

## Omaha Public Power District

1623 HARNEY \* OMAHA, NEBRASKA 68102 \* TELEPHONE 536-4000 AREA CODE 402

August 1, 1979

Director of Nuclear Reactor Regulation  
Attn: Mr. Robert W. Reid, Chief  
Operating Reactor Branch No. 4  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Re: Docket No. 50-285

Gentlemen:

The Omaha Public Power District submitted an Application for Amendment of Operating License dated May 4, 1979, requesting that Appendix B of the Fort Calhoun Technical Specifications (Nonradiological Environmental Specifications) be deleted. All of the monitoring requirements and discharge limits contained in these Technical Specifications are contained in the stations National Pollution Discharge Elimination System ("NPDES") permit with the exception of seven components.

Of those seven components, impingement and ichthyoplankton have been studied under the conditions of the NPDES permit and these studies are no longer required by the NPDES permit. Another one, the thermal plume, was studied by the District under the Nebraska Department of Environmental Control ("DEC") State Certification Program prior to the implementation of NPDES and was not included in the permit. The DEC did not deem it necessary to include the remaining four components,  $\Delta T$ , periphyton, macroinvertebrates and fish to determine the plant's acceptability under Section 316 of the Clean Water Act.

In summary, the District has satisfied the DEC as the appropriate authority concerning its monitoring program and, therefore, the annual cost of \$84,000 for the additional monitoring programs required by the NRC is unjustified.

In response to a request from a member of your staff, the District has prepared a justification demonstrating that deleting all the nonradiological water quality monitoring and reporting requirements from Appendix B of the Technical Specifications will not result in any adverse environmental impact.

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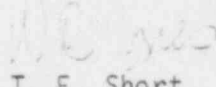
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This technical discussion is submitted without prejudice to the District's position as expressed in its Application that all such requirements are beyond the Commission's jurisdiction and should, therefore, be deleted from the Technical Specifications as a matter of law.

Sincerely,

  
T. E. Short  
Assistant General Manager

TES/KJM/BJH/sd

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ATTACHMENT

## Technical Specification Section 1.2

It is believed that the  $\Delta T$  requirements as described in Appendix B to operating license DPR-40 (Technical Specification 1.2) should be removed. This recommendation is based on the result of the analysis of the effect of delta temperature on the organisms entrained in Fort Calhoun Station's (FCS) once-through condenser cooling system. Of the populations studied (macroinvertebrates, zooplankton, phytoplankton, and ichthyoplankton), the ichthyoplankton population has been shown to experience the highest percentage of entrainment mortality (70%) (King, 1977). "Worst case" estimates of total river effects have been made assuming 100% mortality as well as the average measured level of 70%. Under both conditions the effect on the total larval assemblage passing the station has been estimated to range from 2.6% (King, 1977) to 5.96% (Omaha Public Power District, 1976). Larval fish entrainment data was presented to the State of Nebraska Department of Environmental Control (DEC) in compliance with the station's NPDES permit.

As a result of their evaluation, no further ichthyoplankton monitoring was required under the conditions of the station's NPDES permit. The District believes that no impact in addition to the 5.96% on the ichthyoplankton will result from the elimination of the  $\Delta T$  requirements. Our judgement is based on the fact that entrainment mortality greater than 100% cannot be achieved and that the plant operating conditions are not expected to change.

Currently, the plant operates with 360,000 gpm of circulating water supplied by three circulating water pumps. Under full load (481 MWe)  $\Delta T$  ranges from 19 to 20°F with the three circulators in service. These temperature conditions will not change unless a circulator malfunction is encountered. Under two circulator operation, where water flow is reduced to 240,000 gpm and unit efficiency is sacrificed,  $\Delta T$  could approach 30°F. It is expected this temperature condition would be of short duration, however, if it occurs due to the need to restore full plant capability. Plant load would be reduced under any circumstances to maintain compliance with the effluent's thermal maximum described in Technical Specification 1.1, which is also part of the station's NPDES permit.

Due to the brief period of exposure (2 to 3 minutes) to elevated temperatures at Fort Calhoun Station, the effects of plant entrainment on the zooplankton, phytoplankton, and macroinvertebrate populations has been negligible. Maximum total river effects for zooplankton have been estimated at 0.6% (Rodgers, 1977); for macroinvertebrates at 0.6% (Carter, 1977); and for phytoplankton at <0.4% (Kline, 1977). Due to the fact that the plant will continue to operate under the current circulating water conditions described earlier and that the plant will continue to be in compliance with the NPDES imposed thermal maximum on the effluent, no significant increase in total river effect is anticipated.

