10. BENEFIT-COST ANALYSIS

10.1 ENERGY GENERATING COSTS

Using the Applicant's basic estimates of total capital investment, annual fuel cost, and annual operating and maintenance cost,[1] the Staff has calculated for Table 10.1 the total and annualized generating costs on the basis given below.

The cost figures appearing in Table 10.1 reflect the following basic assumptions: (1) The useful life of each unit is taken as 30 years from its date of first operation. (2) An interest rate of 8.75% is used. (3) Federal, state, and local taxes are not included. (4) The plant capacity factor is taken to be 80%. (5) No transmission or distribution costs were included.

In order to determine an appropriate life-of-plant cost, a reference date of February 1, 1974 (when current modifications are scheduled to be complete), is used. The partially depreciated cost of first construction and the cost of modification are combined for each unit to give a capital cost as of that date. The stream of future fuel, operating, and maintenance costs is considered in terms of its present worth* on the reference date. The present worth of an assumed expenditure of $25 million for decommissioning each unit in the year 2002 is also included. The estimated decommissioning cost is that previously estimated[2] by the Staff for Consumers Power Company Midland Units 1 and 2, a comparable plant.

Annualized costs given in Table 10.1 reflect estimated fuel, operating, and maintenance costs plus amortization and accumulation (inverse amortization) payments for the capital cost and estimated decommissioning costs, respectively.

The Staff estimates the price to consumers (exclusive of transmission and distribution costs) of the annual power output of Units 2 and 3 as about $75 million, about 6-7 mills/kWh. The expected total price paid by consumers (including transmission, distribution, and billing costs) will be in the neighborhood of $225 million, about 20 mills/kWh.

10.2 SUMMARY OF BENEFITS

The primary benefit from the continued operation of Units No. 2 and 3 will be the continued contribution to the quality of life and economic well-being within the Applicant's service area by the generation of about 11.4 billion kilowatt hours per year. An additional benefit of consequence will be the enhanced reliability within the MAIN service area (and,

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*The present worth (at a specific time) of a future payment is the sum which, drawing interest at the assumed rate until the time of the payment, will then be equal to it; i.e., it is the discounted value of the payment.

TABLE 10.1 Estimated Generating Cost[a]
(in millions of dollars)

Construction Cost:		
1974 present worth[b]	235	
Annualized (amortization over 28 years)		22.7
Operating Cost:		
1974 present worth	288	
Annualized:		
Operation and maintenance		4.5
Fuel[c]		23.4
Decommissioning Allowance:		
1974 present worth	5	
Total life-of-plant Cost:		
1974 present worth	528	
Annualized equivalent		51

[a]For Units 2 and 3 jointly, as of February 1974 (excludes cost of transmission and distribution).
[b]Based on 1971 cost at first operation of $229 million, depreciated (straight-line 30-year) to February 1974, plus modification costs of $13.75 million.
[c]Based on fuel cost estimate of 2.05 mills/kWh and assumed generation of 11.4 billion kWh per year (80% capacity factor).

to a degree, within surrounding states) due to the availability of 1620 MWe of generating capacity in addition to that from other existing plants, as discussed in Section 8.1.

An indirect local benefit to the population of the surrounding area will be the employment of about 150 persons for operation of the Station and the resulting injection of about $1.5 million per year into the local economy. A further local benefit will be the payment of an estimated $1.3 million annually to local taxing bodies.

10.3 ENVIRONMENTAL COSTS

10.3.1 Land Use

As discussed in Section 5.1, the Station is located in an area of rapidly growing industrialization. Since Units 2 and 3 are already operating, no new impact will arise from their continued operation. Were they to be abandoned, the most likely result would be the reuse of the cooling lake for a replacement fossil-fueled plant.

In the unlikely event that the cooling lake and spray units were abandoned and the land salvaged, the probable subsequent use would be industrial. The chief resultant change in environmental impact would be elimination of the fogging and icing effects due to the lake and spray units. As discussed in Section 5.1.1, it appears that the possibility of accidents due to fog/ice effects can be largely eliminated by temporarily closing the road which crosses over the lake so that the chief gain from the hypothetical elimination of the lake would be a small increase in public convenience.

10.3.2 Water Use

As discussed in Section 5.2.1, the effects on ground water of continued operation of Units 2 and 3 probably will be undetectable.

Operation of Units 2 and 3 (with closed-cycle cooling) will have several physical effects on surface water. The Illinois River will be warmed by the blowdown discharge and its levels of dissolved solids will be slightly increased. Also, the river flow will be slightly decreased because of evaporation from the cooling lake and the spray units and from the river itself.

For Units 2 and 3 during full power operation, about 16,000 gallons per minute will be evaporated, mainly from the lake and spray units. This is about 0.9% of the average river flow or about 8% of the seven-day ten-year recurrence low flow. Warming of the river (far enough downstream so that complete mixing has occurred) is estimated to be about 0.8°F under average-flow conditions and 2.6°F at low flow. The increase of total dissolved solids in the Illinois River will be about 4 ppm, much less than the fluctuation of the total dissolved solid content, which ranges from 250 to 670 ppm (see Table 2.3). If total chlorine in the Station discharge is limited to 0.1 mg/l as required in Section 5.5.5 for intermittent discharge, average concentrations after mixing in the river will be less than 0.002 mg/l even at low flow.

10.3.3 Biological Effects

Under closed-cycle cooling, nearly all of the small organisms entrained in the makeup water will be lost to the Illinois River (see Section 5.5.1). At average flow in the Kankakee, the diversion for Units 2 and 3 is about 4% of the Kankakee flow and the resulting change in the Dresden Pool of the Illinois will probably be undetectable. At very low flow (10-year recurrence interval) the diversion may reach 35% and the reduction in plankton and fish populations may be measurable. However, the effect is expected to be reversible so that populations will recover as normal flow is regained.

Some fish, predominantly juveniles, will be killed on the traveling screens of the cooling water intake. According to the assessment of Section 5.5.1, fish populations are not expected to decrease measurably as a result. The required monitoring of fish populations during the early years of closed-cycle operation will detect unanticipated larger effects if they should occur, in order that corrective action may be taken.

As discussed in Section 5.5.2, the main possibility of other than very localized effects associated with the warmed discharge plume is connected with the attraction of fish to the warmed plume during the winter months. Existing data are not adequate for assessment of the possible effects but the fish monitoring program should detect any effects capable of measurably changing populations in the Dresden Pool. Because the thermal plume might block the movement of fish if it spanned the river, the Applicant is also required to restrict the 5° isotherm to not more than 25% of the cross-sectional area of the river. Monitoring of dissolved oxygen in the discharge is also required.

The growth of algae in the cooling lake and adoption of some type of control measure could impose additional biological stress on the Illinois River, as discussed in Section 5.5.3. However, the Staff believes that appropriate choice of and use of algal control measures will avoid any consequences of importance.

10.3.4 Radiological Effects

The total population dose from normal operation of Units 2 and 3 is estimated to be about 160 man-rem per year for the population within 50 miles of the Station (about 8.1 million persons in 1980). The dose to individuals in areas near the Station (after the committed modifications) will be less than 1% of that due to natural background. The dose is within the limits imposed by 10 CFR Parts 20 and 50.

10.4 BENEFIT-COST BALANCE

Continued operation of Units 2 and 3 (after completion of current modifications) is expected to have only modest impact on the environment. The identified benefits and environmental costs are listed in Table 10.2. The Staff has considered these benefits and costs in detail and concluded that, on balance, the overall benefits of continued operation of both

TABLE 10.2. Benefit-Cost Summary for the Dresden Nuclear Power Station, Units 2 and 3 (after February 1974 with closed-cycle operation)

Benefits	
Primary benefits:	
Electrical energy to be generated	11.4 billion kWh/yr (at 80% capacity factor)
Generating capacity contributing to reliability of electrical power in the Applicant's service area	1620 megawatts
Secondary local benefits:	
Employment of operating staff	150 persons
Local taxes	$1.3 million
Environmental Costs	
Land Use:	
Farmland displaced for Station and cooling lake	About 1573 acres
Transmission line right-of-way	4 miles
Fogging and icing	Occasional severe localized effects. Impact on public confined to County Line Road at lake crossing (closing of road during fog/ice incidents may be required).
Water Use:	
Water evaporated	About 16,000 gpm at full-power operation.
Ground water pumped	About 32 gpm -- probable negligible effect on water table.
Chemicals discharged to the Illinois River	About 2 tons/day (almost entirely sodium chloride and sulfate).
Maximum thermal input to the Illinois River	900 million Btu/hr
Radiological Impact:	
Normal operation:	
Cumulative population dose (50-mile radius)	160 man-rem per year
Whole-body dose to nearby residents	Less than 1% of natural background
Biological Impact	Small destruction of aquatic life and localized effect on Illinois River ecology during normal-flow periods; more severe but reversible effects during low-flow periods.

units will outweigh substantially the economic and environmental costs incurred. The effects of the different alternatives considered do not change the benefit-cost balance in favor of the alternatives.

References

1. Dresden Nuclear Power Station Environmental Report, Supplement V, Commonwealth Edison Co., Chicago, Ill. (March 12, 1973).

2. Transcript of the ASLB Hearing, June 12, 1972, "In the Matter of Consumers Power Company (Midland Plant Units 1 and 2)," Docket Nos. 50-329 and 50-330, pp. 7822-7836.

11. DISCUSSION OF COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL STATEMENT

Pursuant to Appendix D, 10 CFR Part 50, the Draft Environmental Statement was issued in June 1973 and was transmitted with a request for comment to the following agencies:

Advisory Council on Historic Preservation
Department of Agriculture
Department of Army, Office of the Chief Engineer
Department of Commerce
Department of Health, Education, and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Power Commission
Executive Office of the Governor of Illinois
Illinois Pollution Control Board
Illinois Department of Public Health
Illinois Commission on Atomic Energy
Upper Mississippi River Basin Commission
Board of Supervisors, Grundy County, Illinois
Northeastern Illinois Planning Commission

In addition, the AEC requested comments from interested persons by a notice published in the Federal Register on June 26, 1973 (38 FR 16794).

Comments on the Draft Environmental Statement have been received from the following agencies and organizations and have been considered in preparation of this Final Environmental Statement:

Illinois Environmental Protection Agency
Commonwealth Edison Company
Office of the Assistant Secretary of Commerce
Department of Health, Education, and Welfare
Department of Transportation
Advisory Council on Historic Preservation
Department of Agriculture
Illinois Natural Resource Development Board
Federal Power Commission
Environmental Protection Agency
Illinois Commission on Atomic Energy (University of Chicago)
Illinois Department of Transportation
Department of Interior
Illinois Department of Public Health

Our consideration of comments received and the disposition of the issues involved are reflected in part by revised text in other sections of this Final Environmental Statement and in part by the following discussion. With the exception of the applicants, the original comments are reproduced in this statement in Appendix G in order of receipt.

11.1 ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

11.1.1 Comment:

Figure 3.13, entitled, "Winter Isotherms from Dresden Station during Low-River-Flow Conditions" indicates that the 5 degree isotherm in the discharge plume reaches from one shore of the Illinois River almost to the other shore. There may be some question concerning whether a discharge plume of this extent will allow a sufficient zone of free passage for aquatic life. Under most circumstances, this discharge plume will float on the surface and expand into the upper layers of the river only for the 5 degree isotherm range, thus allowing a sufficient zone of free passage for aquatic life underneath this plume.

Response: The presence of an adequate zone of passage depends upon the vertical as well as horizontal extent of the thermal plume. Because of the uncertainties in thermal hydraulic modeling (partly due to a poor hydraulic model of the Illinois River) the plume calculations in section 3.4.6 were primarily done to show that the surface area of the 5°F plume will probably be less than 26 acres and that the 5° isotherm may extend across a considerable portion of the river.

All data presently available is based on theoretical mathematical modeling and has not been verified. The applicant is presently expanding its modeling program and has committed to verify the final model used by actual test of the discharge plume.

11.1.2 Comment:

The Permit Section, Division of Water Pollution Control, issued the [illegible]ing Permit #1973-EB-664-OP, dated April 12, 1972 to Commonwealth Edison Company for the two discharges from the Dresden generating station. Discharge 1 contains condenser cooling water and process streams from Unit 1, and discharge 2 is the overflow from the cooling lake, which contains condenser cooling water and process streams from Units 2 and 3. This permit was issued for the period of one year.

Response: This permit has been included in Table 1.1. However, it was actually dated April 2, 1973.

11.2 COMMONWEALTH EDISON COMPANY (CECO)

Following are responses to selected comments from the Applicant. The Applicant's comments are not included in Appendix G.

11.2.1 Comment: (On Draft Statement, pg. i, Section 3d)

This section implies that all organisms entrained in the cooling water will probably be killed. The statement should be modified to reflect a range of kill of 20% - 50% for entrained organisms is expected. Refer to reports by C. C. Coutant which discuss survival rates. Also refer to Quad Cities Station Semi-Annual Environmental Monitoring Reports submitted to the AEC.

Response: Kill rates of 20% - 50% can be expected for entrained organisms per condenser passage. Thus, for an open cycle system when the intake flow is a significant portion of the river flow, the survivability of entrained organisms is an important consideration. For a closed cycle system, such as Dresden 2 and 3 will have in early 1974, repeated passage of cooling water through the condensers should kill most of the entrained organisms. Thus, no credit is taken for the relatively small amount of surviving organisms that are returned to the river in the minimal blowdown flow. Since, for closed-cycle operation of Dresden 2 and 3, the intake and blowdown are 66,000 gpm and 50,000 gpm respectively, the Staff has concluded that even with 100% mortality of the entrained drift and planktonic biota, no significant loss to the Kankakee-Illinois River systems will result.

11.2.2 Comment: (On Draft Statement, pg. i, Section 3g)

The Applicant presently has a fog detector and warning sign system installed on County Line Road to assure traffic safety during periods of fogging; this system will be maintained during lake and spray operation. The Applicant feels that this scheme is sufficient to cover the concerns of the Staff.

Response: The Staff was aware that these measures were being developed and from the Applicant's comments understands that implementation is complete. These devices should substantially reduce the driving hazard on County Line Road from pond induced fog. However, due to the unseasonably mild winter of 1972-73, insufficient data under adverse fog conditions are available

to evaluate their effectiveness. Therefore, for a period of 2 years, data shall be obtained to determine the effectiveness of the Applicant's installation in assuring traffic safety on County Line Road during periods of fogging from the cooling lake.

11.2.3 Comment: (On Draft Statement, pg. iv, Section 7d)

This section outlines a condition for licensing whereby the dike integrity needs further analysis (i.e., additional core borings to define the abandoned coal mine and a demonstration that the 4 in. holes along the south dike are not initial stages of soil movement). The Applicant's Consultant, Sargent and Lundy (S&L), reviewed this condition and concluded that, based on the existing information, dike integrity is assured. The consultant's Memorandum on this subject (From J. Steinbach of S&L to J. E. Ellis of CECO dated July 26, 1973) is included for the Staff's consideration and is attached at the end of the comments on the Summary and conclusions Section. These same comments also apply to Section 5.1.4.d (Page 5-6): The Applicant, therefore, believes no need to proceed with any additional program to verify dike integrity is warranted.

In addition, Section 7d outlines the requirements for an extensive dike surveillance program including the incorporation of the program into the Technical Specification. A surveillance program is outlined in a CECO Engineering Instruction No. 1-1-A-37/Production Instruction No. 1-3-A-26. This instruction is attached at the end of the comments on the Summary and Conclusion Section. Since the surveillance procedure is not related to a limiting condition for operation of the plant, the Applicant feels that its inclusion as a Technical Specification requirement is an unjusted extension of Technical Specifications and is not warranted. This same comment also applies to Section 5.1.5.d (page 5-5).

Response: Based on the boring profiles supplied by the Applicant and another review of previously supplied boring data, the Staff concludes that the mine void does not extend beneath either the north or the south dike.* However, the 2 foot depression noted at MK 11 on drawing S108,* may be a result of differential consolidation of subsurface materials, subsidence due to the piping from beneath the dike of material, subsidence due to the existence of a void, or erosion.

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* Commonwealth Edison Co. (CECO) Comments Regarding AEC Draft Environmental Statement for Dresden 2 and 3. From letter, J. S. Abel, Nuclear Licensing Administration BWR, CECO, to B. J. Youngblood, Chief, Environmental Projects Branch 3, Directorate of Licensing, USAEC (August 10, 1973).

Therefore, the Applicant shall determine by additional investigation the cause of the depression and shall perform necessary repairs to insure dike integrity. The results of the investigation and proposed action shall be submitted to the Commission for review and approval. Section 5.1.4.d has been changed to reflect this.

The surveillance program outlined by the Applicant is not acceptable to the Staff. Only 4 inspections are required during the first year and 9 month period. The Applicant's consultant, Dames and Moore, had recommended a monthly inspection frequency.** The Staff agrees with this frequency. Therefore, the Applicant shall carry out a monthly inspection program as outlined in the enclosure to the above comment for two years after which it may be modified as conditions warrant. The program shall also include detailed inspections of the embankment slopes, the toe, and the ground surface beyond the toe on portions of the north dike, the south dike and the west dike. Local wells north of the north dike shall also be monitored.

The question of inclusion of this requirement in the Environmental Technical Specifications is answered in the response to comment 11.2.4.

11.2.4 Comment: (On Draft Statement, pg. iv, Section 7e)

The Applicant objects to including in the Environmental Technical Specification programs for the use and control of herbicides, the disposal of dredgings, measurement and control of the thermal plume, the use of algicides, dike surveillance and elimination of dense fog on local roads.

Response: The Commission requires that, pursuant to Section 50.50 of 10 CFR Part 50, certain conditions and limitations corresponding to key parameters of the NEPA environmental review will be incorporated into the operating license as Environmental Technical Specifications. The programs itemized by the Applicant above identify the major environmental impacts of Dresden 2 and 3 and must be included in the Technical Specifications.

In some cases it is appropriate to specify the detailed limitations or procedures such as the allowable extent of the thermal plume and the frequency of verification. In other cases the criteria identified by the Staff as important are more appropriately specified. Thus, the criteria for application of herbicides carefully define the envelope within which herbicides can be safely utilized without specifying the detailed steps of each procedure.

**Dresden Nuclear Power Station Unit 3, Environmental Report, Supplement V, Commonwealth Edison Co., Chicago (March 12, 1973).

The Staff concludes that the inclusion of these programs in the technical specifications is necessary in implementing NEPA to minimize any adverse environmental effects from Units 2 and 3.

11.2.5 Comment: (On Draft Statement, pg. 2-9, Table 2.1)

1. Table 2.1 ignores several highly significant process sources of nitrogen oxides:

   --- Ammonia production - West of Morris
   --- Nitric acid production - West of Morris
   --- Munitions - Joliet Army Ammunition Plant

2. Also, important process sources of hydrocarbons and/or SO_2 are ignored:

   --- Northern Petrochemical - Northwest of station
   --- Refineries (Mobil and Esso) - North and east of station.

3. It is not clear from the text that actual ground level contamination is not directly related to the emission in Table 2.1. Rather ground level contamination is heavily dependent upon the conditions under which the contaminants are released; thus, smaller sources and area sources are disproportionately important in their contributions to the ambient.

Response: The July 1973 Illinois Environmental Protection Agency Air Contaminate Emission Inventory gives the following data for Grundy County:

	Particulate	SO_2	CO	NO_x
Area Source Total Emissions	2531 Ton/Yr	568 Ton/Yr	21612 Ton/Yr	3241 Ton/Yr
Point Source Total Emissions	3160 Ton/Yr	2750 Ton/Yr	75 Ton/Yr	804 Ton/Yr

The 1970 data provided in table 2.1 appears to be in agreement except for the point source particulate emissions which is now reported to be about one tenth of the 1970 reported value. A small part of this reduction has probably resulted from point source particulate clean up efforts in the area. The majority of the reduction, however, appears to be the result of a reevaluation and subsequent reduction of the emission factors used by the IEPA to calculate the emissions of the mineral industry operations.

Since the ammonia, nitric acid and petrochemical air pollution sources noted in the comment are all in Grundy County their emissions would have been included in the Table 2.1 and thus were not ignored. The munitions facility and refineries noted in the comment are in Will County and thus would not have been included in the table.

