Homework 4

Assigned 7/28/14
Due 8/4/14

Problems 1-7 will be graded on effort alone. You may collaborate freely with others to work these problems.

1. Problem 6.2, pp. 399-400, Wurbs and James. (Leftover from HW 3)

2. Problem 5.4, p. 342, Wurbs and James. Also, tell whether the flow is sub- or supercritical and compute mean shear stress on the channel wetted perimeter.


4. Problem 5.33, p. 345, Wurbs and James.

5. Problem 5.37, pp. 346-347, Wurbs and James.

6. Problem 5.57, pp. 353-354, Wurbs and James. Assume the weir length is 100 ft.
7. Drawn below and on the next page is the dimensioned cross-section and a scaled longitudinal profile for a trapezoidal channel. The channel changes slope at several points. For a flowrate of 1236.7 cfs:

a. Compute normal and critical depths and Froude numbers for all sections of the channel.
b. Specify where subcritical and supercritical flows exist.
c. On a scaled longitudinal profile, draw \( y_n \) and \( y_c \) lines, and sketch the water surface profile. (You do not need to numerically compute full water surface profiles. A sketch is all that is needed.)
d. The channel wall material has a maximum permissible tractive force of 0.55 lb/ft\(^2\). Indicate regions where the channel walls may experience degradation.
Problem 8 will be graded for accuracy. You are to work on this problem individually.

8. A trapezoidal channel under design must follow a sudden drop in elevation and thus requires engineered design of a hydraulic jump at the base of the drop. The channel has bottom width 5.0 ft, sideslope 2H:1V, and is concrete-lined (n = 0.015). The longitudinal bedslope varies as shown in the sketch below. Flowrate is steady at 128 cfs.

(a) Find normal and critical depths in each of the 3 segments of the channel.
(b) Assuming that the flow depth reaches normal depth at the end of segment 2, determine the length of the hydraulic jump and the depth of flow immediately after the jump.