4.16 NON-RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE

Objective

The objective of this specification is to determine the effects of Oconee's chemical and thermal discharges on the aquatic and terrestrial life associated with Lakes Keowee and Hartwell, and on the physical and chemical characteristics of these bodies of water.

Applicability

The non-radiological monitoring program applies to the overall environmental effects resulting from Oconee's chemical and thermal discharges, with a particular emphasis on developing quantitative information for use in making a continuing evaluation of these environmental effects.

Specification

4.16.1 Chemical Wastes

The water flowing from Lake Keowee to Lake Hartwell shall be sampled below the point where Oconee's waste water discharges with the samples being collected continuously for analysis by Standard Methods for the Examination of Water and Waste-Water or other generally accepted procedures. These composite samples shall be analyzed for boron, chlorine, and hydrazine. If these analyses identify measurable concentrations which may be attributable to waste water discharges from Oconee Nuclear Station, the test results shall be reviewed with the South Carolina Pollution Control Authority for a determination of their significance and the need for any corrective action.

4.16.2 Condenser Cooling Water Temperatures

In the event of a reactor-turbine trip, all condenser cooling water pumps on the tripped unit except one shall be tripped to minimize the reduction in temperature of the thermal mixing zone.

During periods of one-unit operation under winter-time conditions, a minimum of three condenser cooling water pumps shall be operated on that unit to minimize the condenser Δt.

4.16.3 Aquatic and Terrestrial Effects

4.16.3.1 Synoptic water quality surveys shall be conducted at six (6) stations on the Seneca River arm of Lake Hartwell and at eight (8) stations on Lake Keowee (see Figures 4.16-1 and 4.16-2) as shown by Table 4.16-1. Data shall be collected a minimum of eight (8) times per year and a minimum of two (2) times during each of the following periods: December-January-February; March-April-May; June-July-August; September-October-November.

4.16.3.2 Three water temperature recording stations on Lake Keowee shall monitor water temperatures in a six point vertical profile on the open lake. The stations shall be located in the connecting canal (503), lake side of the skimmer wall (502), and approximately 1000 feet upstream of the Keowee Hydro intake. A minimum of two of the water temperature recording stations shall be operable at all times.

4.16.3.3 The rate of accumulation of Periphyton organic matter on artificial substrates by the attachment, growth, and reproduction of colonizing organisms shall be used to estimate the productivity of the reservoir. Duplicate artificial substrates (plexiglass slides, 3" by 3") will be held in racks and submerged at a depth of five feet at four locations in the lake (stations 502, 504, 506, and a station in the discharge area - see Figure 4.16-2). These artificial substrates will be exposed for a period of time necessary for a quantifiable accumulation of biomass. Dry and ash-free weights of each sample, which represents relative productivity values, will be determined according to the procedures described in Standard Methods for the Examination of Water and Waste-Water.

4.16.3.4 For terrestrial surveillance, permanent transects perpendicular to the shoreline will be established on Lake Keowee in the plant site area and on the Seneca River arm of Lake Hartwell. These transects will represent major habitat types characteristic of the lakes area. A vegetative inventory will be undertaken along these transects so that future inventories may identify significant changes. The initial inventory shall be conducted prior to operation of Unit 1. Additional inventories shall be performed annually.

4.16.4 Evaluation and Review

A minimum of one review meeting shall be held annually with supplementary reviews as needed for evaluating or revising the Oconee Non-Radiological Environmental Monitoring Programs.

The specified surveillance programs shall commence upon receipt of the operating license for Oconee Unit 1 and continue for a period of not less than three years after the receipt of the operating license for Unit 3.