The Staff attempted to take a conservative approach in its analysis of the air pollution by selecting the Grundy County emissions data for comparison purposes rather than the heavy industry emission date. Using this conservative approach the Staff has concluded that the air pollution produced by the station is very low and therefore acceptable in terms of its environmental cost vs. the benefits derived.

11.2.6 Comment: (On Draft Statement, pg. 2-30)

Mention is made that Goose Lake Prairie ecology will serve as a baseline for evaluating terrestrial effects due to operation of the Dresden Station. Because of the diverse activities surrounding the Goose Lake Prairie such as manufacturing, and the fact that the prairie is being developed into a grassland preserve and will change, the Applicant feels that for purposes of evaluating the effects from Dresden Station's operation and separating any causes from those other activities is unrealistic.

Response: The Staff agrees that the presence of diverse industrial activities in the environs of the Goose Lake Nature Preserve makes it very difficult to isolate effects of the Dresden Station alone. The same could be said for each individual industry in the area. This should not imply, however, that no evaluation need be done. The Dresden Station must share in the responsibility for the overall cumulative effects of industrialization. Also although no adverse effects of the Station on the Preserve are expected during normal operation, the possibility of an abnormal occurrence cannot be discounted. Some brief description of the present state of Preserve is therefore considered necessary and included in the statement.

11.2.7 Comment: (On Draft Statement, pg. 3-7, 3-42 and 3-43)

The NaOCl concentration is 15%, not 13%. The calculation in paragraph 3.6.2 is correct for 15% NaOCl.

Response: A check with the plant operating personnel revealed that the concentration listed on the NaOCl containers was 13.06%. A further check was made of the calculations noted in the Draft Statement to assure that the proper concentration were used when calculating the chemical effluents concentration. As far as the Staff can determine all concentrations noted are correct as shown.

11.2.8 Comment: (On Draft Statement, pg. 3-8)

The statement is made that the Units 2 and 3 blowdown will be discharged via the Unit 1 discharge canal. The same statement is also made on page 3-20 (top paragraph). Blowdown from Units 2-3 may not be discharged into the Unit 1 canal. The Applicant has retained the University of Iowa (Institute of Hydraulic Research) to physically model the discharge structure to determine the best discharge configuration for releasing the heated effluent from Unit 1 and the Lake blowdown from Units 2 and 3. The results of this study may show that it is permissable to discharge the blowdown thru the existing Units 2 and 3 discharge canal via the flow regulating station to the river. This study is referred to on page 3-26 and has been expanded in scope as described.

Response: The Staff was unaware that continued use of the Unit 2 and 3 discharge canal was still being considered by the Applicant. See response to comment 11.2.18 for additional discussion.

11.2.9 Comment: (On Draft Statement, pg. 3-21)

The Applicant does not agree with the Staff's estimate of monthly lake discharge temperatures. The Staff's analysis as detailed in Appendix D is in error due primarily to inadequate consideration of the effect of the sprays. The Staff's equation for T_{in} on page D-2 allows for a constant 2°F drop in temperature for the 68 modules in the inlet canal. This is not accurate as the performance will vary depending on the ambient meteorological conditions and the water temperatures realized.

A current Sargent & Lundy Lake-Spray computer evaluation using 1964 Midway Airport Weather data has yielded the following results for full load, closed-cycle operation during the summer:

Month	T_{out} (AEC-Staff)	T_{out} (S&L)
June	96.5°F	91.3
July	102.1°F	95.4
August	105.5°F*	92.4
September	94.8°F	87.9

Actual temperature data indicates that the temperatures predicted by S&L more accurately reflect the actual maximum temperature conditions that will be realized.

Response: The Staff has reevaluated its analysis of the thermal discharges and lake temperature and has made several changes to the text and Appendix D. This reflects a conservative estimate of the conditions which can be expected when closed cycle operation is implemented. See Section 3.4.6 and Appendix D.

11.2.10 Comment: (On Draft Statement, pgs. 3-26 thru 3-40)

On page 3-27, in the first paragraph of Section 3.5.1 regarding liquid waste, it is stated that wastes are classified on the basis of chemical composition and not radioactivity. This statement is somewhat erroneous. While liquid wastes are segregated as high purity, low purity, and chemical, these groupings also yield segregation by level of radioactivity. High purity water, through low in conductivity, is typically primary system drainage, and as such, is rather high in activity in contrast to the low purity water which is primarily floor drainage or other sources isolated from the primary systems.

The second paragraph on page 3-31 describes the augmented low purity waste system to be installed by early 1974. Due to the high conductivity of the low purity water to be treated by this system, termed the Maximum Recycle system, it was deemed impractical to filter and demineralize the water in this system. Consequently, the following equipment is being installed:

a. One 200,000 gallon surge tank

b. Two 22,000 gallon neutralizer tanks

c. Two 25 gpm concentrators and steam supplies

d. Two 200 gpm demineralizers

*Actually was 102.5°F.

Water is taken from either the surge tank or the existing collector tank and neutralized before being routed, unfiltered, to the concentrators. The concentrator condensate is routed through mixed bed demineralizers and to either the waste sample tanks or floor drain sample tanks for sampling. Based on plant water inventory and processed water quality, the water can then be either recycled for further processing, sent to condensate storage for reuse in the primary system, or discharged to the river. Concentrator concentrate will be transferred to the solid waste system. Demineralizer resin can be either regenerated in the condensate demineralizer system or transferred to the solid waste system.

Note "c" on Table 3.7 (page 3-34) indicates demineralizers will be provided for the floor drain waste treatment system. As previously described, this system will also consist of concentrators. The demineralizers will be utilized to polish concentrator condensate.

The last paragraph on page 3-35 indicates that radwaste ventilation air discharges without treatment to the reactor building vent. All ventilation air from the radwaste building is passed through a prefilter, an absolute filter, and is then discharged through the 310' main chimney.

This paragraph also refers to a discharge of radioactivity to the atmosphere during High Pressure Coolant System operation or testing. Ventilation air from this room is exhausted through the reactor building ventilation system and HPCI operation does not affect activity levels in the ventilation air. The HPCI turbine gland seals are condensed, however, and the non-condensibles are exhausted to the atmosphere through the Standby Gas Treatment System to the 310 foot main chimney.

Also on Figure 3.17, the waste gas system drawing does not show all the equipment (i.e. 3rd stage steam jet air ejector, preheater, water separator, cooler condenser, and moisture separator). In addition, bypasses for the recombiner and charcoal absorbers are not shown. The correct schematic for the modified off gas system can be found in Special Report No. 4A submitted to the AEC previously. This schematic is included at the end of Chapter 3 comments, Page 3-31.

The first paragraph of section 3.5.3 on solid wastes on page 3-37 indicates that excess water from the centrifuges is returned to the floor drain collector. This water is routed to either the waste collector, floor drain collector, cleanup filter sludge storage tank, or filter sludge storage tank.

Response: Appropriate changes have been made to the text of Section 3.5. The principal change includes the addition of 2-25 gpm evaporators to the floor drain subsystem. Liquid waste collected in a new 200,000 gallon surge tank or the existing floor drain collector tank will be neutralized, processed through the evaporators, mixed bed demineralizers and collected in the floor drain sample tanks. After sampling and analysis the liquid waste will either be recycled for reuse in the primary system or discharged to the river. Evaporator bottoms will be transferred to the solid waste system and shipped offsite. In our evaluation of the changes we considered that all of the processed liquid from the floor drain subsystem will be discharged to the river. As a result of these changes the calculated releases of radioactive materials in liquid effluent are reduced from approximately 5 Ci/yr as shown in Table 3.5 to approximately 0.9 Ci/yr. Correspondingly the maximum cumulative annual dose received by any member of the permanent population from normal liquid releases from Units 2 and 3 as shown on Page 5-17 (0.2 mrem/yr) will be reduced accordingly.

11.2.11 Comment: (On Draft Statement, pg. 5-3)

In the last paragraph on page 5-3, the Staff indicates the need to lessen the consequences of fogging and icing caused by the cooling lake and sprays. The Applicant presently has a fog detector and warning sign system installed on County Line Road to assure traffic safety during periods of fogging. This scheme will be maintained during lake and spray operation. The Applicant feels that this program is sufficient mitigation of the consequences of the cooling lake and spray icing and fogging problems.

The problem of icing was most prevalent along Dresden Road and resulted from the sprays located west of the road. These spray modules have been relocated to the lake intake canal between the lake lift station and the Dresden Road bridge. The final location of the remaining spray modules required for closed cycle operation will be in canal areas other than the canal immediately west of Dresden Road. The final spray location will greatly reduce the icing and fogging problems on Dresden Road which have occurred in the past.

The comments of the Staff are, of course, appreciated. However, the Applicant does not feel that this is a proper subject for the Technical Specifications.

Response: The installation on County Line Road are addressed in the response to comment 11.2.2.

Movement of the spray modules from the canals immediately west of Dresden Road should substantially reduce the icing on this road and the bridge that crosses the canals. Although the prevailing winds are from the West, winds from the East may cause icing from the spray modules placed in the canals east of the road. The Applicant is still expected to turn off the necessary modules if icing does occur.

11.2.12 Comment: (On Draft Statement, pg. 5-18)

Clarification of Table 5.5 is needed. What is the meaning of commercial dietary intake as shown in the table? Where are the 8 million people? If they are in the Chicago area most of the population is upstream and not downstream.

Response: The "commercial dietary" intake shown in Table 5.5 refers to the intake of commercially available food stuffs. The 8 million people referred to in the table are primarily in the metropolitan Chicago area. They receive a commercial dietary dose as a result of consuming food produced downstream of the Dresden Site.

11.2.13 Comment: (On Draft Statement, pg. 5-22)

The Staff's hypothesized conclusion that 109°F condenser discharge temperatures will have a significant effect on the fish population at the Illinois River appears to be unwarranted in light of the data obtained from present studies. Condenser temperatures of 109°F will probably result in a total loss of entrained larval fish or fish eggs coming from the Kankakee, but should not affect the fish population of the Illinois River.

The Applicant also feels it is wrong for the Staff to look at the open-cycle operation at the intake canals of the station as though it was a large biotic vacuum cleaner which will suck in all biota eventually resulting in a substantial detectable loss of biota at the mouth of the Kankakee River. Studies by the Applicant show that the conditions hypothesized by the Staff do not exist. The Staff has not presented any substantial data which support their hypothesis.

In the third paragraph the Staff states that about 4% of the Kankakee is diverted through Units 2 and 3 under closed-cycle operation and all entrained

biota will be killed. The Applicant' experience does not confirm the Staff assumption that all entrained organisms will be killed under closed-cycle operation when 4% of the Kankakee is diverted through Units 2 and 3.

In the last paragraph on page 5-22 the Staff discusses the entrainment of sensitive stages of fish larvae. The Applicant has no particular problem with this section but feels that the Staff should incorporate some of the following additional information into this section to expand the concepts on fish larvae presented in the draft.

1. The intake velocity will determine the entrainment potential, along with the particular species of fish, water temperature, dissolved oxygen and other factors relating to water quality. It is likely at the intake velocity listed, that fish over 100 mm. in size will not become entrained under normal circumstances.

2. Species that may have eggs occurring in the drift in the Kankakee River would be gizzard shad. Species of fish which would likely have larvae in the drift would be gizzard shad, carp, species of shiners (Notropis) and possibly walleye. It is highly unlikely that these species would survive in the Illinois River; therefore, any kill due to Dresden Station is insignificant. Most other species of fish found in the lower Kankakee have eggs and larvae that are closely associated with nests, vegetation, or bottom material in their earliest life stages. (Inventory of the Fishes of Four River Basins in Illinois, 1963, Spec. Fish Rep. No. 3, Ill. Dept. of Conser., June 1964.)

3. Because of poor water quality in the upper Illinois River adjacent to the Dresden plant, only pollution tolerant species such as carp, goldfish, green sunfish and some emerald shiners, have been common for a number of years. The actual discharge area of the Dresden Plant into the Illinois River maintains better water quality because this water originates mainly from the Kankakee River. As a consequence, both in the discharge area of the Kankakee River to the Illinois River and in the plant's discharge area, better quality of water is available for fish for a limited distance.

The survival of fish which may move out of the Kankakee into the Illinois River would be dependent upon the dilution ratio in the mixing waters. In the sampling of the Dresden pool during summer months, only occassionally are any species other than goldfish, carp, or emerald shiners taken, therefore the contribution of the Kankakee River fish population to the Illinois population can be regarded as insignificant, at least until such time that the Des Plaines River maintains sufficient water quality to support fish on

permanent basis. At present, it is academic whether the plant is on a once-through or closed-cycle cooling system for Units 2 and 3, as desirable species of fish inhabit the Des Plaines-Illinois River in the vicinity of Dresden Station only on a temporary basis.

Response: Under open-cycle operation, temperatures of 109°F at the condenser exit can result in large losses of entrained fish larvae and eggs. (The Staff does not believe that all such planktonic organisms will be killed, since, as was noted elsewhere in the DES, the existence of about a dozen species of fish in the Dresden cooling lake implies that some undetermined number of fish larvae and/or eggs can survive entrainment). Since some of the fish in the Illinois River are very likely recruited from the Kankakee River, either as adults or as larvae, loss of the larvae from the Kankakee River due to condenser passage, can be expected to affect fish populations in the Illinois River.

Under open-cycle operation, the volume of intake water for the Station is 1,142,000 gpm. This exceeds the 7-day 2-yr recurrence low flow of the Kankakee River, as is stated in the DES. All of the Kankakee flow and its entrained biota, as well as some of the Des Plaines River, will therefore flow through the Station during the low flow periods. The Staff is unaware of any studies by the Applicant that show no detectable loss of biota under those conditions. The Staff will welcome any results of such studies. The term "nearly equals" has been changed to read 67%.

In the absence of any data, the Staff made the conservative assumption, for purposes of calculations, that under closed-cycle operation all entrained biota may be killed. To the Staff's knowledge, the Applicant has not carried out any condenser passage studies to determine what percentage of entrained biota are killed. The Staff would be interested to know what "experience" the Applicant is referring to in this comment. The higher temperatures under closed cycle conditions and repeated condenser passage make survival of entrained biota less likely.

The Staff agrees with the Applicant that fish over 100 mm in size will not become entrained under normal circumstances. They may, however, be impinged on the travelling screens.

The Staff reiterates that gizzard shad, carp, and shiners can and do survive in the Illinois River (see Table 2.4). Even if this were not so, a philosophy that allows an industry to add to the degradation of a waterway on the basis that the system is polluted anyway, is unacceptable.

The Staff believes that the Station should not take credit for maintaining the Illinois River with better quality water. If the Station were not where it is, the Kankakee water would still flow into the Illinois at the Dresden Pool, and, additionally, would not be carrying waste heat into it.

In preparing the Statement, it was necessary to take into account not only the present state of the river, but also the conditions expected and/or desired during the lifetime of the Station, particularly since efforts are being made by state and federal agencies to improve the quality of surface waters.

11.2.14 Comment: (On Draft Statement, pg. 5-23)

There is a substantial question as to whether impingement information can be related to any significant adverse effect on number and species of fish in the Illinois River. (This is discussed in greater detail in comments on pg. 6-7, Section 6).

With respect to intake velocity and fish impingement the Applicant would like to offer the following additional comment not taken into account in the Staff's discussion. Traveling screen velocity of 1.85 ft./sec. is high enough to cause entrainment of some gamefish under 100 mm. in length provided they allow themselves to approach this close to the screens. The velocity at the bar racks of 0.5 or 0.6 ft/sec. would entrain only very small fishes, such as larvae. Larger fish would become impinged upon the screens only if they were in a physiologically weakened condition or dead.

The fish impingement data cited only reflects open-cycle operation and cannot be used to compare closed-cycle operation.

It must be re-emphasized that loss of larger fish on the screens probably results from fish entering through the bar rack being in a weakened condition and, hence, incapable of avoiding entrainment velocities.

The Applicant feels a program similar to the Dresden 1972 River Monitoring Program outlined in Table 6.1, Page 6-8 of the Draft Environmental Statement in conjunction with a traveling screen impingement monitoring program is

adequate to show that fish killed by impingement on the Dresden traveling screens does not result in an adverse depletion of fish species and numbers in the Illinois and Kankakee Rivers.

Response: The Table indicates the species. The Staff agrees that impingement data alone are meaningless unless related to data on fish populations in the rivers (see Section 6 of DES).

Although fish in a physiologically weakened condition are more likely to be impinged on the travelling screens than healthy fish, the Staff disagrees that only such weak or dead fish are impinged. The intake velocity at the Dresden travelling screens of 1.85 feet per second is higher than the average swimming speed of most fish in this river, which the Staff has assumed to be about 1.5 feet per second[1],[2]. When a fish senses the presence of the screen, he will attempt to escape. If he swims directly into the current then his velocity must exceed 1.85 feet per second at the screens in order to escape. If he swims at an angle to the current, additional velocity will be required in order to escape, depending on the angle.[3] For example, if he turns away from the screens at an angle of 60°, he must swim at a velocity of 3.6 feet per second to avoid impingement. Some of the smaller fish may not be able to achieve the higher swimming speed necessary to avoid impingement.

The Staff agrees with the Applicant that data obtained during open-cycle operation cannot be used to estimate results of closed-cycle operation, which is one reason the requirement for impingement monitoring is made in Section 6 of the DES.

The Staff reiterates that unless fish population studies are carried out in conjunction with fish impingement data collection, the monitoring program will be inadequate to determine whether impingement kills have a significant adverse effect on the river populations.

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1 L. King, "Swimming speed of the channel catfish, white crappie, and other warm water fishes from Canoningo Reservoir, Susquehanna River, Pa." Icthyological Associates Bulletin No. 4, March 20, 1969.

2 C. H. Hocutt, "The effects of temperature on the swimming performance of the largemouth bass, spotfin shiner, and channel catfish." Icthylogical Associates Report No. 5, Feb. 5, 1970.

3 D. W. Bates, O. Logan, and E. A. Pesonen, "Efficiency evaluation, Tracy Fish Collecting Facility." USDA Dept. of the Interior, Bureau of Commercial Fisheries, Pacific Region. Oct. 1960.

11.2.15 Comment: (On Draft Statement, pgs. 5-26 thru 5-31)

The Staff indicates that in winter low river flows are unlikely. Low river flows can and do occur in the winter. See for reference the monthly flow rates at Marseilles (III. R.) and Wilmington (Kankakee R.) in the Ill. Div. of Waterways records.

Dresden pool becomes nearly anaerobic during the summer in most years (i.e., recent record, Starrett, 1971). Consequently, any rise in temperature of the water could tend to aggravate a lower dissolved oxygen, although heated water entering from a plant, such as Dresden, may be considerably higher in dissolved oxygen, even though the temperature is higher than the ambient Des Plaines-Illinois River water.

Response: Appropriate changes have been made to the text to reflect that low river flows can and do occur in the winter.

The nearly anaerobic conditions of the Dresden pool during summer combined with the high concentrations of sewage wastes are severe impediments to the healthy natural state of the Dresden pool. Therefore, the Applicant must assure that all necessary precautions are taken to keep the Station operation from adding to this oxygen deficit.

11.2.16 Comment: (On Draft Statement, pg. 5-27)

The Staff has slanted the impact of the thermal discharge in statement 1 of the thermal effects within the mixing zone. Data collected since 1969 indicates that there is a scarcity of benthic organisms, with the exception of tubidficid worms, even in areas outside the influence of Dresden Station. This is a reflection of the poor water quality of the Des Plaines and Illinois Rivers and not the effect of a thermal discharge.

Statement 3 of the thermal effects within the mixing zone is unsubstantiated, since no predator fish have yet been collected within this area.

Response: The Staff agrees that the absence of certain benthic organisms can be a reflection of the poor water quality, but reiterates that at the immediate outfall, this effect is aggravated by the heated discharge, such that even tubificid worms would probably be absent. As water quality improves in the future, this outfall effect may become increasingly evident.

