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CP&L
Carolina Power & Light Company

February 28, 1977

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT
UNIT NO. 2
DOCKET NO. 50-261
EPA PUBLIC HEARING

Dear Mr. Rusche:

On February 8, 1977, the U. S. Environmental Protection Agency (EPA) held a Public Hearing in Hartsville, South Carolina, in the matter of our H. B. Robinson Steam Electric Plant request for a 316(a) alternative effluent limitation. In order to keep the NRC apprised of all matters concerning H. B. Robinson Unit 2, we are transmitting herewith a copy of written testimony filed on behalf of Carolina Power & Light Company (CP&L) at that public hearing. The testimony for CP&L consisted of statements by Mr. Wilson W. Morgan, Mr. Ralph L. Sanders, Dr. William T. Hogarth, and Dr. Charles M. Weiss.

Yours very truly,

M. A. McDuffie
Senior Vice President
Power Supply

MAM/dkm
Attachment

2141

336 Fayetteville Street • P. O. Box 1551 • Raleigh, N. C. 27602

STATEMENT
OF
WILSON W. MORGAN
ON BEHALF OF
CAROLINA POWER & LIGHT COMPANY
FEBRUARY 8, 1977

My name is Wilson W. Morgan. I am a Vice President of Carolina Power & Light Company and manager of the System Planning and Coordination Department. CP&L is grateful for this opportunity to appear before the Environmental Protection Agency and the South Carolina Department of Health & Environmental Control. In the course of our presentation we will summarize the data we have submitted showing that the Robinson impoundment can continue to be used as a cooling lake without interfering with the maintenance of a balanced population of fish and wildlife and without the necessity of adding cooling towers or other costly cooling devices. Following my more general remarks, Mr. Ralph L. Sanders, Jr., Manager of the Company's Environmental Technology Section, will briefly summarize the specific studies which we have conducted in Lake Robinson and Black Creek and introduce Dr. Charles M. Weiss, from the University of North Carolina, and Dr. William T. Hogarth, Principal Scientist of CP&L's Fisheries and Aquatic Unit, who will describe the conclusions reached in our studies.

Before hearing from them, however, I would like to briefly review the legal and regulatory requirements which must be followed in determining whether or not the Company should be allowed to continue using the impoundment as a cooling lake or whether it should be required to spend $35 million for cooling towers to reduce lake temperatures. Under the Federal Water Pollution Control Act Amendments of 1972, everyone who discharges pollutants,

including waste heat, is required to obtain what is known as a National Pollutant Discharge Elimination System permit from either the EPA or a state agency approved by EPA. This permit is usually referred to as an NPDES permit.

In issuing a permit, EPA or the state agency is required to impose conditions which will result in utilization of the best available technology for reducing or eliminating the discharge. In addition to this technologically based limitation, the permit must also contain any other conditions which are necessary to assure compliance with state water quality standards.

The Environmental Protection Agency's technologically based thermal limitations in effect at the time the Robinson NPDES permit was issued did not require additional thermal controls. This was because waste heat from the plant is discharged to a cooling lake which, by definition under the regulations, constituted best available technology. There was, however, serious question about whether or not thermal discharges from the plant would comply with South Carolina's water quality standards. This question was further complicated by the fact that the State of South Carolina and the Environmental Protection Agency adopted different views about whether or not compliance with water quality standards was required in the lake proper or at the point of discharge from the dam.

As a result of these questions concerning compliance with the South Carolina water quality standards, the Company requested and was granted permission to demonstrate that it could continue to discharge heat to the lake without additional controls and without interfering with the

maintenance of a balanced indigenous population of fish and wildlife on the lake and in Black Creek. This request was made pursuant to Section 316(a) of the Federal Water Pollution Control Act, which is why we commonly refer to our submittal to EPA as a "316(a) Demonstration". Section 316(a) is a special provision written into the Act by Congress in recognition of the fact that thermal discharges are not like other pollutants. Its effect is to provide a statutory right to establish through factual evidence that a healthy fish and wildlife population will flourish in spite of the fact lake temperatures are not as low as the state water quality standards would otherwise require.

