Exercise 4 Solution CE 374K Hydrology Spring 2012

1. Determine the distance in feet from the upper most to the lower most cross-section on Brushy Creek. How many cross-sections are there in this distance? What is the average distance between the cross-sections? Repeat this calculation for South Brushy Creek. Describe in words the cross-section at Station 2668.501 on Brushy Creek. What value of Manning's n is used? What is the distance to the next downstream cross-section (ft) for the Left Overbank, Channel and Right Overbank flows? What is the lowest elevation of the stream bed (ft above datum)? What is the highest elevation of a point in the cross-section? What is the horizontal length of the cross-section (ft)?

Distance from the upper most to the lower most cross section on Bushy Creek:

$$2{,}840 - 40 = \mathbf{2{,}800}\boldsymbol{ft}$$

There are **35** cross-sections on Bushy Creek.
Average distance between cross sections (Bushy Creek):

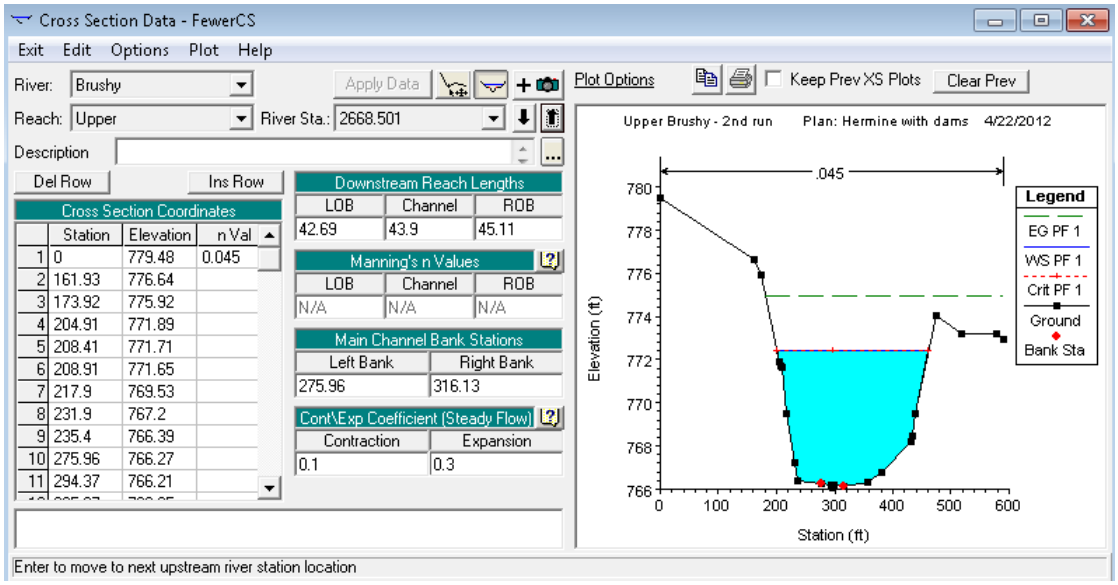
$$\mathbf{82.35}\boldsymbol{ft}$$

Distance from the upper most to the lower most cross section on South Bushy Creek:

$$1{,}440 - 404.64 = \mathbf{1{,}035.36}\boldsymbol{ft}$$

There are **15** cross-sections on South Bushy Creek.
Average distance between cross sections (South Bushy Creek):

$$\mathbf{73.95}\boldsymbol{ft}$$



Manning's number = 0.045
Distance to the next downstream cross-section:

Left Overbank = 42.69 ft
Channel = 43.90 ft
Right Overbank = 45.11 ft

Lowest Elevation of the Streambed = 766.04 ft
Highest Elevation of a point in the cross-section = 779.48 ft
Horizontal Length = 275.96 + 316.13 = 592.09 ft

2. Calculate the average velocity over all cross-sections in each of the three reaches (ft/sec). Using these data and the plots of the water surface profiles, describe what is controlling the water surface elevation in South Brushy Creek for the reach we have analyzed.

Upper Bushy Creek

Station	Vel (ft/s)
2,840.00	12.08
2,748.02	9.95
2,668.50	14.61
2,624.49	8.8
2,564.69	7.37
2,520.00	8.17
2,480.00	7.92
2,384.11	7.64
2,311.33	8.05
2,240.00	7.35
2,160.00	7.56
2,083.51	8.05
2,000.00	7.75
1,921.57	7.56
1,840.00	7.66
1,739.10	7.88
1,680.00	7.35
1,600.00	6.34
1,520.00	8.8
1,440.31	9.81
1,362.65	9.44
1,288.95	7.73
1,245.76	8.54
Average	8.54

Lower Bushy Creek

Station	Vel (ft/s)
945.48	13.86
861.10	11.7
801.04	12.36
720.00	12.82
640.00	12.38
560.00	11.82
480.00	12.61
400.00	13.65
320.00	11.8
240.00	13.83
160.00	17.85
40.00	13.94
Average	13.22

