Georgia Power Company Route 2, Box 299A Waynesboro, Georgia 30830 Telephone 404 554-9961 404 724-8114

Southern Company Services, Inc. Post Office Box 2625 Birmingham, Alabama 35202 Telephone 205 870-6011



April 4, 1986

Director of Nuclear Reactor Regulation Attention: Mr. B. J. Youngblood PWR Project Directorate #4 Division of PWR Licensing A U. S. Nuclear Regulatory Commission Washington, D.C. 20555

File: X7BC35 Log: GN-860

REF: Bailey to Denton, GN-544, 3/11/86

NRC DOCKET NUMBERS 50-424 AND 50-425 CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-109 VOGTLE ELECTRIC GENERATING PLANT - UNITS 1 AND 2 SER CONFIRMATORY ITEM 6: VERIFICATION OF CATEGORY 1 BACKFILL

Dear Mr. Denton:

Attached are revised pages 12 and 13 of the response to DSER Open Item 4 originally transmitted by the referenced letter. This portion of the original response was modified, as indicated by the change bars, to update the conservative evaluation of the backfill density testing originally performed for the period 5/8/80 to 11/30/84. The update includes data for the subsequent period of 12/1/84 to 12/31/85 as agreed to in confirmatory item 6.

In a meeting with the NRC in Bethesda on July 22, 1977 it was agreed that the compaction criteria to be used for Category 1 fill would be as follows: The fill shall have an average compaction of 97 percent of the maximum density determined by ASTM D 1557 with no tests below 93 percent and with not more than 10 percent of tests between 93 and 95 percent. The quality control record at the VEGP meets the above criteria comfortably and it has been demonstrated that ASTM D 1557 is an appropriate test which has been performed correctly.

A confirmatory testing program was initiated at the request of the NRC in June 1984 to verify the maximum laboratory dry densities that were being used to determine the percent compaction in the field. This program, which is discussed in detail in the original Response to Open Item 4, compared the ASTM D 1557 test performed in the field with other laboratories and other ASTM

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tests. In order to demonstrate the high quality of the fill, the field compaction record was re-evaluated based on data developed in the confirmatory testing program. The re-evaluation was performed in a very conservative manner in accordance with the following:

When the percent passing the No. 200 sieve size equaled or exceeded 6 the maximum density was increased by 3.5 pcf.

When the percent passing the No. 200 was less than 6 the maximum density was increased by 4.5 pcf.

When the percent passing the No. 200 sieve was not known the maximum density was increased by 4.5 pcf.

In January 1986, the re-evaluation was updated to include the 2795 tests performed during the period 12/1/84 to 12/31/85. Based on these 2795 tests the evaluation showed that for the latter period:

- The average compaction was 101 percent.
- 89.4 percent of the tests exceeded 97 percent compaction.
- 2.8 percent of the tests were between 95 and 93 percent.
- Less that 0.5 percent of the tests were less than 93 percent.

Of the 9 tests that fell below 93 percent after the above adjustments, 8 were located north of the turbine building where the required average compaction is 95 percent. Data from north of the turbine building were included in all the averages and percentages computed, thus making the evaluation even more conservative.

For the entire 13,057 tests performed for the period 5/8/80 to 12/31/85 the evaluation showed that

- The average compaction was 100 percent.
- 86.4 percent of the tests exceed 97 percent.
- 3.7 percent of the tests were between 95 and 93 percent.
- 0.6 percent of the tests were less than 93 percent.

Based on the above data it can be seen that the re-evaluation for the recent period of 12/1/84 to 12/31/85 is consistent with the evaluation previously submitted. As was previously concluded, by this very conservative evaluation the fill meets the requirements of the FSAR.

The Category 1 backfill effort is presently over 95 percent complete. We suggest that since less than 5 percent of the fill remains to be placed, and since this material will primarily be placed in yard areas which do not support category 1 structures, no further evaluation is required.