Pursuant to this special provision of Federal law, Carolina Power & Light Company conducted comprehensive biological studies which show that Lake Robinson supports and has supported a viable and robust aquatic population even though lake waters are elevated above natural temperatures. Thus, consistent with the factual data presented to EPA, the only permit limitations which the Company believes appropriate under existing law are those necessary to provide reasonable assurance that future lake temperatures will remain within the ranges observed historically. Mr. Sanders will address what these should be in more detail in his remarks. Suffice it for me to say that in our opinion the limitations suggested in the Public Notice for this hearing, together with additional limitations which we have suggested in response to questions raised by EPA, are more than adequate to assure that future temperatures remain within the ranges observed historically.

Before turning from the legal requirements, I should point out that the statute does not require or allow EPA to consider the effect of the thermal discharge upon swimming and other recreational uses. The only relevant data to be considered in reaching a decision in this case is that which deals with the impact of the thermal discharge upon fish and wildlife. And even then the statute does not require a showing that there is no impact, only that the impact is not inconsistent with maintaining a balanced indigenous population. In addition, it should be noted that identification of the otherwise applicable thermal limitation in this case has been rendered somewhat more difficult by the fact the Fourth Circuit Court of Appeals overturned and required reconsideration of the portion of the regulations which establish the technologically based thermal effluent limitations. Specifically, the Court ordered EPA to evaluate whether greater use of cooling lakes should not be allowed and encouraged under the regulations. And in a somewhat similar vein, South Carolina recently amended its water quality standards in order to facilitate the use of cooling lakes where they are ecologically acceptable and otherwise represent best available technology under applicable EPA regulations. The practical effect of each of these developments is to provide an additional legal basis for allowing continued utilization of the existing once-through cooling system.

Let me turn now to the question of the plant's discharge as it affects recreation. While the impact of the Robinson Plant's thermal discharge on recreational usage of the lake is technically not relevant in this hearing, we are sensitive to the impact heat from the plant has on homeowners around the

lakeshore. However, we have to keep things in perspective and cannot lose sight of the fact that Lake Robinson is neither a natural lake nor a publicly owned lake. It was built by Carolina Power & Light Company on CP&L lands by impounding waters to which the Company had all requisite legal rights. The lake was not constructed for recreational purposes, but rather was designed to provide a means of transferring waste heat associated with the production of electricity to the atmosphere. In designing and building the cooling lake in the late 1950's, the Company took its future needs into account, and in keeping with the plan to use the lake for additional units built Robinson Unit 2 and placed it in service in 1971.

In response to public requests the Company agreed to open the lake to development. It did this so that residents in the area could enjoy the lake's obvious recreational benefits and scenic beauty to the extent public use was consistent with the primary purpose of the impoundment--to transfer heat from the plant to the atmosphere. Thus, in 1962 CP&L announced that it would sell some of its properties adjoining the lake. In the press release announcing the decision, however, the Company was careful to say that it was only making the

> expanse of fresh water available to the public as broadly as is consistent with its primary purpose, which is that of supplying unpolluted cooling water for the condensers in generating electricity.

The Company also noted in its press release that the discharge canal, which then extended more than a mile upstream from the dam, would be extended further upstream "as the plant capacity is increased".

This information was readily available to the public before any properties along the lakeshore were sold, as shown in part by an article and map which appeared in the Florence, South Carolina, Morning-News on October 28, 1962. You will see from the copy of this article which is reproduced on the screen in front of you that we said the lake would be available for public recreation, swimming, boating and fishing only

> as far as is consistent with its primary purpose as a source of unpolluted cooling water for the H. B. Robinson Steam Electric Generating Plant.

You will also notice by the dotted lines that the future extension of the discharge canal was a matter of public knowledge.

