Georgia Power Company
Post Office Box 4545
240 Peachtree Street, N.W.
Atlanta, Georgia 30302
Telephone 404 522-6060

W. E. Ehrensperger
Senior Vice President
Power Supply

September 26, 1979

Mr. William H. Regan, Jr.
Acting Assistant Director for
Environmental Projects and Technology
United States Nuclear Regulatory Commission
Division of Site Safety and Environmental Analysis
Washington, D.C. 20555

NRC DOCKET NUMBERS 50-424 AND 50-425
CONSTRUCTION PERMIT NUMBERS CPPR-108 AND CPPR-109
ALVIN W. VOGTLE NUCLEAR PLANT-UNITS 1 AND 2
MULTIPORT DIFFUSER

Dear Mr. Regan:

Your letter of June 22, 1979 requested that we advise you of our plans for optimizing the multiport diffuser for 2-unit operation. You also requested the dispersion characteristics of the thermal plume for that diffuser.

Our single multiport diffuser is being redesigned to optimize its performance for 2-unit operation. Construction drawings will be prepared following the completion of final design studies which include an investigation of river sediment deposition and erosion in the vicinity of the diffuser.

Preliminary analysis of the redesigned diffuser indicates that the maximum downstream extent of the 5°F isotherm will be about 16 feet and the maximum predicted volume within the 5°F isotherm will be approximately 1,500 cubic feet. This estimated 5°F isotherm volume of 1,500 cubic feet is significantly less than the 2,400 cubic feet previously predicted for the 4-unit project discharge flow and the original multiport diffuser design.

Pertinent information associated with the multiport diffuser optimization is presented in the following:

DESIGN RIVER CONDITIONS

Bottom elevation	=	70' msl
Surface elevation	=	80' msl
Width	=	330'
River flow	=	5,800 cfs
Velocity	=	1.7 fps
Temperature	=	41°F (winter)

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PRELIMINARY MULTIPORT DIFFUSER DESIGN

The multiport diffuser will consist of either a 42 or 48-inch diameter manifold (determined by the hydraulic transient analysis being performed) with 25, 6-inch diameter nozzles spaced on 30-inch centers (Figure 1). The diffuser portion will begin about 40 feet from the river bank and extend 100 feet offshore (60-foot diffuser length). A nozzle orientation of 20^{o} above the horizontal in the direction of the river flow was selected to minimize jet interference with the water surface and river bottom. Diffuser performance was evaluated for nozzle discharge velocities between 2.5 fps and 25 fps and a plant effluent temperature of 84^{o}F. The normal plant discharge for 2-unit operation, with no radwaste discharge, is 11,000 gpm which will result in nozzle velocities of about 5 fps. The plant operation for maximum effluent discharge is presently being re-evaluated; however, the maximum discharge will not result in nozzle velocities in excess of 25 fps nor an effluent temperature in excess of 84^{o}F.

ANALYTICAL APPROACH TO THE THERMAL PLUME COMPUTATION

The submerged multiport diffuser system was designed to discharge the flow through a series of relatively small nozzles to achieve rapid mixing with the receiving water. In developing the diffuser configuration, the manifold diameter, nozzle spacing, and the nozzle diameter were selected to ensure reasonable uniformity of the discharge velocities from the nozzles and to provide the required dilution performance. The jet velocity was evaluated to ensure that it was sufficiently high to provide complete mixing of the discharge flow with the river flow passing over the diffuser within a limited distance downstream of the diffuser. The characteristics of the 5^{o} isotherm were obtained using the experimental results presented by Parr and Sayre (reference).

Please advise if you require additional information at this time. We are presently performing final design studies and will provide the design details in the FSAR/ER.

