Jordan
Jones &
Goulding
INCORPORATED

2000 CLEARVIEW AVE., N.E.
ATLANTA, GEORGIA 30340
PHONE: (770) 455-8555 ☐ FAX: (770) 455-7391

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June 27, 1997

Mr. Troy Ledbetter
Big Canoe Property Owners Association
Wolf Scratch Village
Big Canoe, GA 30413

RE: Petit Lake Dam Site
Summary of Preliminary Engineering Evaluation

Lake Petit Dam
(Big Canoe)
Dichtomo Co.

Dear Mr. Ledbetter:

Jordan, Jones & Goulding, Inc. (JJ&G) and Piedmont Geotechnical Services have completed the preliminary civil and geotechnical engineering evaluation tasks currently authorized for the above referenced project. This letter has been prepared to provide a brief summary of our findings and current recommendations as described in more detail within the attached Evaluation Report.

A limited amount of historical data about the dam site has been assembled and reviewed by both engineering firms. This information came from several sources, including field data collected during our last site visit on May 13th, the original construction plans for Petit Lake Dam prepared in 1971, review of the Georgia Safe Dams project files, and discussions with Cranston, Robertson, and Whitehurst and Big Canoe representatives. We have requested additional information about the original design calculations, construction monitoring reports, piezometer water level records and other pertinent documentation from Cranston, Robertson, and Whitehurst about 4 weeks ago; however, this information has proven to be difficult for them to assemble, particularly since most of these records are approximately 25 years old and have been previously archived. Based on recent discussions with Mr. Tom Robertson, we anticipate receiving some of this additional documentation with the next 2-3 weeks.

Based upon our field observations and the review of the historical data obtained to date, there are several issues which need to be addressed. These items are as follows:

1) The principal spillway for the dam appears to be functioning adequately and in general accordance with the original design drawings. A letter from EPD Safe Dams dated April 15, 1996 (specifically Items #7 and #8), indicates that water

appears to be leaking under the principal control weir and then exiting through the spillway slab on the right side (looking downstream). Upon closer field inspection, this condition does not appear to be caused by water seepage flows beneath the spillway slab. Instead, there is a small steady discharge from the cold water release pipes onto the spillway and flowing over an irregularity in the concrete finish of the slab downstream. This irregular surface of the concrete slab is causing a small hydraulic jump as water flows over it, and this condition may have been misinterpreted by Safe Dams as leakage underneath the spillway. The irregularity should be fixed by using sand bags to temporarily deflect water flows away from the small depression, and then repair slab in accordance with enclosed Detail A to match the relatively smooth uniform finish of the adjacent concrete slab areas.

2) The concrete impact basin for the low level drain system was observed in the field and found to have large amounts of sediment and plants present in the bottom. There is a small steady flow of water discharging from the structure, but it was difficult to identify its specific source within the concrete box due to its impact block which inhibits viewing this area. Based on our review of the design plans and other information, we suspect that this small flow is coming from the interior gravel drain system within the earth dam. We recommend that all sediment deposits be removed from the impact structure and additional visual observations be performed from inside the box to review and evaluate the flow conditions. It is also strongly suggested that the low level drain valve be opened by Big Canoe to insure its performance capability during an emergency situation and to flush the interior of the low level drain conduit. Depending on the outcome of this visual inspection of the flows from the impact basin conduits, it may be deemed necessary to perform a video examination of the pipe interiors to determine their integrity and overall condition.

3) Two large wet areas on the downstream face of the dam near the second berm from the bottom were also reviewed during our field visit. These areas are specifically addressed as items #5 and #6 in the letter from EPD Safe Dams dated April 15, 1996. Our review of the historical information in Safe Dams files indicates that these areas of apparent seepage have been an on-going problem since shortly after the original dam construction was completed. There are several possible explanations for this seepage which are discussed in detail within the attached Piedmont Geotechnical Consultants report. If this seepage is localized condition, it can be effectively controlled with shallow filter drains designed to collect seepage flows. However, our preliminary analysis of this dam has raised some possible concerns about the overall

stability of the dam structure which are addressed in the next few paragraphs.

4) Our primary engineering concern for this project has now shifted from the apparent seepage phenomenon to a more serious concern about the impact of a relatively shallow water surface level (phreatic surface) through the dam relative to overall stability. Our review of the piezometer data provided verbally by Mr. Robertson and field measurements from these monitoring wells during our May 13th site visit have suggested that a shallow water surface has existed within 12 feet or less of the downstream slope face's lower sections since within 1-2 years after its construction. Based on our experience with similar earth fill dams, this water surface should be much deeper on a structure of this size, particularly with a designed clay core and internal drainage system. The primary effect of an elevated internal water surface within this dam would be a substantial decrease in stability safety factors. Based on our preliminary assessment of this condition, we conducted a limited computer analysis based on several assumptions to evaluate the potential impacts on overall stability of an embankment of this height and geometry.