We think that the majority of the citizens in this area have enjoyed the many recreational opportunities which CP&L's Lake Robinson affords them without losing sight of the fact that recreational use of the lake must of necessity be secondary to its primary purpose of providing a means of dissipating heat from the plant. We also believe that the vast majority of our customers, including those who use the lake for recreation, would clearly prefer that we continue to use the lake for cooling purposes. They recognize that the lake has already been built and that its cost is reflected in electric rates. If we quit using it for cooling purposes, in addition to paying for the lake they would also have to pay $35 million for cooling towers. On top of that, they would have to absorb the cost of approximately 62 million KWH of wasted electricity every year since cooling towers would reduce the output of the plant but the plant would still consume the same amount of fuel. Based on average residential usage, this would provide electricity for

approximately 5,000 homes for one year. The only benefit members of the public would get from this would be an improvement in swimming conditions in the mid-portion of the lake during the summer months. Considering the limited number of people to which this benefit would accrue--at a cost of $35 million to CP&L's other customers--we simply do not believe that modifications can be justified. This is doubly so where, as our data clearly show, the lake is not having an adverse impact on the environment.

CP&L has always tried to be a good neighbor and we think that we have been successful. To the extent feasible we have tried to accommodate the wishes and desires of those who live in the areas we serve. This is evidenced in part by the fact that we have been willing to open our lake to public use to the extent such use is consistent with its primary purpose.

We believe the Robinson Plant is a genuine asset to Darlington County and surrounding communities. In addition to providing a recreational facility of considerable value to the local community, the Robinson Plant has a major influence on the local economy. Last year it had a payroll of $2.23 million and paid $1.73 million in taxes to Darlington County.

In closing, let me simply say that we solicit your understanding and ask that you keep matters in proper perspective. Remember that from the first, the opening of Lake Robinson to recreational use by the public was with the clear understanding that any recreational usage was secondary to the lake's use as a cooling facility for the plant. We know that there are some who wish the lake existed for the sole purpose of swimming and other recreational activities. In fairness to our customers, however,

we simply cannot agree that it is in any way sensible to ask them to spend $35 million to insure that the lake will be ideally suitable for these purposes 100% of the time.

Mr. Ralph Sanders will now describe the environmental studies which have been undertaken in support of the Company's 316(a) Demonstration.

STATEMENT
OF
RALPH L. SANDERS
ON BEHALF OF
CAROLINA POWER & LIGHT COMPANY
FEBRUARY 8, 1977

I will describe how CP&L became involved in environmental investigations in Lake Robinson, how these studies have grown in scope and complexity, and briefly describe what the results of these studies mean to all of us. A more complete description of the techniques, the data, and the analyses which were the basis for our 316(a) demonstration report will then be presented by Dr. Weiss and Dr. Hogarth.

Lake Robinson is a 2250 acre reservoir created in 1959 to provide cooling water for the H. B. Robinson Steam Electric Plant. Water drains into Lake Robinson from 173 square miles of rolling sand hills and from numerous streams draining low-lying bog and swamp lands. These streams are typically darkly stained and slightly acidic, and are generally described as "blackwater." Lake Robinson is typical of blackwater lakes such as Great Lake and Catfish Lake in North Carolina and others throughout the southeastern coastal plain. Blackwaters are normally not very productive and they support only a limited concentration of aquatic life. Lake Robinson has some areas, primarily in the shallow northern reaches, where aquatic vegetation is abundant and a relatively rich aquatic community has developed. In other areas, including most of the lower lake, the coarse shifting sand and dark color have restricted the natural development of abundant vegetation or fisheries communities.

Carolina Power & Light Company began initial investigations of the potential effects of plant operation on the lake environment in early 1973.

These initial studies provided a general understanding of the distribution of aquatic life in the lake, identified most of the important species of fish, and served to demonstrate the relative effectiveness of a variety of sampling techniques. Temperature and water quality information were also obtained with each biological sample during this general survey of the ecology of Lake Robinson. This environmental surveillance continued into early 1974. By then our data seemed to show that the fish populations in the lake were about the same as we would expect in any other blackwater lake. In other words, it appeared that the heat from the Robinson Plant was not interferring with the maintenance of a balanced, indigenous population of shellfish, fish, and wildlife in and on Lake Robinson. So, in mid-1974 we submitted the results of this first year of studies to the EPA and to the SCDHEC. Although these agencies did not seriously disagree with our tentative conclusions, they felt a more thorough study would be required to provide a sound basis for a regulatory decision. In late 1974 the EPA granted us a year, until June 30, 1976, to make those additional studies.

