

LAW ENGINEERING TESTING COMPANY Environmental Sciences, Geotechnical and Construction Services

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September 30, 1976

Mr. L. C. Dail Civil/Environmental Division Duke Power Company P. O. Box 2178 Charlotte, North Carolina 28242

50-269/274287 10151 4-1.2

Subject: Possible Maximum Acceleration at Oconee Nuclear Station from Jocassee Reservoir Induced Seismicity

Dear Mr. Dail:

As authorized on September 21, 1976 by Mr. R. S. Bhatnagar, Law Engineering has completed an analysis and report of the possible maximum acceleration at the Oconee Nuclear Station due to seismicity in the Jocassee Reservoir area.

The maximum possible earthquake for the Lake Jocassee area has been calculated to be  $M_L = 5.6$ . The details of this calculation and a description of the seismicity of the Lake Jocassee area can be found in the summary report of Jocassee Hydro-Station Seismic Studies dated September 30, 1976.

This report presents a maximum acceleration value for the Oconee Nuclear Station due to maximum hypothetical earthquake at Lake Jocassee. In order to do this a magnitude versus intensity relationship will be presented, intensity attenuation between Lake Jocassee and Oconee Nuclear Station will be estimated and an appropriate maximum acceleration for the plant will be determined using current intensity versus acceleration relationships.

The magnitude versus intensity relationship used in this study is the Gutenburg-Richter relationship,  $M = 2/3 I_0 + 1$ . Figure 1 shows the relationship along with six earthquakes which serve to demonstrate the applicability of this relationship in the southern Piedmont geologic province. The earthquakes used are listed on the following page.

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Earthquake	Magnitude	Epicentral Intensity (Modified Mercalli Intensity)	References
Arvonia, Va. December 22, 1875	5.75	VII	Law Engineering internal earthquake files, Earthquake History of Virginia - Hooper, M.G. and Bollinger, G.A., 1971.
Union Co.,S.C. January 1, 1913	5.45	VII	Law Engineering internal earthquake files, Earthquake History of Virginia - Hooper, M.G. and Bollinger, G.A., 1971.
Lincoln Co., Ga., August 2, 1974	4.5	v	Intensity Survey of Lincoln Co., Ga. Earthquake. Benson, A.F., and Fogle, G.H., November 20, 1974.
Seneca, S.C. July 13, 1971	3.6	IV	Law Engineering internal earthquake reference files.
Jocassee, S.C. November 25, 1975	3.2	IV	Law Engineering internal earthquake reference files.
Jocassee, S.C. January 13, 1976	2.35	II - III	Law Engineering internal earthquake reference files.

Using this relationship, the Lake Jocassee area maximum hypothetical earthquake,  $M_L = 5.6$ , is an epicentral intensity VII MM. It should be noted that both the Union County and Arvonia earthquakes have magnitudes similar to the Lake Jocassee hypothesized maximum earthquake and were both of epicentral intensity VII MM.

The intensity, at a distance of 18 km (the distance from Lake Jocassee to the Oconee Nuclear Station), from an epicentral

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intensity VII MM at Jocassee, was found by attenuating the maximum intensity, according to intensity versus distance relations for other Piedmont Province earthquakes (see Figure 2). Two events of comparable magnitude and maximum epicentral intensity were used. These are the Union County, South Carolina earthquake of January 1, 1913 and the Arvonia, Virginia earthquake of December 22, 1875. The average distance in the Piedmont Province for the extent of each intensity contoured was estimated and plotted in Figure 2. The magnitudes of these 2 events are within one-quarter magnitude units of the maximum hypothetical earthquake at Jocassee. Figure 2 indicates an attenuation of one half intensity unit at a distance of 18 km. Therefore, the intensity at 18 km for a maximum intensity VII MM event of magnitude ML = 5.6 in the Piedmont Province would be VI - VII MM.

Based upon an earthquake intensity of VI - VII MM (6.5) at the surface in the area of Ocone: Nuclear Station, we conclude that the maximum acceleration at the foundations on rock will be about 0.10 g. This value is at least as conservative as current intensity, acceleration relationships (Trifunac and Brady (1975), Neumann (1954), Hershberger (1956), and Gutenberg and Richter (1956)).

If you have any questions, please contact us.

Very truly yours,

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