The "as-designed" cross-section geometry was based on the original construction plans showing 6 berms connected by 2.5H:1V slopes, and the resulting minimum safety factors were 1.8 for steady state conditions and 1.1 for seismic event. These two safety factors exceed the Safe Dams' required minimum values of 1.5 and 1.1 respectively for these two design conditions.

Next, the "as-built" embankment geometry was evaluated using the surveyed cross-section from the Corps of Engineers Phase I inspection report (5 berms connected with 2H:1V slopes). This condition also incorporated an assumed phreatic surface interpolated from the piezometer readings and location where seepage has been observed at the surface (see exhibit B for schematic illustration of water level conditions). The resulting calculated minimum safety factors were 1.1 for steady state conditions and 0.7 for the seismic event. These values are well below the Safe Dams' design requirements, and raise some serious concerns about the potential stability of the existing dam structure.

It is important to note that these analyses were relatively simplified and based on several assumptions made due to lack of detailed geotechnical information. However, it is our preliminary opinion that if there is an elevated phreatic surface in the dam, it could cause a potentially dangerous condition within the downstream slope face. Our preliminary evaluation indicates that additional studies are needed as soon as possible to obtain field data to confirm or adjust these assumptions, and then evaluate the dam with data more representative of actual field conditions.

We recommend that these additional studies should at least include the following items:

1. JJ&G should prepare 2-3 field surveyed cross-sections of the existing embankment slopes.

2. Additional historical data should be assembled including original design calculations, construction monitoring records, and laboratory testing data.

3. Several water surface observation wells should be installed down the downstream slope face and regularly monitored to determine phreatic levels at various locations and depths.

4. The borings performed for the observation walls will provide the opportunity to obtain undisturbed soil samples and Standard Penetration Tests needed to evaluate existing soil conditions and strength parameters.

These outlined additional studies, which are beyond our current scope of services, are considered to be critical for resolving the concerns about slope stability and overall dam safety. If these studies reveal that overall stability is not a concern, then a specific renovation approach for the surficial seepage can be prepared. However, if slope stability of the dam is determined to still be a major concern, then remedial improvements would need to be designed and then reviewed by Safe Dams prior to implementation.

Please review this letter and the attached Piedmont Geotechnical Consultants report and then contact us with any questions you may have. It should be noted that the results of this preliminary evaluation are cause for concern, but are not conclusive until the additional engineering activities are completed. We look forward to hearing from you in the near future and are prepared to provide you with a proposal covering these additional studies upon your request.

Sincerely,

JORDAN, JONES, & GOULDING, INC.

John W. Britton, P.E.
Project Manager

JWB:kc

cc: Mark Kilby, JJ&G
Karl Myers, Piedmont Geotechnical Consultants, Inc.
Simmons Watts, Safe Dams Program

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Jordan Jones & Boulding

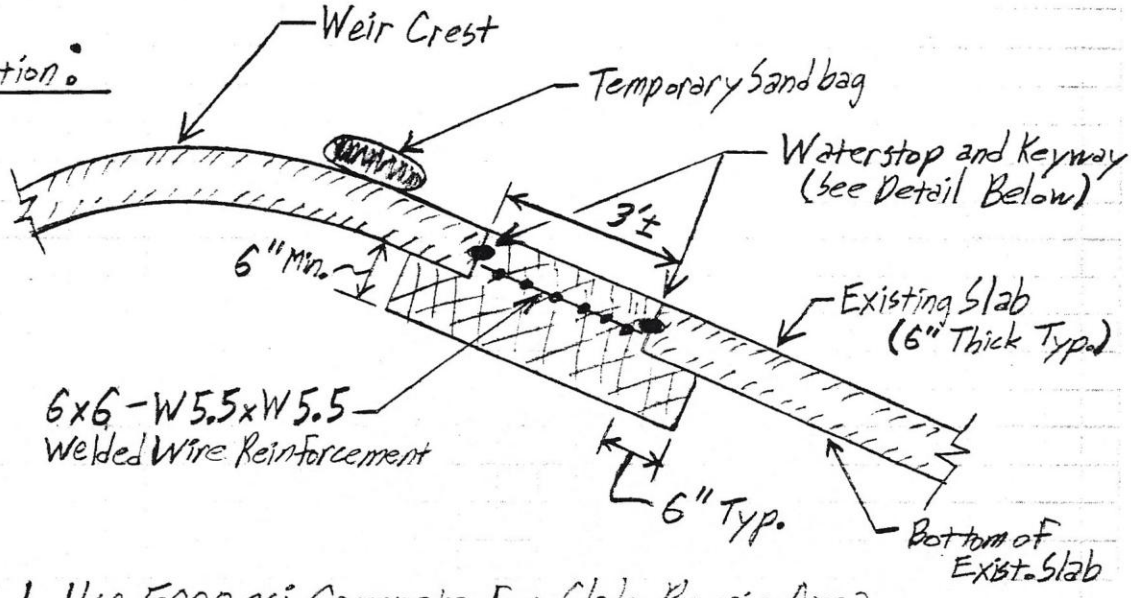
PROJECT NUMBER: 6620.003 PAGE: ____ OF: ____

