures", New York Department of Transportation, Division of Design and Construction, 1971.)

Note: To use the following chart you must know:

(1) Q full capacity
(2) Q_{10}
(3) V full
(4) V_{10}

where Q = discharge in cfs and V = Velocity in FPS.

ESTIMATION OF STONE SIZE AND DIMENSIONS FOR CULVERT APRONS

Step 1) Compute flow velocity V_o at culvert or paved channel outlet.

Step 2) For pipe culverts D_o is diameter.
For pipe arch, arch and box culverts, and paved channel outlets, $D_o=A_o$, where A.= cross-sectional area of flow at outlet.

For multiple culverts, use $D_o=1.25xD_o$ of single culvert.

Step 3) For apron grades of 10% or steeper, use recommendations For next higher zone. (Zones 1 through 6).

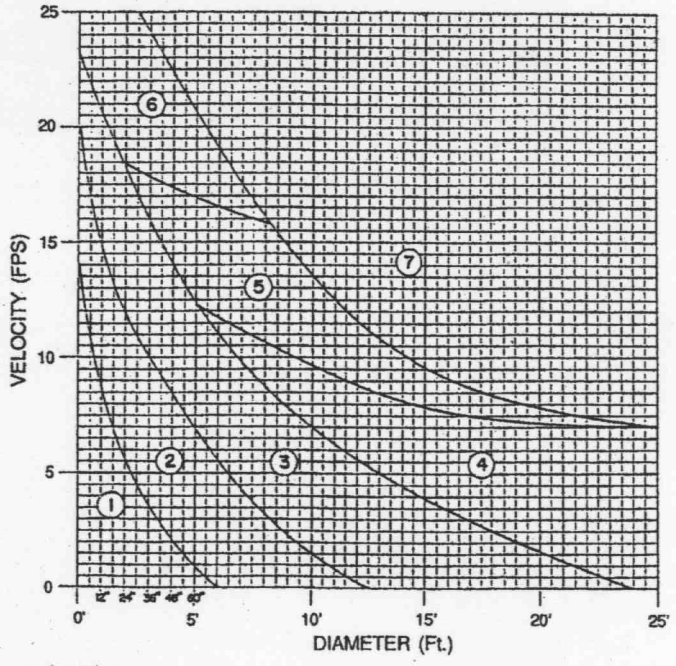

Figure 8.06.b.1

CULVERT 1
24", 6.21 FPS
ZONE 2

CULVERT 2
24", 8.44 FPS
ZONE 2

ZONE	APRON MATERIAL		LENGTH OF APRON TO PROTECT CULVERT L1	LENGTH OF APRON TO PREVENT SCOUR HOLE USE L2 ALWAYS L2
1	STONE FILLING (FINE)	CL. A	3 x D_o	4 x D_o
2	STONE FILLING (LIGHT)	CL. B	3 x D_o	6 x D_o
3	STONE FILLING (MEDIUM)	CL. 1	4 x D_o	8 x D_o
4	STONE FILLING (HEAVY)	CL. 1	4 x D_o	8 x D_o
5	STONE FILLING (HEAVY)	CL. 2	5 x D_o	10 x D_o
6	STONE FILLING (HEAVY)	CL. 2	6 x D_o	10 x D_o
7	SPECIAL STUDY REQUIRED (ENERGY DISSIPATORS, STILLING BASIN OR LARGER SIZE STONE).			

Fig. 8.06.b.2

Width = 3 times pipe dia. (min.)

DETERMINATION OF STONE SIXES FOR DUMPED STONE CHANNEL LININGS AND REVETMENTS

Step 1) Use figure 8.06.b.3 to determine maximum stone size (e.g. for 12 Fps=20" or 550 lbs.

Step 2) Use figure 8.06.b.4 to determine acceptable size range for stone (for 12 FPS it is 125-500 lbs. for 75% of stone, and the maximum and minimum range in weight should be 25-500 lbs.)

Note: In determining channel velocities for stone linings and revetment, use the following coefficients of roughness:

	Diameter (inches)	Mannin's "n"	Min. thickness of lining	(inches)
Fine	3	0.031	9	12
Light	6	0.035	12	18
Medium	13	0.040	18	24
Heavy	23	0.044	30 (Channels)	36 (Dissapators)

DITCHLINE CALCULATIONS
(Calculations perfomed with Flowmaster)

Eastern Ditch
Worksheet for Triangular Channel

Project Description	
Project File	c:\projects\05-050\05-050 calcs\05-050 d.fm2
Worksheet	Eastern Ditch
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.033	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	19.10	cfs

Results		
Depth	1.56	ft
Flow Area	7.32	ft²
Wetted Perimeter	9.88	ft
Top Width	9.38	ft
Critical Depth	1.20	ft
Critical Slope	0.020166	ft/ft
Velocity	2.61	ft/s
Velocity Head	0.11	ft
Specific Energy	1.67	ft
Froude Number	0.52	
Flow is subcritical.		

Notes:

T = yds
T = 62.4 x 1.56 x 0.005
T = 0.486

Use Straw with Net Liner, T=1.45 max

Northern Ditch
Worksheet for Triangular Channel

Project Description	
Project File	c:\projects\05-050\05-050 calcs\05-050 d.fm2
Worksheet	Northern Ditch
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.033	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	6.81	cfs

Results		
Depth	1.06	ft
Flow Area	3.38	ft²
Wetted Perimeter	6.71	ft
Top Width	6.37	ft
Critical Depth	0.80	ft
Critical Slope	0.023140	ft/ft
Velocity	2.02	ft/s
Velocity Head	0.06	ft
Specific Energy	1.12	ft
Froude Number	0.49	
Flow is subcritical.		

