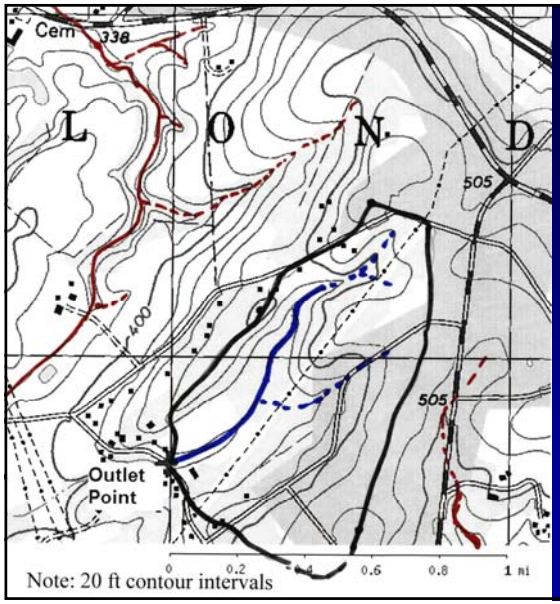
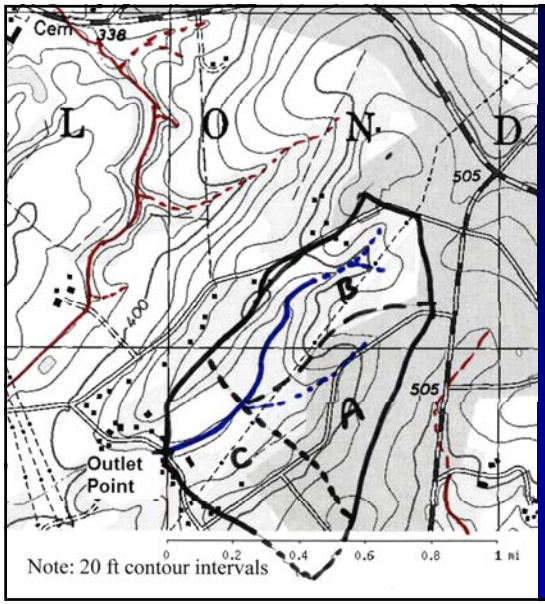
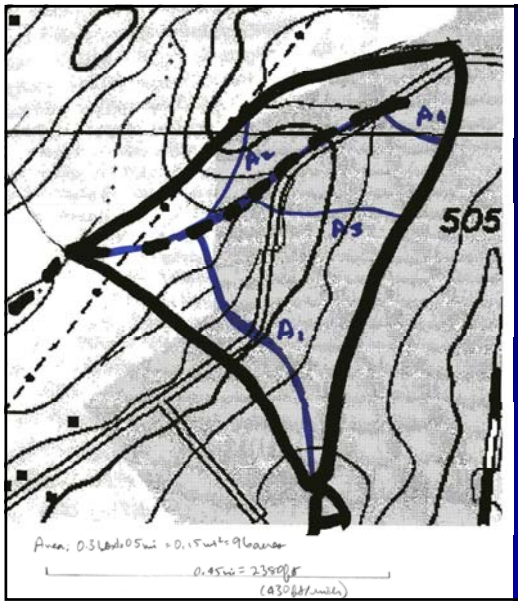
Do Not Look at These Solutions until After you Have Completed the Module 3 Watershed Hydrologic Analysis



Watershed boundary based on topographic information. High-lighted main drainage above location of interest, and adjacent drainages.



Subdivided into 3 subwatersheds for more appropriate hydrologic analyses. Need area, CN, and Tc for each surbarea, then can use WinTR-55 to calculate the hydrographs from each and the combined hydrograph.



Need to evaluate alternative flow drainage pathways to identify the likely Tc. In this case, four candidate paths are examined.