In our judgement, there will be no adverse environmental impact as a result of removing the  $\Delta T$  requirements from the Technical Specifications.

Carter, Steven R. 1977. Macroinvertebrate Entrainment Study at Fort Calhoun Station in L. Jensen ed. Fourth National Workshop on Entrainment and Impingement. EA Communications; Melville, N. Y.

King, Ronald G. 1977. Entrainment of Missouri River Fish Larvae through Fort Calhoun Station in L. Jensen ed. Fourth National Workshop on Entrainment and Impingement. EA Communications; Melville, N. Y.

Kline, Phillip A. Phytoplankton Entrainment Study in S. Carter ed. Operational Environmental Monitoring In the Missouri River Near Fort Calhoun Station, October 1973 through 1977. Summary Report to Omaha Public Power District, Omaha, Nebraska.

Rodgers, Gary R. 1977. Entrainment of Crustacean Zooplankton Through Fort Calhoun Station in L. Jensen ed. Fourth National Workshop on Entrainment and Impingement. EA Communications; Melville, N. Y.

### Technical Specification Section 2.1.2

The Technical Specification to monitor the thermal plume at Omaha Public Power District's 481 electrical gross megawatt Fort Calhoun Station Unit No. 1 is based upon the Mixing Zone Statement which was a part of the Nebraska Water Quality Standards adopted by the Nebraska Environmental Control Council on June 19, 1972. The incorporation of the thermal plume monitoring into the Technical Specifications was to insure compliance with the State of Nebraska's Water Quality Standards. Temperature monitoring would determine the physical dimensions of the thermal plume under fluctuating Missouri River flow and variable operating conditions of the station. Compliance with the Mixing Zone Statement would be determined by thermal plume monitoring.

The original intent to satisfy the 1972 requirements has become obsolete due to the promulgation of the revised Water Quality Standards issued effective June 30, 1976, and amended September 26, 1976, and December 27, 1976. This new set of standards exempts effluents from mixing zone requirements as were specified in the 1972 regulations. The change in the Water Quality Standards was based on the implementation of regulations by the Environmental Protection Agency under the authority of the Federal Water Pollution Control Act. These regulations made thermal effluents illegal with the exception of units as specified in the Code of Federal Regulations (40 CFR Part 423) that are smaller than 500 MW or were in service before January 1, 1974. These units did not have a thermal effluent limitation. Fort Calhoun's thermal discharge to the Missouri River operates on National Pollutant Discharge Elimination System Permit No. NE0000418 and has as its only temperature requirement a thermal maximum.

In support of the deletion of this Technical Specification is the extent of the data generated, that demonstrates plume configurations under commonly occurring plant operating and river flow conditions. Thermal plumes were conducted when flows ranged as low as 14,000 cfs to as high as 67,000 cfs. Since the Missouri River is characterized by wide variations in river flow, the monthly thermal plume mappings are indicative of these flow patterns. Flows recorded by the U. S. Geological Survey (USGS) at Omaha, Nebraska during the five-year study period ranged during the winter months from about 10,000 cfs to 22,000 cfs. Five thermal plumes were mapped, representing these winter flow conditions. Data from three of these five plumes was collected by aerial infrared scanning due to the fact that hazardous winter conditions and heavy ice flow generally inhibited thermal measurements by boat. During the spring and summer months, the USGS recorded river flows ranging from 30,000 to 50,000 cfs. Thermal plume measurements were taken on 26 occasions which represent this range of conditions. Occasional peaks in flow beyond 60,000 cfs were recorded by the USGS and five thermal plumes were taken to represent these conditions. The thermal plume data collected is typical of Missouri River flows as recorded by the USGS during the five-year study period.



Although Technical Specification 2.1.2 requires monthly thermal plume surveillance for at least the first two years of plant operation, surveillance has continued since 1973, and currently there is five years of data which has been collected by Omaha Public Power District, the Nebraska State Department of Environmental Control (DEC), and Texas Instruments, Inc. Aerial infrared temperature recordings were taken by Texas Instruments. Surface and triple depth plume data was collected throughout the five year study. This data indicated that the magnitude of the thermal plume dimensions is dependent primarily upon percent power (total BTU's of heat discharged), Missouri River flow, and circulating water discharge flow. Under all conditions tested to date, a zone of passage for the movement or drift of fish and aquatic biota has been maintained. This was documented in the District's Five-Year Report which has been submitted to the Commission on July 24, 1978.