At least two of the fish species found in the Illinois and Kankakee rivers, (channel catfish and black crappie) prey on small fish. (See Tables 2.4 and 2.7)

11.2.17 Comment: (On Draft Statement, pg. 5-30)

The Applicant objects to the Staff's imposition of the EPA definition of the zone of passage because it is in conflict with the proposed recommendation of the Technical Committee of the N.A.S. (i.e. "Blue Book"). It is the Applicant's understanding, at this time, that the committee's recommendation will limit the size of the zone of passage to a minimum of 33% of the cross-sectional area of the river.

Three important conclusions should be added to the second paragraph concerning Dresden's plume causing a thermal block to the movement of fish.

1. There is probably no resident species of fish presently in the Illinois River near Dresden which requires migration for reproduction or any other life history purpose. It is possible that the Kankakee presents a nursery area as a source of the young carp and emerald shiners that are found in the Illinois and Des Plaines Rivers, but this is because of the poor water quality and not because of any inherent migratory needs.

2. At present, migration is not a necessary function of fishes in the Dresden pool, however, if water quality improves to the extent where game fish can survive from one year to the next, it is possible that a 90°F plume across the river would inhibit fish movement. This would have to be substantiated by a movement study. Most warm-water species do not require movement in rivers to complete life cycles, however movement by some species such as suckers and walleye pike does occur for spawning in the spring. At this time the plume temperatures at Dresden would more likely be in the order of 70°F and should not present a barrier.

3. Furthermore, in the specific case of Dresden Station, it is difficult to appreciate the need for such esoteric restrictions as a definitive numerical zone of passage in view of the considerable barrier to passage imposed by the Dresden Island Dam.

Response: The Staff has concluded that the EPA's definitions of an adequate zone of passage should continue to be used until the State of Illinois specifies otherwise.

Although the three conclusions by the Applicant are plausible, there is no evidence to warrant their inclusion as a Staff statement. Because of the paucity of data on fish movements in these rivers, the Staff took a conservative stand, but will welcome any evidence from field studies that can support or negate these conclusions.

11.2.18 Comment: (On Draft Statement, pg. 5-31)

The Applicant's position with respect to the 25% mixing zone limitation is stated in the aforementioned testimony. With regard to the measurement and control of the thermal plume, the University of Iowa, as a consultant to the Applicant, has undertaken physical modeling of the Dresden discharge to determine the extent and temperature distributions in the near and far field. From the results of the University's work, the Applicant will determine whether or not modification of the present discharge structure is necessary to achieve compliance with the State thermal regulations. In any event, field verification of the modeling results will be carried out after this decision is made. Once adequate correlation between the predicted results of modeling and the empirical data of field testing has been demonstrated, no further field verification will be necessary.

Response: The Staff has not evaluated any discharge system for closed-cycle operation other than combining the blowdown from Units 2 and 3 with the Unit 1 once-through flow in the Unit 1 discharge canal. If this method is implemented, then the requirements of Section 5.5 must be met by the Applicant. If an alternative method is utilized, then the design and environmental analysis of the method shall be submitted to the Commission for prior review and approval.

11.2.19 Comment: (On Draft Statement, pg. 5-32)

The Staff's idea that spray drift may possibly be responsible for promoting increased incidences of fungal diseases to crops in the immediate spray canal area seems like an unrealistic possibility because of the lack of agricultural activities in the immediate area of the spray canal.

Response: As noted in the statement, the Staff does not anticipate a severe problem from this spray drift. It must be noted however, that there is an agricultural plot in active use on the normal downwind side of the spray units which could be adversely affected.

11.2.20 Comment: (On Draft Statement, pg. 5-33)

The growth of algae in the cooling lake to the extent where it will create biological nuisances of the magnitude mentioned by the Staff in the draft is a hypothetical premature judgement. The Staff has not taken into account the limiting and other factors that may, in fact, as shown by the limited operational monitoring programs in the lake, limit algae growth and lessen the development of nuisance problems. Some of these factors are turbidity, variation of nutrients into the lake from the Kankakee, variation of heat input into the lake, the tremendous assimilative capacity of the lake, the oxygen that will be placed into the system from the spray canals under closed-cycle lake operation and the species of plankton being seeded into the lake from the Kankakee during lake make-up.

Prior to developing a control program to limit potential algae nuisance problems in the lake, the Applicant feels it is necessary to document such nuisance conditions and then to develop and to take corrective action related to the causative agent.

The Applicant agrees that organic algicides are in most instances not acceptable for wide spread applications because of the added stress that is placed on biota in aquatic systems. The Applicant is not in complete agreement with the Staff's recommendation which would not allow the Applicant to use copper sulfate based strictly on its build up in bottom sediments which may eventually be dredged and deposited elsewhere. As alluded to in the comments of the Draft, no dredging of the lake is anticipated. The Staff has not mentioned the use of chelated copper, an organic copper compound, for algae control, which has a considerably lesser deposition rate than inorganic copper.

The Staff mentions the possibility of using a microstrainer for controlling algae. The use of this device may be very necessary for meeting the rigid water requirements for a potable water supply and may be highly successful. The use of such a device, as implied by the Staff for controlling algae in Dresden's circulating water supply, is impractical and unrealistic.

Response: The Staff did not conclude that growth of nuisance algae will occur in the lake. However, this is a possibility that must be considered by the Applicant in planning its lake management program.

The Staff agrees that while it is certainly necessary to document such nuisance conditions, it is better to take preventive action when indicated by trends in the results of the lake monitoring program rather than wait for a nuisance condition to occur.

The Staff does not advocate the use of chelated copper because this would pose an even greater hazard to biota in the Illinois River than would copper sulfate.

The use of microstrainers for algae removal is realistic unless a large nuisance bloom has occurred, in which case other physical removal methods may be more practical.

11.2.21 Comment: (On Draft Statement, pg. 5-33)

The Applicant's calculations on the amount of silt build-up in the Dresden Cooling lake indicate that it will not be a significant problem and, therefore, dredging will not be necessary.

Under open-cycle conditions, our sampling indicates that 45% of the input suspended solids will settle out in Pool #1 of the lake. This calculates to a 2.26 foot build-up over the entire pool for the 40 year life of the plant. Pool #1 averages 16-20 feet in depth, so the 2.54 foot build-up in silt results in about a 13% reduction in volume. Pools 2 and 3, which have an average depth of 8 feet, would accumulate 0.96 feet of silt on the bottom. This is about 12% of the volume of the pools.

Under closed-cycle conditions where only about 65,000 gpm rather than 1,000,000 gpm is taken from the river, the amount of solids deposited will be greatly reduced. Additionally, when this smaller amount of water is used the suspended solids will be lower because almost all of the water will be drawn from the Kankakee River. The Kankakee River has a significantly lower suspended solids level than the Des Plaines. Our calculations show that the build-up of silt in Pool #1 should not exceed 0.105 feet during the 40-year life of the plant. This results in only a 0.55% reduction in volume. In pools 2 & 3 a build-up of 0.04 feet is predicted. This results in a 0.50% reduction in volume.

The accumulation of silt in pools 4 & 5 would be expected to be significantly less than pools 2 & 3 and therefore is considered negligible.

Therefore, since we do not expect a serious problem of silt build-up, we do not feel it is necessary to submit dredging and disposal program. Further, should the calculations be in error, a disposal program according to the then current State and Federal requirements will be developed when needed. The Applicant feels that a disposal program at the present time is a waste of valuable manhours and, at best, premature.

Response: The Staff agrees that deep silting throughout any portion of the lake will not occur. However, due to flow fluctuations and eddy currents, silt may build-up excessively over very limited areas or in mounds. This could most likely occur at the lift station discharge and possibly near the ends of the flow distribution dikes. Thus, some removal or redistribution of silt is likely to be required. The text now reflects this consideration.

11.2.22 Comment: (On Draft Statement, pg. 5-34)

Aerosols containing viable fecal organisms from a trickling filter spray system may be a potential health hazard during certain climatic conditions some distance from the source. (The Applicant does not understand what type of organisms Reference 38 is referring to? Are they fecal coliform, salmonella, shigallae or Vibrio cholerae? Will the Staff clarify this?) To relate this condition to sprays from Dresden's system that utilizes water that has a 2-1/2 day retention time in the cooling water cycle and to waters that have fecal coliform counts many magnitudes less than a sewage trickling filter system and the fact that fecal coliform counts have been shown to reduce in numbers as they pass through the cooling water cycle, is a very unrealistic unreasonable comparison. Also, the Applicant has estimated that the effective distance for spray drift is approximately 600 feet from the spray system. This does not compare to the 0.8 mile drift distance discussed in the referenced trickling filter study.

Past monitoring results of the spray canals indicate that the fecal coliform counts have had a range of approximately 0-10,000/100 ml. This contrasts with trickling filter effluent counts which have a range of 100,000 to many million/100 ml.

The Applicant feels that it is an imposition for the Staff to assure that health hazards due to the operation of spray modules be controlled, when a health hazard has not been found to be associated with nonsewage aerosols. The Applicant views the aerosols from its spray canal, having a F. coliform range of 0 to 10,000/100 ml. to be no more hazardous to public health than the spray mist from any barge on the Illinois River or any lock and dam spillway along the Illinois or Mississippi Rivers. The Applicant feels that what the Staff has recommended in this section (e.g., if bacterial counts in the spray canals exceed state standards for body contact, the Applicant shall assure that health hazards due to operation of the spray modules are controlled) is based on a non-relatable example in the literature and would become a meaningless procedure for spray canal operation. Regulation of spray canal operation based on F. coliform counts would become impossible to implement since the counts vary from day to day and hour to hour and since the counts represent 24-48 hour after the fact information.

The Applicant feels that when the lake goes closed-cycle, the volume of water entering the system will be less, thus reducing the total number of F. coliform taken into the Lake and Spray system. Based on these reasons, the Applicant objects to developing and Environmental Technical Specification mentioned in Section 5.5.3.e for implementing a plan to control the sprays to assure that they are not a health hazard.

The Applicant, as in its past monitoring programs, plans to continue to document the level of fecal coliform in its spray canal system.

Response: The Staff agrees that spray drift or mist potentially hazardous to humans can arise from many sources, e.g., wave action on surface waters, dams, flushing toilets, dentists' water drills, etc. This should not imply that we must ignore the spray system at Dresden. A direct comparison of the Dresden sprays with a sewage plant trickling filter was not intended. This reference (38) was cited as an illustration of the fact that some fecal organisms in air, originating from a spray system, can survive to considerable distances, depending on meteorological conditions. The Staff also agrees that it will often be impossible to control spray canal operation based on fecal coliform determinations, for reasons stated by the Applicant. However, this potential problem should not be ignored, and routine fecal coliform counts can give some indication of long-term normal water conditions and abnormal conditions can thus be detected. The Staff also agrees that under the closed-cycle operation, the 20-fold

dilution of the make-up water will substantially reduce the density of fecal organisms in the spray canals. Such reduction will normally result in safe levels. However, this conclusion must be verified by monitoring data.

11.2.23 Comment: (On Draft Statement, pg. 5-37)

In the third paragraph on page 5-37 reference is made to a test conducted by the Applicant on July 26, 1972. The results of this test appear in error; it is inconceivable that chloramines were absent. If this was the case, the implication is that inadequate chlorination was occurring during the test. In this same paragraph the Staff states that some 8 ppm of combined chlorine (chloramines) could be formed. This statement appears correct, but it contradicts the test conclusions. Also, in this paragraph a total chlorine residual limitation of 0.1 ppm is stipulated.

This limitation is reiterated in paragraph 2 on page 5-38 and the Staff concludes that, due to the closed-cycle operation of the cooling lake, the residual chlorine in the Unit 1 discharge to the river will be diluted and therefore meets the stipulated limit. The Applicant feels that there is no way that the 8 ppm combined chlorine concentration from Unit 1 can be reduced to 0.1 ppm by dilution due to the ammonia content of the river. The free chlorine will be dissipated, but the chloramines will remain and the dilution factor is not enough to get below the 0.1 ppm total chlorine residual limit. The Applicant is presently conducting a series of tests to verify these comments.

Response: The Staff's statement on chlorine, Section 5.5.5a of the DES, was apparently unclear to the Applicant. To reiterate: Despite the data provided by the Applicant, indicating that no free or combined chlorine was found in the Station discharge (results which the Applicant now indicates may be in error), the Staff was of the opinion that occasional high levels of combined chlorine might be discharged to the river, due to occasional high levels of ammonia in the intake water. The discharge from Unit 1 would be particularly suspect since the cooling water does not pass through the lake and sprays. The Staff did not conclude that Unit 1 discharge would always meet the stipulated limit by dilution with lake blowdown using present discharge volumes. The Staff therefore requires that the Applicant monitor its discharge to the river. The AEC-imposed limit of 0.1 mg/liter total chlorine for a period not to exceed 2 hours per day must be complied with by means suitable to the Applicant and the Staff.

11.2.24 Comment: (On Draft Statement, pg. 6-7)

Item 1. The Applicant objects to this conclusion which requires that all chemical, biological, and physical parameters (which is unclear, because biological is not listed in Table 6.2) listed in Table 6.2 be sampled at a frequency of at least eight times a year or once/month because of the following reasons:

Chemical:

1. Many of the chemical species on this list show little seasonal variation and can be monitored at a much lesser frequency than 8 or more times per year (e.g. heavy metals and nutrient series).

   The sampling frequency of the August 1970 monitoring period for chemical parameters will characterize seasonal variations which occur during various flow conditions of the river.

2. A heated effluent has little involvement with changing the chemical composition of a specific chemical specie (with the exception of DO & temp.). It is felt that monitoring at the frequency the Staff recommends would not tell the Applicant a great deal more about plant effect to the chemical community than what he already knows.

   The important consideration in a monitoring program, regardless of the frequency, is how the experimental area relates to the control area.

Biological:

Biological parameters are not listed on Table 6.2 as referenced in this section.

This section requires complete clarification on the Staff's part prior to commenting on the sampling frequency or to developing an Environmental Technical Specification.

Physical:

With regard to the measurement of the surface and vertical extent of the thermal plume under extreme and average river flow conditions, the Applicant will follow, as previously stated, a planned program under

various flow conditions for near and far field verification of the Dresden physical discharge model. Once verification of the model is complete, no further field testing will be required.

Completion of the physical modeling work, which is being conducted by the University of Iowa, is anticipated for late fall, 1973. Once the results of this work are fully evaluated a schedule for field verification will be compiled and forwarded to the Staff.

Item 2. The Applicant does not agree with the Staff imposing as a monitoring requirement diurnal plankton sampling. The necessity of routine diurnal plankton sampling would add little to a monitoring program of station operation effects. The Applicant does recognize that one or two determinations of this sort might be helpful in order to determine the degree of homogeneity and diurnal variation in plankton populations in the rivers. It appears that for routine measurement, nondiurnal sampling would be sufficient. The Applicant, therefore, anticipates little significant diurnal and spatial variation and sees little practical reason for incorporating this study into the Environmental Technical Specification.

Item 3. The Applicant does not see the rationale and objectives to be acomplished by the Staff's proposed dissolved oxygen monitoring study. It is assumed that the basis for the proposed program is founded on biological considerations. If this is true, the dissolved oxygen concentrations have been found to be near saturation and significantly higher in the Kankakee than in the Illinois River. The lower Illinois River values are due to the influence of the Des Plaines River. Studies, both past and present, have not suggested that dissolved oxygen concentrations in the thermal plume from the Dresden Station approach limiting conditions for the support of biological systems. The Applicant, therefore, believes that the DO sampling frequency suggested by the Staff is unfounded. The Applicant, however, will continue dissolved oxygen monitoring in the Des Plaines and Kankakee Rivers, ambient Illinois River, Illinois River downstream and in the plume on a quarterly diurnal basis.

In addition to this, the Applicant will measure dissolved oxygen concentrations during thermal plume evaluations designed to verify the physical model. The Applicant is proposing to conduct dissolved oxygen determinations which will be part of that program.

Item 4. The Applicant concurs with "item four" and feels that the expansion of this program as suggested by the Staff would be worthwhile.

Item 5. The program recommended by the Staff is not designed to provide for an adequate assessment of impingement. Data collected would be inadequate for even an empirical evaluation of the effects of fish loss due to station operation on Kankakee and Illinois River populations. The daily fish counts are not necessary because adequate subsampling techniques are available to estimate fish loss. More importantly the suggested program does not require species identification and length and weight frequency distribution except for one day per month. This is inadequate since the natural variability is not known and extrapolation of the monthly samples to daily fish counts will not provide even a good point estimate of the actual numbers and weights of each species removed. If the one day per month diurnal sampling is biased in any way, the entire months daily samples will be biased. The Applicant proposes to conduct a survey of the trash basket every 4th day. On the 4th day all fish collected in the trash baskets, in a 24-hour period will be counted, identified, and individual length and weight and frequency distribution determined from and adequate subsample for each species.

Item 6. When Units 2 and 3 begin closed-cycle operation, the water velocities in the intake canal from the Kankakee River will be substantially reduced. There will continue to be an area of higher intake velocities in the area where makeup water from the Kankakee mixes with lake water prior to the bar racks and travelling screens. However, young of the year or small fish will not be continuously subjected to high water velocities throughout the entire intake system. Since fish will be able to move from the area immediately prior to the bar racks and travelling screens into the makeup water canal, it is hypothesized that the number of fish removed by the travelling screens will be reduced.

Data presented in Table 5.6 are for a very short period of time, and they do not suggest that a concern exists about effects of impingement on fish populations in the Illinois and Kankakee Rivers. All species, with the exception of suckers, were immature. In addition the majority of fish were gizzard shad. It is difficult to comprehend how Station operation could affect fish populations since the natural mortality rate of the gizzard shad and more importantly the fingerlings of all species is extremely high.

The Applicant proposes no fish monitoring studies in addition to those discussed above in Item 5.

Item 7. With the amount of ammonia in the river, and the dilution flow available, there is no way to meet the stipulated 0.1 ppm total chlorine limitation (See Section 5.5.5 Comments).

Last Paragraph. The Applicant agrees that monitoring is necessary. However, the Applicant disagrees with the last paragraph of Section 6.2.1.a.7 under Item 8 on page 6-11 in which the Staff recommends a two (2) year nonradiological river monitoring program. The Applicant feels that a review of the nonradiological river monitoring program can be made now. Based on data from river monitoring programs began in 1968, it can be concluded that the upper limit of the effects of Dresden Units 2 and 3 has been adequately defined. Any future monitoring program should be aimed at detecting gross trends only.

Response: The Staff reiterates that sampling twice each season for the first 2 years of closed-cycle operation is the minimum necessary to indicate seasonal variations (incidentally, in Table 6.2, bacteria are considered biological entities). The Staff has not seen any data that verify the Applicant's comment that the "August 1970 monitoring program for chemical parameters will characterize seasonal variations which occur during various flow conditions of the river." At the end of the 2-year period, the Staff believes there will be sufficient data to determine what the sampling frequency shall be for routine monitoring, if any is considered necessary after the initial 2-yr period.

The Staff would agree with the Applicant that diurnal plankton sampling would add little to a monitoring program if an adequate diurnal sampling program had been carried out prior to this. To the Staff's knowledge, this has not been done, and therefore, a relatively intensive program for about 2 years seems necessary before a truly "routine" monitoring can be carried out with confidence. Otherwise, the choice of a particular depth and time of sampling for "routine" monitoring would be haphazard rather than random.

The above reasoning also applies to the dissolved oxygen monitoring. The reason for the Staff concern in this matter is noted in the response to the comment 11.2.15.

The Staff is agreeable to the Applicant's new proposal for trash basket surveys every 4th day, but reiterates the need for fish population studies in order to determine whether the numbers and kinds of fish killed by impingement are significantly adverse to the populations. Fish kill data alone serves only to provide numbers which cannot be interpreted in terms of effects on the environment. The Applicant is perhaps fortunate that Illinois state agencies carry out work, including fish surveys, on the Illinois and Kankakee rivers. Cooperative studies and consultation with

these agencies would very likely lessen the total amount of field work that the Applicant will need to do to evaluate the significance of fish kills due to Station operation.

The Staff discussion regarding impingement of fish on the bar rack and travelling screens is covered in the response to comment 11.2.14.