TABLE 4.16-1

SYNOPTIC WATER QUALITY PARAMETERS SAMPLED
LAKE KEOWEE AND LAKE HARTWELL

		Lakes	
		Keowee	Hartwell
1.	Temperature	X	X
2.	Dissolved Oxygen	X	X
3.	Secchi Disc	X	X
4.	pH	X	X
5.	Manganese	X	X
6.	Total Iron	X	X
7.	Turbidity	X	X
8.	Biochemical Oxygen Demand	X	X
9.	Total Alkalinity	X	
10.	Ammonia Nitrogen	X	
11.	Nitrate Nitrogen	X	
12.	Ortho-Phosphate	X	
13.	Total Phosphate	X	
14.	Silica	X	
15.	Conductivity	X	

i Temperature and dissolved oxygen measurements are made at all stations both Lakes Hartwell and Keowee at ten (10) foot intervals from a one (1) foot depth to the bottom depth; except station #605 where measurements are made at mid-depth only.

ii Secchi Disc is measured at all stations except station #605.

iii BOD measurements on Lake Keowee are made at a minimum of three (3) randomly selected stations each survey. Separate samples are taken at one (1) foot, ten (10) foot and bottom depths at each station.

iv BOD measurements on Lake Hartwell are made at all stations from a composite of water from one foot, mid-depth, and bottom depths; except station #605 which is from mid-depth only.

v All other parameters are measured at a minimum of three (3) depths at each station; except station #605 which is measured at mid-depth only.

Bases

General operating procedures during one unit wintertime operation of Oconee Nuclear Station will require three (3) or four (4) condenser cooling water pumps running; this procedure will serve to reduce Δt and consequently the absolute discharge temperature. In the event of a loss of steam to the condensers, the number of circulating cooling water pumps in operation will be reduced to one. Thus, the pool of warm water in the discharge area will be relatively close to ambient lake temperatures and the thermal shock to organisms in the immediate discharge area in the event of loss of steam to the condensers will be minimized.

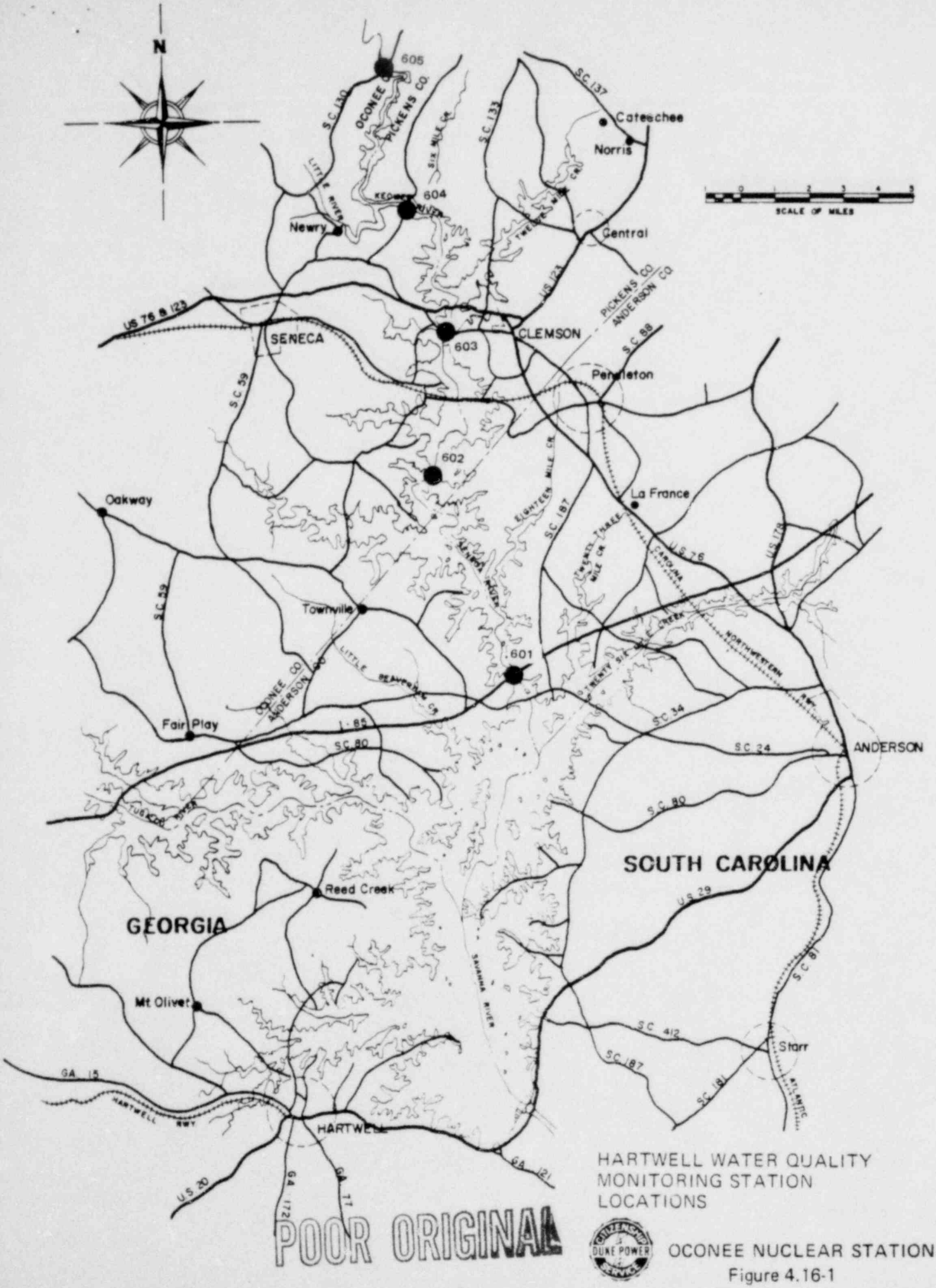
These operating procedures will lower the temperature to which organisms inhabiting the discharge waters will be acclimated. Thus, their ability to withstand a reduction in temperature will be increased. LD_{50} temperature tolerance limits for 24 hours for fish species characteristic of Lake Keowee, such as largemouth bass, bluegill, and channel catfish, indicate that these species will be able to withstand a temperature shock reduction greater than 20°F during winter operation.[1] It should be noted that the only fish which will be exposed to the maximum temperature shock would be those in the immediate region of the discharge structure. Fish further out in the mixing zone would be inhabiting cooler water and would be acclimated to a temperature lower than that being discharged. Also, fish further out in the mixing zone would be exposed to a much slower change in temperature.