Subwatershed A

area: 96 acres

CN (B soils and good woods cover): 55

Tc: 0.7 hrs

alternative flow paths need to be evaluated
(there is no specific channel, so only sheetflow and shallow concentrated flow)

flowpath A1 (woods, light underbrush):

- sheetflow: 150 ft at 4.7% 19 min
- shallow conc flow:
  - 1800 ft at 4.7 % 3.9 ft/sec and 1800 ft = 460 sec = 8 min
  - 950 ft at 0.5% 1.1 ft/sec and 950 ft = 860 sec = 14 min
- total travel time: 41 min = 0.7 hrs

flowpath A2 (woods, light underbrush):

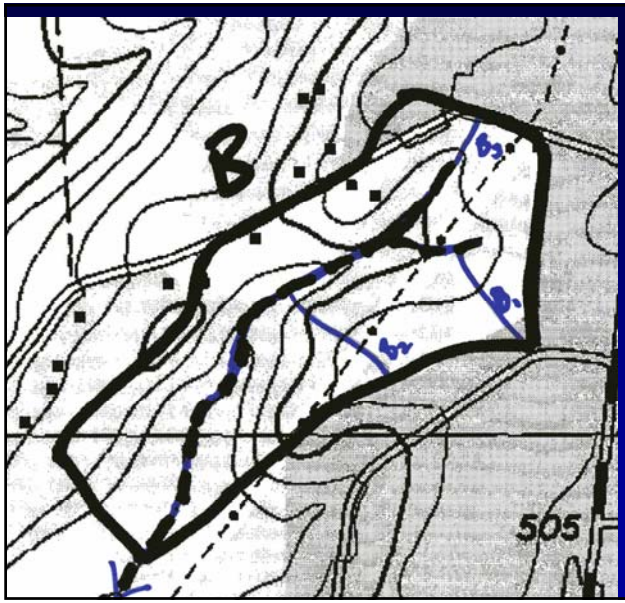
- sheetflow: 150 ft at 7.8% 18 min
- shallow conc flow:
  - 860 ft at 5.8% 3.3 ft/sec and 860 ft = 260 sec = 4 min
  - 950 ft at 0.5% 1.1 ft/sec and 950 ft = 860 sec = 14 min
- total travel time: 36 min = 0.6 hrs

flowpath A3 (woods, light underbrush):

- sheetflow: 150 ft at 3.1% 22 min
- shallow conc flow:
  - 1030 ft at 6.8% 3.9 ft/sec and 1030 ft = 260 sec = 4 min
  - 1420 ft at 2.1% 2.0 ft/sec and 1420 ft = 710 sec = 12 min
- total travel time: 38 min = 0.6 hrs

flowpath A4 (woods, light underbrush):

- sheetflow: 150 ft at 1.9% 26 min
- shallow conc flow:
  - 370 ft at 1.9% 2.2 ft/sec and 370 ft = 170 sec = 3 min
  - 2540 ft at 3.2% 2.8 ft/sec and 2540 ft = 910 sec = 15min
- total travel time: 44 min = 0.7 hrs



Subwatershed B

area: 139 acres

CN (B soils and good woods cover): 55

Tc: 1.2 hrs

alternative flow paths need to be evaluated
(there is no specific channel, so only sheetflow and shallow concentrated flow)

flowpath B1 (woods, light underbrush):

- sheetflow: 150 ft at 1.4% 31 min
- shallow conc flow:
  - 740 ft at 1.4 % 1.5 ft/sec and 740 ft = 490 sec = 8 min
  - 3100 ft at 1.3% 1.6 ft/sec and 3100 ft = 1940 sec = 32 min
- total travel time: 71 min = 1.2 hrs

flowpath B2 (woods, light underbrush):

sheetflow: 150 ft at 1.4% 31 min

shallow conc flow:

820 ft at 8.5% 5.0 ft/sec and 820 ft = 160 sec = 3 min

2110 ft at 1.4% 2.0 ft/sec and 2110 ft = 1060 sec = 18 min

total travel time: 52 min = 0.9 hrs

flowpath B3 (woods, light underbrush):

