WCNOC EM 02-89

WOLF CREEK GENERATING STATION

ANNUAL ENVIRONMENTAL OPERATING REPORT

1988

ENVIRONMENTAL MANAGEMENT SECTION

WOLF CREEK NUCLEAR OPERATING CORPORATION

P.O. BOX 411

BURLINGTON, KS 66839

PUBLISHED APRIL 1989

PREPARED BY

DAN HAINES

IE25 1/1

WOLF CREEK NUCLEAR OPERATING CORPORATION
WOLF CREEK GENERATING STATION

1988 ANNUAL ENVIRONMENTAL OPERATING REPORT

1.0 INTRODUCTION

Wolf Creek Generating Station (WCGS) has committed to minimizing the impact of facility operation on the environment. The 1988 Annual Environmental Operating Report is being submitted in accordance with the objectives of the Environmental Protection Plan (EPP) as required by Facility Operating License NPF-42. The report is to demonstrate that the plant operated during 1988 in an environmentally acceptable manner.

2.0 ENVIRONMENTAL MONITORING

2.1 AQUATIC [EPP Section 2.1]

2.1.1 Impacts of Water Withdrawal on the Neosho River

The owners have contracted with the Kansas Water Resources Board to pump 9.672 billion gallons per calendar year from the tailwaters of the John Redmond Reservoir (JRR) to Wolf Creek Cooling Lake (WCCL). During 1988, 3.876 billion gallons or 40 percent of this allotment was used. Auxillary raw water was pumped at a rate of approximately 1.3 million gallons per day which comprises about 13 percent of the total pumped. The remainder was transferred via the make-up pumps operated from June 16 through June 30 and from August 12 through September 15, 1988. Based on monitoring studies completed during the year, no changes attributable to these withdrawals have been witnessed in the river water quality or phytoplankton biomass.

2.1.2 Chlorine Discharges to Wolf Creek Cooling Lake

Total residual chlorine (TRC) was postulated in Section 4.2.6.1 of the Final Environmental Statement/Operating License Stage (FES/OLS) to range between 0.68 and 1.08 mg/l at the Circulating Water System (CWS) discharge. Three 30-minute doses per day at 411 pounds of chlorine per dose were projected to produce these concentrations. These chlorine doses were expected to cause periodic, appreciable mortality among aquatic organisms in a conservatively estimated 40 acres of the discharge area of WCCL (Section 5.5.2.2, FES/OLS).

Administered by the Kansas Department of Health and Environment (KDHE), the WCGS National Pollutant Discharge Elimination System (NPDES) permit allows TRC to be a maximum of 0.2 mg/l in the circulating water effluent. Chlorine dose duration is limited to two hours per day. In practice, WCGS has fallen well below the NPDES allowable limits. Actual chlorine dosages to the CWS have averaged approximately 61 pounds per day. Compliance with the daily maximum TRC limit was 100 percent. Compliance with chlorination dose durations was greater than 99 percent. Monitoring during 1988 detected a daily average TRC concentration when the CWS was operational of less than 0.1 mg/l, well below the 0.2 mg/l permitted level. In Section 5.5.2.2 of the FES/OLS, the proposed chlorination treatments were not expected to meaningfully affect the overall biological productivity of WCCL. Because the actual monitored values during CWS chlorination were well below the evaluated levels and no fish mortalities

attributable to chlorination were observed, permitted chlorine discharges during 1988 were not considered to have had appreciable effects on the cooling lake environment.

Allowance in the NPDES permit was provided to enable WCGS to discharge chlorinated water from the Service Water System (SWS) when the CWS was not operating. During the 1988 refueling outage, this situation existed. The CWS was taken out of service on October 9 and remained off until November 28, 1988. Both the CWS and SWS were not operated from November 8 through 13, 1988. The WCGS need for higher TRC concentrations in the SWS flow during normal operations was not of environmental concern because of the immediate dilution of chlorine levels once the SWS flow was combined with CWS discharge. The SWS comprises approximately eight percent of the normal CWS flow and normal chlorine monitoring of the CWS verified significant chlorine dilution. Without CWS flow, however, the SWS discharged without dilution to WCCL. Permit TRC limits may be established for this discharge once sufficient data are collected. As of this report, the KDHE has not limited chlorine while in this operational mode. Average TRC measured at the SWS confluence with the CWS was 0.8 mg/l. By the time this flow path reached the WCCL discharge, TRC was reduced to an average of 0.5 mg/l. The average daily chlorine dose to SWS during this period was 650 pounds. Both the observed average TRC and actual dose rates were below the range evaluated in the FES/OLS (0.68 to 1.08 mg/l TRC at 1233 pounds/day). Within this range chlorination effects were judged to be acceptable (Section 5.5.2.2, FES/OLS).

A different operational mode used during 1988 resulted in a third chlorine discharge route to the cooling lake. A portion of the SWS flow was diverted to the Essential Service Water System (ESWS) and discharged to the Ultimate Heat Sink (UHS), which is part of the cooling lake. This was done to supply warming lines that prevent ice formation at the ESWS intake. This diverted flow was continuous and had no additional chlorine added over that dosed to the SWS. The KDHE approved this discharge and TRC data collected during 1988 will be used to establish limits to this discharge. This flow will be monitored as a new NPDES outfall. These data, collected from February 12 through March 13, 1988, ranged from 0.01 to 0.41 and averaged 0.2 mg/l TRC. This is below the evaluated range of 0.68 to 1.08 mg/l TRC, which was judged to be acceptable (Section 5.5.2.2, FES/OLS). Further evaluation by WCGS personnel demonstrated that no increases in chlorine effects to the WCCL biota over those previously evaluated would result from this flow diversion during winter conditions (EPP Evaluation 88-04 summarized later).

