CE 641 FATE AND TRANSPORT MODELIMG OF ECOSYSTEMS

Mid-Term Exam (Take-Home Part)

Conduct a unit response analysis of the BOD/DO model for Walnut Creek to quantify the significance of DO consumption of the following components:

1. CBOD load from the Troy plant
2. NBOD load from the Troy plant
3. DOD load from the Troy plant
4. SOD (Benthic oxygen demand) in Walnut Creek
5. Upstream CBOD/NBOD/DOD combined (i.e., above the Troy plant)

The receiving water conditions are: the flow rate upstream of the Troy plant = 6.14 cfs; water temperature = 27°C. The in-stream CBOD removal and deoxygenation rates = 0.06 day^{-1}. No nitrification is expected in Walnut Creek. One constraint is that the DO standard of 5 mg/L must be met in the receiving water.

Answer the following questions:

(a) Present accumulated DO consumption vs. distance in one single plot in the above order and properly identify each component. [See Figure 6-6 in the textbook.] Discuss your results.

(b) If the river bottom is dredged to clean up the sediment (i.e., SOD = 0), approximately what additional CBOD load (in CBOD$_5$ lb/day) is allowed from the Troy plant, yet still meeting the 5 mg/L DO standard? **You are not allowed to** run the model for this part. You must derive this answer from the model results in (a) and show your analysis on paper.

Bring your completed work (pledged) to the in-class exam on Wednesday, Oct. 17 at 3:30pm.