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If your staff requires any additional information, please do not hesitate to contact me.

Sincerely,

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J. A. Bailey Project Licensing Manager

JAB/sm Enclosure xc: R. E. Conway R. A. Thomas J. E. Joiner, Esquire B. W. Churchill, Esquire M. A. Miller (2) B. Jones, Esquire Vogtle Project File

G. Bockhold, Jr. D. C. Teper W. C. Ramsey NRC Resident Inspector L. T. Gucwa

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## ATTACHMENT

## DSER OI-4 VERIFICATION OF FSAR COMMITMENTS ON COMPACTIONS OF CATEGORY 1 BACKFILL PAGES 12 AND 13 REVISED

NRC staff statement the record has been re-evaluated in the most conservative manner possible. Using LETCO and GPC data the analysis of the record was made in the following manner:

When the percent passing the No. 200 sieve size equaled or exceeded 6 the maximum density was increased by 3.5 pcf.

When the percent passing the No. 200 was less than 6 the maximum density was increased by 4.5 pcf.

When the percent passing the No. 200 sieve was not known the maximum density was increased by 4.5 pcf.

The test record was originally reviewed for the period May 1980 through November 1984 and later updated to include the period December 1984 through December 1985.

This was done because it represented the period when the mechanical compactor was in use by GPC. It also represents the bulk of Category 1 backfilling to date. Based on the 13,057 tests considered it was determined that the average compaction was 100 percent. This exceeds the PSAR commitment of 97 percent average compaction. It was also found that 86.4 percent exceeded 97 percent compaction, 9.3 percent were between 97 and 95 percent, 3.7 percent were between 95 and 93 percent and 0.6 percent were less than 93 percent. The latter consisted of 72 tests which were randomly located throughout the fill.

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In reality the fill consists of about 77 percent of silty sand with between 6 and 13 percent passing the 0.074 mm size so that assigning an additional 4.5 pcf to the maximum densities is undoubtedly conservative where the percent passing the No. 200 sieve is not known. Also the 4.5 pcf applies to ASTM D 4253, which yields higher maximum densities for sands with less than 6 percent finer than 0.074 mm, but the design and the compaction criteria are based on ASTM D 2049 where the maximums are lower. Table VI shows some shallow standard penetration test results in the backfill made in 1980 and reported to the NRC in Reference 16 of the FSAR. These tests show a very homogeneous competent fill. This is further verified by the extremely high standard penetration test blow counts recorded in 10 borings made in the Category 1 fill in 1985. These tests showed:

- o Top 10 feet of fill STP blow counts varied from 30 to 97 with a conservative average of about 50.
- Depth range 10 to 30 feet STP blow counts of 62 to 200 with a conservative average value of about 100.
- Depth range 30 to 80 feet STP blowcounts of 100 to 200 with a conservative average of about 150.

When the blowcounts are corrected for energy ratio of the hammer and normalized to a confining pressure of 1 ton per square foot, the normalized blow counts are 80 at 5 feet, 87 at 20 feet and 80 at 60 feet. Such a narrow range of corrected blowcounts is consistent with a uniformly compacted fill. Furthermore, the high value of normalized blowcounts clearly shows there is no possibility of liquefaction in the backfill for any level of ground acceleration.

## Conclusion of Fill Evaluation

The compaction criteria for the Category I backfill are that the average compaction shall be 97 percent, no tests shall be below 93 percent and not more than 10 percent of tests between 95 and 93. Based on increasing the maximum densities by the greatest differences determined in the confirmatory test program the average compaction of the fill is 100 percent, 3.7 percent of tests are between 93 and 95, 0.6 percent of tests are below 93 percent and randomly located within the fill. The standard penetration tests made in the fill in 1985, details of which are discussed above, provide further confirmation of the high quality and acceptability of the Category 1 fill.

It is therefore concluded that by this very conservative evaluation the fill meets the requirements of the Safety Analysis Report.