Another requirement which was incorporated into Technical Specification 2.1.2 was the development of a mathematical thermal plume model. The modeling concept was intended to mathematically predict the dimensions of the thermal plume so that compliance with the Water Quality Standards could be estimated under the varying plant power and river flow conditions. It is believed by the District that development of theoretical modeling for a predictive estimate of the nature of the thermal plume has lost significance from its once intended purpose. The extensive accumulation of thermal plume data over five years has eliminated the need for modeling. High, average, and low river flow plumes have been recorded, such that the nature of the Fort Calhoun Station's thermal plume has been clearly defined. The biological influence of the thermal plume has been monitored throughout the five year study and was reported upon in the Fort Calhoun Station Unit No. 1 Five-Year Report previously submitted to the Commission. The operation of the Fort Calhoun Station has had minimal effects on the availability and composition of phytoplankton, zooplankton, and macroinvertebrates in the drift of the Missouri River. The impact of the station on the distribution and abundance of forage fish has been negligible.

Due to the fact that there are no current thermal plume regulations at the Fort Calhoun Station, and because there exists a well documented record of thermal plume, it is the District's belief that thermal plume monitoring should be discontinued. It is also the District's opinion that the purpose of thermal plume modeling has lost significance due to the extensive data base generated.

#### Technical Specification Section 2.2

It is recommended that Technical Specification 2.2, entitled "Monitoring and Reporting on Loss of Biota by Impingement", be deleted as a requirement at the Fort Calhoun Station Unit No. 1. This ongoing surveillance study has been continuing since May of 1973. All data from 1973 through 1977 was compiled and reported upon in the station's Five-Year Report which was submitted to the Commission on July 24, 1978.

The deletion of this requirement is based upon the fulfillment of the studies' specific objectives. The number, species, size, quantity, and physical condition of fish and other aquatic fauna impinged on the traveling screens were determined and reported. Daily samples were collected at noon (+2 hours) and midnight (+2 hours) from May through September, and at noon only (+2 hours) from October through April. A total of 2,345 hourly samples was collected during the 56-month study. In addition, 24 hour impingement studies were conducted on 29 occasions from 1974 through 1976 to determine diurnal impingement rates.

Freshwater drum and gizzard shad were the most common species impinged throughout the study except in 1976 when channel catfish were the second most common fish collected. The size of the impinged fish were generally less than 100 mm in length. Approximately 50% of the fish sampled were recorded as dead, although the annual percentage classified as dead ranged from 30.7% in 1976 to 73.4% in 1974. Of the two major species impinged, gizzard shad had the lowest percent of individuals classified as alive (28.3%) followed by freshwater drum (38.2%). The survival rate, classified as alive, for channel catfish was 71.8%.

"Variations in the rate of impingement was related to the natural variability in water temperature, spawning and recruitment success, seasonal distribution and abundance of fishes, and controlled river flows. A comparison of hourly and 24 hour studies indicated that the daily studies provided an accurate estimate of monthly impingement rates (King, 1978)."

By projecting the monthly impingement rates, it was estimated that approximately 500,000 fish were impinged at the Fort Calhoun Station from May, 1973, through December, 1977. The impact of the removal of these fish can be put into perspective by analyzing fish population data collected in the vicinity of the station. Studies conducted by NALCO Environmental Sciences near the vicinity of the Fort Calhoun Station has shown no modification in the fish population's total size, relative species composition, or age-class distribution such as to be attributable to impingement losses. Based upon catch rate and the size of fish near the station, changes in the fish community have not been noted. The numerical catch varied substantially among years, but species relative abundance was similar from 1973 through 1977. The combined average catch per unit effort (CPE) for the five most abundant fish caught by electroshocking was consistently higher at locations on the Iowa shore than at locations on the Nebraska shore. The sections sampled along the Iowa shore included quiet water habitat behind wing dikes, which provides better resting and feeding habitat than the channelized cutting bank habitat along the Nebraska shore. The CPE downstream of the thermal discharge on the Nebraska side of the river was higher than the upstream Nebraska side location which indicated that fish generally did not avoid the area of thermal influence. The average size of fish collected throughout the five years was quite uniform indicating fish stocks have not been reduced. Hesse & Wallace (Nebraska Game & Parks Commission, 1976) reported that little effect could be attributed to the operation of the station.



As previously stated, the majority of the fish impinged at the Fort Calhoun Station were generally less than 100 mm in length representing the young-of-the-year fish. Under natural conditions, young-of-the-year fish have high mortality rates (>90.0%) (Marcy, B. C., Jr., 1974). Although natural mortality coupled with fish losses due to impingement may reduce the juvenile population, the overall effect of impingement at the Fort Calhoun Station appears to be minimal. Few adult fish are impinged and are thus left in the natural environment for breeding purposes. Five years of fish population studies indicate no alteration in the abundance and diversity of fish near the station. This is a strong indication that the losses due to impingement have not affected the Missouri River fishery ecosystem.