Sincerely,

W E Ehrensperger

W. E. Ehrensperger

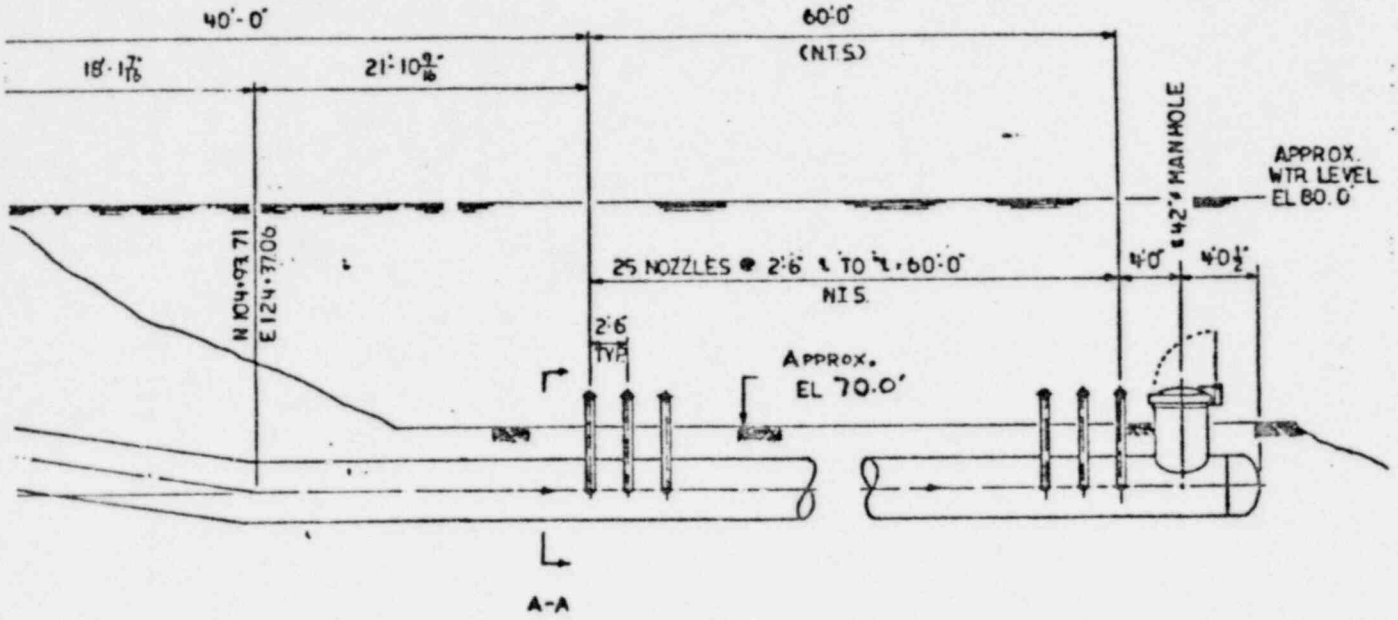
REFERENCE: A. D. Parr and W. W. Sayre, "Prototype and Model Studies of the Diffuser-Pipe System for Discharging Condenser Cooling Water at the Quad-Cities Nuclear Power Station," Iowa Institute of Hydraulic Research Report No. 204. June 1977.

WEE/caa
Enclosure
Distribution Attached

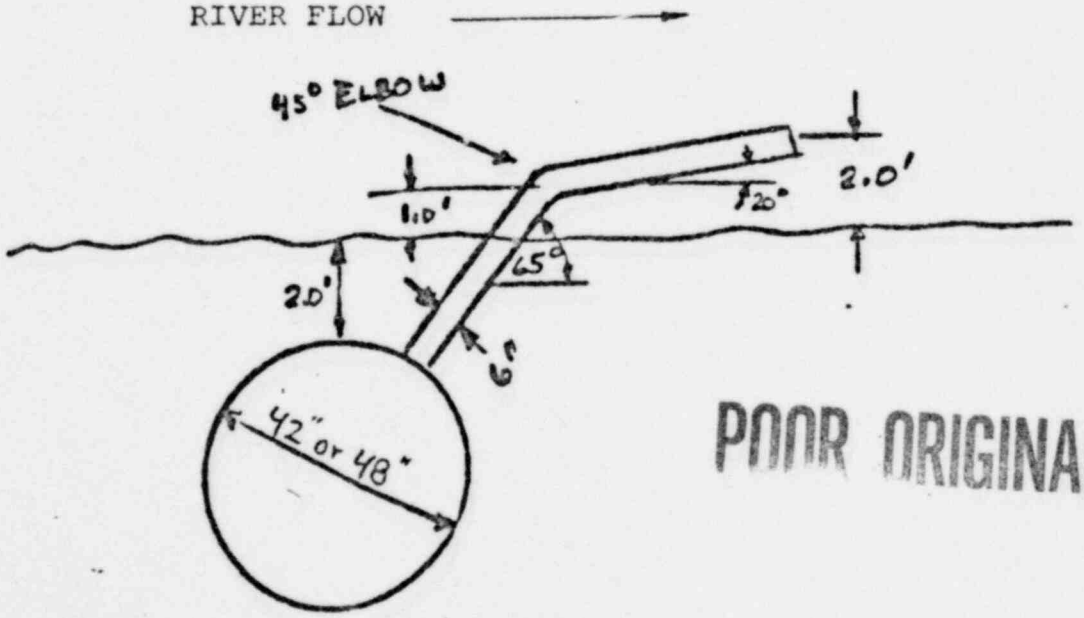
cc: I. S. Mitchell, III
R. A. Thomas
J. A. Bailey
G. F. Trowbridge, Esquire
T. E. Byerley
B. L. Lex
J. G. Farley, Jr.
D. E. Dutton
L. T. Gucwa
C. D. McCrary

FIGURE 1

RE-DESIGNED MULTIPORT DIFFUSER



ELEVATION (LOOKING UPSTREAM)



DIFFUSER CROSS SECTION A-A

PROPOSED NOZZLE CONFIGURATION