Our expanded study program included investigations of water quality and temperature, fisheries, aquatic vegetation, mammals and reptiles, and the microscopic life forms in the water and in the bottom of the lake. This slide shows the system of stations which were sampled at least monthly for fish and other life forms as well as for temperature and water quality. Additional programs of temperature measurements were conducted separately during this period. During the course of the study, more than twenty-two professionals and ten techicians participated in the sampling programs and the laboratory analyses. Both state and federal biologists have visited Lake Robinson and accompanied CP&L scientists who were collecting biological, temperature, and water chemistry data.

In the course of the comprehensive environmental studies, we have noted with some satisfaction that a significant number of people in the area use the lake for recreation. Even though recreation is not an issue in this proceeding and even though the temperature of some heated areas of the lake may not be attractive for swimming during the hotter summer months, it is gratifying to see the significant participation in water contact sports, as well as in sailing, power boating, fishing, and camping.

As we completed the majority of field sampling in April, 1976, final evaluation and interpretation of data began. The results and findings of over three years of environmental monitoring and surveillance were carefully compiled, reviewed, and examined. On June 30, 1976, report preparation was completed, and the H. B. Robinson Steam Electric Plant 316 Demonstration, Volumes I, II, and III was submitted to the EPA. I would like to offer this document into the record of this hearing together with the supplements which have been submitted on December 13, 1976, and January 7, 1977, in response to EPA questions. From the extensive evidence contained in this report, CP&L scientists and the EPA and the SCDHEC have concluded that effluent limitations prescribed in the FWPCA are more stringent than necessary for the protection and propagation of the indigenous communities of fish, shellfish, and wildlife in and on Lake Robinson and that alternative limitations should be imposed which allow continued use of Lake Robinson for condenser cooling.

The public notification of this hearing proposed specific seasonal temperature limitations, except for the spring months, for water entering Lake Robinson from the discharge canal. Our studies have shown the proposed limitations to be more than satisfactory to protect the lake environment. The supplements to the

316 report, which we submitted in December and January, proposed discharge temperature limits for each of the spring months and proposed additional, longer term limits for the summer months. Combining all of these limitations on the temperature of the water entering the lake provides a complete set of constraints which will protect the lake environment. Please remember that these are temperatures at the end of the discharge canal and that lake temperatures will be much cooler.

The allowable temperatures in °F which can be supported by available data are:

for June through September,

averaged over 24 hours - 111.2

over 30 days - 108.7

over 60 days - 106.7

over 90 days - 105.8

for October,

averaged over 24 hours - 99.5

30 days - 95.9

for November,

averaged over 24 hours - 91.4

over 30 days - 86.0

for December through February,

averaged over 24 hours - 85.1

over 30 days - 78.8

for March,

averaged over 24 hours - 93.2

over 30 days - 89.6

for April,

averaged over 24 hours - 97.7

over 30 days - 95.0

for May,

averaged over 24 hours - 100.4

over 30 days - 96.8

These limitations are fully adequate to assure us all that future operation of the plant will be as compatible with the fish in Lake Robinson as past operation has been. We believe no other limitations on plant operation are necessary or justified.

I would now like to introduce Dr. Charles Weiss who will discuss the studies conducted on water quality and on the very small organisms that fish eat. Dr. Weiss is Professor of Environmental Biology in the Department of Environmental Sciences and Engineering of the University of North Carolina and is a recognized authority in his field. He is a Fellow of the American Society for Advancement of Science. Dr. Weiss.