Because the data presented in Table 5.6 covers a very short period, the Staff is requiring a two-year fish monitoring program that will include both fish impingement data and fish population studies. Results from these programs should document with greater confidence the Applicant's conclusion that Station operation will not adversely affect fish populations.

The Staff has discussed the chlorine problem in the response to comment 11.2.23. These are several ways to meet the stipulated 0.1 ppm total chlorine discharge requirement including holdup of blowdown and/or dechlorination techniques.

The Applicant feels that the upper limit of the effects of Units 2 and 3 has been adequately defined, and that there is no need for further non-radiological river monitoring other than for gross trends. The Staff disagrees, particularly in view of the fact that Units 2 and 3 will operate with the lake in a closed-cycle mode, for which condition no data has yet been collected.

11.2.25 Comment:

In estimating generating costs, the Staff present valued all expenditures, whether investment or expense, and added them together. This method is incorrect from the Applicant's standpoint since it does not include income tax considerations or carrying charges on investment.

The Staff used a capacity factor of 80% (second paragraph, Section 10-1). In our opinion, this is too high. A capacity factor of 65% is more realistic. The generation at a 65% capacity factor would be 9.1 billion kW hours per year instead of 11.4 billion which is based on an 80% capacity factor.

The $72 million figure used in paragraph 5 of Section 10.1 is not explained and doesn't seem consistent with the annualized equivalent costs presented in Table 10.1. Assuming the $72 million is correct and a 65% capacity factor is used, the price to consumers would be $180 million.

The Staff used a fuel cost estimate of 2.05 mills per kW hour (Table 10.1, footnote c). This number is based on the initial core cost only and, therefore, assumes no escalation. The Applicant has recalculated a first 10 year levelized fuel cost of 2.41 mills per kW hour and believes this is a more realistic estimate.

Copies of Table 10.1 (page 10-2) and Table 10.2 (page 10-5) reflecting the Applicant's revisions outlined above are included at the end of the comments on chapter 10.

The Applicant feels that preceding comments and revisions should not alter the basic conclusions reached by the Staff in Section 10.4 (page 10-4), i.e. "the overall benefits of continued operation of both units will outweigh substantially the economic and environmental costs incurred."

Response: The Staff computation of generating costs does not include taxes because these, as transfer payments within the national economy, do not represent a real expenditure of resources intrinsic to construction and operation of the Station. Thus, taxes appear irrelevant to a NEPA review. Taxes are, however, a real and substantial cost to the Applicant and no implication to the contrary is made or intended by the Staff analysis.

The Staff considers 80% to be a reasonable estimate at present of average capacity factor over the life of current nuclear plants. However, the statistical basis for the estimate is admittedly meager because of the small number of modern plants now in operation. Thus, the estimate may well change as more history of operation develops. Also, the actual capacity factor for a given plant in a given system will depend on the system load factor and on the comparative economics of operation of the different types of generating capacity within the system. Admittedly, after 30 or 40 years of operation, the capacity factor may decrease, however, at this time no data is available on this effect.

Recalculation of Table 10.1 on the basis of the Applicant's estimates of 65% capacity factor and fuel cost of 2.41 mills/kWh would result in only minor changes. For example, the total life-of-plant cost would change from $528 million to $516 million.

Use of the lower estimate for capacity factor (65%) would reduce the primary benefit of energy generated by 19%. If the hypothetical validity of the lower estimate stemmed from system requirements, no reduction of

TABLE 10.1 Estimated Generating Cost[a]
(in millions of dollars)

Construction Cost:		
1974 present worth[b]	235	
Annualized (amortization over 28 years)		22.7
Operating Cost:		
1974 present worth	273	
Annualized:		
Operation and maintenance		4.5
Fuel[c]		21.9
Decommissioning Allowance:		
1974 present worth	5	
Total Life-of-plant Cost:		
1974 present worth	513	
Annualized equivalent		49

[a]For Units 2 and 3 jointly, as of February 1974 (excludes cost of transmission and distribution).

[b]Based on 1971 cost at first operation of $229 million depreciated (straight-line 30-year) to February 1974, plus modification costs of $13.75 million.

[c]Based on first 10 year levelized fuel cost estimate of 2.41 mills kW hour and assumed generation of 9.1 billion kW hour per year (65% capacity factor).

system reliability would occur, and the other primary benefit (contribution to reliability) would be unchanged. The balance of costs and benefits would continue to favor operation of Units 2 and 3.

11.3 OFFICE OF THE ASSISTANT SECRETARY OF COMMERCE (DOC)

11.3.1 Comment: (On Draft Statement, pg. 2-23)

The use of a shoreline seine would tend to bias the fish collections in favor of certain species. With regard to Table 2.4, a discussion of the effects of this sampling bias on the "Relative abundance" of fish collected near the station would be desirable.

Response: Seining is relatively non-selective for species and size in small rivers or embayments.* Although the Illinois River is hardly a small river, the use of the shoreline by fish in this river due to mid-channel dredging, barge traffic, etc., (see DES pg. 5-30) lends to its consideration as a small river. Shoreline seining in this particular case is therefore considered by the Staff to be an adequate method for sampling. It is entirely possible, of course, that one or more species frequenting the mid-channel would not have been sampled.

11.3.2 Comment: (On Draft Statement, pg. 2-33)

This section refers to "about a dozen species of rough fish" that reside in the cooling lake. Table C.4, page C-12, indicates, however, that not all these species are "rough" fish (e.g., largemouth bass and bluegill).

Response: The word "rough" has been deleted.

11.3.3 Comment: (On Draft Statement, pg. 3-26)

It is stated that "the area within the 5°F isotherm will always be less than 26 acres." However, because the plume size and shape depends to a great extent on the river flow (velocity) and wind conditions, the total cumulative area covered by the plume in all its configurations may well be greater than 26 acres.

* R. R. Garton, and R. D. Harkins, "Guidelines: Biological Surveys at Proposed Heat Discharge Sites." FSEPA Water Quality Office, Northwest Region. April 1970.

Response: The Staff interprets the Water Pollution Regulations of Illinois as regulating the size of the instantaneous area within the 5°F isotherm. Thus, the cumulative area covered by the plume in all its configurations is an inappropriate parameter to consider.

11.3.4 Comment: (On Draft Statement, pg. 3-43)

The concentration of total chlorine in the cooling lake at the point of discharge should be mentioned.

Response: The concentration of total chlorine at the point of discharge is discussed in Section 5.5.5 of the DES.

11.3.5 Comment: (On Draft Statement, pg. 5-23)

The Staff's conclusion that the entrainment effects of the closed-cycle operation of Units 2 and 3, in conjunction with Unit 1, will "cause no long-term adverse effects on the river as a whole" may well be true. However, it would be desirable to discuss the potential adverse effects in the pools immediately downstream with respect to stock recruitment from the Kankakee River.

Response: The Staff has concluded that as long as an adequate zone of passage is maintained in the Dresden pool (see Section 5.5.2 of DES), no adverse effects of station operation are expected in the pools downstream.

11.3.6 Comment: (On Draft Statement, pg. 5-23)

With regard to impingement of fish, the fish collection program for the traveling screens should be described, either in this section or in section 6. We recommend that this program include collection of data on number, length, and weight of each species impinged on the traveling screens.

Response: The fish impingement monitoring program is discussed in Section 6.

11.3.7 Comment: (On Draft Statement, pg. 5-29)

In addition to the increased susceptibility to pesticides, the possibility that the rate of uptake of pesticides by fish may occur more rapidly at higher water temperatures should also be discussed.

Response: The Staff mentions the possibility of higher metabolic rates which include rates of uptake.

11.3.8 Comment: (On Draft Statement, pg. 5-29)

Discussion of the possibility that mortality of fish may increase due to increased incidence of disease or formation of gas embolisms also seems warranted.

Response: A statement on gas bubble disease has been added to this section.

11.3.9 Comment: (On Draft Statement, pgs. 6-3 to 6-6)

The location of sample stations depicted in Figures 6.1 and 6.2 appears adequate, although we feel that more emphasis should be placed on the area adjacent to the intake. With reference to the benthic samples, replicate grab samples should be taken to ensure an accurate representation of the benthic community.

The use of the Kemmerer sampler at only one depth limits the usefulness of the data on phytoplankton. As suggested by the Staff on page 6-7, this study should be expanded. We recommend that the program be additionally expanded to include the Des Plaines River and a minimum of two stations in each river.

The original River Monitoring Program for "fish measurement" was inadequate, as noted by the Staff on page 6-7. However, this program has been improved, according to Table 6.3. We suggest further expanding this program to include sampling with gill nets and trap nets, if possible, and increasing the sampling frequency to once per week from April through September.

Response: The Staff agrees that it would be desirable to increase the number of replications, sampling sites, and sampling methods in the Applicant's montioring program. However, the Staff must attempt to strike an adequate balance between what would be an academically desirable program and one that would provide the necessary information at minimum expense, since the cost will eventually be borne by the consumer.

11.3.10 Comment: (On Draft Statement, pg. 6-16)

The "sample media" should include benthic animals, which are important in the food chain. Sediments and biota should also be sampled near the effluent discharge, as well as at the stations listed in Table 6.7. Sediments accumulate many radionuclides, and thus are a good indicator of environmental radioactivity.

Response: Sampling of benthic organisms will be included in the Environmental Technical Specification. The locations used to sample sediments and biota as given in Table 6.7 are considered better indicators of environmental radioactive contamination than the immediate discharge area.

11.3.11 Comment: (On Draft Statement, pg. 6-16)

We are unable to evaluate the average annual radiological impact on man via atmospheric dispersion as discussed in section 5.4. The atmospheric dispersion computations are explained as "done using the methods described in Reference 9." This reference apparently is a computer program, is described as "in preparation," and is not available to the reviewer. No reference is given to the source configuration (source height and type) nor on the meteorological data upon which the computations are made. It is stated that the relative concentration (chi/Q) is not applicable and that a unitless concentration ratio, K_c, is used to characterize the multi-source Dresden facility. This is misleading since according to the staff's reference (see footnote, page 5-15), $K_c = (chi/Q)\ (uL^2)$ where u is wind speed and L a reference parameter for length. Thus, in order to determine the effective chi/Q needed to compute dose, a value for L is required as well as the wind speed. None of this information is specified directly or is available through a reference or in an appendix.

Response: Specific information on the source configuration (source height and type) is contained in Sections 3.1 and 3.5. The meteorological data upon which the computations are made is contained in Sections 2.4 and 5.4.

The dispersion of the radionuclides released to the atmosphere was evaluated using a steady-state Gaussian plume algorithm. Since Dresden is a multiple release point site, each release point was treated with its appropriate

parameters, such as air flow rate, temperature, release height, etc. The concentration of radioactivity at the receptor, X, is then the summation of the contributions from the various release points. To provide the reader with a set of identifying numbers, K_c values have been presented in Tables 5.2 and 5.3 of the FES. Using the procedure of Slade,* we have defined K_c as

$$K_c = X/X_e$$

where X_e is the concentration in the effluent aperture. For a multi-source facility, X_e is taken as a reference concentration defined as if all release points mixed in the immediate vicinity of the plant. In this manner, a single set of dispersion parameters is representative of a multi-source facility.

11.4 DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (HEW)

11.4.1 Comment:

Section 3.4.3 (Dresden Cooling Lake) references a Figure 2.14 however, there is not such figure in the draft document. Section 3.4.4 describes the spray modules and states in part that each module consists of four (4) spray nozzles. However, Figure 3.10 shows a spray module being installed in the canal and the module consists of five (5) spray nozzles. This could affect the cooling efficiency of the spray modules.

Response: The reference to Table 2.10 which appears on page 3-31, paragraph 6, should have been on Table 3.10.

The reference to Figure 2.14 which appears in the title of Section 3.4.3 should have been to Figure 2.12. Both errors have been corrected.

The centermost attachment to the horizontal pipe of the spray module shown in Figure 3.10 contains the pump and its motor rather than a spray head as seen on the other four (4) pipe attachments.

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* Slade, D. H., Meteorology & Atomic Energy 1968, U.S.A.E.C. (1972), see page 237, Eqn. (5.73).

11.5 DEPARTMENT OF TRANSPORTATION - U.S. COAST GUARD

11.5.1 Comment:

"It is noted that fogging and icing resulting from the operation of the cooling lake will continue to be a hazard to travel on adjacent roads. In this regard, the draft statement provides that serious consideration must be given to the fog problem. It is also noted that the statement provides that during periods of intense fogging and icing, the Applicant shall assure travel safety on those roads. We assume these actions would include alerting the motorist of the fog-ice problem through adequate detecting and signing, closing certain sections of the existing highways to travel during uncontrollable periods and possible modification of the plant's operations during certain atmospheric conditions for achieving relief to this problem."

Response: The reply to this comment will be found in the response to comment 11.2.11.

11.6 ADVISORY COUNCIL ON HISTORIC PRESERVATION

11.6.1 Comment:

Although your environmental statement indicates that there is a National Register property (the Illinois and Michigan Canal) in the immediate vicinity of the proposed power station, it lacks a determination as to whether or not the proposed undertaking will have an effect on the property. Until such a determination is made by your agency, the Advisory Council cannot comment with respect to your project.

Response: In reevaluating this matter the Staff concludes that the physical separation of the Illinois and Michigan Canal from the Station property, due to the presence of the Illinois River in between, will assure that no damage will result to this historic property due to the operation of the Dresden Station.

11.6.2 Comment:

In the case of land under the control of jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed

undertaking will result in the transfer, sale, demolition, or substantial alteration of potential National Registe properties. If such is the case, the nature of the effect should be clearly indicated.

Response: The determination and statement have been added to this document (see Section 5.1.1).

11.6.3 Comment:

In the case of lands not under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will affect any non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance.

Response: This determination and statement has also been added to this document (see Section 5.1.1).

11.7 DEPARTMENT OF AGRICULTURE

11.7.1 Comment:

We suggest that the Illinois Department of Conservation be contacted for comments, because they would know more about the effect of the project on Illinois' natural resources than the other Illinois departments or the U.S. agencies.

In general, the Forest Service has no objection to the operation of Dresden Units 2 and 3. Effects on vegetation are estimated to be much less than those of coal-fired or oil-fired plants.

The environmental effects of mining and concentrating the uranium ore are not given, and there is no statement on the effect on vegetation of burying radioactive waste at Sheffield, Illinois.

In applying herbicides along transmission lines (pp. 5-35/5-34), care should be taken to avoid excessive amounts over roots of trees adjacent to power lines.

No effect on vegetation is anticipated from ozone that is formed around conductors.

Response: The State of Illinois has been contacted for comments.

The environmental effects of mining and concentrating the uranium and the disposal of radioactivy waste are subjects of other AEC statements and thus are not considered in this document.

11.7.2 Comment: (On Draft Statement, pg. 4-3)

Soil survey information is included in the statement and it is noted that the average corn yield from the area inundated by the cooling reservoir is approximately 90 bushel per acre. The statement should also indicate that yields from this land in future years would have been greater and that the economic loss would therefore increase.

Response: Although future increases in productivity may occur, the Staff is unable to quantify any such increases and thus has not attempted to speculate in this area.

11.7.3 Comment: (On Draft Statement, pg. 5-5)

The surveillance program should include inspection of the vegetative cover in the vicinity of the embankment.

The Soil Conservation Service, through the Will County Soil and Water Conservation District, is willing to provide technical assistance in matters concerning soils, control of erosion and sedimentation, and establishment and maintenance of vegetation suitable for soil protection, wildlife habitat enhancement and beautification.

Response: An appropriate note regarding this surveillance program has been added to the statement (see Section 6.2.1.c).

11.8 ENVIRONMENTAL PROTECTION AGENCY (EPA)

(Since the comments presented in the "Introduction and Conclusions" of the EPA Comments are included in the text of those Comments, the staff responses begin with the text comments.)

Radiological Aspects

Radioactive Waste Treatment

11.8.1 Comment:

Although this is a draft statement for a licensing action associated with Dresden Units 2 & 3, we believe it is appropriate for us to address comments, as needed, to systems in Dresden Unit 1. This is particularly true for the gaseous effluents since the present and proposed regulations which govern gaseous effluent releases apply to the site as a whole. Furthermore, it is our understanding that there will be no separate statement issued for Dresden Unit 1. The present gaseous waste treatment system for Dresden Unit 1 is not capable of limiting radiogas discharges and subsequently offsite doses (to individuals and to the population), to levels that are "as low as practicable." The draft statement indicated that the applicant is committed to install a modified off-gas system for Dresden Unit 1 in 1975. We commend this action and encourage the applicant to expedite the plant's effluent control system modifications (especially since the population doses from Dresden Unit 1 are comparatively large; the Dresden Unit 1 population dose estimate is over an order of magnitude greater than any population dose estimate for a nuclear power plant for which statements have been prepared). Although the design details for the augmented systems may not be available, we believe that the final statement for Dresden Units 2 & 3 should include the design objectives for the proposed Unit 1 radioactive waste system modifications and any other descriptive information available.

Response: The proposed Unit 1 modified off-gas system will utilize catalytic recombination to eliminate radolytic hydrogen and oxygen. The remaining off-gas will be allowed some decay using a delay mechanism. This will result in a design decontaimination factor of about 100 relative to the existing system.*

*Letter from J.S. Abel, Nuclear Licensing Administrator-BWR, CECO, to B. J. Youngblood, Chief, Environmental Projects Branch 3, USAEC, dated October 22, 1973.

11.8.2 Comment:

Since Dresden Units 2 & 3 are operating, actual operating data would provide a basis for making estimates of plant performance. Actual operating data for Dresden Unit 1 were utilized to estimate the radiological environmental impact for that facility; however, the standard source term model was used to estimate discharges from Dresden Units 2 & 3. We request that the available operating data for Dresden Units 2 & 3 be utilized to evaluate the radiological environmental impact of the units and to compare the results with the assumptions used in the standard models. In particular, available operating data from the Dresden Units should be presented and utilized in the final statement for:

1. Gaseous and liquid releases (on a isotopic basis, if available);

2. Leak rates from the coolant and power conversion systems;

3. Radionuclide concentrations in the reactor coolant as a function of time;

4. Radionuclide partition factors and waste treatment equipment decontamination factors (on an isotopic basis, if available); and

5. Power generation history (either a histogram or a tabular presentation of effective full power days).

Response: The calculated releases of radioactive materials in liquid and gaseous effluent from Dresden, Units 2 and 3 are given in Tables 3.5 and 3.8 respectively. The principal parameters and conditions used in our evaluation and source term calculations are given in Table 3.3. Our analysis is based on our model of the applicant's radioactive waste management systems and considered plant operating conditions furnished by the Applicant. The parameters such as leak rates, partition factors, decontamination factors, power generation history, primary coolant nuclide concentrations used in our evaluation have been derived from operating experience where data were available including data from Dresden 2 and 3. Where operating data were inconclusive or not available information was drawn from laboratory, field test and design data. Consequently, these parameters best represent nuclear power reactor operating experience averaged over the life of the plant. The bases for our parameters are given in WASH-1258, Volume 2, Appendix B.

11.8.3 Comment:

Reactor Accidents

We have examined the analysis of accidents and their potential risks which have been developed in the course of engineering evaluation of reactor safety in the design of nuclear plants. Since these accidents are common to all nuclear power plants of a given type, we concur with the approach to evaluate the environmental risk for each accident class on a generic basis. Extensive efforts have continued to assure safety through plant design and accident analyses in the licensing process on a case-by-case basis. However, we favor the additional step now being undertaken of a thorough analysis on a more quantitative basis of the risk of potential accidents in all ranges. We believe this will result in a better understanding of the possible risks to the environment.

In order to provide a fuller understanding of the direction of these efforts, we request that the final statement provide information on the nature, expected schedule, and level of effort of those generic studies which are expected to lead to a basis for a subsequent assessment concerning the risk from all potential accident classes in the Dresden Nuclear Power Station. We recognize that this subsequent assessment may be either generic or specific in nature depending on the outcome of the generic studies. In addition, the final statement should include a commitment that this assessment will be made publicly available within a reasonable time period following completion of the generic studies. If the above efforts indicate that unwarranted risks are being taken at the Dresden Nuclear Power Station, we are confident that appropriate corrective action will be taken.

