Georgia Department of Natural Resources
Environmental Protection Division
Safe Dams Program
4244 International Parkway
Suite 110, Atlanta, GA 30354
Lonice C. Barrett, Commissioner
Harold F. Reheis, Director
404/362-2678

December 17, 2001

FILE COPY

Mr. R. Neil Davies, P. E.
Geo Syntec Consultants
1100 Lake Hearn Drive
Atlanta, GA 30342-1523

SUBJECT: Lake Petit Dam
Pickens County

Dear Mr. Davies:

Our office has completed its review of the seismic stability review for the dam submitted December 8, 1998. I apologize for the delayed response. The following issues must be addressed before our office can approve the engineering submittal and proposed remedial repairs to the dam.

1. Our office is unfamiliar with the software SEEP/W. Please provide a copy of the software documentation/user's guide for our review.

2. Our office surveyed the downstream slope. That survey showed the slope to vary from 2.17 H to IV to 2.67H to IV with the steepest section at the bottom of the dam. Attached is a copy of the sketch depicting the slope. It would appear that evaluating the entire slope at 2.5 H to IV is not entirely representative of what exists in the field, especially with the steepest section being at the downstream toe of the dam.

3. Your report references geotechnical evaluations and reports completed by Piedmont Geotechnical Associates dated May 29, 1997 and April 1, 1998. Our office does not have copies of those reports. Please submit them because they should include drilling logs, shear testing information, etc.

4. In your executive summary, you note on page 1 that there is a high phreatic surface may develop near the downstream toe at the time of seasonal high water (ie spring/winter rains). However, your permeability testing of soil samples indicate 10^{-6} permeability. How can enough rain infiltrate the slope to cause this condition to occur?

5. A seepage flow net needs to be developed for the dam and submitted. Furthermore, how the seasonal wet phenomenon can occur given the lab testing results must be rectified.

6. Do you have more extensive data now from the piezometers that were installed? If so, please submit it. If not, why not? Do the piezometer readings show a significant rise in the spring? Do you have any site rainfall gauge records that account for any type of response in the piezometers that support your theory about rainfall infiltration?

7. Generally speaking, the correlation of the SPT blow count (N) values to effective shear stress are skewed by the presence of gravel of 2 to 12 percent as reported. The gravel encountered drove the blow count up and the documentation for Ø' correlations notes that it is for clean to silty sands and not gravel.

8. Page 8 of your report references the engineering plans and material specifications in Section 2.3.1. Please provide copies of that information including all the construction plans, construction and material specifications, and as-built plans if they are available for our review. If you do not have a complete set, who does?

9. In Section 2.3.3, on page 10, you note that the compression wave velocities are consistent with published values for unsaturated and nearly saturated soils. What is the range for saturated soils? What constitutes "nearly saturated" soils?

10. In Section 3.2.1 on page 12, you note that total stress strength parameters should be used for the seismic stability analysis if the soil is not prone to cyclic pore water pressure build-up during an earthquake. What type of soils are not prone to this build up? How is this applicable in this situation given the high phreatic line?

11. Please provide a copy of the "Report of Engineering Evaluation Lake Petit Dam" by Law Engineering dated March 18, 1974 for our review.

12. Section 4.3 and Section 4.5.1 imply that the embankment has a porous, homogeneous medium, but Section 4.3 qualifies that reasoning by stating that the embankment medium is also anisotropic. Generally speaking, the implied conclusion is not consistent depending on which set of circumstances you are addressing. The embankment is either a porous, homogeneous medium or a porous, anisotropic medium.

13. In Section 4.5.2, you relate the monthly precipitation records for Jasper, Georgia to the piezometer readings at the dam. Do you have any rainfall data that is nearby as opposed to 20 miles away? Do you have any more current data that supports this conclusion?

14. Given that the maximum variation for piezometer P-4A is 6.9 feet, are you sure there is no surface infiltration occurring down the borehole?

15. In Section 5.2.1, how did you arrive at an average moist unit weight of 125 lbs/ft^3 given that the boring logs note significant mica in the samplings which is further confirmed by a number of dry unit weights of less than 100 lbs/ft^3 for the shell materials?