Lake Robinson the standing crop or total cell quantity of the phytoplankton, at any one time, at both the point of cooling water intake as well as at the point of discharge following passage through the steam condensors, has consisted of similar populations. Upstream of the discharge canal the numbers and species of the phytoplankton are similar to those found in a free flowing stream, e.g. Black Creek. The same taxa and major groups were primarily important at all stations. Green algae were dominant throughout the year. The variety of species was low at all stations but comparable to other waters of similar quality. The standing crop and primary productivity (rate of carbon fixation by the phytoplankton) appears higher in the lower impoundment, near the cooling water intake, as compared to the rate of carbon fixation in the mid impoundment, at the point of discharge. Even though the increase in temperature reduced primary productivity in the discharge area, the effect appeared to have had little impact on phytoplankton population composition and abundance. This heat stress was limited to the summer months with subsequent recovery of the phytoplankton as indicated by a return to rates of carbon fixing found in non-heat exposed waters.

The zooplankton or microscopic animals which subsist largely on the phytoplankton, was dominated by only a few species of two major groups, the Cladocera and Copepoda. During August the zooplankton numbers were greatly reduced at the discharge and lower impoundment but this effect was momentary, returning to previous levels in September.

The bottom dwelling aquatic invertebrates, consisting primarily of various developmental stages of insect larvae, constitute the benthos. Since the benthos tend to remain in one location, their presence or absence generally reflects a combi-

nation of an initial selection of locale because of specific bottom characteristics, and a response that indicates either avoidance or acceptance of the environmental quality of the overlying water. The benthos, as dredged from various sections of Lake Robinson, were found to be comparable to and representative of other lakes and impoundments in the southeastern Piedmont and coastal plain of the Carolinas. Within Lake Robinson abundance and variety of the benthos were relatively consistent throughout the year in all parts of the reservoir except in the immediate cooling water canal discharge area. Within this zone abundance and variety were similar to other parts of the impoundment for the period of November through May but were lower during the summer months. This decrease would appear to have resulted from some thermal effect. The apparent heat stress was limited to the immediate discharge area and did not appear to be permanent as indicated by recolonization and recovery in the period of November through May.

In summary, the aquatic environment of Lake Robinson, which is characteristic of bog and swamp waters of the coastal plain of southeastern United States, has been found to have indigenous populations of plankton and benthos characteristic of other waters of similar origin. These populations appear to have the capacity to sustain themselves through seasonal changes and have reacted to thermal stress in only very localized situations and for limited periods of time. These indigenous populations have shown great resiliency in responding to thermal stress.

At this time I would like to introduce Dr. William T. Hogarth of Carolina Power & Light Company. Dr. Hogarth received his Bachelor of Science Degree in Biology from the University of Richmond in 1963 and a Master of Science Degree in Fishery Biology from the University of Richmond in 1965. In 1976 he received his Ph.D. Degree

in Zoology-Fishery Biology from North Carolina State University. Dr. Hogarth has been directly involved in fishery studies, research and field programs for the past 14 years and will discuss the fisheries of Lake Robinson.

STATEMENT
OF
WILLIAM T. HOGARTH
ON BEHALF OF
CAROLINA POWER & LIGHT COMPANY
FEBRUARY 8, 1977

Carolina Power & Light Company has been involved in studying the fish populations in Lake Robinson since 1973 (Slide 1). The species present, the relative abundance (including their distribution within the lake), and the pounds of fish per acre found in various parts of the lake were examined. Fish food habits were compared with the abundance and distribution of fish foods available and as an indication of the "health" of the population. The age composition of the fish population was studied from the examination of fish scales to see if it was reasonably normal or indicated abnormal conditions. Reproduction was examined in Lake Robinson fishes with regard to season, water temperature, and location within the lake. The entrainment of fish eggs and larvae through the plant has been evaluated as has been the impingement of fish on the intake screens. A one year creel survey was conducted to document the recreational and sport fishing uses of the lake. Intensive temperature surveys were conducted on the lake during the 316 study period and additional temperatures were recorded during the various biological sampling periods.