2.1.3 Cold Shock

In the event of a rapid decline in plant power level during winter, fishes attracted to the WCGS heated discharge could experience mortality due to "cold shock", a quick reduction in body temperature. In reference to licensing document evaluations, the WCGS EPP Section 2.1 (c) states, "Cold shock effects on fish due to reactor shutdowns could cause significant mortality to aquatic species in the cooling lake". In 1988, cold shock mortality events due to plant shutdowns were observed, however, they were judged not to be greater than impacts anticipated in licensing documents.

2.1.4 Impingement and Entrainment

Impacts of entrainment and impingement were projected to be significant in the WCGS EPP. Condenser mortality for entrained organisms was expected to approach 100%. Because of this, sampling efforts to monitor entrainment impacts were not required by the Nuclear Regulatory Commission (NRC) and have not been implemented by WCGS. Through casual observations, fish impingement at the WCCL circulating water intake was considered minimal, thus no sampling efforts to monitor impingement impacts have been implemented.

2.1.5 Impacts of Wolf Creek Cooling Lake Discharges to the Neosho River

Cooling lake discharges into the Neosho River are regulated by NPDES permit limitations. Since discharges are sporadic, chiefly from stormwater runoff and infrequent blowdowns, water is sampled on the first day of each discharge and weekly thereafter until the end of each respective discharge. Effluent parameters measured include a flow rate estimate, temperature, pH, TDS, sulfate, and chloride concentration. Discharges are regulated to maintain a zone of passage in the Neosho River for aquatic organisms at the Wolf Creek confluence. Consequently, the flows allowed from WCCL may range from zero to unrestricted, depending upon the water quality and temperature similarities with the Neosho River. A maximum of 90 ^{0}F is allowed in the Neosho River downstream of the mixing zone from Wolf Creek. In 1988, no NPDES violations at the WCCL dam (Outfall 004) were recorded. At no time

did water quality criteria restrict WCCL discharge to the Neosho River. Based on monitoring studies completed, there have been no apparent deleterious effects to Neosho River water quality or phytoplankton biomass due to WCCL discharges.

2.2 TERRESTRIAL [EPP Section 2.2]

2.2.1 Control of Vegetation in the Exclusion Zone

The composition and structure of vegetation in the 453 ha (1120 acre) exclusion zone were selectively controlled to be compatible with the function and security of station facilities. Most areas in the immediate vicinity of the power block have been planted and maintained in a lawn-type condition. Other areas within the exclusion area have been mowed for security and aesthetic purposes.

2.2.2 Vegetation Buffer Zone Surrounding Wolf Creek Cooling Lake

To create a 500 acre buffer zone around WCCL, all agricultural production activities were curtailed in 1980 below an approximate elevation of 1095' MSL, eight feet above WCCL normal operating surface water elevation (1087' MSL). This border ranges from approximately 200 to 400 feet adjacent to the lake shoreline. Previously grazed or hayed native tallgrass areas were left undisturbed. Cultivated lands were allowed to advance through natural successional stages or native grass stands were reestablished. Land management activites specified in an annual land management plan included controlled burning and native tallgrass seeding to enhance and/or maintain the

designated buffer zone with a naturally occurring biotic community.

2.2.3 Herbicide Use for Maintenance of Wolf Creek Generating Station Structures

A soil sterilant was applied on selected gravel areas of WCGS. These include the Protected Area Boundary, various lay-down storage yards, meteorological tower, support building borders, storage tank berms, switchyard, hazardous waste and waste oil storage areas, and on-site railroad beds. The herbicides applied consisted of 8 pounds of Karmex (EPA Reg. No. 352-247) and 4 to 6 pounds of Oust (EPA Reg. No. 352-401) per 100 gallons of water. Application rates ranged from 20-50 gallons per acre. A one percent solution of Roundup (EPA Reg. No. 524-308-AA) with water was also used in selected areas. These herbicides are registered by the Kansas Department of Agriculture. No environmental impacts from herbicide treatment of WCGS facilities were identified.

No herbicides were applied to the transmission right-of-ways associated with WCGS during 1988.

2.2.4 Waterfowl Disease Contingency Plan and Monitoring

A waterfowl disease contingency plan was maintained to provide guidance for station biologists in the event of suspected or actual disease outbreaks. The contingency plan lists appropriate federal and state wildlife agency contacts to be made by WCGS in the event of such problems. During routine wildlife monitoring and surveillance

activities taking place over this reporting period, no avian mortality attributable to disease pathogens was identified.

2.2.5 Fog Monitoring Program [EPP Subsection 4.2.1]

Visibility monitoring was initiated in December 1983 and continued through 1987. The purpose of this study was to evaluate the impact of waste heat dissipation from WCCL on fog occurrence along U.S. 75 near New Strawn, Kansas. Upon conclusion of the 1987 data collection, its was determined that sufficient information was available to evaluate cooling lake fogging and all commitments relevant to fog monitoring had been satisfied. Because no problems were identified by these data, no formal fog monitoring program was completed during 1988. Through casual observations, Environmental Management personnel did not observe any incidents of man-made fog along U.S. 75 during 1988. In addition, there were no reports of such incidents from individuals or local agencies responsible for traffic safety. Implementation of mitigative actions or further monitoring was not warranted.