16. Please provide the mohrs circle plots, void ratio information, etc that led to the conclusion that the peak strength condition of Ø' angle which seems high for soils with high mica content.

17. In Section 5.2.2, how did you arrive at an average moist unit weight of 130lbs/ft^3 given the boring log notes about mica content of the samplings and some dry unit weight of 105 lbs/ft^3 and less?

18. Please provide the mohrs circle plots, void ratio information, etc that led to the conclusion that the peak strength condition of 40° to 41° for the core materials. Did this value occur because of gravel within the samples? Use of a 34° Ø' angle seems high for soils with high mica content.

19. What was the final ratio of the horizontal to vertical hydraulic conductivity (k_h/k_y) used for the shell and core material? Similarly, what was the vertical hydraulic conductivity used or did it vary by location? If so, how and why?

20. On page 28, you use the October 23, 1998 data to develop your model. You note the phreatic line is 10 to 20 feet below ground surface depending on location within the dam. Given that October is the driest month of the year typically and there was a drought as well, have you re-evaluated your model with more current data during the rainy periods of late winter/early spring to see if it is valid?

21. On page 33, you set a boundary condition of 1517 msl to maintain the water level at the ball field at the same evaluation as the outlet elevation of the drain into the creek. If the drain collects water upstream, then the invert (1520) would be higher than 1517 as well as the water table at the field. This boundary condition should be set higher unless there is piezometeric data that the ball field/beyond the toe that shows otherwise.

22. How do you arrive at an existing static slope stability safety factor of 1.52 for static steady-state seepage conditions and a seismic safety factor of 1.46 for the steady-state seepage condition with a horizontal load of 0.183g? This is not consistent with stability analyses that our office has seen for the last 23 years by numerous geotechnical firms.

23. Are elevations for the Law Piezometers in msl? Where are they located? In Table 4-1, is the October 29, 1997 value elevated due to a poor surface seal for L5?

24. What elevations are the results for Table 4.2 referenced to?

25. What is the value of Table 4-3? It only covers seven days worth of readings.

26. Were the ball field soils noted in Table 6-1 actually tested for vertical permeability or just estimated?

27. In Table 6-4 for the EML Scenario, when was the measured pressure head taken? If it was not measured, why is it labeled as such? What does it represent?

28. In Boring G-1B, at a depth of 95 feet, the drilling log notes zero blow count material and a resulting drop by the weight of the rods. It was not mentioned in the report. Why not? Is it significant?

29. Law's October 21, 1998 letter notes that they were unable to lower the geophones below 103 feet and the hole had water at 27 feet. Does this affect the test results?

30. Table 1 at G-1A has Poisson's values that range from -1.5 to 0.47. According to Law's Report, these values imply materials from dissimilar fill (rock/soil mixture) to saturated unconsolidated soils. Similarly, Table 2 has a number of values at 0.45 to 0.48, which indicates saturated, unconsolidated soils. Is this accounted for in the stability analyses? If so, how?

31. When the hammer blows were delivered to the metal plate and the wooden beam, were they delivered by hand or by a mechanical method? Why is this test valid and what does it really mean?

32. It appears that only one triaxial test was done per tube sample. Typically, our office has received three tests per tube to confirm that the results are consistent.

33. How is the pheratic surface traced in the stability cross sections? A trace of the phreatic surface should be shown on the cross section.

34. Are the pore pressures estimated by the W/Seep model appropriate? There was no hydraulic conductivity testing done in the lab or in the field with the insitu soils?

35. What happens if the earthquake event has a long duration and the dam does dissipate the pore water pressures? Is the embankment still stable?

36. The estimated effective stress level (su) along the potential slip surfaces appears to vary from 1000psf to 5400psf. For Piedmont Residual Soils, this is not adequately conservative. The assumed strength envelope must be adjusted to intercept the vertical axis at the origin.

If there are any questions, please contact our office at 404/362-2678.

Sincerely,

Francis E. Fiegle

Francis E. Fiegle II, P. E.
Program Manager
Safe Dams Program

FEF:kf

Attachment

c: Big Canoe Property Owners Association
Law Engineering