Response: Section 7.1 has been changed to respond to the EPA concern on the generic assessment of the risk from all potential accident classes.

Non-Radiological Effects

Thermal Effects

11.8.4 Comment:

The draft statement indicates that, as soon as the rad-waste system is operable, the applicant intends to utilize a closed-cycle cooling system for Units 2 and 3. The estimated time for the closed-cycle operation for Units 2 and 3 is February 1974. Based on information in the statement, however, it appears

that in some situations the closed-cycle system will not be used. The statement should detail the frequency and circumstances which would require operation in other than the closed-cycle mode, and evaluate the potential impacts on the biological and physical characteristics of the river.

Response: Under rare and unexpected situations when the lake is inoperative and the demand for power would require continual Station operation, the Station could be operated temporarily in the open-cycle mode. The frequency of such events are postulated to be very low and may not occur during the remaining life of the plant. The Environmental Technical Specifications will require operation in the closed-cycle mode. Extenuating circumstances requiring open-cycle operation must be received and approved by the Commission.

11.8.5 Comment:

At the present time the upstream temperatures on the Des Plaines River are sufficiently high during some periods of the year that the operation of the Dresden Nuclear Power Plant as planned will probably violate the Water Pollution Regulations for the State of Illinois, which constitute existing federally approved water quality standards. These standards presently apply to the Des Plaines and Illinois Rivers and require the following temperatures not to be exceeded: January, February, March and December - 60°F, all other months - 90°F. In addition, temperature increases caused by thermal discharge shall not exceed 3°F above ambient during one percent of the hours in a 12 month period.

The State of Illinois has revised the temperatute limits for the Lower Des Plaines River, from the I-55 Bridge to the confluence with the Kankakee River. This standard would require that the following temperatures shall not be exceeded by 5°F more than 4% of the time over a 12 month period: January, February - 60°F, March - 70°F, April - 77°F, May - 85°F, June, July, August, September, October - 90°F, November - 76°F, and December - 70°F. We have, however, expressed our reservations whether such standards would be federally approvable in a letter dated June 15, 1973, to Mr. Samuel Lawton, Acting Chairman of the Illinois Pollution Control Board. In addition, our agency recommended in a letter to Mr. William Blaser, formerly of the Illinois EPA, dated December 14, 1972, a new and more stringent thermal standard for the Illinois River. Copies of both letters and the recommended standards are attached.

During the recent hearings by the Illinois Pollution Control Board on the proposed amendment to the temperature standard for the Des Plaines River the applicant's witness indicated that temperatures at the Joliet Yacht Club (immediately upstream from Dresden) are already sufficiently high to violate the present standards. Considering this testimony and information related to the thermal discharge from Dresden in the draft statement, we must conclude that the operation of the three Dresden Units results in even worse temperature conditions downstream from the plant. An adequate evaluation of the impact of the waste heat contribution from Dresden requires additional information on the waste heat contributions upstream. We recommend that the applicant perform an evaluation of the waste heat loads and resultant stream impact created by the applicant's Joliet and Will County fossil fuel plants upstream of Dresden on the Des Plaines River. This evaluation should be included in the final statement. It is possible that the applicant may have to consider limiting the thermal input of the Joliet and Will County plants as well as controls at Dresden.

Response: If the ambient Illinois River temperature in the vicinity of the discharge exceeds approximately 88°F in the summer or 58°F in the winter, the full power heated discharge of the Station would probably violate the above noted Illinois River temperature standard. Under such conditions the Applicant would be expected to curtail or cease operation unless extenuating circumstances prohibit such action and the State of Illinois allows a variance. The revised state standards for the lower Des Plaines River are in no way a consideration for the Dresden plant. The Illinois River standards were approved by the Environmental Protection Agency by letter from Francis T. Mayo, Regional Administrator (region V) to Honorable Daniel Walker, Governor of Illinois, dated January 16, 1973. EPA informed the Staff that the temperature standards in their comment were in error. The comment above has been appropriately corrected.

11.8.6 Comment:

Since EPA has recommended that Illinois adopt even stricter standards than the present ones, the situation concerning compliance of the Dresden discharge could be even more critical in the future. This fact, coupled with the provisions of the FWPCA requiring "best practicable control technology currently available" by July 1, 1977, and "best available technology economically achievable" by July 1, 1983, argue for modifications of the proposed cooling system. Although the guidelines defining the above terms have not

yet been promulgated by EPA, it is likely they will require some form of closed-cycle evaporative cooling. Thus, we recommend that serious consideration be given to converting the once-through system currently employed for Dresden Unit 1 to closed-cycle as will be used for the other two units. In addition, we recommend that blowdown from all three units be taken from the cold side of the cooling system (i.e., after the water has been cooled by the cooling lake).

The final statement should include a detailed analysis of the operation of all three Dresden units with closed-cycle cooling and pertinent information should be submitted as part of the application for a Section 402 permit under the FWPCA (i.e., a permit under the National Pollutant Discharge Elimination System).

Information in the draft statement indicates to us that, if Dresden Unit 1 continues operation with once-through cooling, the water requirements from the Kankakee River will be equivalent to 117% of the 7-day-10-year-low-flow; under extreme conditions, this could rise as high as 260% of the river flow. These additional water requirements will be obtained from backflows from the Illinois and Des Plaines Rivers. Aside from recycling of heated discharge water which would hamper plant cooling, this backflow would result in relatively poor quality water from these two rivers partially or totally infiltrating the mouth of the Kankakee River, which has water of much higher quality and supports a good fish and aquatic biota population. This problem argues in support of the recommendation made above that the cooling system for Unit 1 be converted to closed-cycle whereby the water demands would be reduced to a fraction of that necessary for the once-through system.

Response: Dresden Unit 1 was issued a full term operating license in October 1960. Since no major licensing action has been taken with Unit 1 since the NEPA, the provisions of NEPA do not apply. The Staff has identified the impacts of Units 1, 2 and 3 assuming closed-cycle blowdown from Units 2 and 3 mixing with the once-through discharge of Unit 1. Our analysis shows that the mixing zone requirements and the maximum river temperature requirements of Illinois (EPA approved) will probably not be violated by the proposed discharge system. The Staff has concluded that an adequate zone of passage may not exist (as recommended by EPA and, as yet, not accepted by Illinois). The Applicant's studies, now in progress, of the discharge methods must consider these effects. The AEC will require that an adequate zone of passage exist. These studies will indicate what method is best suited to accomplish this goal. Imposition of required closed-cycle cooling on Unit 1 at this time cannot be justified.

11.8.7 Comment:

We also understand that there has been difficulty with the operation of the spray modules in the cooling canal. Additional discussion of the performance of the closed-cycle system and the impact of failures of the spray system on the Illinois River thermal loads should be included in the statement.

Response: Failure of all of the spray modules would have little additive effect upon the Illinois River thermal loads since the Unit 1 discharge contributes most of the heat released. Such postulated failure is, however, considered unrealistic since the spray system consists of 98 separately powered units. In its comments to the draft of this Statement, the Applicant projected improved operational reliability of these units due to recent redesign and modification.

Biological Effects

11.8.8 Comment:

The discharge from the operation of the Dresden facility will aggravate the dissolved oxygen sag caused by the effluent from the Metropolitan Sanitary District of Greater Chicago and high temperatures from the Joliet and Will County Stations. Any reduction in dissolved oxygen of the Kankakee water will cause further standards violation. In our opinion, this operation also violates the non-degradation clause of the Water Pollution Regulations of Illinois since increased temperatures and lowered dissolved oxygen will further degrade the river.

Response: As discussed in Section 5.5.2.b, normal operation of the Dresden Station should not lower the dissolved oxygen in the water discharged to the Illinois river, primarily because of the aeration action of the sprays. A decrease in dissolved oxygen could occur, however, if large algal blooms occur in the cooling lake. The Applicant is required to prevent such blooms by carrying out a lake management program.

11.8.9 Comment:

The statement repeatedly rationalizes environmental aspects with the argument that the Illinois River as a whole will not be seriously affected. We do not agree with this supposition. The Illinois River is 439.25 kilometers (273 miles) long with numerous tributaries. An impact at its source may be hard to measure at its mouth. Nevertheless, any impact at any point along the river is important and must be considered individually and evaluated in the immediate area as well as further downstream.

Response: The Staff has evaluated the impact to the immediate area as well as to the river as a whole, using what it considers to be the best available information.

11.8.10 Comment:

A major concern in plant operation is the impact on the fish populations in the Kankakee River as a result of cooling water intake. The statement in Table 2.7 shows that there is a good fish population in the river with a significant number of small mouth bass and green sunfish as well as many minnows that serve as a food source for these game fish. Because of its good quality (dissolved oxygen 10.7 mg/l, pH 7.1, total phosphorus 0.8 mg/l, and COD 6 mg/l), the Kankakee supports a high quality fishery. The statement on page 5-23 mentions that most fish populations can stand a certain harvest rate, and loss of fish through the predation of the traveling screens can be considered part of the harvest. In our opinion, however, power plant traveling screens should not be considered as a useful tool in fisheries management. We recommend that the applicant be required to protect all life stages of important game and forage fishes, using whatever technology is necessary at the intake structure to do this. Therefore, it is our opinion that a bypass be provided on both the canals in order to minimize fish loss and injury.

Furthermore, Section 316(b) of the FWPCA requires that intake structures reflect the best technology available for minimizing environmental impact. It is noted that velocities at the bar rack and traveling screens for Unit 1 are approximately .152 m/sec (0.5 ft/sec.). Also, it is noted that reference is made to the operation of Indian Point Nuclear Generating Plant No. 1 where data indicated that reducing the intake velocity from .366 m/sec to .244 m/sec (1.2 ft/sec to 0.8 ft/sec.) considerably reduced the number of fish killed. It is our opinion that the intake velocity should be reduced from the design value of .567 m/sec (1.85 ft/sec.) to .152 m/sec (0.5 ft/sec.).

Response: The Staff agrees that the intake velocities for Units 2 and 3 at the traveling screens are undesirable. For a new plant this change in design would probably have been required. However, modification of the intake structure (backfitting) would cause considerable shutdown time and expense which would eventually accrue as a detriment to the consumers. Until the impingement kills at Dresden are shown to cause adverse effects on the fish populations of the Kankakee and Illinois Rivers, the expense of back-fitting is unjustifiable. The Applicant is required to assess the impact

of fish impingement on river fish populations for two years of closed-cycle operation. If serious effects are indicated, the Applicant shall be required to take corrective action (see also response to comment 11.2.14).

Chemical Effects

11.8.11 Comment:

Chlorination of the condenser cooling water for slime control, and chlorination of the effluent from the sanitary sewage trickling filter plant may result in continuous discharge of chlorine to the Illinois River. The expected concentrations of chlorine in the receiving water from this source should be indicated in the final statement. In our opinion, the discharge of chlorine should be monitored to insure that the concentration in the river is limited to the following recommendations:

Type of Criteria	Recommendation for Residual Chlorine
Continuous	0.002 mg/l
Intermittent	(1) 0.2 mg/l Not to exceed 30 minutes per day (2) 0.10 mg/l Not to exceed 2 hours per day

Response: The Applicant is required to monitor residual chlorine in the discharge (see DES, p. 6-7). Both condenser discharge and sewage effluent are subject to the limit of 0.1 mg/l in the discharge not to exceed two hours per day (see FES, p. 5-38). For continuous discharge, the Applicant is limited to 0.01 mg/l in the discharge, which upon dilution in the receiving water will be less than 0.002 mg/l, the EPA criteria for the receiving stream. Field determinations of 0.002 mg/l are not possible with present techniques, and the Staff has therefore required that measurement be made in the discharge. Levels of 0.01 mg/l are just above the present limit of detection.

11.8.12 Comment:

In addition, no mention is made of the handling and disposal of sludges arising from the treatment of the sanitary sewage. Sludge disposal procedures should be detailed. Also, the characteristics of the sanitary effluent are not included in the statement and no mention is made that the system conforms to the requirements of the State of Illinois.

Response: The Spirohoff primary digestion tank digested solids (sewage sludge) are removed on an approximate bimonthly interval during non-winter months by a private contractor. The sludge is pumped into a truck tank, transported and disposed of at a state approved disposal site. The technique of handling sludge in this manner is approved and complies with requirements of the State.

Monthly average values of weekly samples of the final liquid effluent for the period January through August 1973 are shown in the following table:

	BOD_5	Suspended Solids	DO
Average	25.7 ppm	26.3 ppm	5.[illegible] ppm
Maximum	42.9 ppm	29.0 ppm	7.7 ppm
Minimum	9.7 ppm	14.7 ppm	2.7 ppm

The effluent characteristics shown above, when compared to State of Illinois Standards for BOD and suspended solids for deoxygenating wastes, show that Dresden's final liquid effluent meets the State's* criteria.. The requirements of the State of Illinois are contained in the "Water Pollution Regulations of Illinois" and shown in Appendix A to this statement. Para 404(a) "no effluent shall exceed 30 mg/l of BOD_5 or 37 mg/l of suspended solids..." Para 401(c) allows for averaging the sample for a 24 hr period and puts an absolute maximum of 5 times the numerical standard.

11.8.13 Comment:

The statement makes reference in the chemical and waste processing sections of operating procedures that waste will be held and monitored before release for either re-use or discharge to the Illinois River. It is not clear as to what reporting procedures will be developed and/or to whom these reports will be submitted. A very close surveillance of the monitoring program is necessary and should be coordinated with the AEC and the State Regulatory Agency. Assurance of discharges within the allowable limits is important and can only be met if the reporting procedures are followed.

*Letter J.S. Abel, Nuclear Licensing Administrator-BWR, CECO, to B.J. Youngblood, Chief, Environmental Projects Branch 3, USAEC, dated October 22, 1973.

Response: Environmental Technical Specifications will be implemented controlling the monitoring and disposal of waste. In addition, a report will be submitted for the previous six months operations, as part of the Semiannual Operating Report, summarizing the results of the environmental activities for the 6 month period. Periodic site inspections by AEC Regulatory Operations personnel will provide additional surveillance.

Additional Comments

11.8.14 Comment:

1. The bases for the AEC's estimate of the direct dose rate from the station should be presented. This information should include the type of concrete shielding around the turbines, the source-term in the turbine system, and the method used to calculate the direct shine doses at locations offsite. It would also be helpful if actual dose measurements of the direct dose are presented in the final statement. Even though direct shine doses should be low near the site, the statement should provide criteria governing offsite exposure to direct doses.

Response: Estimates of the direct dose rate were made using Monte Carlo computational methods employing a source term based on staff's experience. Information as to shield construction, etc., can be found in the FSAR. Operational experience, without the augmented radwaste system, has indicated an annual site boundary dose rate - including the direct dose rate as well as the plume contribution - of about 30 mrem/yr. The N^{16} shine from the turbine building has been measured at background level* thus showing good agreement with the Staff's estimate of 1 mrem/yr.

11.8.15 Comment:

2. The environmental report for Dresden Unit 3 (Supplement 1, page 15) indicates the reactor's modified main condenser air ejector gaseous waste treatment system will include a spare recombiner system. However, the draft statement does not mention spare recombiners for either Dresden Unit 2 or Unit 3. This discrepancy should be clarified. If Units 2 and 3 do not have spare recombiners, then Table 3.8 of the draft statement should include the gaseous discharge estimates for the periods of recombiner downtime, as has been previously included in similar cases.

Response: For the modified off-gas system for Units 2 and 3, redundancy of the air ejector, preheater, recombiner, off-gas condenser, water separator,

*"Environmental Radiation Survey of the Dresden Nuclear Power Station" Env. Analysts Inc., N.Y. (December 1971).

cooler-condenser, moisture separator, particulate filters, and charcoal vault air conditioning units is provided for operating convenience and maintenance. Valving is provided for selecting either one or both recombiner trains. Each recombiner train consists of a third-stage air ejector, preheater, recombiner, off-gas condenser, and a water separator. Provision is made for the 2 hydrogen analyzers to sample the effluent from either one or both recombiner trains. Either one or both cooler condenser trains (cooler condenser, moisture separator, reheater, and prefilter) may be selected for operation. The charcoal can be operated in one of three modes: (a) all 12 vessels in series; (b) 3 parallel strings of 4 vessels; or (c) bypassing of all charcoal. Valving is provided to return the modified off-gas system to the existing system by bypassing and isolating the catalytic recombiner charcoal bed system equipment.*

11.8.16 Comment:

3. Table 3.6 of the draft statement contains estimates of cesium discharges from the existing and modified liquid waste treatment system for Units 2 and 3. The table indicates that cesium discharges to the environment increase when the modified waste treatment system becomes operational. This apparent discrepancy should be resolved in the final statement, especially since the discharge of cesium to the environment results in the main contribution to whole body doses via the liquid discharge pathways.

Response: The quantities of specific radionuclides shown in Table 3.6 of the DES to be released from the augmented system were calculated to be a fraction of the values shown. However, to compensate for equipment downtime and anticipated operational occurrences the values were normalized to a total release of 5 Ci/yr excluding tritium and dissolved gases. This normalization gives the appearance that certain nuclides increase over those calculated to be released from the present system which were not normalized. Since the issuance of the DES we have changed a number of our source term parameters based on more recent data including our parameter for normalizing releases of radioactive material in liquid effluents. Table 3.6 of the FES has been revised in accordance with our parameters for normalization discussed in WASH-1258, Volume 2, Appendix A, Section 18 on Page A-13.

11.8.17 Comment:

4. The draft statement has contradicting information on the date of completion of the modified gaseous waste treatment system, and this should be clarified in the final statement.

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*Quad Cities Units 1 & 2, Special Report No. 1 and Supplemental Information for Dresden Units 2 & 3, Special Report No. 4A, Modified Off-Gas System. Commonwealth Edison Company.

Response: Table 3.7 of the DES has been corrected to show that a modified offgas treatment system will be installed by the fall of 1973. Paragraph 1 on Page 3-37 of the DES has been revised to reflect this same time period. These changes are consistent with the applicants commitment contained in a letter to B. J. Youngblood from J. S. Abel, Commonwealth Edison Co. dated August 10, 1973.

11.8.18 Comment:

5. The applicant indicates in the environmental report Supplement IV (AEC Question 3) for Dresden Unit 3, that two waste concentrators will be included in the floor drain system of the Dresden Units 2 and 3 liquid radwaste treatment system. The draft statement does not discuss or indicate the provision of the two waste concentrators. The final statement should clarify this discrepancy.

Response: See response to comment 11.2.10.

We have been advised in a letter to B. J. Youngblood from J. S. Abel, Commonwealth Edison Co., dated August 10, 1973, of the addition of two waste concentrators in the floor drain system. In our response to comments from the applicant we have presented our evaluation together with the calculated releases of radioactivity in liquid effluent as a result of this modification.

11.8.19 Comment:

6. The final statement should present the primary coolant concentration of I-131 that was assumed in calculating I-131 releases from Dresden Units 2 and 3. Using assumptions presented in the draft statement for the proposed Appendix 1 and adjusting for plant size, we estimate releases that are twice those presented in Table 3.8 of the draft statement for Units 2 and 3.

Response: Since our evaluation of the radwaste treatment systems and the issuance of the DES for Dresden, Units 2 and 3 a number of our parameters have changed. These changes have occurred due to more recent data received from inplant measurements performed independently by AEC and GE and from experience data from operating reactors. The effect of the changes in our parameters result in an increase of less than 10% in the calculated iodine releases shown in Table 3.8 of the DES. The assumptions used in the draft

statement for proposed Appendix I were developed by ORNL. In the DES we calculated a dose to the child's thyroid through the grass-cow-milk pathway to be 1.3 mrem/yr from iodine releases from Units 2 and 3 at the nearest actual cow. The calculated dose is well below our as low as practicable guideline of 15 mrem/yr. The slight increase in iodine releases due to changes in our parameter would increase the calculated dose by the same percentage (less than 10%). This increase would not change our conclusion that releases of iodine from Unit 3 meet our as low as practicable guidelines.

11.8.20 Comment:

7. The AEC detailed in the draft statement the applicant's environmental surveillance program that had been operating for fourteen years. The final statement should discuss the results of this extensive program and indicate any significant radiological findings.