2.2.6 Wildlife Monitoring Program [EPP Subsection 4.2.2]

A wildlife monitoring program was initiated to monitor and assess wildlife populations or parameters most likely to be impacted by the operation of WCGS. As outlined in the 1987/1988 annual wildlife study plan, specific objectives of the wildlife monitoring program were to assess waterfowl, waterbird, and bald eagle usage of WCCL, to

assess transmission line collision mortality of waterfowl using WCCL, and to develop an annual wildlife report. Because these annual monitoring programs target each migration season (autumn through early spring), this EPP reporting period overlaps with part of the 1988/1989 monitoring program. The objectives of this program were the same as for the 1987/1988 season minus the transmission line collision assessment. Wildlife monitoring activities are summarized in Attachment 1 of this report.

2.2.7 Land Management Program [EPP Subsection 4.2.3]

Land management activities on all company-owned lands except the 453 ha (1120 acre) WCGS exclusion area were designed to achieve balances between agricultural production and conservation values. An annual management plan was formulated to address needs and propose accepted techniques for land maintenance, soil conservation, and wildlife management. These included construction or repair of livestock fences and ponds, and the construction or establishment of terraces, waterways, and permanent vegetative covers. A summary of the 1988 Land Management Report appears in Attachment 1 of this report.

3.0 ENVIRONMENTAL PROTECTION PLAN REPORTING REQUIREMENTS

3.1 PLANT DESIGN OR OPERATING CHANGES [EPP Section 3.1]

Proposed plant design and operational changes which have the potential to affect the environment must receive an environmental evaluation prior to implementation. A summary of each Plant

Modification Request or operating change which received an environmental evaluation in 1988 is presented. There were no changes in station design or operation nor were there tests or experiments that involved an unreviewed environmental question during 1988.

Evaluation 88-01: Application of Hydrochloric Acid to Circulating Water Screen House Floor

This evaluation covered concerns with the by-products of an etching process required to prepare floors for a non-slip surface. This was to be done in the Mechanical Pump Room at the Circulating Water Screen House. Since the pH of the hydrochloric acid (muriatic acid) used would be neutralized before it was rinsed into the intake bays, no environmental impacts would occur. In the rinse, total dissolved solids and total suspended solids would be minor when diluted in the CWS flow and discharged to the cooling lake. No significant increase in evaluated environmental impacts would result from this project.

Evaluation 88-02: Processing of High TDS Collector Tanks to the Site Oily Waste Separator through Turbine Building Sump

An environmental evaluation was required due to an operational procedure revision involving the flow path of a plant effluent. The procedure allowed for the High TDS Collector Tanks to be drained and ultimately discharged to the cooling lake via the Oily Waste Separator. The discharge point is an NPDES monitored outfall and this effluent routing had been

acknowledged and approved by the KDHE. The procedure's intent was to allow a back-up route for these tanks when the Wastewater Treatment Facility was inoperable. No increase in evaluated impacts would result from this operational procedure.

Evaluation 88-03: Processing of Low TDS Collector Tanks to the Site Oily Waste Separator through Turbine Building Sump

This environmental evaluation was identical to Evaluation 88-02. The procedure covered operation of the Low TDS rather than the High TDS Collector Tanks. Routing through the Oily Waste Separator was approved by the KDHE and this is a monitored NPDES outfall. No increases in evaluated impacts would result.

Evaluation 88-04: Diversion of Heated and Chlorinated Service Water System Flows to the Ultimate Heat Sink

This was an evaluation of the environmental impacts from diverting a portion of the heated and chlorinated Service Water System (SWS) flows to the Ultimate Heat Sink (UHS) in the cooling lake during winter conditions. The purpose was to supply warming lines to prevent ice formation at the Essential Service Water (ESW) intake and to provide chlorinated water to the ESW components to reduce microbiologically induced corrosion. These flows normally are discharged to WCCL with the CWS. The diverted flow was routed to the UHS discharge, 2[illegible] feet under the surface of the cooling lake.

Because flow was low, the area of WCCL affected by the heated and chlorinated discharge was minute, basically limited to the

immediate vicinity of the underwater discharge structure. It was concluded that no increases above those evaluated for the CWS discharge would result from discharging heated and chlorinated SWS flows to the UHS. The temperatures and TRC concentrations measured combined with the small flows would not significantly increase the exposure of the WCCL fishery to cold shock, increase area waterfowl disease or depredation events, nor increase chlorine effects on the cooling lake biota during winter conditions.

Evaluation 88-05: Auxiliary Building and Control Building Pressure Test

This evaluation involved a temporary procedure change to allow routing the discharge of the condenser vacuum pumps to the turbine building. This discharge normally went to the unit vent from the condenser air removal/absorber unit. Air and water vapor were the effluent components considered within the scope of this evaluation. Thus, no adverse environmental impacts would result.

Evaluation 88-06: Temporary Modification for the Injection of Betz Powerline WCN01 into the CWS

This evaluation covered the impacts associated with chemical application to inhibit scale formation in the CWS condensers to improve plant performance. The chemical was an organic phosphonate liquid (Betz Powerline WCN01). Its initial high pH would present no environmental problem because of its low feed rate (70 gallons per day) when compared to CWS (500,000 gpm). The concentration of the chemical was at approximately 1/10,000

of that evaluated and found to cause no mortality in test organisms. Consequently, no adverse environmental impact to WCCL would occur.

Evaluation 88-07: Temporary Procedure Change Routing Regenerative Waste to the Lime Sludge Pond

This procedure change covered an interim method to route water treatment regenerative wastes to the Lime Sludge Pond (LSP). Discharge from the LSP to the cooling lake is an NPDES monitored discharge (Outfall 005). The only environmental concern with this discharge was that of pH. Mechanisms to insure proper pH compliance before being discharged into and subsequently out of the LSP were identified. Thus no environmental impacts would occur.