General operating procedures during summertime will result in discharge temperatures relatively close to ambient surface lake temperatures. In the event of a loss of steam to the condensers, the number of condenser cooling water pumps in operation will be reduced to one for the tripped unit. LD_{50} temperature tolerance limits for 24 hours for fish species characteristic of Lake Keowee, such as largemouth bass, bluegill, and channel catfish, indicate that these species will be able to withstand a temperature shock reduction greater than 30°F during summer operation.

In addition to the surveillance programs outlined in the specification which will be implemented by Duke Power Company, a fisheries study has been initiated by the Bureau of Sport Fisheries and Wildlife of the Department of the Interior. The research aims of this study are to "establish status of fish population in Keowee Reservoir prior to nuclear power generation plant operation" and to "determine effects of heated water effluent on distribution, movements, growth, production, and harvest of the principal fishes and on production and utilization of plankton and benthos when nuclear generating plant is in operation." The primary aim of the study by the Bureau of Sport Fisheries and Wildlife is to "determine the effects - both detrimental and beneficial - of the heated water on the fish population through the reservoir."

The surveillance programs will be reviewed annually by Duke Power to determine the effectiveness of these programs. Members of government agencies, university groups, consultants, etc. will be invited to participate in this review.

[1]Anonymous. 1962. Heated Discharges...their effect on streams. Division of Sanitary Engineering, Bureau of Environmental Health, Pennsylvania, Department of Health. pp. 18-20.



HARTWELL WATER QUALITY
MONITORING STATION
LOCATIONS

DUKE POWER COMPANY

OCONEE NUCLEAR STATION
Figure 4.16-1

POOR ORIGINAL

LAKE KEOWEE WATER Q
MONITORING STATIONS

OCONEE NUCLEAR

Figure 4.16 - 2