Notes:

T=yds
T= 62.4 x 1.06 x 0.005
T = 0.33

Use Straw with Net Liner, T = 1.45 max

(continued) Sample Problem 8.05a Design of a grass-lined channel.

Channel summary:
Trapezoidal shape, Z=3, b=3 ft, d=1.5 ft, grade = 2%

Note: In Sample Problem 8.05a the "n-value" is first choosen based on a permissible velocity and not a design velocity criteria. Therefore the use of table 8.05c may not be as accurate as individual retardance class charts when a design velocity is the determining factor.

Tractive Force Procedure

The design of riprap-lined channels and temporary channel linings is based on analysis of tractive force.

NOTE: This procedure is for uniform flow in channels and is *not* to be used for design of deenergizing devices and may not be valid for larger channels

To calculate the required size of an open channel, assume the design flow is uniform and does not vary with time. Since actual flow conditions change through the length of a channel, subdivide the channel into design reaches as appropriate.

PERMISSIBLE SHEAR STRESS

The permissible shear stress, T_d, is the force required to initiate movement of the lining material. Permissible shear stress for the liner is not related to the erodibility of the underlying soil. However, if the lining is eroded or broken, the bed material will be exposed to the erosive force of the flow.

COMPUTING NORMAL DEPTH

The first step in selecting an appropriate lining is to compute the design flow depth (the normal depth) and determine the shear stress.

Normal depths can be calculated by Manning's equation as shown for trapezoidal channels in Figure 8.05d. Values of the Manning's roughness coefficient for different ranges of depth are provided in Table 8.05e for temporary linings and Table 8.05f for riprap. The coefficient of roughness generally decreases with increasing flow depth.

Table 8.05e Manning's Roughness Coefficients for Temporary Lining Materials

	n value for Depth Ranges*		
	0-0.5 ft	0.5-2.0 ft	>2.0 ft
Lining Type			
Woven Paper Net	0.016	0.015	0.015
Jute Net	0.028	0.022	0.019
Fiberglass Roving	0.028	0.021	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Mat	0.066	0.035	0.028
Synthetic Mat	0.036	0.025	0.021

* Adapted from: FHWA-HEC 15, Pg. 37 - April 1988

Table 8.05g
Permissible Shear Stresses for Riprap and Temporary Liners

Lining Category	Permissible Unit Shear Stress, T_d Lining Type	(lb/ft^2)
Temporary	Woven Paper Net	0.15
	Jute Net	0.45
	Fiberglass Roving:	
	Single	0.60
	Double	0.85
	Straw with Net	1.45
	Curled Wood mat	1.55
	Synthetic Mat	2.00
	d_{50} Stone Size (inches)	
Gravel Riprap	1	0.33
	2	0.67
Rock Riprap	6	2.00
	9	3.00
	12	4.00
	15	5.00
	18	6.00
	21	7.80
	24	8.00

Adapted From: FHWA, HEC-15, April 1983, pgs. 17 & 37.

Design Procedure-Temporary Liners

The following is a step-by-step procedure for designing a temporary liner for a channel. Because temporary liners have a short period of service, the design Q may be reduced. For liners that are needed for six months or less, the 2-yr frequency storm is recommended.

Step 1. Select a liner material suitable for site conditions and application. Determine roughness coefficient from manufacturer's specifications or Table 8.05e, pg. 8.05.10.

Step 2. Calculate the normal flow depth using Manning's equation (Figure 8.05d). Check to see that depth is consistent with that assumed for selection of Manning's *n* in Figure 8.05d, pg. 8.05.11. For smaller runoffs Figure 8.05d is not as clearly defined. Recommended solutions can be determined by using the Manning equation.

Step 3. Calculate shear stress at normal depth.

Step 4. Compare computed shear stress with the permissible shear stress for the liner.

Step 5. If computed shear is greater than permissible shear, adjust channel dimensions to reduce shear or select a more resistant lining and repeat steps 1 through 4.

Design of a channel with temporary lining is illustrated in Sample Problem 8.05b, pg. 8.05.14.

SEDIMENT TRAP CALCULATIONS
(Sizing per NCDENR Manual)

SEDIMENT TRAP ANALYSIS

Project Data

Name:	Blair Project	Description:	RV/Boat Storage Facility	Manager:	CPK	Date:	12/18/2005
Number:	05-050	Location:	Mt. Gilead Road, Chatham Co., NC	Engineer:	CPK	Revision:	12/18/2005

Calculation Data:

				Rainfall Data			Surface Area Calculations					Storage Volume Calculations					Weir Data
Trap	Rational Coefficient	Drainage Area	Disturbed Area	Tc	I10	Q10	Surface Required	Length @ Weir	Width @ Weir	SA Provided	SA Prov. > SA Req'd	Storage Required	Minimum Depth	Design Depth	Storage Provided	Stor. Prov > Stor. Req'd	Weir Length
#		AC	AC	min	in/hr	cfs	sf	ft	ft	sf	y/n	cf	ft	ft	cf	y/n	ft
1	0.40	1.00	1.00	5.00	7.10	2.84	1237	45.00	30.00	1350	Y	1800	2.00	2.00	2132	Y	4.00
2	0.40	3.00	3.00	5.00	7.10	8.52	3711	150.00	25.00	3750	Y	5400	2.00	2.00	6132	Y	8.00
											N					N	4.00
											N					N	
											N					N	
											N					N	
											N					N	
											N					N	
											N					N	
											N					N	

Notes:

1 All dimensions based on NCDENR design criteria presented in "Erosion and Sediment Control Design Manual"

2 All dimensions noted are measured at or from the crest of weir.