Evaluation 88-08: Hazardous Waste Storage Area Upgrading

This evaluation covered the environmental impacts associated with construction and upgrading of the Hazardous Waste Storage Facility. Improvements were to include a concrete slab, concrete coatings, guttering, a drainage system, and potable water. The major environmental concern was with the etching of the concrete with hydrochloric acid (muriatic acid) for chemical resistant surface preparation. With proper use of an acid neutralizing agent, verifying neutral pH, and rinsing with large amounts of water, no environmental impacts would exist.

Evaluation 88-09: Modification to the Downstream Grating on the Make-up Pipe through the John Redmond Dam

The evaluation covered the use of the make-up pipe through John Redmond Reservoir to supply water to the WCCL Make-up Screen House. This pipe had not been used appreciably since it was installed during construction of WCCL. The grating, designed to prevent people from entering the pipe, impinged unexpected numbers of fish. The numbers trapped were judged to be of little impact to the Neosho River fishery. To enhance the pipes flow efficiency and reduce public unsightliness problems, the grating was modified by removing every other vertical and horizontal bar. This significantly reduced the problem.

An addendum to this evaluation was completed to cover unforeseen problem with using this pipe during winter conditions. The cold water temperatures greatly increased the susceptibility of the fish to becoming pulled through from above John Redmond Dam. More fish were trapped on the grating, although not as many as before the modifications. What was evident was the increased numbers on the rock shelf on which the flow spreads before reaching the channel. However, it was concluded that the mortality was not great enough to significantly impact the fishery of the Neosho River. What was a problem was the visibility of these fish to the public. To remedy impingement on the grating, procedure changes requiring grating removal before use were considered. To eliminate stranding fish on the rock shelf, a channel was cut from the grating to the make-up channel (approximately 45 feet). These mitigative actions taken will reduce environmental impacts with operating the make-up pipe during all seasons.

Evaluation 88-10: Procedure Change Involving Anticorrosion Chemical Discharge from the Component Cooling Water System

This procedure covered the filling and venting of anticorrosion chemicals and water from the temporary cooling water piping to the ILRT Air Dryers Condenser and After Cooler. Environmental concerns were with the high pH typical in the effluent. Provisions ensured that pH would be checked and change if necessary to comply with NPDES limitations before being discharged. No environmental impacts were present.

Evaluation 88-11: Removal of Lead from Non-power Block Plumbing Systems

New federal potable water regulations required that solders containing lead not be used when constructing or altering potable water systems. Specification requirements maintained by WCGS were changed to allow only solders with 0% lead content. This evaluation covered altering solder specifications on an existing Plant Modification Request to require use of 0% lead solder. No environmental concerns were present with this change. All impacts benefited human health.

3.2 NON-ROUTINE ENVIRONMENTAL REPORTS

3.2.1 Submitted Non-Routine Reports

No non-routine environmental reports involving significant impact were submitted to the NRC during 1988.

3.2.2 Unusual or Important Environmental Event Evaluations

No unusual or important environmental events reportable under specifications in the EPP were identified during 1988.

3.3 ENVIRONMENTAL NONCOMPLIANCES [EPP Subsection 5.4.1]

At WCGS in 1988, nonradiological environmental noncompliances were recorded along with the events surrounding them. These noncompliance events included deviation from NPDES permit criteria, ecological samples destroyed in transit, and documentation of fish kill events. These noncompliances were evaluated and determined not to be reportable pursuant to EPP Section 5.4.1.

ATTACHMENT 1

SUMMARY OF ENVIRONMENTAL INVESTIGATIONS AT WOLF CREEK GENERATING STATION, 1988

Wolf Creek Nuclear Operating Corporation

Environmental Management

Burlington, Kansas

1. 1988 Land Management Report

This document reports on the implementation of the 1988 Land Management Plan for Wolf Creek Generating Station (WCGS). Unanticipated activities are also presented. This report only involves the mostly agricultural lands around the cooling lake. Management of landscaped property associated with the power block area, switchyard, and other plant support buildings is not part of this program. Activities presented were designed to satisfy Sections 2.2(b) and 4.2.3 of the Environmental Protection Plan, Appendix B of the Facility Operating License. General objectives of this plan were to:

a. reduce soil loss on agricultural and "old field" areas
b. maintain or increase agricultural production while enhancing wildlife benefits
c. establish, improve, and/or maintain the native grass areas
d. improve wildlife potential on non-agricultural lands

Grasslands were used for various purposes depending on the location and capability of each area. These included grazing and haying. Some were inaccessible, unfenced, or were deemed unfit for these purposes. Other areas were left unused to preserve lake shoreline stability, fulfill regulatory requirements, or reserved for its wildlife value. In these cases, the areas were rested. They comprise about 1150 acres of grass, 150 acres grass/tree mixture, and 275 acres of timber.

Grazed rangeland totaling 1680 acres was managed by 13 separate agreements with area farmers. One 50 acre pasture was rested. Lease options or controls included grazing season length, rotation programs, and stocking rates. Absolute tenant compliance was not formally verified, however, blatant violations of lease requirements were not evident. Other management

activities included fence and pond construction and controlled burning. Approximately 417 acres were leased to 12 separate local farmers for hay production. Cutting and bale removal dates specified in the leases were met by most tenants.

