

CIVE 717 - RIVER MECHANICS

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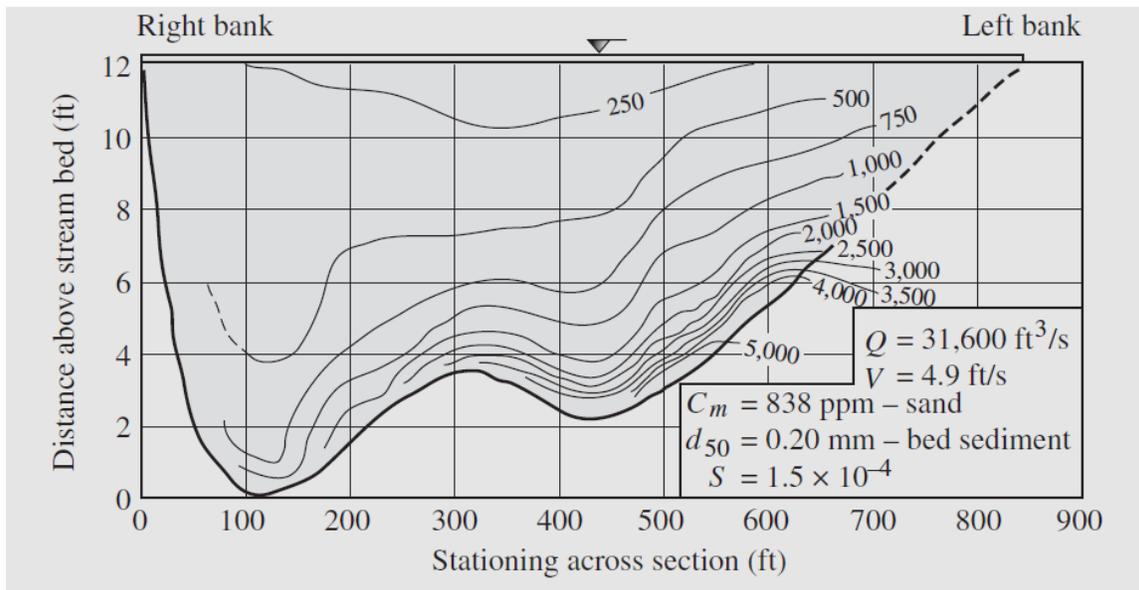
Homework #2 - Chapters 5-7 due March 10, 2022

Problem # 1 (10%) Gradually varied Flow Profiles

Is the equation for gradually varied flow (Eq. 5.24) the result of conservation of momentum or conservation of energy? Can you explain the difference?

Problem # 2 (40%) At-a-Station Hydraulic Geometry (English Units)

Consider the cross-section of the Missouri River below and estimate Manning n . Develop a spreadsheet for the hydraulic geometry parameters as a function of flow depth every 1 ft until 12 ft. Estimate the velocity and discharge assuming constant n . Plot at-a-station hydraulic geometry relationships on a log-log scale. Compare flow velocity and floodwave celerity $c = dQ/dA$. Discuss the results.



Problem # 3 (50%) – Numerical Diffusion

Solve Computer Problem 7.2 (p. 204) with two pulses (a duration of 15 min at 100,000 mg/l at $t = 0$ and a second pulse lasting 3 min at 200,000 mg/l starting at $t = 1$ hour). You should get the same results as shown on p. 195. Now replace the first pulse with a 3 min pulse at 500,000 mg/l starting at $t = 6$ min. Compare the contaminant concentration vs time at a distance on 10 km and 20 km from the source. At what distance will the two pulses have the same concentration? [Note, you can use any method without numerical diffusion (e.g. Leonard scheme or the analytical method with error functions)].