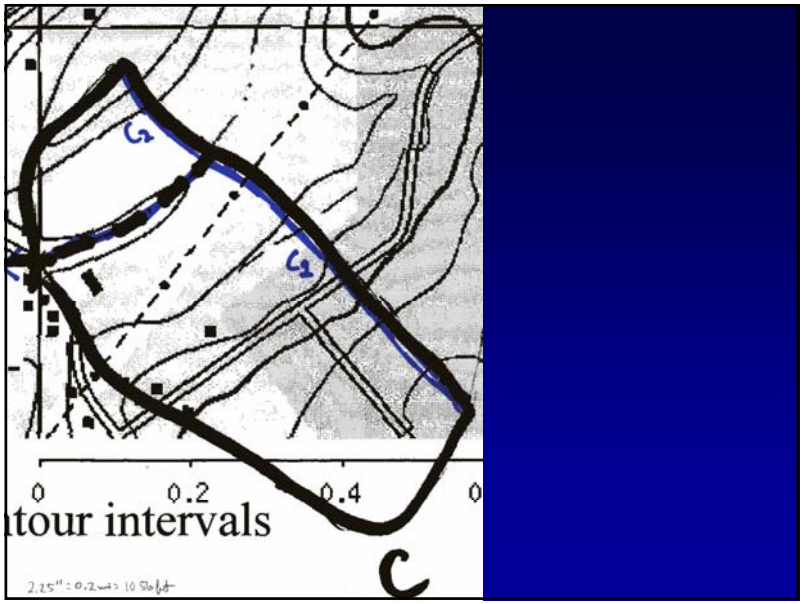
sheetflow: 150 ft at 1.0% 35 min

shallow conc flow:

240 ft at 3.0% 2.8 ft/sec and 240 ft = 85 sec = 1 min

3820 ft at 1.3% 2.0 ft/sec and 3820 ft = 1910 sec = 32 min

total travel time: 68 min = 1.1 hrs



Subwatershed C

area: 134 acres

CN (B soils and good woods cover): 55

Tc: 0.7 hrs

flowpath C1 (woods, light underbrush):

sheetflow: 150 ft at 2.4% 9 min

shallow conc flow:

2530 ft at 3.6 % 2.8 ft/sec and 2530 ft = 900 sec = 15 min

1550 ft at 0.7% 1.4 ft/sec and 1550 ft = 1110 sec = 18 min

total travel time: 42 min = 0.7 hrs

flowpath C2 (woods, light underbrush):

sheetflow: 150 ft at 9.1% 14 min

shallow conc flow:

830 ft at 8.3% 3.8 ft/sec and 830 ft = 220 sec = 4 min

1550 ft at 0.7% 1.4 ft/sec and 1550 ft = 1110 sec = 18 min

total travel time: 36 min = 0.6 hrs

Worksheet 5a: Basic watershed data

Project: class hydrology example — Location: Jefferson Co. AL — By — Date

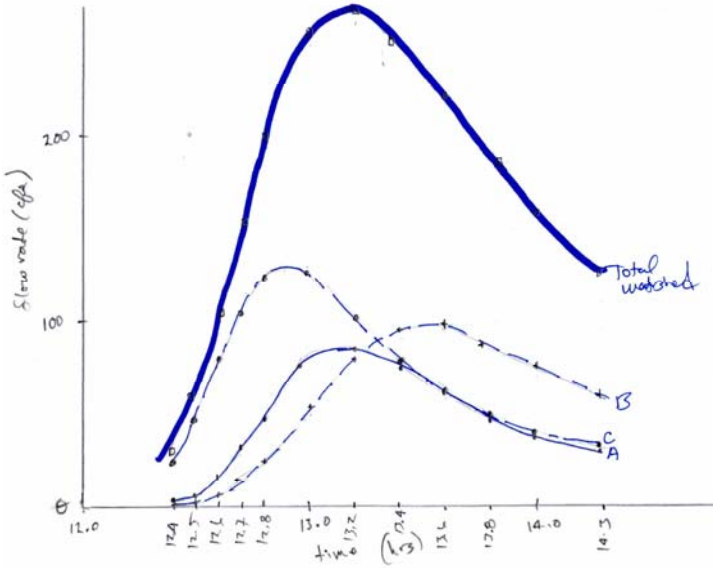
Check one: ☑ Present ☐ Developed — Frequency (yr): 25yr type III — Checked — Date

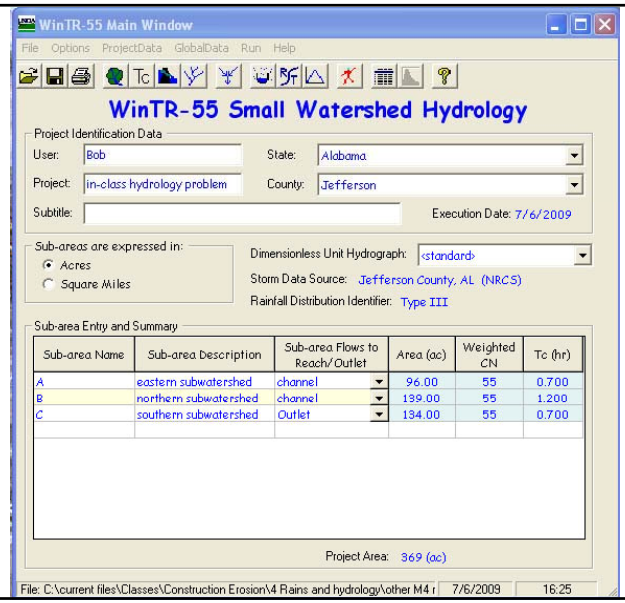
Subarea name	Drainage area A_m (mi^2)	Time of concentration T_c (hr)	Travel time through subarea T_t (hr)	Downstream subarea names	Travel time summation to outlet ΣT_t (hr)	24-hr rainfall P (in)	Runoff curve number CN	Runoff Q (in)	$A_m Q$ (mi^2—in)	Initial abstraction I_a (in)	I_a/P
A	96ac 0.15 mi^2	0.7	0	C	0.3	6.9	55	2.1	0.32	1.6	0.23
B	139ac 0.22 mi^2	1.2	0	C	0.3	6.9	55	2.1	0.46	1.6	0.23
C	134ac 0.21 mi^2	0.7	18mm 0.30	—	0	6.9	55	2.1	0.44	1.6	0.23

