*University of Michigan* *Department of Civil and*

*Environmental Engineering*

**Semester Project** **– Part 4**

**CEE 546 – Slopes, Dams and Retaining Structures**

**Winter 2013**

The data from the field and the laboratory testing came back, right on time to revise your analyses and complete your report, which is due on 04/22/2013 by 5pm.

The site investigation data are consistent with your assumptions/analyses in terms of the soil stratigraphy at the failure site. However, the characteristics of soil 2 are significantly different. The material is sandy clay (CL). The Fines Content of the soil is 70%. The plasticity of the fines is characterized by LL=27 and PL=10. The permeability of the soil is lower than that of the fill, and equal to 10-7 cm/sec. The in situ unit weight is 18 kN/m3 and the shear strength of the soil is characterized by a cohesion of 18 kPa and a friction angle of 30 degrees.

For the new information that has become available, revise your seepage and slope stability analyses. Assume that the lake is 4 ft deep and that the water table is at the surface in the vicinity of the toe. For the revised analyses, estimate:

1. The amount of flow at the toe of the embankment
2. The vertical pore pressure profile (i.e. x axis is pore pressure, y axis is elevation) estimated by the model at:
   1. the centerline of the lake;
   2. the centerline of the crest of the embankment;
   3. the location where the slope height of the embankment is 3.6 m (half way up the embankment slope);

Assume a relative elevation, i.e., use an elevation of 0 m at the toe of the embankment. For each location plot on the same figure pore pressure profile from Seep/W (which considers flow), vs. the pore pressure profile from Slope/W (which uses hydrostatic increase from the water table assumed).

1. The exit gradient at the toe of the levee. What is the calculated Factor of Safety against piping?

Compare the results to your previous analyses (that had uniform soil properties) and comment on the results.

Use the results of the seepage analyses in Seep/W (i.e. the pore pressure at different locations of the model) as input in your Slope/W model (using the unit weight and strengths estimated previously). What is the new factor of safety against instability?

Summarize your conclusions/findings of the report.

Prepare the results in a final report, along with your conclusions and submit it to Dr. Athanasopoulos-Zekkos. This is your final report so it needs to have your signature (and your P.E. stamp; assuming that you have one). There is tremendous responsibility that goes along with the submission of this final report and so make sure it is an excellent product both in terms of analyses (technical content), technical writing and presentation (structure, figures, tables, etc.). In addition to everything else, this report is likely to become available to the public, so you better be very confident about your results and proud of the outcome.