

**CE 3372 – Water Systems Design**  
**Exercise Set 17**

Purpose: Sewer system pipe alignment in SWMM

**Exercises**

1. Figure 1 is a sketch of four different configurations. All pipes have Manning's n 0.015. The invert elevations, pipe diameters, and pipe lengths are given on the sketch. The input flows are  $Q_1 = 20$  CFS,  $Q_2 = 66$  CFS,  $Q_3 = 110$  CFS, at the indicated nodes. The upper two cases have a FREE outfall downstream boundary condition; the lower two cases have a FIXED pool elevation boundary condition (pool elevation is 3.5 feet).

Build a SWMM model that implements the four cases. Once the model is functional, run the model for a 6-hour interval using DYNAMIC WAVE routing, and use the output conditions at hour 6 of the simulation to address the following list of tasks/questions. Assume that the maximum depth at each **node** is 15 feet.

- a) For Case 1 (Upper most condition), screen capture the profile plot.
- b) Which of the pipes in Case 1 are surcharged?
- c) What is the computed discharge in each pipe (from left to right)?
- d) For Case 2 (Second from top condition), screen capture the profile plot.
- e) Which of the pipes in Case 2 are surcharged?
- f) What is the computed discharge in each pipe (from left to right)?
- g) Does Case 2 have more unused capacity than Case 1?
- h) For Case 3 (Second from bottom condition), screen capture the profile plot.
- i) Which of the pipes in Case 3 are surcharged?
- j) What is the computed discharge in each pipe (from left to right)?
- k) For Case 4 (Bottom condition), screen capture the profile plot.
- l) Which of the pipes in Case 4 are surcharged?
- m) What is the computed discharge in each pipe (from left to right)?
- n) Does Case 4 have more unused capacity than Case 3?
- o) Explain the hydraulic advantage of matching the soffit (crown) elevations in contrast

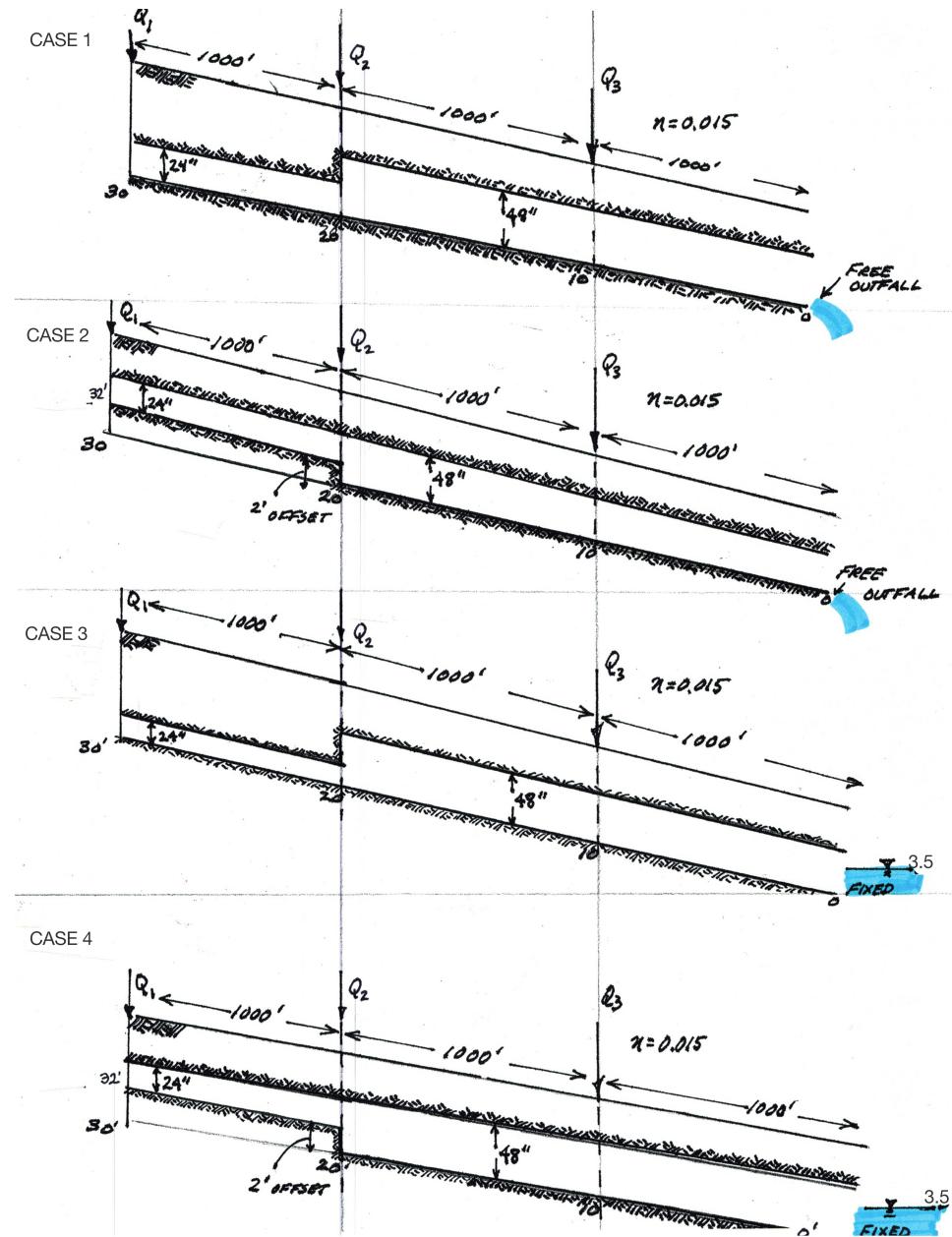


Figure 1: Four (4) cases to model in SWMM

to matching the flow line (invert) elevations at a pipe diameter change.