The following discussion will describe the various techniques used for sampling and evaluating the fisheries population of Lake Robinson and the lake water temperature. We will show how the two programs, biological and thermal, relate in determining the effects of the operation of H. B. Robinson Units 1 and 2 on the lake aquatic populations.

In order to collect the fish for these studies, we have used a variety of sampling gear. Gill nets (Slide 2) were used to sample fish in the deeper areas of the lake while wire traps (Slide 3), seining (Slide 4), and electrofishing (Slide 5) were used along the shoreline areas. These gear types were used to collect data on juvenile and adult fishes so that we could evaluate the species composition, relative abundance (or number of each species), and distribution of the population within the lake. To allow comparison of the weight per unit area (standing crops) with other impoundments and lakes, a method for collecting all fish from a known area was used. A quick-acting toxicant, rotenone, which can be easily neutralized and has been used extensively by fishery biologists was utilized for this purpose (Slide 6). A volume of rotenone calculated specifically for each blocked off area was used to remove all fish so that they could be identified, counted, measured, and weighed. All of these data collection techniques are accepted by biologists as appropriate for studies of this kind and have been approved by both the EPA and by the SCDHEC.

Fish used for food habit analysis were preserved after collecting and returned to the laboratory. In the lab (Slide 7) the stomachs were removed and their contents flushed into a petri dish for identification and counting under a microscope. Age and growth rates were determined from the examination of fish scales. Scales were removed in the field from the fish (Slide 8) posterior to the tip of the pectoral fin and placed in labeled scale envelopes. In the lab the scales were removed from the envelope and placed on plastic sheets (Slide 9) which were heated and pressed to form permanent scale impressions. These impressions were examined (Slide 10) under a microprojector and the age and growth increments recorded.

In evaluating reproductive activity, fish were checked for spawning condition by attempting to strip eggs or milt. The ease with which eggs and milt can be stripped is an indication of nearness to spawning activity. The number of eggs available to spawn was estimated from fish ovaries removed and preserved in the field and returned to the lab. The eggs were then separated (Slide 11) from ovarian tissue and counted in the laboratory. Larval fish collections were made from lake shoreline areas with plexiglass larval traps (Slide 12) and from the surface waters over deeper areas by towing a plankton net. In the lab larval fish were removed from the samples and identified and measured under a microscope.

Fish impingement on the plant intake screens was evaluated by washing the intake screens after a known time period, collecting the fish which had been impinged (Slide 13) and identifying, counting, measuring, and weighing the catch. Entrainment samples were collected by lowering a plankton net into the intake structure (Slide 14) and straining a known volume of water through the net to determine the volumetric rate of entrainment. The same type of net seen here (Slide 14) was used in collecting the towed larval fish samples described above.

The pictures of people using the lake for recreation shown by Mr. Sanders were taken during the creel survey. In addition to counting people engaged in various recreational activities, fishermen were interviewed, catches examined, and the information placed on a survey card (Slide 15)(Blank card). A copy of the card was left with the fishermen and they were requested to enter the time they finished fishing and the number of any additional fish caught and to return the postpaid preaddressed card.

What did we determine from this effort? We found that the fish population in Lake Robinson is typical of Southeastern blackwater lakes. The fish are living successfully in the lake and appear to be distributed relative to the available habitat. They are reproducing in sufficient numbers to maintain their population and growth appears typical.

In comparing the species (Slide 16) of fish collected from Lake Robinson to the species found in several other similar lakes, Lake Robinson had the greatest number of species. This slide which is reproduced from the 316(a) demonstration report shows that of the seven blackwater lakes from which fisheries data is available, Lake Robinson and Lake Waccamaw had by far the greatest number of species. It should also be noted that of the seven lakes only 2 report crappie, Lake Robinson and Alligator Lake. However, we noted in our report that crappie were collected in "very low numbers" and discussed the reasons for this.

Lake Robinson created an opportunity for unbounded population growth of the fishes from Black Creek. New impoundments typically provide excellent sport fishing opportunities but as the impoundment ages a greater dominance of the more prolific non-game species is likely.