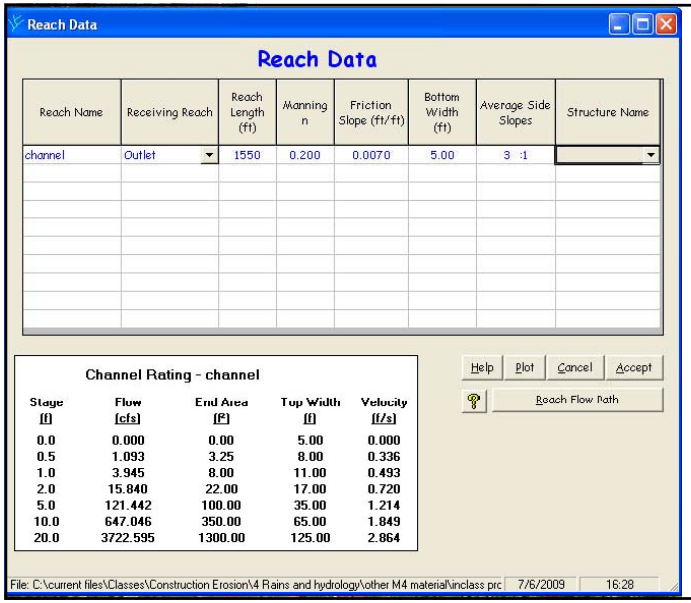
Worksheet 5b: Basic watershed data

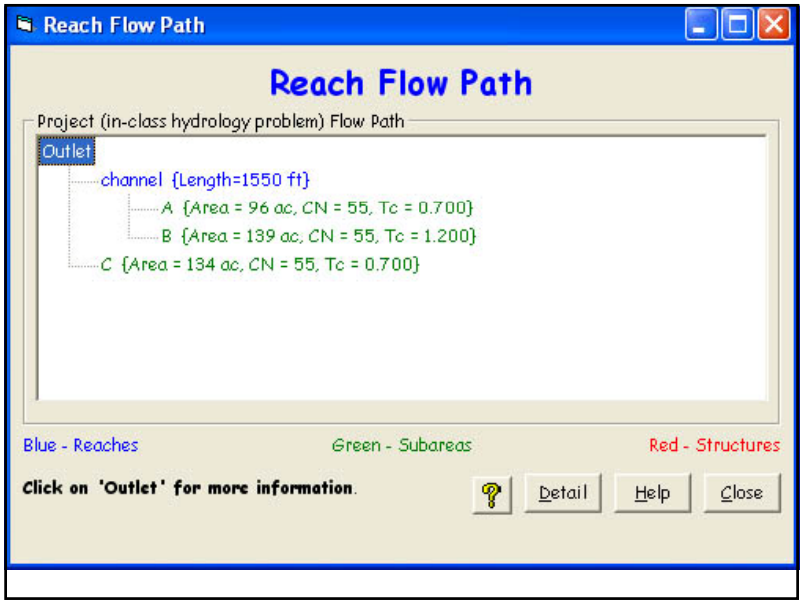
Project: class hydrology example — Location: Jefferson Co. AL — Check one: Present / Developed — Frequency (yr): 25, type III — By: — Checked: — Date: — Date:

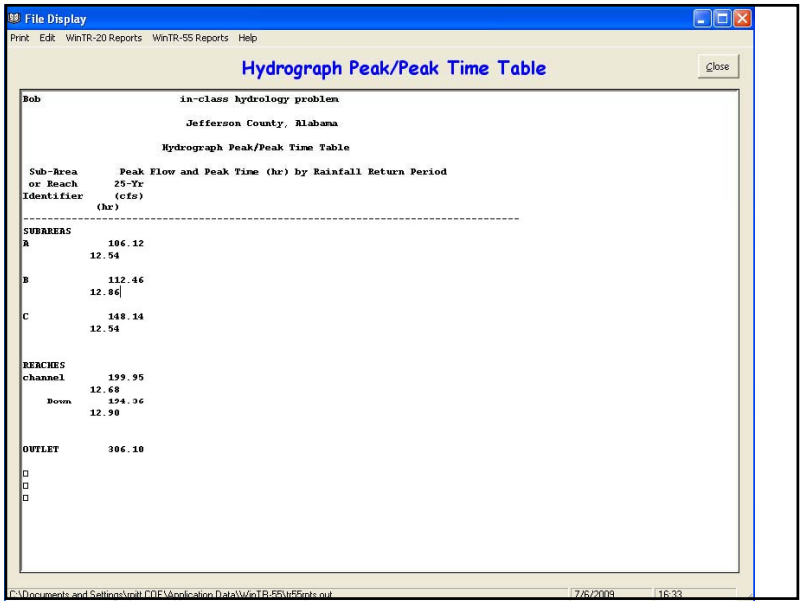
Subarea name	Basic watershed data used 1/				Select and enter hydrograph times in hours from exhibit 5-II 2/											
	Subarea T_c (hr)	Σl_i to outlet (mi)	i_a/P	$A_m\Omega$ (mi^2–mi)	12.4	12.5	12.6	12.7	12.8	13.0	13.2	13.4	13.6	13.8	14.0	14.3
					Discharges at selected hydrograph times 3/ (cfs)											
A	0.7	0.3	0.3	0.32	10	26	57	102	156	205	270	240	192	151	122	96
					32	83	182	326	499	656	864	768	614	485	390	307
B	1.25	0.3	0.3	0.86	3	8	17	33	55	115	174	208	214	195	168	133
					14	37	78	152	253	529	800	956	984	897	773	612
C	0.7	0	0.3	0.44	58	113	182	243	283	287	233	178	139	114	98	83
					255	497	801	1069	1245	1263	1025	783	612	502	431	365
Composite hydrograph at outlet					301	617	1061	1550	2000	2580	2489	2571	2211	1885	1591	1285