Response: Radiological monitoring in the vicinity of the Dresden complex was initiated in 1958. In general, the program has indicated that the radioactivity levels in most environmental media in the immediate environs as the station have hardly been distinguishable from the natural and fallout radioactivity levels. Measurements of foodstuffs, including milk, have been at levels below detection limits. Particulate deposition, although at various periods detectable, has been within the variability of fallout deposition.

In addition, to the routine monitoring program, the environs of the station have been the subject of several special reports and studies, references 1-3 below.

11.8.21 Comment:

8. Table 5.2 of the statement presents estimates of the residential population near the site that were utilized for the integrated population doses presented in Table 5.4. However, there are many industrial workers employed within five miles of the site that were not considered in the population dose estimates. The final statement should include estimates of the population and the population dose for these workers.

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1 Kahn, B., et al., Radiological Surveillance Studies at a Boiling Water Nuclear Power Reactor, BRH/DER 70/1, USP.H.S., Bureau of Radiological Health, Rockville, Md. (1970).

2 Dresden Report 21, Commonwealth Edison Co., April, 1973.

3 Shmuklarsky, M.J., Environmental Radioactivity in Illinois, Rad Data & Reports 13, 509 (1972).

Response: The Applicant obtained the following industrial worker populations by telephone contact.*

Industrial Facility	Shift		
	Day	Swing	Night
Midwest Fuel Recovery Plant[1]	100	15 plus 15 weekend	15
Northern Petro Chemical Co.	325	70	70
Amax Aluminum	340	70	60
Reichold Chem. Co.	55	13	12
Ill. Clay Products	90	10	2
GE Training Facility	10	10	10
Rexene Polymers	115	30-35	30-35
Mobil Oil Co.	425	45	40
Glidden Durkee	145	34	20

[1]GE operates with four rotating 15-man shifts in order to cover a seven day week.

The calculated airborne dose for these workers is 4.2 man rem from Unit 1 and 0.05 manrem from Units 2 and 3. Since some of these workers live in close proximity to the plant and have already been credited with exposure, this value is somewhat inflated.

11.8.22 Comment:

9. Information for pollutant emissions of hydrocarbons, aldehydes, and organic acids that result from operations of diesel generators, spaceheating boilers and fire pumps was not provided. The final statement should provide information concerning fuel use rate, fuel analysis, equipment operation time, and individual pollutant emission factors for each type of equipment in order that independent calculations can be made to verify the applicant's air pollutant emission and ambient air estimates.

*Letter J.S. Abel, Nuclear Licensing Administrator-BWR, CECO, to B.J. Youngblood, Chief, Environmental Projects Branch 3, USAEC, dated October 22, 1973.

Response: The following information was obtained from the report, "State of Illinois, Environmental Protection Agency, Division of Air Pollution Control, Operations Permit Applications", submitted by Commonwealth Edison Company for Dresden Station, dated April 2, 1973.

Standby Diesel Generators D-3, D-2, D 2/3
Fuel - #2 Distillate - 0.3% sulfur by wt.
Avg. operation time - 3 hrs/month - 12 months/yr

Heating Boilers - 2/3A, 2/3B
Rated heat input-31.8 MBtu/hr
Operation time - 24 hrs/day, 7 days/wk, 45 wks/yr
Type fuel - #6 (Bunker "C")
Est. annual consumption-2,428,403 lb

Heating Boilers - 1A, 1B
Rated heat input 17.99 MBtu/hr
Operations time - 24 hrs/day, - 7 days/wk, - 40 wks/yr
Type fuel - #6 (Bunker "C")
Est. annual consumption-1,816,023 lb

Exhaust Gas Analysis

	Diesels (each)	Heating Boilers (each)			
	D-3, D-2, D2/3	2/3A	2/3B	1A	1B
CO_2	42.1 lb/hr	.04 lb/hr		0.2 lb/hr	
NO_2	45.1 lb/hr	12.5 lb/hr		7.08 lb/hr	
SO_2	25.8 lb/hr	29.5 lb/hr		16.7 lb/hr	
Particules	7.8 lb/hr	4.8 lb/hr		2.7 lb/hr	

11.8.23 Comment:

10. The subject of non-radioactive wastes is not given adequate consideration. Only one paragraph of Section 3.7.2 is devoted to this subject. Provisions for storage of non-radioactive solid wastes and means by which non-radioactive storage containers are identified to prevent accidental placing of radioactive contaminated materials in them are not discussed. Frequency of pick-up and contractual arrangements with the commercial contractor are not mentioned. Any contract with a private waste disposal company should clearly require that all non-radioactive wastes must be taken to a sanitary landfill or disposal facility holding a valid license for operation from the Illinois Environmental Protection Agency. Disposal of wastes at any other site should be grounds for immediate cancellation of the contract.

Response: Solid waste is generated from controlled areas and uncontrolled areas. Waste that comes from controlled areas is bailed and handled as radioactive waste. Waste that comes from uncontrolled areas is handled with the standard solid waste handling techniques before pick up and disposed by scavenger. Larger individual pieces of solid wastes from controlled areas are assumed to be radioactive until inspected and are classified as radioactive or non-radioactive and disposed of accordingly.

All non-radioactive wastes are handled off-site by a scavenger and disposed of in an approved State of Illinois sanitary landfill in Morris, Illinois. The disposal techniques that are used in handling non-radioactive solid waste comply with the State of Illinois Guidelines for handling solid waste.

There are no provisions concerning radioactivity in the agreement with the solid waste scavenger.*

11.8.24 Comment:

11. Much of the information provided in this statement seems to be the "opinion of the staff." Section 4.2 Impacts on Water Use, Section 4.3 Ecological Effects, Section 5.1.3 Transmission Lines, and Section 5.2.1 Ground Water are some examples: Important data and conclusions, especially those concerning environmental matters, should be further substantiated.

*Letter J.S. Abel, Nuclear Licensing Administrator-BWR, CECO, to B.J. Youngblood, Chief, Environmental Projects Branch 3, USAEC, dated October 22, 1973.

Response: The Staff has formed its independent judgement based on the available facts, which at times are limited. These judgements, though stronger than impressions, cannot always be proven or disproven by positive knowledge, and thus can only be subjected to logical reasoning. While the term "opinion of the Staff" may seem noncommittal, in most cases a Staff conclusion was intended.

11.8.25 Comment:

12. The statement states on page 2-8 that the Kankakee-Des Plaines area is quite important archeologically and that one site is located on Dresden property. What is the status and importance of this site? How will the site be affected by future operations at Dresden?

Response: The site on the Dresden property is not unique and is not considered to be important. According to existing records it is a dispersed accumulation of Indian artifacts. It is anticipated that this site will not be affected by operations, but may be adversely affected if additional construction on the site occurs at a later date.

11.8.26 Comment:

13. On page 2-13 the statement states that the Dresden cooling lake and dike are partially located over an abandoned coal mine. Further, on page 3-15, it states that the extent of this mine is not known. Severe water pollution problems could result from a cave-in or seepage into or out from this mine. Problems of groundwater contamination and flood problems that may result from damage to the dike should receive additional study.

Response: The Staff has concluded that the coal mine does not extend beneath the cooling lake perimeter dike, see response to comment 11.2.3. The Staff has reviewed the available information and concludes that seepage of mine water into the ground water will not be significantly increased by the presence of the mine.

The mined area beneath the center dike appears to be overlain by about 18 feet of dense cohesive glacial till soil. The overburden pressure over the mine will increase in excess of 50 percent of that prior to construction of the dike. If future subsidence does occur, the dike is the most likely location. This will be readily detected by sagging of the dike and any hydraulic connection to the mine quickly filled in. Because of the large volume of the lake, any leakage from the mine to the lake will be greatly

diluted prior to discharge to the river. Based on the general low sulfur content of the coal in this area and the general ground water characteristics of the area, the concentration of pollutants in the mine water is not expected to be significantly above the levels in the groundwater. If a significant buildup of mine pollutants should occur in the lake after going closed-cycle, this will be detected by the lake monitoring program and corrective action can be taken.

11.8.27 Comment:

14. Erosion and sedimentation problems would be primarily associated with construction activities, dike failures, concentration of constituents, and silt deposits from flow-through volumes in the cooling facilities. The latter category appears to be the most significant, since the silt deposits will tend to accumulate on the lake bottom and will require periodic dredging of the lake to maintain its effective volume. The problem of disposal of the dredged material has not been considered in the statement. While it is stated that "There are methods of disposal that will have no adverse impact," no specific method is stated.

Response: See response to comment 11.2.21.

11.8.28 Comment:

15. The section entitled "Excessive Growth of Algae" (page 5-33) should be expanded. The disposal methods for algae and weeds removed from the cooling lake, the algicide to be used, the method of containment in the lake and the impacts of the algicides on the Illinois River should be addressed.

Response:

The lake management program, which is to include considerations mentioned in DES, Section 5.5.3.b, will be drafted by the Applicant and subject to approval by the Staff. Details of the program, to be incorporated into the Tech Specs, have not been completed. See response to comment 11.2.20.

11.9 ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT)

11.9.1 Comment.

Illinois Department of Transportation does not concur that fog and icing will be restricted to within a few hundred feet of the cooling lake. Experience with fog and icing has indicated that a serious safety hazard to motor vehicle traffic has resulted from the close proximity of cooling lakes, particularly in winter. Interstate Route 55 is located approximately 3000 feet from the east edge of the Dresden cooling lake and in the prevailing wind direction from the lake. Under stable conditions (E and F Classes of Pasquille stability) the potential exposure of Interstate 55 to fog and icing under normal weather conditions is approximately 30 hours per month in winter (computed from weather data and Pasquille/Wind Rose studies of Chicago-O'Hare and Midway Airports, Peoria Airport and Rockford Airport). The added influence of the cooling lake at Dresden increases this potential exposure by its presence and injection of considerably more water vapor into the air. This influence reasonably will intensify existing fog and icing conditions and, to a slight extent, create fog situations that would not normally occur. The distance of 3000 feet (Interstate 55 to cooling lake) is no assurance that Interstate 55 will not be effected. Fog and supercooled fog will migrate several miles under light winds. (Supercooled fog problems and studies in Washington, Oregon, Alaska, West Germany, France, and England support this fact.)

Response:

The Dresden cooling pond has been in operation for two winters. During this period, the Applicant has made regular and frequent visual observations of visibility along I-55. He also maintains a visibility meter at the intersection of I-55 and Lorenzo Road.

After two seasons of use, only one example of cooling pond fog reaching I-55 has been observed. On that occasion, visibility remained at or above two miles; there were also a few snowflakes in the area, but no accumulation on the road surface. Thus, the Staff concludes that the pond, once it commences closed-cycle operation, will not create a fog hazard over I-55. Steam fog at Dresden is usually most dense over the spray canals and over Pool 1, which is further from I-55 than the mid-temperature region of the lake and its less foggy Pools 2 and 3. Super cooled natural fogs are not uncommon in northern Illinois.

The Applicant will continue to make fog observations along this highway after the plant goes to closed-cycle operation. This data will be summarized, and a report submitted to the AEC at semiannual intervals.

If the pond does in fact create a hazard to traffic on I-55, the Applicant shall take whatever measures are necessary to eliminate the hazard.

11.9.2 Comment:

The environmental report does not address the problem of steam fog on the Illinois River. Water injected into this river in winter at temperatures of more than 80°F will undoubtedly create steam fog of significant density. Since the Illinois River is considered a "year round" navigable river for commerce purposes, this problem should be addressed in the environmental report as a potential hazard to safety and navigation on the river.

Response:

Steam fog is frequently present over unheated Illinois rivers in winter due to the advection of very cold air masses over open water. This fog is usually thin and whispy, and can cause deposits of low-density rime ice on vegetation and structures near the banks. It is usually too thin and too shallow to interfere with river navigation. This natural fog rarely penetrates more than a few tens of feet inland, as the meteorological conditions (very cold air over a free water surface) which cause the steam fog also contribute to its dissipation by further mixing and evaporation. Advection-radiation types of fog are also quite frequent over Illinois rivers.

About the only type of boat traffic on the Illinois River during periods when steam fog is possible are barges which are equipped with navigation aids (such as radar) for use during periods of natural fog of all types.

Because of the greater air-water temperature difference downstream of a thermal discharge, steam fog will be more frequent, last longer and be more opaque than it would otherwise be. There are numerous thermal discharges along the barge routes of the Illinois River System. The Applicant's Dresden, Joliet, and Romeoville open-cycle cooling systems are three examples. These discharges do not appear to have created serious navigational problems along this barge route to date.

After the Dresden Units 2 and 3 commence closed-cycle operation, the thermal discharge to the Dresden Pool will be greatly reduced (see Section 3.4.6), compared to the once-through operation; hence, the frequency and density of artificial steam fog will be reduced.

11.10 DEPARTMENT OF INTERIOR (DOI)

Summary and Conclusions

11.10.1 Comment:

We suggest that the area of land purchased for the operation of Dresden 1 be indicated on page i in addition to the approximately 1,573 acres purchased for the operation of Units 2 and 3. We also suggest that the area involved in the approximately four miles of new transmission line rights-of-way be identified.

Response: The land originally occupied by Unit 1 is approximately 953 acres (see Section 4.1). The 4 miles of new transmission line right-of-way occupies a total of 93 acres with only 0.6 acres (tower bases) unavailable for its original use. This is now indicated on page i.

11.10.2 Comment:

According to Condition a. to the operating license, Units 2 and 3 will be allowed to operate on a once-through condenser cooling basis in "unusual circumstances." We suggest that "unusual circumstances" be defined to the extent possible. The potential adverse impacts relating to these exceptions should be described in the appropriate sections of the statement.

Response: This is discussed in the response to comment 11.8.4. The types of occurances that might prevent closed-cycle operation are; dike failure, failure of the flow regulating station, spray canal failure, and failure of the HP gas line within the lake perimeter. Although these events may occur, as evidenced by the recent dike failure at Dresden, they are not likely to occur frequently and many years would likely elapse between events. Infrequent, short term operation in the open-cycle mode is not expected to have a significant adverse effect on the Illinois River. The Commission will weigh the expected environmental harm for the given conditions against the need for power in deciding whether to permit open-cycle operation.

11.10.3 Comment:

Condition e. to the operating license requires the applicant to implement Environmental Technical Specifications that are acceptable

to the AEC staff. Identification and implementation of these programs is needed, however, we do not believe it proper to defer detailed discussions of major programs for environmental protection to the Environmental Technical Specification phase of AEC licensing procedure. Most programs identified in this paragraph could significantly affect environmental quality and must be described in the environmental statement.

Response: The Staff agrees that major programs for environmental protection should be identified for inclusion in the Environmental Technical Specifications. In preparing the final statement, the Summary and Conclusions has been expanded. The important areas identified during the Staff environmental review are included with crossreferencing to the discussion in the text.

11.10.4 Comment:

Historical Significance

We request that particular caution be taken during plant operation to insure the integrity of the 1513-acre Goose Lake Prairie Nature Preserve owned by the State of Illinois. This tract is less than one mile southwest of the Dresden Nuclear Power Station and was recommended as a potential natural landmark in the National Park Service's "Island Wetlands" theme study. It has since been evaluated but not recommended due to the presence of certain unnatural conditions. The evaluator does however, state, "it is hoped that management over the next 4-5 years will upgrade at least some sites to a more original and natural condition, and at that time the area should be reevaluated for this (Natural Landmark) designation." A study of the Central Lowlands Natural Region is scheduled to begin in FY 1974. The Goose Lake Prairie Nature Preserve will be reconsidered in this study.

Response: The Staff is aware of the possible Natural Landmark designation for Goose Lake Prairie Nature Preserve. Even if this were not so, the Staff is of the opinion that the Preserve must be protected (Sec. 2.7.5.a). The Staff has also concluded that the operation of Dresden Units 2 and 3 will have no adverse effects on the Preserve. No monitoring program was considered necessary in the Preserve, particularly since any sampling for such a program would likely be of more disturbance to the Preserve than Station operation.

11.10.5 Comment:

Geology

The statement is made on page 2-13 that faults and seismic conditions in general are not considered to be of major importance to the environmental effects of nuclear power plants. We emphatically do not agree. The careful assessment of geologic site characteristics and the proper design of critical structures to accommodate these characteristics and assure structural integrity is essential to preventing or mitigating the consequences of potential accidents, including the class 9 accident, which could result in the release of radioactive materials to the environment. Therefore, we strongly recommend that the environmental statement present a more comprehensive summary of the regional and local site geology, and specify how the geologic and seismologic analyses have been taken into account. In this respect, we note that the AEC has published "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (Proposed Appendix A, 10 CFR 100, Federal Register, November 25, 1971) which prescribes the nature of required investigations. The impact statement should clearly specify whether these criteria have been applied to the Dresden site.

The necessity for careful geologic investigations and engineering design and construction to accommodate the natural characteristics is illustrated by problems that have been experienced with the cooling lake including the failure of a 50-foot section of the cooling-lake dike on October 13, 1972, that resulted in a total loss of impounded water. Although the soil conditions were taken into account in the repair of the dike, we note that the dike was not analyzed for the effect of a seismic event. The draft statement indicates on page 5-4 that "it is felt an acceleration factor or 0.1 to 0.15g would not imperil the integrity of the cooling lake." In our view, such an assertion requires additional explanation and justification.

Response: Faults and seismic conditions are considered in the evaluation of certain structures such as the cooling lake. Therefore, the statement on page 2-13 has been removed. An assessment of the geologic site characteristics and the proper design of critical structures essential to preventing or mitigating the consequences of potential accidents was completed by the Staff in the safety evaluation for Unit 3 dated November 18, 1970.

Based on static analysis of similar structures when the factor of safety was between 1.5 and 2.0, the factor of safety with a seismic event of 0.1g was found to be $\geq$ 1.0. An independent evaluation of the dike stability was conducted by the Analytical and Computer Division of Sargent and Lundy, Engineers. They evaluated the static design of the dike for a profile having weak soils and the dike resting directly on rock. The factors of safety obtained ranged from 6 to 13. The Staff considers this to show dike integrity for an Operating Basis Earthquake of 0.1g.

11.10.6 Comment:

An analysis should be presented to show what consequences a postulated massive dike failure would have on the reactors or on their operations if it occurred after the lake becomes an integral part of the cooling system. It has not been made clear whether dike failure could result in loss of coolant to the reactors, and how serious the consequences of such an accident would be. We believe the document should be amended accordingly.

Response: The response to this question was addressed in the Staff's Safety Evaluation report for Unit 3 dated November 18, 1970. It states in part "The applicant has performed a safety analysis considering various failures of the dikes that form the lake, the lift station that provides the motive force for the water, the spillways, and the flow-regulating station. It concludes that the ability to take water from the river for plant shutdown or safety is not jeopardized by the new cooling lake. The liquid radwaste discharge point is located such that no radioactive effluent could be released into the lake. The ability to impound water for safe plant shutdown is not affected adversely by the construction of the cooling lake. We have reviewed the applicant's analysis and agree with the above conclusions. We conclude that the use of this Dresden Lake cooling system will have no detrimental effect on plant safety."

11.10.7 Comment:

In analyzing possible causes of dike failures, internal causes resulting in overflow of the cooling lake appear to have been fully considered on pages 7-9 through 7-11. We recommend that the statement include an evaluation of the possible impacts that flooding of the Kankakee River many have on the integrity of the north dike. This seems advisable and appropriate

since parts of the cooling lake occupy the former floodplain of the river, and the top of the dike is within 22 feet of the average river level at its eastern end. We are concerned that there may be increased backwater or flooding for given river flow now, which did not exist under pre-construction conditions, due to the encroachment of the dikes on the floodplain. The applicant could determine this by comparing before-and-after flood profiles through this region and in the upstream reach of the river. It may well be that the railroad embankment also encroaches on the left floodplain.

Response: High flows could (under very extreme flood conditions) cause a failure of the north dike. However, the impact of such a failure, either to the plant or the environment, would be minimal. Since the cooling lake is not safety related, its failure would not adversely effect the plant although its failure would result in a shutdown. The only effects to the environment would be an increase in river water temperature and river stage. Neither of these effects, however, would probably be measurable since the volume of the lake is small in relation to the flood volumes that could cause failure.