Crappie populations are inherently cyclic, reaching periods of high and low abundance. It is our belief that the newly developed crappie population once reaching a low period in its natural cycle was replaced by the bluegill in Lake Robinson. Bluegills are tough competitors, having the capability of high reproductive success and flexibility in food habits.

It is our contention based upon our studies and references to the

literature, that bluegills from Lake Robinson are better competitors than the crappie and have exploited the available food resources thus preventing the crappie from attaining any substantial population size so as to enter into the fishery. The presence of young crappie and some adults in Lake Robinson indicates that they are present but only a very low number. This shift in species abundance as a result of competition for food in a low productive blackwater impoundment is typical and has been experienced in similar lakes and impoundments as a newly impoundment or lake ages.

Estimates of the number of fish in various areas of Lake Robinson (Slide 17) indicated all areas held reasonable numbers of fish during the August rotenone samples with bluegill, largemouth bass, warmouth, and chain pickerel abundant in most instances. A comparison of the fish per acre in Lake Robinson to other similar lakes (Slide 18) shows that Lake Robinson is within the range reported and has a higher fish population density than most of the others.

The second major portion of the environmental program of Lake Robinson and Black Creek, thermal monitoring, evolved in 3 phases (Slide 19).

1. The initial phase, which began in April, 1973, consisted of sampling 5 transects and 2 stations in the lake. In August, 1973, two Black Creek stations were added. An additional lake transect and a creek station were added in August, 1974.

2. A grid was added in the discharge area in April, 1975, with 33 sampling points. At the request of EPA this program was modified in August, 1975, with the number of sampling points

being reduced by one-half and additional lake stations were added.

3. In June, 1975, continuous temperature recorders were placed at 4 locations in the lake and 1 location in Black Creek below the lake.

All of these data were available and reported in the 316(a) demonstration study submitted to EPA and SCDHEC on June 30, 1976.

During the summer a maximum daily average temperature of 111°F has been experienced at the end of the discharge canal. High temperatures such as this have been generally recognized as above the thermal limits for most fish species. However, the extensive fisheries studies at Lake Robinson have indicated that reasonable populations exist despite these relatively high temperatures in limited portions of the lake. This may be a result of the fish adapting to these higher temperatures through long term acclimation; by fish behavior such as temporary avoidance of certain areas during periods of elevated temperatures; by limiting residence time in these areas, or as we believe, through a combination of these. Regardless of the mechanisms involved, the populations are reasonable and there is no reason to expect an appreciably different fish population if maximum temperatures were reduced.

Our suggested spring temperature limitations for the NPDES permit of 34.0 (93.2°F), 36.5 (97.7°F), and 38.0 (100.4°F) for maximum daily average temperatures and maximum 30-day average temperatures of 32.0 (89.6°F), 35 (95.0°F), and 36

(96.8°F) for March, April, and May, respectively and those for the other temperatures identified in the public notice are seasonal and are tailored to fit the seasonal requirements of various species. They are based on the comprehensive thermal and biological studies conducted on the lake which have shown that these temperature limits will provide areas of the lake that remain within the range of normally accepted thermal requirements for growth and reproduction of important fish species, and that a normal population will exist. The justification for the suggested spring temperatures is contained in the December 13, 1976, submittal of supplemental data to Mr. Jack Ravan of EPA. We strongly feel that these temperatures will provide for the "protection and propagation of a balanced, indigenous population of fish and wildlife in and on Lake Robinson."

Fish populations are sensitive to environmental changes and reflect these changes. If plant operations had resulted in past stresses of sufficient severity to alter fish populations, our studies would have detected these alterations. We have found, however, the fish population to be typical of other blackwater lakes. The total scope of our biological programs have shown that with Units 1 and 2 generating electricity Lake Robinson has -- to quote the regulations "provided for protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife." We are, of course, very glad to find that this power plant and its cooling lake, constructed in the late 1950's, are compatible with today's standards of environmental protection.