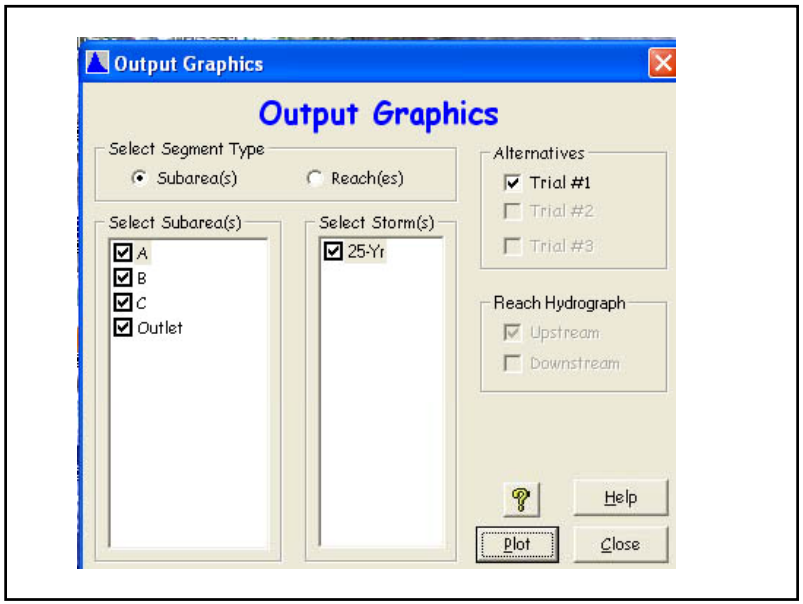


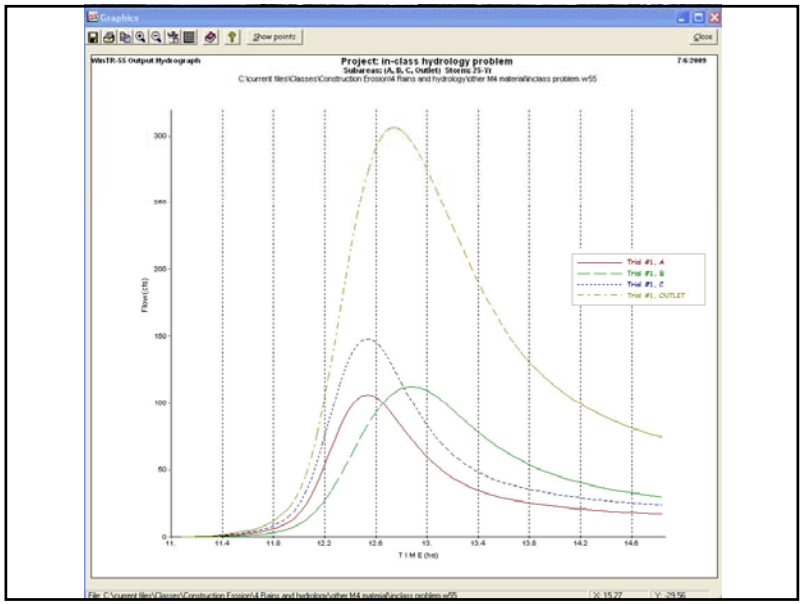


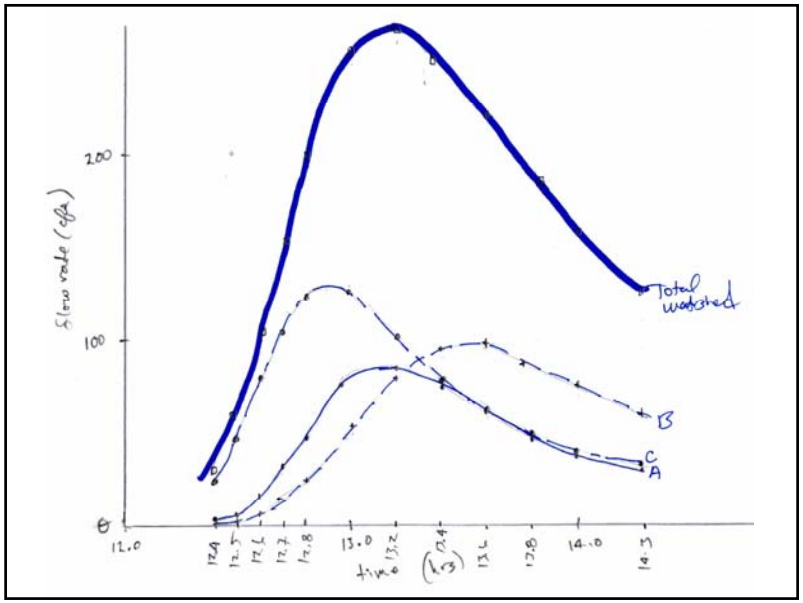



Reach Flow Path
Reach Flow Path
Project (in-class hydrology problem) Flow Path
Outlet
channel {Length=1550 ft}
A {Area = 96 ac, CN = 55, Tc = 0.700}
B {Area = 139 ac, CN = 55, Tc = 1.200}
C {Area = 134 ac, CN = 55, Tc = 0.700}
Blue - Reaches
Green - Subareas
Red - Structures
Click on 'Outlet' for more information.
Detail
Help
Close


File Display
Print Edit WinTR-20 Reports WinTR-55 Reports Help
Hydrograph Peak/Peak Time Table
Close
Bob in-class hydrology problem
Jefferson County, Alabama
Hydrograph Peak/Peak Time Table
Sub-Area or Reach Identifier
Peak Flow and Time (hr) by Rainfall Return Period
25-Yr (cfs) (hr)
SUBAREAS
A 106.12 12.54
B 112.46 12.86
C 148.14 12.54
REACHES
channel 199.95 12.68
Down 194.36 12.90
OUTLET 306.10


Output Graphics
Output Graphics
Select Segment Type
Subarea(s)
Reach(es)
Alternatives
Trial #1
Trial #2
Trial #3
Select Subarea(s)
A
B
C
Outlet
Select Storm(s)
25-Yr
Reach Hydrograph
Upstream
Downstream
Help
Plot
Close


Graphics
Show points
Close
Project: in-class hydrology problem
Flow(cfs)
TIME (hr)


Flow rate (qA)
200
100
0
12.0
12.4
12.5
12.6
12.7
12.8
13.0
13.2
13.4
13.6
13.8
14.0
14.3
Total
weighted
B
C
A