South Bushy Creek

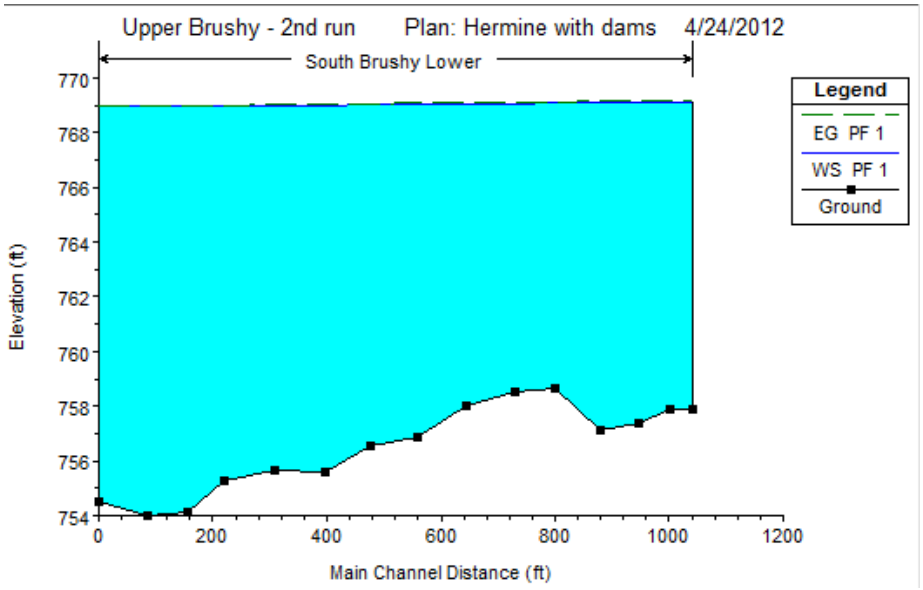
Station	Vel (ft/s)
1,440.00	2.51
1,400.00	2.34
1,345.81	2.38
1,280.00	2.35
1,200.00	2.36
1,130.14	2.33
1,047.73	2.38
960.00	2.24
880.00	2.12
800.00	2.18
712.82	2.51
625.06	1.83
560.00	1.78
488.93	1.84
404.64	1.86
Average	2.20

The velocity in the main Brushy Creek is much higher than in the South Brushy Creek, and the water surface elevation in South Brushy Creek is nearly horizontal. What that means is that the large flow in Brushy Creek is acting as a choke and is preventing the water from the South Brushy Creek from discharging as it would like to do so. There is a backwater effect going up South Brushy Creek from the junction of the two creeks that controls the depth and velocity of water in South Brushy Creek.

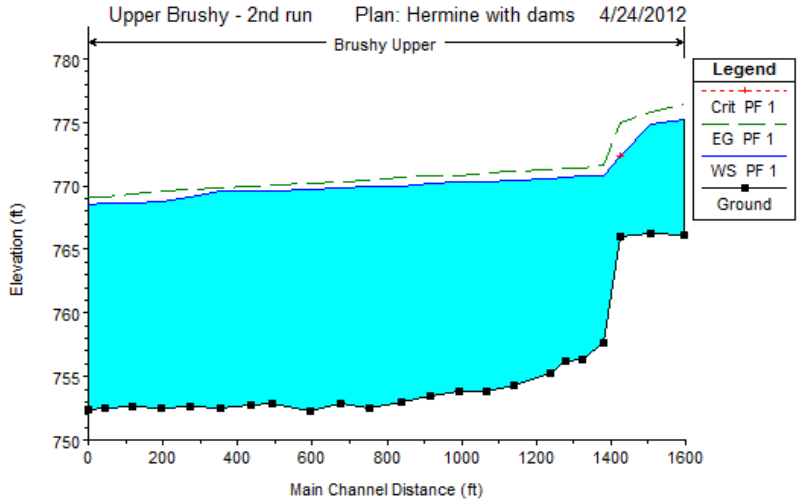
The three reaches and their discharges are:

South Brushy 2500 cfs; Brushy Creek, Upper Reach 16,300 cfs, Brushy Creek, Lower Reach 18,800 cfs.

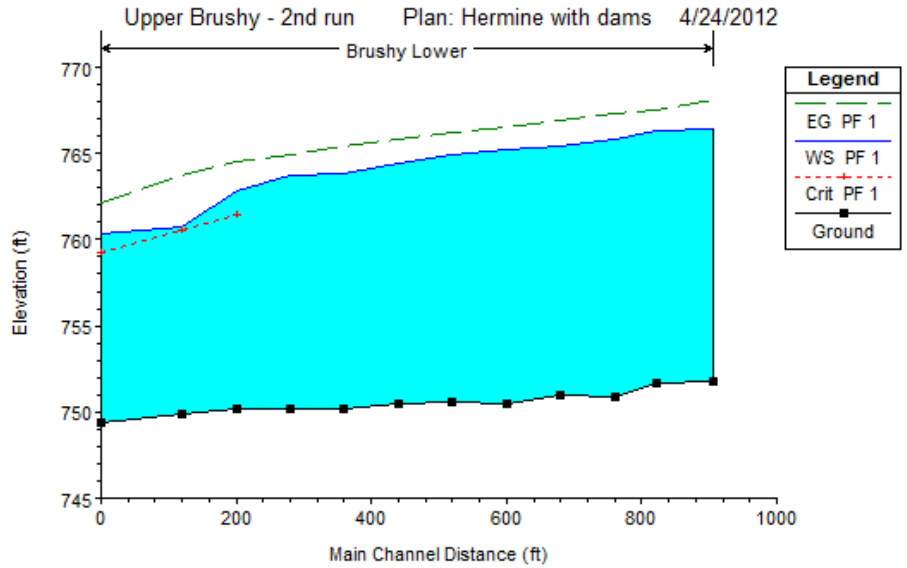
Water Surface Profile: South Brushy Creek



Water Surface Profile: Brushy Creek, Upper Reach



Water Surface Profile: Brushy Creek, Lower Reach



3. A map showing the floodplain of Brushy Creek in the area of Walsh Dr.