As to the effect of the cooling lake dikes on Kankakee River flood stages, it is the opinion of the staff that this effect would also be minimal. Flood flows and resulting river stages in the site vicinity are greatly influenced by the Dresden Island Lock and Dam downstream and, to a lesser degree, by the railroad embankment and bridge immediately upstream of the cooling lake. For high flood stages, up to elevation 512 feet msl or so, most of the area opposite the cooling lake would already be inundated before water began to impinge on the dikes. Therefore, the entire area to the north bank of the Des Plaines River could be considered as the flood plain. Since the area of the cooling lake is small in comparison to the total flood plain area, the effect on flood stages would be minimal. In addition, the railroad embankment and bridge could restrict the amount of flow past the site except for very high flood stages above about 525 feet msl; thereby further reducing the effect of the dikes on flood stages.

11.10.8 Comment:

The Atomic Energy Commission recognizes that the possible environmental effects related to the abandoned coal mine beneath the cooling lake have not been fully considered and, as a condition to the issuance of the operating license has required the applicant to make additional core

borings. We recommend that an analysis be made of the effects of the mine on the structural integrity of the dikes, and also any potential pollutional effects on ground water or surface water on or off the site as a result of impounding water above the mine.

Response: See responses to comments 11.2.3 and 11.8.26.

11.10.9 Comment:

Ecology

As indicated on page 2-8, the State of Illinois has reclassified the Illinois, Des Plaines, and Kankakee Rivers as "Public and Food Processing Water Supplies." This reclassification is expected to provide the impetus for cleaning up the water courses and reclamation of the rivers and their resources. Based on the State's plan to improve the quality of these waters, we believe that this section should describe the anticipated impact that the plant will have on the improved water quality and the associated fish and wildlife of the air.

Response: In performing its analysis of the environmental effects of Unit 2 and 3 operation, the Staff assumed that the quality of the Illinois river already meets or exceeds the conditions defined by the Water Pollution Regulations of the State of Illinois. Therefore, the postulated impacts noted are those that would be associated with the future state of the river rather than the present state of the river.

11.10.10 Comment:

The relative numbers of coliform bacteria and fecal coliform bacteria given on page 2-28 for the years 1958-1971 are incorrect. The total coliform bacteria should exceed that of fecal coliform bacteria.

Response: The Staff was aware of the discrepancy in the data, but because the data were taken directly from the reference, no changes were made. Communication with the Illinois EPA did not resolve this discrepancy.

11.10.11 Comment:

The sixth paragraph on page 2-33 should be expanded to indicate the relative quality of the "inputs" to the Dresden Pool. Based on temperature data given on page 3-21 when all units are operating, most of the organisms identified may be eliminated from the cooling pond during substantial periods of the year.

Response: It is possible that some of the organisms in the Dresden cooling pond during certain periods of the year may be eliminated from the warmest pool. However, this effect is expected to have no adverse impact on the Illinois River, which is the primary concern of the Staff. Of greater importance to the river is the possibility of large algal blooms in the pond, resulting in increased organic load to the river. The Applicant is required to carry out a lake management program that will prevent such input to the Dresden Pool (Sec. 5.5.3.b.).

11.10.12 Comment:

River Discharge

We share the concern expressed by the AEC staff on page 3-26 that the thermal plume may seriously restrict free fish passage in the river. We are also concerned with the performance of the spray canal cooling system and believe that careful monitoring of this system and of the heated water discharged to the river should be mandatory.

Response: No response is necessary.

11.10.13 Comment:

Solid Radioactive Wastes

The solid wastes that result from operations of Units 2 and 3 are discussed briefly on pages 3-37 and 3-41. The wastes are described in very general terms as being evaporator bottoms, spent resins, filter sludge, filters, miscellaneous paper, rags, and contaminated clothing. Estimates are given that about 2,000 55-gallon drums of solid radioactive waste will be shipped offsite annually to a burial site at Sheffield, Illinois. The draft statement contains an inconsistency in

the estimated radioactivity of this waste, the figure being given both as 4,800 and 5,700 curies of activity on pages 3-37 and 3-41, respectively.

We believe that the offsite disposal of the operational solid radioactive wastes from the Dresden Nuclear Power Station constitutes an important long-term environmental impact, and the AEC must satisfactorily solve the problem of these proliferating operational wastes from all nuclear plants before they present a major problem. Therefore, we strongly recommend that the environmental statements for all reactors, including Dresden Units 2 and 3, should specify the kinds of radionuclides their physical states, and their concentrations in the wastes, and the estimated total volume of wastes for the expected operating life of the reactor. Additionally, if an environmental impact statement has not been prepared for the proposed burial or disposal site, or if such a statement does not fully consider wastes of the nature and quantity of those generated at the Dresden station, then we believe it incumbent on the AEC to include an evaluation of the disposal site in this present environmental statement. We believe such an evaluation should discuss the Federal and State licensing provisions, criteria, and responsibilities for the site in connection with: (1) determination of the hydrogeologic suitability of the site to isolate the wastes of the Dresden station and any other wastes accumulating or expected to accumulate at the site from the biosphere for specific periods of time; (2) current and continuing surveillance and monitoring of the site; and (3) any remedial or regulatory actions that might be necessary throughout a specific period of time in which all the wastes will be hazardous.

In connection with the above, we note that "radioactive wastes other than high-level," which apparently include reactor operational solid wastes, have been discussed pages G-2 through G-1 of the AEC document "Environmental Survey of the Nuclear Fuel Cycle." We do not consider the generalized descriptions in that document of the management and disposal of these wastes as being adequate to cover the concerns expressed above because the descriptions on pages G-2 through G-9 and G-12 through G-14 are not specific to a particular site or to the particular wastes being disposed there. Similarly, the environmental considerations on pages G-16 through G-21 are not specific to a particular site or to particular wastes.

Response: The estimated radioactive content of solid wastes as shown on page 3-37 of the DES is the applicant's projected value based on the design of the radwaste treatment systems described in the DES. Since the issuance of the DES, the applicant has modified the design of the liquid radwaste system as described in the Final Environmental Statement for Dresden, Units 2 and 3. Based on our evaluation of the modified system and data from operating reactors with similar radwaste systems, we estimate 950 drums/unit of wet solid waste (spent demineralizer resins, filter sludges and evaporator bottoms) containing approximately 1.7 Ci/drum. Since the majority of the radioactivity will be contained in this waste, we consider that all wet solid waste will be stored onsite for approximately 180 days prior to shipment. This period of onsite storage will allow short-lived radionuclides time to decay. We estimate greater than 90% of the radioactivity associated with these wastes will be long-lived fission and corrosion products principally Fe-55, Co-60, Co-58, Cs-134, Cs-137, Sr-90 and Sr-89. We estimate 700 drums/unit of dry and compacted solid wastes containing less than 5 Ci/yr will be shipped from the station each year.

The concerns over the disposal of solid radioactive wastes are appropriately addressed in the AEC document "Environmental Survey of the Nuclear Fuel Cycle". As noted in that document, the environmental effects of the entire uranium fuel cycle with regard to an individual reactor are small. Further, the potential for any significant effect from the disposal of solid radioactive wastes from a reactor is extremely limited due to (1) the small quantity of radioactivity contained in the wastes, and (2) the care taken in establishing and monitoring commercial land burial facilities as noted below. Commercial land burial facilities must be located on land which is owned by a state or the Federal government, and after radioactive wastes are buried at a site the land must not be used for any other purpose. Authorization to operate a commercial land burial facility is based on an analysis of nature and location of potentially affected facilities and of the site topographic, geographic, meteorological, and hydrological characteristics; which must demonstrate that buried radioactive waste will not migrate from the site. Environmental monitoring includes sampling of air, water and vegetation to determine migration, if any, of radioactive material from the actual location of burial. To date, there have been no reports of migration of radioactivity from commercial burial sites. In the event that migration were to occur, plans for arresting any migration have been developed. On the basis of the general environmental considerations of burial sites now developed, the wide range of wastes that can be buried, and the observation that an applicant is not restricted to a specific burial site, the staff believes that a detailed discussion of solid radioactive waste disposal sites is inappropriate to an environmental statement for any one nuclear power plant facility.

11.10.14 Comment:

Chemical and Biocide Effluents

In view of the recognized detrimental environmental impacts of chlorine on the aquatic environments, the use of this element should be minimized. We suggest that considerable care be given to reducing the use of chlorine and specifically chlorine concentrations in the plant effluent.

Response: Strict controls shall be required on chlorine concentrations in the plant effluent. See Section 5.5.5.a.

11.10.15 Comment:

Ecological Effects

This section should indicate that 1,573 acres of agricultural land which previously supported wildlife has been converted to an industrial use and that the wildlife associated with this habitat has been lost.

Response: This is adequately discussed in Section 4.1 of this statement.

11.10.16 Comment:

Impacts on Water Use

Based on information available to us, there is a great probability that substantial amounts of chloramines will be discharged to receiving waters. The cumulative effect of chloramines from the cooling pond of Dresden Units 2 and 3, the discharge from Unit 1, and the effluent from Collins Electrical Generating Station may individually or in combination cause severe damage to present or future fish and wildlife resources. Therefore we suggest that the cumulative effects from all sources that would interact with those from this plant should be discussed in this section.

We believe that this section should also acknowledge the implication of the Federal Water Pollution Control Act as amended in 1972. As stated in the Act "it is the national goal to eliminate the discharge of pollutants into navigable waters by 1985."

The references on pages 5-8 and 5-3-7 to tables 2.8 and 2.5, respectively, should apparently be changed to tables 2.3 and 2.6.

Response: The Applicant has conducted a study showing no residual chlorine in the once-through effluent from Units 2 and 3 during chlorination. The Applicant has since questioned these results and is conducting further studies. The Staff has concluded that no residual free chlorine will be present in the lake blowdown from Units 2 and 3. This will be verified by a monitoring program. Intermittant chlorination of Unit 1 will be controlled to insure discharges do not exceed currently acceptable guidelines. These levels are based on the continuing reduction of residual chlorine after discharge and the large dilution in the river.

11.10.17 Comment:

Nonradiological Effects on Ecological Systems

Entrainment of aquatic organisms into the cooling water system is discussed on page 5-21. The magnitude of these effects which occur during low or critical summer flow periods should be mentioned since these periods often coincide with peak metabolic activity for most aquatic organisms. Removal of biomass from the system during critical environmental periods could control the magnitude of downstream fish resources or subject these populations to unacceptable stresses.

Response: The Staff has discussed the magnitude of entrainment effects (Sec. 5.5.1.) for both open- and closed-cycle operation of the cooling lake. Under closed-cycle operation, which will be the normal operating mode for Units 2 and 3, entrainment effects on the biomass are not expected to affect downstream fish resources for the following reasons: (a) During average flow about 86% of the Kankakee River bypasses the plant thus providing an adequate base for recovery of most planktonic populations downstream; (b) the dead entrained organisms from Unit 1 will still be available as fish food; (c) the lake blowdown will contain additional organisms originating in the lake which will contribute to fish food sources.

During low flow (7 day-4 year recurrence) essentially no Kankakee River water will bypass the plant due primarily to Unit 1. This once-through unit (ΔT=19°F) and an estimate of 15%-50% kill of entrained organisms can be expected. This could be an unacceptable impact on a continuous basis but since such low flows occur approximately once in 4 years, and since there is a constant flow of fish food sources from the Des Plaines River and the cooling lake blowdown to the Illinois, it is the Staff's

conclusion that there will be little effect on the fish of the Illinois River. It is possible however, that if such flows coincide with the planktonic stage in the life cycle of some invertebrate species, the population of these species may be markedly decreased for a year or longer.

11.10.18 Comment:

Cooling Lake and Spray Canal Effects

It is indicated on page 5-33 that the problem of disposal of the dredged material from the cooling lake and spray canal has not been considered by the applicant. According to condition d., the applicant is required to implement Environmental Technical Specifications including a program for disposal of dredgings. Since this activity could have a major environmental impact, we recommend that an estimate of dredging requirements and probable disposal methods be included in the final environmental statement

Response: See response to comment 11.2.21 and Section 5.5.3.c.

11.10.19 Comment:

The warm water of the 1,275 acre cooling lake built for the closed-cycle cooling system scheduled for use after February 1974 is a potential resource the beneficial uses of which should be considered. We recommend that the applicant be encouraged to consider possible uses of the water for such things as aquaculture, which might have the added benefit of helping to maintain the lake free of "nuisance" growths of aquatic organisms. Relative to costs of plant construction and operation, any short-term monetary benefits from using the thermal effluents are likely to be insignificant, but long-term benefits may include: (1) increased knowledge gained from experimentation with use of thermal effluents by local educational or other institutions; (2) significant benefits to the small segment of the community involved in use of the water.

Response: Although some very imaginative thinking, research and development activities are being undertaken regarding the use of the heated discharges of water from power plants, the Staff is unaware of any proven commercial uses for this resource at the present time. Since the production of large quantities of low-grade heat are adjunct to the physical laws for the operation of a power plant, the Applicant would be quite pleased to see a beneficial use developed. The Applicant is not, however, charged to perform such research and development, and should not, therefore, be required to undertake such activities as part of its licensing requirements.

11.10.20 Comment:

The importance of proper care in the use of algicides is discussed on page 5-33. The Department of the Interior's 1967 publication entitled "Biological Associated Problems in Freshwater Environments" is referred to as discussing method for the physical removal of aquatic weeds and the use of microstrainers for algae. However, the particular methods which will be used to control growths of nuisance aquatic organisms and procedures for their disposal are not described in the statement. The methods that will be used and the associated environmental impacts of the selected control program should be identified in this section.

Response: It is the Staff's policy to allow the Applicant to prepare its own program for lake management, subject to the review and approval of the Staff. Details of the program to be implemented at Dresden have not been completed, but will be included in the Applicant's Environmental Technical Specifications.

11.10.21 Comment:

We suggest that this section be expanded to include important dissolved gasses in addition to effects of dissolved oxygen. For example, supersaturation of nitrogen gas in water has produced fish kills at several steam-electric power plants.

Response: See section 5.5.2.a. for a discussion of the effects of dissolved gasses.

11.10.22 Comment:

The potential for the dispersal of viable fecal organisms in aerosols as a result of the spray system is recognized on page 5-34. It is also indicated that if bacterial counts in the spray canals exceed state standards, the applicant will take appropriate action. We suggest that measures which would control this problem should be identified and the potential impacts resulting from implementation of these controls on fish and wildlife resources should be described.

Response: One control measure presently proposed is to shut off the spray systems during periods of epidemic occurrences of enteric diseases in communities upstream of the stations intake, or when fecal coliform counts in the spray canals greatly exceed state standards.

This action will likely increase the temperature of the lake blowdown by about 8°F over present estimate of normal operation and accordingly increase the area of the 5°F ΔT isotherm. Since this circumstance is expected to occur only rarely, if at all, no adverse effects are expected except at the immediate outfall area. After dilution with the discharge of Unit 1 the net temperature increase at the outfall will be about 2°F. This would result in very local effects at the immediate outfall. Since the likelyhood of a health hazard developing is small, the small impact resulting from securing the sprays would be acceptable for short periods of time. (See Comment 11.11.1)

11.10.23 Comment:

Transmission Line Effects

The fourth paragraph on page 5-35 should be updated by deleting the indication that the Bureau of Sport Fisheries and Wildlife has approved for certain applications the use of 2, 4, 5-T. This Department's approval for the use of this herbicide was withdrawn in 1970. The Department of the Interior has prohibited the use of 2, 4, 5-T on lands under its control and has also prohibited its use in any program it funds since 1970.

Although the economical cost is sometimes more for hand or mechanical clearing methods, the cost to the environment is usually must less. Therefore we suggest that the applicant seriously consider mechanical clearing methods which would eliminate or reduce the need for herbicides.

Response: The appropriate change has been made to the text.

11.10.24 Comment:

Chemical Discharge Effects

We suggest that this section identify and describe the impact of heavy metals which will be discharge by the plant.

Response: The Dresden Station will add no heavy metals to the discharge. However, concentration of lake water due to evaporation may increase the concentration of any heavy metals present in the makeup water by a factor of about 1.3, in the blowdown to the Illinois River. Water analysis of samples from the lake intake in July 1972 by the Applicant indicated concentrations of Cu, Zn, and Hg to be 0.08, 0.04, and less than 0.0001 mg/liter, respectively. Data supplied by the Illinois Natural history Survey indicated Pb concentrations of less than 0.05 mg/liter in 97% of samples taken of Kankakee River water at Momence in 1966-71 (3% of the samples were 0.05 mg/liter). Cd concentrations were less than 0.005 mg/liter for 90% of the samples (100% were equal or less than 0.02 mg/liter); Cr concentrations were 0.005 mg/liter or less, for 97% of the samples (100% of the samples were 0.01 mg/lit or less). Assuming, therefore, a total heavy metal concentration in the makeup water of 0.2 mg/liter, the concentration in the blowdown to the river would be 0.3 mg/liter or less. The Staff does not expect these levels to be toxic to river biota, even at the immediate outfall. The concentrations are much below the maximum concentrations allowed by the Illinois EPA in any effluent.

11.10.25 Comment:

Nonradiological Studies

The sampling program should be reviewed periodically to determine if sampling equipment and techniques will result in the collection of adequate qualitative and quantitative data especially as related to impingement of fish.

Response: Results of the monitoring program will be submitted to the Commission semiannually for review. In addition, the nonradiological river monitoring program will be reviewed by the Staff after the first 2 years of closed-cycle operation. The Applicant is also required to demonstrate the adequacy of the particular sampling design selected (Sec. 6.2.1.a. Conclusion). The program for fish impingement data collection is discussed in the response to comments 12.2.40, 12.2.56 and 12.2.57.

11.10.26 Comment:

Environmental Effects of Accidents

This section contains an adequate evaluation of impacts resulting from plant accidents through class 8 for airborne emissions. However, the environmental effects of releases to water is lacking. Many of the postulated accidents listed in tables 7.1 and 7.2 could result in releases to the Kankakee and Rivers and should be evaluated.

We also think that class 9 accidents resulting in both air and water releases should be described and the impacts on human life and the remaining environment discussed as long as there is any possibility of occurrence. The consequences of an accident of this severity could have for reaching effects and could persist for centuries. The AEC recognition of the severe consequences of such an accident is indicated in USAEC Regulatory Guide 4.2.

Response: The doses calculated as consequences of the postulated accidents are based on airborne transport of radioactive materials resulting in both a direct and an inhalation dose. Our evaluation of the accident doses assumes that the applicant's environmental monitoring program and appropriate additional monitoring (which could be initiated subsequent to an incident detected by in-plant monitoring) would detect the presence of radioactivity in the environment in a timely manner such that remedial action could be taken if necessary to limit exposure from other potential pathways to man.

Interior states that Class 9 accidents should be described and the environmental impact discussed. Because the current AEC position is as stated in the accident assessment writeup (that in view of the low probability of the accident the environmental risk is extremely small) no specific response to this Interior comment is required in the Final Detailed Statement.

11.10.27 Comment:

Alternative Energy Sources

The basic assumptions necessary to determine the amount of air pollutants which would be emitted by a comparable sized fossil-fueled power plant

are not given in the text. We think that these data which would allow the reviewer to confirm the appropriateness of such assumptions, should be given in the environmental statement.

Response: The allowable air pollutants released from a coal fired station needed to replace the Dresden Units 2 and 3 have been recalculated by the Staff using the EPA standards for coal fired plants (40 CFR 60). These new valves and the assumptions used are noted in the revised table 9.1 of this statement.

11.11 STATE OF ILLINOIS, DEPARTMENT OF PUBLIC HEALTH

11.11.1 Comment:

It is this Department's opinion that the possibility of health hazards from the operation of these spray canals and the possible dispersion of fecal coliform into the air would be at most a minimal health hazard. Our decision is based upon the relative low amount of human fecal coliforms that have been observed in this river and that there have been no reported incidents of disease around sewage treatment plants which use aeration techniques on raw sewage containing much higher concentrations of microorganisms.