Another consideration for deletion of this monitoring requirement is based upon an evaluation of the impingement data by the Nebraska Department of Environmental Control. After a review of the Intake Monitoring Report for the Fort Calhoun Station, produced in compliance with NPDES Permit No. 0000418, they concluded that losses due to impingement were within an acceptable range and that further monitoring was unnecessary.

As a result of this five-year surveillance program, it was determined that no long-term adverse changes have occurred in the ecosystem as a result of plant operation. The District believes that the impingement study is no longer needed and should be deleted as a Technical Specification requirement.

#### Technical Specification Section 3.1

It is recommended that Technical Specification 3.1, entitled "Periphyton, Macroinvertebrate, and Fish", be deleted as a requirement at the Fort Calhoun Station Unit No. 1. This ongoing study consisted of pre-operational investigations (1971-1972) and investigations conducted while the plant has been in operation (1974-1977). All data from these primary, secondary, and tertiary populations were compiled and reported in the station's Five-Year Report, which has been submitted to the Commission on July 24, 1978. The request for deletion of this requirement is based upon the results of the data and the overall fulfillment of the studies' specific objectives.

Periphyton and macroinvertebrate studies were conducted by three separate groups (i.e., Environmental Protection Agency (EPA), Region VII, 1971-1972; EPA and NALCO Environmental Sciences (NALCO), 1974; EPA, NALCO, and Ecology Consultants Incorporated (ECI), 1975; and ECI, 1976-1977). All biological collections were conducted by Omaha Public Power District (OPPD) with the exception of the EPA which collected its own samples.

Results of all periphyton and macroinvertebrate monitoring studies at the Fort Calhoun Station indicate that the station's thermal discharge influenced the assemblages of these organisms in the immediate vicinity of the station, 100 feet downstream from the thermal discharge. These effects were localized and rarely statistically significant. After reviewing studies conducted by the Nebraska State Department of Environmental Control on the Missouri River, the District believes that the natural variations within these parameters in the Missouri River are greater than the localized variations attributable to the thermal discharge. Biochemical reaction rates are normally accelerated by increases in temperature. This was verified by higher productivity (based upon chlorophyll a values of periphyton and biomass of macroinvertebrates) in the immediate area of the thermal discharge. Comparisons of productivity levels further downstream of the thermal discharge were comparable to upstream or unaffected river conditions indicating that the increased productivity was very localized in the immediate discharge area.

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Biomass analysis from macroinvertebrates samples was normally greater at the most thermally effected zone except on certain occasions which normally occurred during the hot summer months when temperatures were greater than 30°C. During these periods, the locations upstream from the thermal discharge and 2,000 feet downstream of the discharge generally exhibited higher biomass than the location nearest to the immediate discharge 100 feet downstream.

Analysis of the periphyton community studied throughout the five year program indicate an increase in chlorophyll a and total pigment values of samples located 100 feet downstream of the discharge. These increases favored the production of certain bluegreen algae, but no significant effect was detected on the structure of the periphyton community at this location when temperatures were greater than 30°C. Further downstream from the immediate thermal discharge (2,000 feet downstream), the periphyton community was similar to the unaffected location upstream from the discharge. The results obtained indicate that the thermal effect was localized in the area of the immediate discharge.

NALCO conducted fish population studies near the Fort Calhoun Station and noted that no changes had occurred in the fish community structure near the station. This conclusion was based upon catch rate and the size of fish throughout the five year study. Also, Hesse & Wallace (Nebraska Game & Parks Commission, 1976) reported that little effect could be attributed to the operation of the station.

In conclusion, the District believes that preoperational and post-operational data provide sufficient evidence to show that the only effect the operation of the Fort Calhoun Station has caused upon the primary and secondary populations is localized in a small area at the immediate thermal discharge from the plant. Also, the tertiary consumers have not been influenced by station operation as evidenced by five years of fish population studies. The extensive data already generated indicate no further need to continue monitoring as specified in Technical Specification 3.1. It is therefore recommended that this specification be deleted from Appendix B to Operating License DPR-40.