Controlled burning on WCGS grasslands was used to slow woody invasion, decrease less desirable cool season grasses and weeds, and increase prairie vigor and production. Approximately 1450 acres were planned to be burned in 1988, of these 1161 acres were burned. Of those burned 140 were unplanned and were done to facilitate a neighbor's burning efforts. Several areas were burned during mid-May, which was later than past seasons. Good control of woody invaders was evident.

Approximately 45 acres were planted to native grass. The acreage consisted of "old field" areas along the lake shorelines. Establishment of native prairie grasses will reduce weedy areas, diversify wildlife habitat, and allow for easier control of tree and brush invasion. Soil erosion will also be checked.

Approximately 1390 acres were leased to 15 local farmers for crop production. Management of these leases was consistent with past seasons. Double-cropping and fall tillage, except for winter wheat, were again not allowed. Compliance with lease requirements of contour farming and leaving standing edge crops for wildlife was good. The root plow was used on selected fields during 1988. This was accomplished through tenant agreements in the lease contracts. This should increase the crop production along the tree borders without harming the trees. Increased production in these areas will increase seed left for wildlife and higher harvests beyond the edge rows will also raise income. This was evident during the dry year experienced. New terraces were built on two fields and repair to existing ones were completed on three fields. No new waterways were built. The

terraces will slow storm water runoff thus reduce soil erosion. Increased land values, production capability, and decreased silt load to the cooling lake should be realized. In summary, it was felt that company lands were managed balancing wildlife and soil conservation benefits with agricultural production.

2. 1988 Water Quality Monitoring Report

Environmental monitoring completed by WCGS personnel included studies on the Neosho River and Wolf Creek Cooling Lake (WCCL). Objectives accomplished by these studies were:

1. documentation of concentrations of general water quality parameters, aquatic nutrients, organically-derived materials and certain trace metals in the Neosho River and WCCL

2. determination of phytoplankton productivity of the Neosho River and WCCL

Water quality studies in the Neosho River near WCCL have been conducted at locations above and below its confluence with Wolf Creek since 1973. Seasonal mean concentrations of most water quality parameters during 1988 were within previously established ranges for the study area and no between-location differences were seen for any of the parameters monitored. Differences in average 1988 values as compared with previous years' conductivity, sulfates, chemical oxygen demand (COD) and nitrates were attributable to the drought which began in summer 1988 and continued through the year's end. Below-normal rainfall meant little direct runoff into this section of the river and smaller, less frequent releases from John Redmond Reservoir (JRR) than usually occur. In 1988, average river turbidity was lower than any previous study year and average conductivity was higher than found since 1983 as a result of the dry conditions. Average values for river nitrates and COD in 1988 were near the bottom of their previous ranges while sulfates continued their recent trend of increase to levels not seen since 1979 and 1980. Since filling of WCCL began in 1981, flows from Wolf Creek into the Neosho River have been limited to seepage, releases for

testing of blowdown procedures, and runoff events. There have been no apparent deleterious effects to water quality in the Neosho River due to operation of WCGS based on available water quality monitoring data.

Water quality studies of WCCL began when the lake was initially filled during 1981. Water quality was greatly influenced by makeup water being pumped from the Neosho River during that year. Between 1982 and 1986 makeup water was generally only added during routine use of the auxiliary raw water pumps and quarterly testing of the makeup water pumps. In 1987 use of makeup water increased to nearly 0.97 billion gallons and this rose 4-fold to 3.9 billion in 1988. Despite this increase and as has been seen in the years since filling, WCCL water quality has been generally independent from influence of the Neosho River. Concentrations of water quality parameters were very similar among locations in the cooling lake, with the shallow upstream site (Location 2) slightly different in water quality than near the main dam (Location 6) and the station intake (Location 8). In general, concentrations of dissolved and suspended constituents in 1988 fell within ranges established during previous years of cooling lake operation. Exceptions to this were sulfates, total dissolved solids (TDS) and conductivity which were at their highest levels since lake fill. Not surprisingly, turbidity concentrations were at their lowest levels ever. With drought conditions during much of 1988, WCCL had reduced natural inflows and lower lake level than during previous years. In combination with forced evaporation due to plant operations, these conditions produced sulfate concentrations which continued their mild trend of increase while TDS and conductivity which are affected by sulfate levels also increased above previous operational marks. The TDS rise was a reversal of the decline seen in 1986 and 1987. In summary, no consistent trends in cooling lake chemistry have yet been seen which are attributable to WCGS operations.

Surface water temperatures in the cooling lake during spring and summer periods have been warmer than during preoperation years. This was expected with operation of the plant and has been especially evident at Location 2, which receives heated effluent during spring, summer and fall when southerly winds prevail. Dissolved oxygen data indicated stratification with an anoxic hypolimnion beginning in June, forming strongly in August and being nearly dispersed by October. This pattern varied somewhat from previous years when WCCL generally stratified completely by June or July and had mixed, well oxygenated bottom waters by August. Based on WCCL's relatively large average depth (21 ft.) and data from other Kansas impoundments, longer periods of vertical stratification for the cooling lake would be expected but have not occurred during preoperational or operational years. Considering data prior to and including 1988, stratification patterns in WCCL appear to be independent of the generating station's intake, warming, and discharge of circulating water.

