

# CIVE 716 EROSION AND SEDIMENTATION

Pierre Y. Julien

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## Assignment #5 for Chapters 10 and 11 due on Wednesday May 3, 2023

### Problem # 1 Concentration Profiles (50 points) English and SI Units

Answer the questions from Problem 10.2 on p. 259 using the measurements of the Low Flow Conveyance Channel for the two profiles on pp. 138-139. Graphically determine the  $R_o$  and fall velocity  $\omega$ , and use a spreadsheet to recalculate the mean flow velocity, momentum correction factor, unit discharge, unit sediment discharge  $q_s$  in lb/ft.s, and the flux-averaged concentration in mg/l. Compare the profiles and discuss the results.

|                   |                        |                   |                        |
|-------------------|------------------------|-------------------|------------------------|
| Cross Section:    | LF -11                 | Cross Section:    | LF -11                 |
| Station:          | 32ft)                  | Station:          | 47ft                   |
| Planform:         | Plane bed              | Planform:         | Dune                   |
| Date:             | Jun-99                 | Date:             | May-01                 |
| Discharge:        | 625 ft <sup>3</sup> /s | Discharge:        | 585 ft <sup>3</sup> /s |
| Flow Area:        | 202 ft <sup>2</sup>    | Flow Area:        | 239 ft <sup>2</sup>    |
| Wetted Perimeter: | 52.69 ft               | Wetted Perimeter: | 53.66 ft               |
| Hydraulic Radius: | 3.95 ft                | Hydraulic Radius: | 4.04 ft                |
| Average Depth:    | 5.04 ft                | Average Depth:    | 7.34 ft                |
| Top Width:        | 50.1 ft                | Top Width:        | 50.2 ft                |
| Energy Slope:     | 0.000382               | Energy Slope:     | 0.000413               |
| Froude Number:    | 0.33                   | Froude Number:    | 0.28                   |
| Manning's:        | 0.02                   | Manning's:        | 0.035                  |
| Total Depth:      | 5.6 ft                 | Total Depth:      | 7.1 ft                 |
| shear velocity    | 0.22 ft/s              | shear velocity    | 0.232 ft/s             |

### Problem # 2 Sediment-rating Curves (50 points) English Units

Consider the data from the Niobrara River from Computer Problem 11.1 p. 317-18. For these conditions, calculate the sediment transport in lb/ft.s for three values of unit discharge ( $q = 1, 3, \text{ and } 10 \text{ ft}^2/\text{s}$ ) using the methods of Brownlie, Yang, Simons-Li-Fullerton, and Engelund-Hansen based on  $d_{50}$  only (no size fractions). Plot the results on the sediment-rating curve p. 318, and compare with the field measurements. Discuss the results of your analysis.

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