PROJECT NAME: Petit Lake Dam BY: JWB DATE: 6/27/97

SUBJECT: ____ CHK'D: ____ DATE: ____

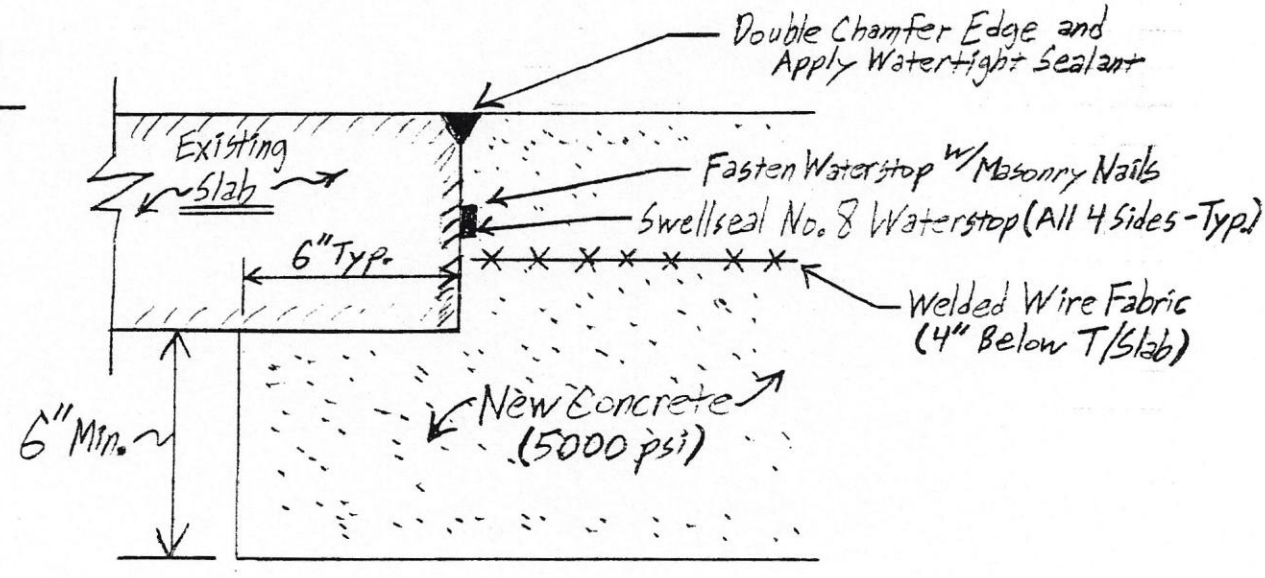
Exhibit A - Spillway Slab Repair Detail

Cross-Section:



Notes:
1. Use 5000 psi Concrete for Slab Repair Area.
2. Sawcut Existing Slab to remove small depression and about 6" to either side (approx. 3'x3' area).
3. Use sand bags to reroute water flows away from repair area and keep exposed subgrade in dry condition.

Waterstop Detail:



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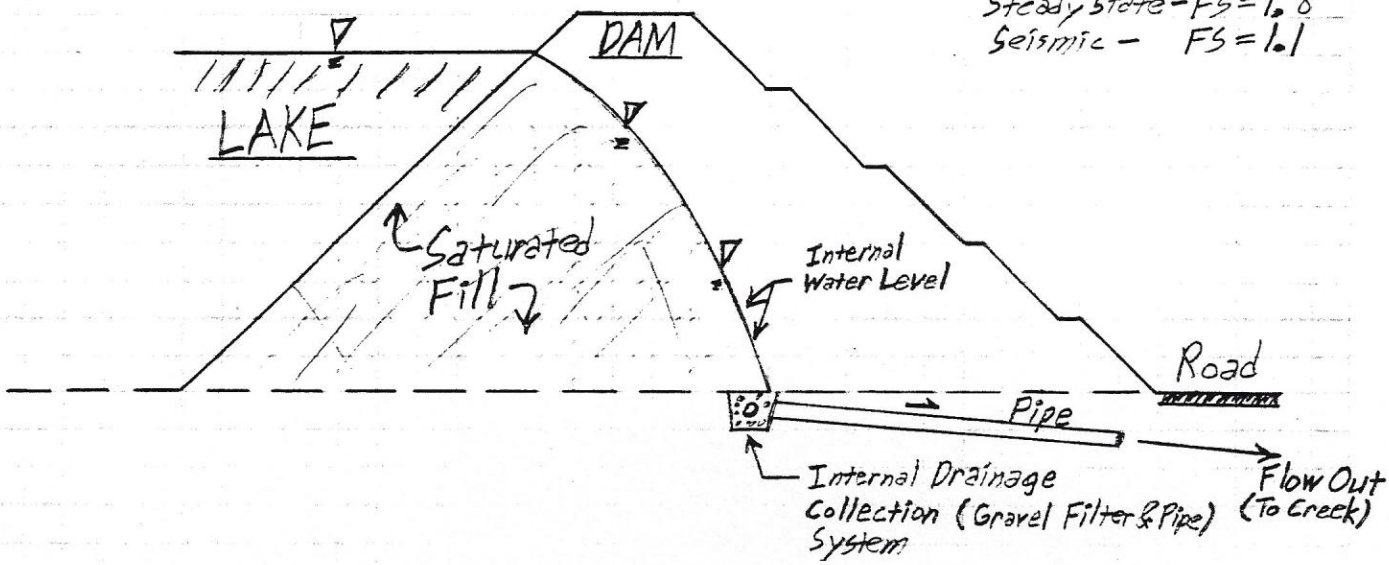
SUBJECT: ____ CHK'D: ____ DATE: ____

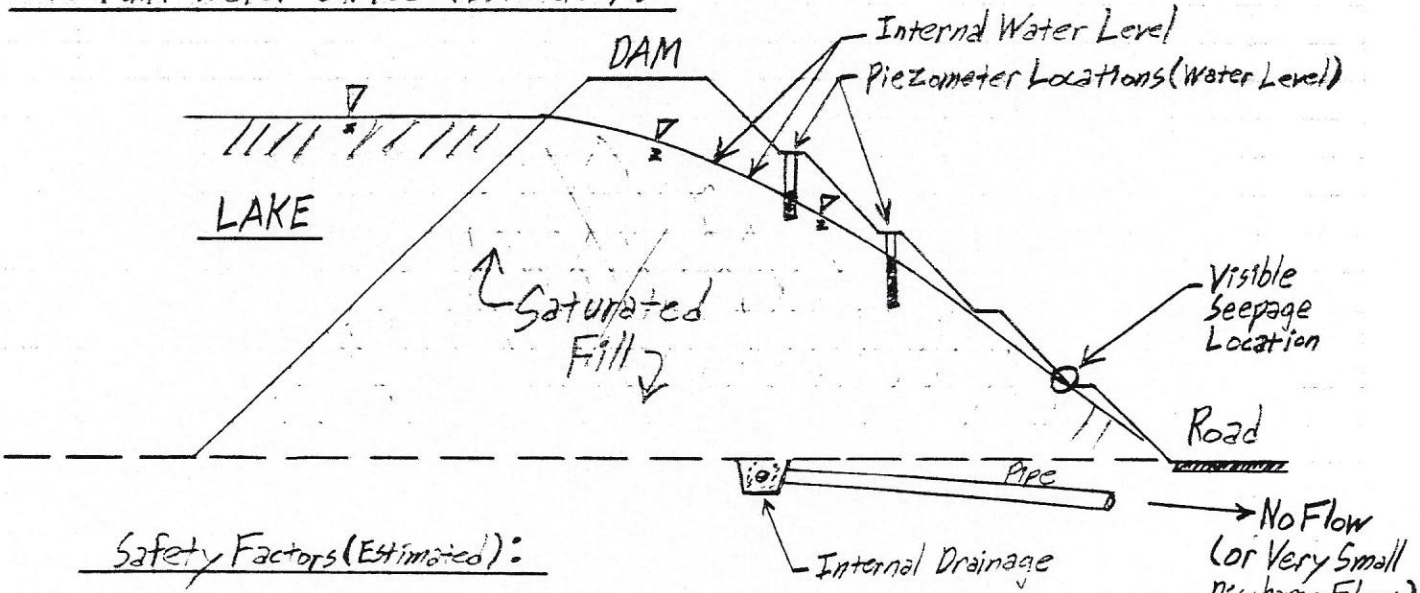
Exhibit B - Schematic Illustration of Water Surface Conditions

"As Designed" Water Surface (Idealized):

Safety Factors:
Steady State - FS = 1.8
Seismic - FS = 1.1



"As Built" Water Surface (Estimated):



Safety Factors (Estimated):

Steady State → FS = 1.1 < 1.5
Seismic → FS = 0.7 < 1.1
↑ Safe Dams' Minimum Criteria (1997)