Phytoplankton chlorophyll a concentrations as indicators of standing crop have been monitored in the Neosho River above and below the confluence with Wolf Creek since 1973. Flow in the study area is controlled by releases from JRR. In 1988, due to summer and fall drought conditions, average Neosho River flows were low compared with previous years. The annual average chlorophyll a concentration was 30.86 mg/m^3 which fell in the middle of previous years' range of averages (3.81-63.88 mg Chl a/m^3). This was not expected since, as was seen in 1986, riverine algal production generally increases with reduced flows as the body takes on more lentic characteristics. Nevertheless, chlorophyll a monthly and yearly average values above and below the Wolf Creek - Neosho River confluence were nearly identical in 1988 and were similar to those from previous years. Therefore, there is no indication that adverse effects have occurred on Neosho River phytoplankton as a result of plant operation.

Phytoplankton chlorophyll a concentrations in the WCGS cooling lake have been monitored bimonthly since 1981. Previous years' average values ranged from 11.0 mg/m^3 in 1981 to 6.3 mg/m^3 in 1987 but within that span have shown slow oscillations - down during 1982-1984 and up during 1985-1986. Concentrations in 1988 increased to 7.94 mg/m^3 which fits well within the established range. Locational chlorophyll a differences within WCCL in 1988 were similar to the pattern seen previously of highest levels at the shallow, upstream Location 2, lowest concentrations at the deep, pelagic Location 6 with samples from near the circulating water intake channel's Location 8 falling in-between. Overall, chlorophyll a concentration as an indicator of phytoplankton standing crop shows WCCL to continue in the mesotrophic range with mild, infrequent fluctuations indicating little or no plant operational impacts.

3. Occurence and Abundance of Asiatic Clams (*Corbicula fluminea*)

The Asiatic clam (*Corbicula fluminea*) has been reported to cause biofouling problems in power plant cooling systems. The first report of *Corbicula* near WCGS was August 1986 when immature clams were collected at long-term monitoring sites located on the Neosho River upstream and downstream of the Wolf Creek confluence. To compliment the on-going ecological monitoring program, a discrete survey was conducted during the fall of 1988 to identify the distribution of *Corbicula* in the vicinity of WCGS. This late summer effort is completed annually. This report presents the findings of this survey.

During the *Corbicula* survey, 45 discrete sampling efforts were completed of which included 23 efforts in WCCL, 18 below and 2 above JRR in the Neosho River. Collected were 49 live clams and 59 isolated valves (unbroken, half-shell, dead). These included 15 live clams and 25 valves collected below and five live and 29 valves collected above the Wolf Creek confluence to the Neosho River. Twenty-seven live and three valves were found at the Burlington city dam while two live and two valves were found further upstream. No *Corbicula* were found at the WCCL makeup pumps located near the JRR spillway, nor were any found upstream of JRR. Similarily, searches on WCCL yielded no evidence of *Corbicula*.

The apparent lack of *Corbicula* upstream of JRR minimizes the potential that it will become established in WCCL. It is generally accepted that other than man mediated dispersion, downstream drift of the planktonic larval stage is the main factor affecting range extensions. Therefore, before *Corbicula* could be introduced in WCCL via makeup water, it would have to occur upstream in JRR. Although *Corbicula* has been found in most

substrates, suggested preferred substrates are not present in the Neosho River immediately below or in JRR. This condition should further decrease the likelihood of Corbicula pioneering into WCCL. Thus far, monitoring in the vicinity of WCGS has shown Corbicula far below nuisance levels. Chances that Corbicula will become established in WCCL are limited at this time but the potential for introduction exists provided the river population remains established. Future annual surveys should monitor population trends and document local range extensions near WCGS.

4. 1988 Fishery Monitoring Activities

Fishery monitoring surveys were conducted on WCCL from April through October 1988. These resulted in the collection of 3,313 individual fish representing 11 families and 29 species. Collection methods used were fyke netting, seining, electroshocking and gill netting. Data collected were used to describe the fishery which was subsequently evaluated based on the goal of increased plant reliability through reduced gizzard shad impingement. Catch data calculated as percent relative abundance for all gears combined showed bluegill highest (27.4%) and gizzard shad next (11.2%). This shad percentage represents a drop of 48% from 1987. Predators came next with largemouth bass (8.2%), white crappie (6.9%), walleye (6.7%) and wipers (4.2%) maintaining high numbers. Green sunfish were seventh in 1988 at 4.0% which is down from 10.6% and 3rd place in 1987. White bass were eighth at 3.9%. When total biomass of all species in the standardized effort is considered, wipers were first at 16.5% followed by common carp (13.7%), walleye (13.1%), largemouth bass (10.8%), white crappie (9.3%), channel catfish (9.0%) and smallmouth buffalo (7.2%). White bass were eighth at 6.1%. Considering a life expectancy of five to seven years and that the age of the dominant wiper year class was seven in 1988, it is surprising that natural mortality hasn't reduced their number further thus far. The only other noteworthy result was the increased catch of smallmouth buffalo which raised them to seventh. Gizzard shad from 1987 to 1988 dropped from 3.3 to 2.2% and from tenth to eleventh position. This decline in gizzard shad may have been due in part to cold shock mortality experienced in February 1988 following a plant trip.

