CE 365K Assignment 4. Flow in Pipes and Culverts Spring 2015
Hydraulic Engineering Design

1. A circular concrete pipe is 0.75m in diameter, Manning's n is 0.013, and the slope is 0.0273. If the pipe is flowing at normal depth of 0.56m, determine the corresponding discharge (m^3/s). Solve the problem using FlowMaster, and also by hand so that you can compare your solution with that produced by the program.

2. A detention pond drains through a circular concrete culvert that has a square-edged inlet with a headwall (n = 0.013, K_e = 0.5). The peak discharge from the pond is 4 m^3/s, and the headwater elevation is 15.5m. The culvert is 10m long on a 5% slope. The depth of the headwater is 4m and the tailwater elevation is below the elevation of the downstream invert. What is the elevation of the upstream invert? What size culvert is required? Use the Quick Culvert Calculator to solve this problem and include a screen capture of the Culvert Master output in your solution.

3. The Culvert Master program has additional options for more extended Analysis and Design. It's time to exercise your imagination as a hydraulic design engineer and develop a design problem of your own. Do the following:

(a) Develop a specification of your design problem and write a problem statement.

(b) Present a solution of your design problem.

(c) Examine two variants of your design solution that also satisfy your project constraints and allow for examination of alternatives in the final design decision that might consider other factors such as cost, asthetics, available space in the problem area, etc.