### Technical Specification Section 3.2

The ichthyoplankton entrainment study in the Missouri River near the Fort Calhoun Station was initiated in April, 1974. The goal of the study was to evaluate the impact of station operation on drifting larval fish that were subjected to condenser and plume entrainment. The study was designed to fulfill monitoring requirements as specified in Technical Specification 3.2 of Appendix B to Operating License DPR-40 for the Fort Calhoun Station Unit No. 1 and to provide information to meet the station's NPDES permit. Accumulative results were presented in the station's Five-Year Report, which was submitted to the Nuclear Regulatory Commission as scheduled in July, 1978. Data on species composition and abundance, horizontal and vertical distribution, and viability of larvae collected from the intake, discharge, and plume locations were used to determine the impact of station operation on the larval fish community. The following discussion is an excerpt from studies presented in the Fort Calhoun Station's Five-Year Report (King, 1978).

The larval fish assemblage in the Missouri River was dominated by freshwater drum, catostomids, carp, and Stizostedion sp. Freshwater drum were the most abundant larvae collected, comprising from 43.7 (1974) to 88.2% (1977) of the total yearly larval catch. Catostomids, including carpsucker (Carpiodes sp.), white sucker, buffalo (Ictiobus sp.), and redhorse (Moxostoma sp.) were the second most common larvae encountered. Combined, freshwater drum and catostomids accounted for 95.4% of the larvae collected during the study.

The occurrence of larval fish in the drift followed similar patterns throughout the 5 year study. The sauger-walleye group (Stizostedion sp.) and Catostomidae, primarily Ictiobus sp., were the dominant taxa in May and freshwater drum and catostomids, primarily Carpiodes sp., were dominant from June through July. The relative abundance of larvae did not necessarily correspond to the relative abundance of adult fish present in the vicinity of the station. Game fish, including white bass, Lepomis sp., yellow perch, Pomoxis sp. and sauger-walleye comprised less than 1% of the larvae collected. These fishes are either nest builders or random spawners which lay adhesive or demersal eggs. Spawning characteristics combined with low relative abundance of adults near the station probably account for the low occurrence of game fish larvae in the drift. In contrast, freshwater drum comprised 3.9% of the adult fish in the vicinity of the station in 1977; however, 90% of the larvae in the drift were drum. Freshwater drum are pelagic spawners (Davis 1959; Nelson et al. 1967) which probably accounts for the high relative abundance of drum larvae in the drift. Other fishes that are either random or pelagic spawners whose larvae commonly occurred in the drift included carp, catostomids, gizzard shad, and goldeye which are common species in the vicinity of the station.

The horizontal distribution of larval fish was determined on each sampling date to estimate the percentage of larvae that were exposed to entrainment. Results of the transect studies

indicated significantly ( $p \leq 0.05$ ) higher densities along the cutting bank of the river, adjacent to the station's intake structure. Densities generally were lowest at the mid-channel location. Larval densities near the filling bank varied but were generally similar to those at the mid-channel location. Species composition was similar along the transect.

The vertical distribution of larval fish in the Missouri River has not been as extensively studied as horizontal distribution because of high river velocity and the difficulty in obtaining mid-depth and bottom samples. Data collected from the intake and discharge locations suggest that larvae also exhibit a heterogeneous vertical distribution. Intake densities averaged approximately 55% higher than discharge densities over the 5 year study. Differences between locations generally were most pronounced during peak periods of larval abundance, which corresponded to high relative abundance of freshwater drum.

In 1977, the vertical distribution of larvae was determined near the intake structure by Omaha Public Power District personnel. The results of this study documented a significant ( $p \leq 0.05$ ) decrease from surface to bottom in vertical distribution (Omaha Public Power District, unpublished data). Mean surface and bottom densities differed by a factor greater than three.

Entrainment effects were determined only during periods of heat transfer, which prevented the separation of mechanical and thermal effects. The estimated entrainment losses ranged from 2.6 to 5.3% of the total larval assemblage.

The deletion of Technical Specification 3.2 from the operating license at the Fort Calhoun Station is recommended by the District. Support for the deletion of this requirement was provided by the Nebraska Department of Environmental Control (DEC). After a review of the Intake Monitoring Report for the Fort Calhoun Station, produced in compliance with NPDES Permit No. 0000418, it was concluded that larval fish losses due to entrainment were within an acceptable range and that no further monitoring would be required by the DEC.

Based upon the conclusion as presented in the Fort Calhoun Station's Five-Year Report, submitted to the Commission on July 24, 1978, it can be seen that all objectives of the study as defined in Technical Specification 3.2 have been clearly met. It is the District's belief, which is also supported by the Department of Environmental Control, that the level of larval fish entrainment is within an acceptable range and that further monitoring is unnecessary. It is therefore recommended that Technical Specification 3.2 be deleted as a requirement of the Fort Calhoun Station Unit No. 1.