Growth and body condition data using Proportional and Relative Stock Density (PSD, RSD), relative weight (Wr) and condition factor (K_{TL}) continue to show large average sizes, slowing growth of early predator year classes and low

to moderate condition for Wolf Creek predators. Wiper growth continues but at rates which are more modest and variable than in its earliest years. Since lake fill, growth of largemouth bass and black crappies from the 1981 and 1982 year classes has been followed. In 1988 the numbers of fish captured from these groups became very small due to natural mortality. Growth of largemouth bass, crappies, white bass, and walleyes continues at moderate rates. For all Wolf Creek predators, average sizes are large and the proportion of mature fish (quality size and larger) versus smaller, immature fish (stock size) is also large, leading to very high PSD's. At the same time, condition of these predators is lower than the averages from other Kansas impoundments. In contrast, both gizzard shad PSD and Wr values are close to the top of reservoirs surveyed in Kansas. While these qualities in shad have been shown to be optimal for production of a good prey base, few young-of-the year gizzard shad in WCCL remain through their first winter. Little or no survival of the last four year classes of gizzard shad indicate that the combination of predation pressure and winterkill are adequate to control expansion of the WCCL shad population. Thus, no impingement problems have been experienced so far. The sportfish/roughfish ratio in Wolf Creek is very high when compared with other reservoirs in the midsection of the U.S. The unusually low number of gizzard shad and equally unusually high number of predators in WCCL meant predator condition was low but more importantly, so were impingement rates.

5. Wildlife Monitoring Activities
October 1987 through March 1988

Avian density and diversity observed during operation of WCGS were similar to preoperational studies. Establishment of WCCL has resulted in an increase in species diversity observed in the local area. Annual species diversities have increased approximately 50 percent above those observed prior to lake filling. This was expected as the lake provided numerous waterbird habitats while upland areas supported similar bird populations that were present prior to lake filling. Detectable differences due to station operation were not found.

Threatened or endangered species observed since 1973 included the White-faced ibis, bald eagle, peregrine falcon, prairie falcon, and interior least tern. Bald eagles were common winter residents using WCCL primarily as a feeding and loafing site. The prairie falcon was removed and the white-faced ibis was added to the Kansas threatened list as of May 1987. These species migrate through or infrequently visit the area and can be expected to be observed in the future.

Bald eagle usage on WCCL declined initially since plant operation began while remaining constant on JRR. A large increase was observed during the 1987-1988 winter. Initial operational usage on WCCL declined primarily because of the two mild winters which caused gizzard shad, a more vulnerable and preferred food resource, to be more available on JRR than WCCL. Because WCGS was not operating during much of the 1987-1988 monitoring, usage tended to be influenced by the continuous freezing and thawing of the ice-cover on WCCL. This exposed winter killed gizzard shad not usually abundant on WCCL. Intermittent operations through a normal winter period appears to

cause WCCL to be an attractive bald eagle feeding location. Bald eagle usage during severe winter periods with WCGS operating continuously could not be characterized.

Waterbird usage between the two lakes was similar to past years. American coots used WCCL to a much greater extent than JRR. Pondweed development was thought to be the primary reason for this. Double-crested cormorants used both lakes similarly. It was apparent that JRR provided easier foraging habitat while WCCL supplied roosting and nesting sites.

Of the ducks observed on both reservoirs, fluctuating water levels on JRR appeared to greatly influence the distribution between the lakes of early fall migrants. During periods of little fluctuation on JRR, WCCL with its aquatic macrophyte growth appeared to attract these ducks, especially during the 1984-1985 preoperational study. Continued heavy use of these weed beds was not evident during operational studies. With high water levels on JRR, this influence was over-shadowed by the attractiveness of JRR. The operation of WCGS greatly influenced the duck distribution between the two lakes during late winter. The heated effluent kept most of WCCL ice-free, providing previously unavailable late winter habitat. This, in combination with seclusion and close abundant food supplies, appeared to keep ducks on WCCL longer than during preoperational seasons. Because WCGS did not operate continuously during the 1987-1988 monitoring, this pattern was not as distinct. Spring ducks were attracted to JRR almost exclusively over WCCL as during preoperational seasons.

Goose distribution between the two reservoirs was similar to preoperational seasons. The increasing trend evidenced during previous years was not continued during the 1987-1988 operational year possibly because WCCL reflected preoperational conditions.

It was shown that WCCL usage by mallards, snow geese, and to a lesser extent, Canada geese increased initially after operations during winter periods when ice formation on JRR was present. However, usage during the 1987-1988 study compared closer to preoperational studies due to an extended plant outage. Although ice-free condition was probably a major factor, it was evident that wind protection, hunter refuge, and/or high food availability contributed. The area where these factors were most prevalent on WCCL was preferred by mallards and snow geese. These types of waterfowl concentrations are known to cause problems with crop depredations and disease outbreaks. However, the concentrations as of this report have not reached levels high enough to cause wide-spread crop depredation problems. Given similar usage patterns in the future, mallards and snow geese may be expected to have the greatest potential for causing wide-spread depredation problems around WCCL. This is because these species occur in large concentrations. Although snow geese usage from year to year has been highly variable, they have crowded in areas of WCCL at times when late-harvested crops were most vulnerable. Canada geese, although using the same crop types and present on the lake during the same time periods, at this time should not cause problems because they have tended to occur in smaller concentrations around the cooling lake. Any Canada depredation problems would likely be highly localized. Although waterfowl disease outbreaks have not been observed, potential areas of concern will be similar as for crop depredation events because of the consistent usage of the same areas.

Results of collision surveys revealed similar mortality rates to those previously documented. Eight species were identified during the study. None were threatened or endangered species. Inherent biases were identified and measured. It was concluded that collisions with transmission facilities associated with WCCL during preoperational and operational monitoring did not cause sufficient avian mortality to be considered problematic. Also, it was concluded that because of the collision consistency observed between

years, the collision potential of WCGS has been characterized and that no further studies are needed. This statement is valid only if usage of WCCL, especially that of bald eagles, remains similar to that reported.

October through December 1988

This synopsis provides a summary of WCCL bird usage data collected from October through December 1988 as part of the 1988/1989 Operational Wildlife Monitoring Program. These data are not presented in the report summarized above. This monitoring program was reduced from previous years to streamline efforts needed to identify station impacts. Waterfowl, waterbird and bald eagle surveys were reduced from four to two per month from October through March of the following year. With the exception of September surveys, this follows the schedule used by local wildlife agencies monitoring other Kansas reservoirs. This schedule will allow station biologists to determine if changes from previously characterized patterns justify increased monitoring or mitigative action. Formal transmission line collision surveys were discontinued because enough information had been collected to characterize the mortality caused by the lines and it was shown to be insignificant. No problems were expected given similar usage in the future. Special attention was given to both state and federally listed threatened and endangered wildlife species occurring in the vicinity of WCGS.

A total of 29 waterfowl and waterbird species were observed on 6 ground counts during fall and early winter of 1988. The most abundant species were the mallard, American coot, and Franklin's gull making up 35, 39, and 19 percent of the total, respectively. This is similar to the fall monitoring completed during past monitoring seasons. Apparent factors influencing usage of WCCL continue to include relatively clear water, seclusion, wind protected coves, concentrations of aquatic weed growth, and availability of

agricultural fields. Heated effluents influenced waterfowl usage very little to none at all as WCGS was not operating due to a refueling outage throughout most of this time period. Some winter wheat fields on WCGS lands may have experienced crop damage, however these were fairly localized and widespread depredation events were not present. No disease problems were present among waterfowl concentrations on WCCL during the fall and early winter of 1988.

The bald eagle was the only threatened or endangered species observed using WCCL. As during past studies, the eagles were common winter residents first appearing during late November. The cooling lake was used as a feeding and loafing site primarily, however not to the extent observed on JRR. No changes in bald eagle usage of WCCL during the fall and early winter of 1988 were identified.

The evaluation covered the use of the make-up pipe through John Redmond Reservoir to supply water to the WCCL Make-up Screen House. This pipe had not been used appreciably since it was installed during construction of WCCL. The grating, designed to prevent people from entering the pipe, impinged unexpected numbers of fish. The numbers trapped were judged to be of little impact to the Neosho River fishery. To enhance the pipes flow efficiency and reduce public unsightliness problems, the grating was modified by removing every other vertical and horizontal bar. This significantly reduced the problem.

An addendum to this evaluation was completed to cover unforeseen problem with using this pipe during winter conditions. The cold water temperatures greatly increased the susceptibility of the fish to becoming pulled through from above John Redmond Dam. More fish were trapped on the grating, although not as many as before the modifications. What was evident was the increased numbers on the rock shelf on which the flow spreads before reaching the channel. However, it was concluded that the mortality was not great enough to significantly impact the fishery of the Neosho River. What was a problem was the visibility of these fish to the public. To remedy impingement on the grating, procedure changes requiring grating removal before use were considered. To eliminate stranding fish on the rock shelf, a channel was cut from the grating to the make-up channel (approximately 45 feet). These mitigative actions taken will reduce environmental impacts with operating the make-up pipe during all seasons.

Evaluation 88-10: Procedure Change Involving Anticorrosion Chemical Discharge from the Component Cooling Water System

This procedure covered the filling and venting of anticorrosion chemicals and water from the temporary cooling water piping to the ILRT Air Dryers Condenser and After Cooler. Environmental concerns were with the high pH typical in the effluent. Provisions ensured that pH would be checked and change if necessary to comply with NPDES limitations before being discharged. No environmental impacts were present.

Evaluation 88-11: Removal of Lead from Non-power Block Plumbing Systems

New federal potable water regulations required that solders containing lead not be used when constructing or altering potable water systems. Specification requirements maintained by WCGS were changed to allow only solders with 0% lead content. This evaluation covered altering solder specifications on an existing Plant Modification Request to require use of 0% lead solder. No environmental concerns were present with this change. All impacts benefited human health.

3.2 NON-ROUTINE ENVIRONMENTAL REPORTS

3.2.1 Submitted Non-Routine Reports

No non-routine environmental reports involving significant impact were submitted to the NRC during 1988.

3.2.2 Unusual or Important Environmental Event Evaluations

No unusual or important environmental events reportable under specifications in the EPP were identified during 1988.

3.3 ENVIRONMENTAL NONCOMPLIANCES [EPP Subsection 5.4.1]

At WCGS in 1988, nonradiological environmental noncompliances were recorded along with the events surrounding them. These noncompliance events included deviation from NPDES permit criteria, ecological samples destroyed in transit, and documentation of fish kill events. These noncompliances were evaluated and determined not to be reportable pursuant to EPP Section 5.4.1.

WOLF CREEK
NUCLEAR OPERATING CORPORATION

Bart D. Withers
President and
Chief Executive Officer

April 26. 1989

WM 89-0116

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Subject: Docket No. 50-482: Annual Environmental Operating Report

Gentlemen:

Enclosed is the Annual Environmental Operating Report which is being submitted pursuant to Wolf Creek Generating Station (WCGS) Facility Operating License NPF-42, Appendix B. This report covers the operation of Wolf Creek Generating Station for the period of January 1, 1988 to December 31, 1988.

Very truly yours,

BDWithers

Bart D. Withers
President and
Chief Executive Officer

BDW/jad

Enclosure

cc: B. L. Bartlett (NRC), w/a
E. J. Holler (NRC), w/a
R. D. Martin (NRC), w/a
D. V. Pickett (NRC), w/a

IE25
1/1

P.O. Box 411 / Burlington, KS 66839 / Phone: (316) 364-8831