It is our further belief that if studies were carried out in any area in which people congregate such as office buildings that one could detect airborne coliforms within the atmosphere of the sample location. At present there is no evidence that this constitutes a public health hazard or is a viable mechanism for the transmission of disease. As a public health agency we feel, however, that it would be prudent to do limited sampling to determine levels of microorganisms in the intake water even though the degree of possible health hazard appears remote.

Response: The Staff agrees with this comment, based on information presently available. Sampling for fecal coliform and fecal streptococci in the lake intake canal before the sprays shall be included in the Environmental Technical Specifications for the Plant.

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ILLINOIS POLLUTION CONTROL BOARD
RULES AND REGULATIONS

CHAPTER 3: WATER POLLUTION

PART I: INTRODUCTION

101 Authority

Pursuant to the authority contained in Section 13 of the Environmental Protection Act, which authorizes the Board to issue regulations "to restore, maintain, and enhance the purity of the waters of this State in order to protect health, welfare, property, and the quality of life, and to assure that no contaminants are discharged into the waters without being given the degree of treatment or control necessary to prevent pollution", and to adopt water quality standards, effluent standards, standards for the issuance of permits, standards for the certification of sewage works operators, standards relating to water pollution episodes or emergencies, and requirements for the inspection of pollution sources and for monitoring the aquatic environment, the Board adopts the following rules and regulations.

102 Policy

The General Assembly has found that water pollution "constitutes a menace to public health and welfare, creates public nuisances, is harmful to wildlife, fish, and aquatic life, impairs domestic, agricultural, industrial, recreational, and other legitimate beneficial uses of water, depresses property values, and offends the senses." It is the purpose of these rules and regulations to designate the uses for which the various waters of the State shall be maintained and protected; to prescribe the water quality standards required to sustain the designated uses; to establish effluent standards to limit the contaminants discharged to the waters; and to prescribe additional regulations necessary for implementing, achieving and maintaining the prescribed water quality. These regulations were developed in close cooperation with the Federal Environmental Protection Agency in order that, consistent with Illinois law, they may also serve the purposes of the Federal Water Pollution Control Act.

103 Repeals

These rules and regulations replace and supersede Rules and Regulations SWB-1, SWB-5 through SWB-15, and SWB-19, adopted by the Illinois Sanitary Water Board and continued in effect by Section 49 (c) of the Environmental Protection Act "Until repealed, amended, or superseded by regulations under this Act." Accordingly Rules and Regulations SWB-1, SWB-5 through SWB-15, and SWB-19 are hereby repealed, except that any proceeding arising from any act committed before the effective date of the applicable provision of this Chapter shall be governed by the above listed regulations.

105 Analytical Testing

All methods of sample collection, preservation, and analysis used in applying any of the rules and regulations in this Chapter shall be in accord with those prescribed in "Standard Methods for the Examination of Water and Waste Water," Thirteenth Edition, or with other generally accepted procedures.

PART II WATER QUALITY STANDARDS

This part of the rules and regulations concerning water pollution describes the water quality standards that must be met to maintain the specified beneficial uses. References to STORET numbers identify the specific parameter as defined in the STORET system Handbook published by the Federal Environmental Protection Agency.

201 Mixing Zones

(a) In the application of any of the rules and regulations in this Chapter, whenever a water quality standard is more restrictive than its corresponding effluent standard then an opportunity shall be allowed for the mixture of an effluent with its receiving waters. Water quality standards must be met at every point outside of the mixing zone. The size of the mixing zone cannot be uniformly prescribed. The governing principle is that the proportion of any body of water or segment thereof within mixing zones must be quite small if the water quality standards are to have any meaning. This principle shall be applied on a case-by-case basis to ensure that neither any individual source nor the aggregate of sources shall cause excessive zones to exceed the standards. The water quality standards must be met in the bulk of the body of water, and no body of water may be used totally as a mixing zone for a single outfall or combination of outfalls. Moreover, except as otherwise provided in this Chapter, no single mixing zone shall exceed the area of a circle with a radius of 600 feet. Single sources of effluents which have more than one outfall shall be limited to a total mixing area no larger than that allowable if a single outfall were used.

In determining the size of the mixing zone for any discharge, the following must be considered:

1. The character of the body of water,
2. the present and anticipated future use of body of water,
3. the present and anticipated water quality of the body of water,
4. the effect of the discharge on the present and anticipated future water quality,
5. the dilution ratio, and
6. the nature of the contaminant.

(b) In addition to the above, for waters designated for aquatic life (General Standards), the mixing zone shall be so designed as to assure a reasonable zone of passage for aquatic life in which the water quality standards are met. The mixing zone shall not intersect any area of any such waters in such a manner that the maintenance of aquatic life in the body of water as a whole would be adversely affected.

202 Stream Flows

Except as otherwise provided in this Chapter with respect to temperature, the water quality standards in this Part shall apply at all times except during periods when flows are less than the average minimum seven day low flow which occurs once in ten years.

204 Public and Food Processing Water Supply

In addition to the General Standards, waters designated in Part III of this Chapter for public and food processing water supply shall meet the following standards at any point at which water is withdrawn for treatment and distribution as a potable supply or for food processing:

(a) Waters shall be of such quality that with treatment consisting of coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes, the treated water shall meet in all respects both the mandatory and the recommended requirements of the Public Health Service Drinking Water Standards - 1962.

(b) The following levels of chemical constituents shall not be exceeded:

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
Arsenic (total)	01000	0.01
Barium (total)	01005	1.0
Cadmium (total)	01025	0.01
Chlorides	00940	250.
Carbon Chloroform Extract (CCE)	32005	0.2
Cyanide	00720	0.01
Iron (total)	01046	0.3
Lead (total)	01049	0.05
Manganese (total)	01055	0.05
Methylene Blue Active Substance (MBAS)	38260	0.5
Nitrates plus Nitrites as N	00630	10.0
Oil (Hexane-solubles or equivalent)	00550	0.1
Phenols	32730	0.001
Selenium (total)	01145	0.01
Sulfates	00945	250.
Total Dissolved Solids	00515	500.

(c) Other contaminants that will not be adequately reduced by the treatment processes noted in paragraph (a) of this Rule shall not be present in concentrations hazardous to human health.

PART III: WATER USE DESIGNATIONS

This part of the rules and regulations concerning water pollution designates the water uses for which particular waters of the State are to be protected. Waters designated for specific uses must meet the most restrictive standards listed in Part II of this Chapter for any specified use, in addition to meeting the General Standards.

301 General Use Waters

All waters of the State of Illinois are designated for general use except those designated as Restricted Use Waters.

302 Restricted Use Waters

The following are designated as restricted use waters:

(a) The Chicago Sanitary and Ship Canal;

(b) The Calumet-Sag Channel.

(c) The Little Calumet River from its junction with the Grand Calumet River to the Calumet-Sag Channel;

(d) The Grand Calumet River;

(e) The Calumet River;

(f) Lake Calumet;

(g) The South Branch of the Chicago River;

(h) The North Branch of the Chicago River from its confluence with the North Shore Channel to its confluence with the South Branch;

(i) The Des Plaines River from its confluence with the Chicago Sanitary and Ship Canal to the Interstate 55 bridge;

(j) The North Shore Channel, except that dissolved oxygen in said Channel shall be not less than 5 mg/l during 16 hours of any 24 hour period, nor less than 4 mg/l at any time;

(k) All waters in which, by reason of low flow or other conditions, a diversified aquatic biota cannot be satisfactorily maintained even in the absence of contaminants.

303 Public and Food Processing Water Supply

All waters of Illinois are designated for Public and Food Processing Water Supply use except those designated as Restricted Use Waters, and except for the following:

(a) The Chicago River;

(b) The Little Calumet River.

PART IV: EFFLUENT STANDARDS

This Part prescribes the maximum concentrations of various contaminants that may be discharged to the waters of the State.

401 General Provisions

(a) Dilution. Dilution of the effluent from a treatment works or from any wastewater source, is not acceptable as a method of treatment of wastes in order to meet the standards set forth in this part. Rather, it shall be the obligation of any person discharging contaminants of any kind to the waters of the state to provide the best degree of treatment of wastewater consistent with technological feasibility, economic reasonableness and sound engineering judgment. In making determinations as to what kind of treatment is the "best degree of treatment" within the meaning of this paragraph, any person shall consider the following:

(1) what degree of waste reduction can be achieved by process change, improved housekeeping, and recovery of individual waste components for reuse; and

(2) whether individual process wastewater streams should be segregated or combined.

In any case, measurement of contaminant concentrations to determine compliance with the effluent standards shall be made at the point immediately following the final treatment process and before mixture with other waters, unless another point is designated by the Agency in an individual permit, after consideration of the elements contained in this paragraph. If necessary the concentrations so measured shall be recomputed to exclude the effect of any dilution that is improper under this Rule.

(b) Background Concentrations. Because the effluent standards in this Part are based upon concentrations achievable with conventional treatment technology that is largely unaffected by ordinary levels of contaminants in intake water, they are absolute standards that must be met without subtracting background concentrations. However, it is not the intent of these regulations to require users to clean up contamination caused essentially by upstream sources or to require treatment when only traces of contaminants are added to the background. Compliance with the numerical effluent standards is therefore not required when effluent concentrations in excess of the standards result entirely from influent contamination, evaporation, and/or the incidental addition of traces of materials not utilized or produced in the activity that is the source of the waste.

(c) Averaging. Except as otherwise specifically provided in this Part, compliance with the numerical standards in this Part shall be determined on the basis of 24-hour composite samples. In addition, no contaminant shall at any time exceed five times the numerical standard prescribed in this Part.

402 Violation of Water Quality Standards

In addition to the other requirements of this Part, no effluent shall, alone or in combination with other sources, cause a violation of any applicable water quality standard. When the Agency finds that a discharge that would comply with effluent standards contained in this Chapter would cause or is causing a violation of water quality standards, the Agency shall take appropriate action under Section 31 or Section 39 of the Act to require the discharge to meet whatever effluent limits are necessary to ensure compliance with the water quality standards. When such a violation is caused by the cumulative effect of more than one source, several sources may be joined in an enforcement or variance proceeding, and measures for necessary effluent reductions will be determined on the basis of technical feasibility, economic reasonableness, and fairness to all dischargers.

403 Offensive Discharges

In addition to the other requirements of this Part, no effluent shall contain settleable solids, floating debris, visible oil, grease, scum, or sludge solids. Color, odor and turbidity must be reduced to below obvious levels.

404 Deoxygenating Wastes

Except as provided in Rule 602 of this Chapter, all effluents containing deoxygenating wastes shall meet the following standards:

(a) On and after July 1, 1972, or such earlier date as may have been specified in Rules and Regulations SWB-7 through SWB-15, no effluent shall exceed 30 mg/l of five-day biochemical oxygen demand (BOD_5) (STORET number 00310) or 37 mg/l of suspended solids (STORET number), except as follows:

(i) sources discharging to the Mississippi or Ohio Rivers shall comply with this paragraph (a) by December 31, 1973; and

(ii) sources discharging to the Wabash River may discharge up to 40 mg/l of BOD_5 and 45 mg/l of suspended solids until December 31, 1974.

(b) On and after July 1, 1972, or such earlier date as may have been specified in Rules and Regulations SWB-7 through SWB-15, no effluent from any source whose untreated waste load is 10,000 population equivalents or more, or from any source discharging into the Chicago River System or into the Calument River System, shall exceed 20 mg/l of BOD_5 or 25 mg/l of suspended solids, except as follows:

(i) sources discharging to the Mississippi or Ohio Rivers shall comply with this paragraph (b) by December 31, 1973; and

(ii) sources discharging to the Illinois or Wabash Rivers, or to the Des Plaines River downstream from its confluence with the Chicago Sanitary and Ship Canal, shall comply with this paragraph (b) by December 31, 1974.

(c) On or after December 31, 1973, no effluent whose dilution ratio is less than five to one shall exceed 10 mg/l of BOD_5 or 12 mg/l of suspended solids, except as follows:

(i) sources within the Metropolitan Sanitary District of Greater Chicago whose untreated waste load is 500,000 population equivalents or more shall comply with this paragraph (c) by December 31, 1977;

(ii) sources whose dilution ratio is two to one or more but less than five to one shall comply with this paragraph (c) by December 31, 1974;

(iii) sources employing third-stage treatment lagoons shall be exempt from this paragraph (c), provided all of the following conditions are met:

(A) the untreated waste load is less than 2500 population equivalents; and

(B) the source is sufficiently isolated that combining with other sources to aggregate 2500 population equivalents or more is not practicable; and

(C) the lagoons are properly constructed, maintained, and operated; and

(D) the effluent does not, alone or in combination with other sources, cause a violation of applicable water quality standards.

(d) On or after December 31, 1974, no effluent discharged to the Lake Michigan basin shall exceed 4 mg/l of BOD_5 or 5 mg/l of suspended solids.

(e) On or after December 31, 1977, no effluent from any source whose untreated waste load is 500,000 population equivalents or more shall exceed 4 mg/l of BOD_5 or 5 mg/l of suspended solids.

(f) Except as provided in paragraphs (d) and (e) of this Rule 404, on or after December 31, 1973, no effluent whose dilution ratio is less than one to one shall exceed 4 mg/l of BOD_5 or 5 mg/l of suspended solids, except as follows:

(i) sources employing third-stage treatment lagoons shall be exempt from this paragraph (f), provided all of the conditions of subparagraph (c) (iii) of this Rule 404 are met.

(ii) Other sources not within paragraphs (d) and (e) of this Rule 404 shall be exempt from this paragraph provided all of the following conditions are met:

(A) the effluent shall not, alone or in combination with other sources, cause a violation of any applicable water quality standard; and

(B) the effluent shall not, alone or in combination with other sources, cause dissolved oxygen in the waters of the State to fall below 6.0 mg/l during at least 16 hours of any 24-hour period, or below 5.0 mg/l at any time; and

(C) the effluent shall not exceed 10 mg/l of BOD_5 or 12 mg/l of suspended solids; and

(D) on or before September 1, 1972, the owner or operator of such source shall file with the Agency the Project Completion Schedule required by Rule 1002 of this Chapter. In addition to the requirements of Rule 1002, such schedule shall include a program for achieving compliance with the above conditions and with applicable water quality standards, including, but not limited to, dissolved oxygen, bottom deposits, ammonia nitrogen, and phosphorus, with particular reference to nitrogenous oxygen demand and to the control of stormwater overflows; and

(E) the Agency finds that the program will within the compliance dates otherwise applicable assure compliance with the conditions of this subparagraph.

(g) Notwithstanding any other provision of this Rule, any source affected by this Rule 404 and relying in good faith upon the dilution rules of Rules and Regulations SWB-7 through SWB-15 to comply with applicable effluent standards need not comply with the dilution standard of Rule 401(a) until December 31, 1974.

(h) Compliance with the numerical standards in this Rule 404 shall be determined on the basis of 24-hour composite samples averaged over any consecutive 30-day period. In addition, no more than 5% of the samples collected shall exceed 2.5 times the numerical limits prescribed by this Rule.

405 Bacteria

No effluent shall exceed 400 fecal coliforms per 100 ml after July 31, 1972, or such concentrations as may have been prescribed for earlier dates by SWB-7 through SWB-15.

406 Nitrogen

Ammonia Nitrogen as N. (STORET number 00610). No effluent from any source which discharges to the Illinois River, the Chicago River System, or the Calumet River System, and whose untreated waste load is 50,000 or more population equivalents shall contain more than 2.5 mg/l of ammonia nitrogen as N during the months of April through October, or 4 mg/l at other times, after December 31, 1977.

407 Phosphorus (STORET number 00665)

(a) No effluent discharged within the Lake Michigan Basin shall contain more than 1.0 mg/l of phosphorus as P after December 31, 1971.

(b) No effluent from any source which discharges within the Fox River Basin and whose untreated waste load is 1500 or more population equivalents shall contain more than 1.0 mg/l of phosphorus as P after December 31, 1973.

408 Additional Contaminants

(a) The following levels of contaminants shall not be exceeded by any effluent:

CONSTITUENT	STORET NUMBER	CONCENTRATION (mg/l)
Arsenic (total)	01002	0.25
Barium (total)	01007	2.0
Cadmium (total)	01027	0.15
Chromium (total hexavalent)		0.3
Chromium (total trivalent)		1.0
Copper (total)	01042	1.0
Cyanide	00720	0.025
Fluoride (total)	00951	2.5
Iron (total)	01045	2.0
Iron (dissolved)	01046	0.5
Lead (total)	01051	0.1
Manganese (total)	01055	1.0
Mercury (total)	71900	0.0005
Nickel (total)	01067	1.0
Oil (hexane solubles or equivalent)	00550	15.0
pH	00400	range 5-10*
Phenols	32730	0.3
Selenium (total)	01145	1.0
Silver	01077	0.1
Zinc (total)	01092	1.0
Total Suspended Solids (from sources other than those covered by Rule 404)	00530	15.0

* The pH limitation is not subject to averaging and must be met at all times.

(b) Total Dissolved Solids (STORET number 00515) shall not be increased more than 750 mg/l above background concentration levels unless caused by recycling or other pollution abatement practices, and in no event shall exceed 3500 mg/l at any time.

(c) Compliance with the limitations of this Rule 408 shall be achieved by the following dates:

(i) with respect to mercury, by April 25, 1971;

(ii) with respect to all other specified contaminants,

(A) New sources shall comply on the effective date of this regulation;

(B) Existing sources shall comply by December 31, 1973.

PART V: MONITORING AND REPORTING

This part of the rules and regulations concerning water pollution prescribes requirements for monitoring, reporting and measuring contaminant discharges.

501 Reporting Requirements

(a) Every person discharging effluents to the waters of Illinois shall submit operating reports to the Agency at a frequency to be determined by the Agency. Such reports shall contain information regarding the quantity of influent and of effluent discharged, of wastes bypassed, and of combined sewer overflows; the concentrations of those physical, chemical, bacteriological and radiological parameters which shall be specified by the Agency; and any additional information the Agency may reasonably require.

(b) Every person within this State who utilizes mercury or any of its compounds in excess of 15 pounds per year as Hg shall file with the Agency, on or before June 1, 1971 and annually thereafter, a report setting forth the nature of the enterprise; a list, by type and by quantity of mercury products and mercury derivatives produced, use in, and incidental to its processes, including by-products and waste products; the estimated concentrations and annual total number of pounds of mercury that will be discharged into the waters of the State or that will be discharged into any sewer system; and what measures are taken or proposed to be taken to reduce or to eliminate such discharges.

502 Effluent Measurement

In order to facilitate the ability of the Agency to conduct its inspecting and investigating responsibilities as described in Section 4 (d) of the Act, all effluent discharge sewers, pipes or outfalls shall be designed or modified so that a sample of the effluent can be obtained at a point after the final treatment process and before discharge to or mixing with any waters of the State. All treatment works shall include such devices for taking samples and for measuring and recording effluent flow as the Agency may reasonably require.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
1 NORTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

A-13

JAN 16 1973

Honorable Daniel Walker
Governor's Office
State Capitol
Springfield, Illinois 62706

Dear Governor Walker:

As provided by Section 303(a)(1) of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), "any water quality standard applicable to interstate waters which was adopted by any State and submitted to, and approved by, or is awaiting approval by, the Administrator pursuant to this Act as in effect immediately prior to the date of enactment of the Federal Water Pollution Control Act Amendments of 1972, shall remain in effect unless the Administrator determines that such standard is not consistent with the applicable requirements of this Act as in effect immediately prior to the date of enactment of the Federal Water Pollution Control Act Amendments of 1972. If the Administrator makes such a determination, he shall, within three months after the date of enactment of the Federal Water Pollution Control Act Amendments of 1972, notify the State and specify the changes needed to meet such requirements." This letter and attachments shall serve as your official notification of any changes required under 303(a)(1).

A basic policy of the Act immediately prior to the enactment of the 1972 Amendments is to enhance the quality and value of the Nation's waters. It is consistent with the letter and spirit of that Act that all waters be capable of supporting recreational uses and desirable aquatic biota. The basic policy of the above Act was further defined and reinforced in Section 101(a)(1) and (2) of the 1972 Amendments which provide for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water wherever attainable by 1983, and the total elimination of pollutant discharges into navigable waters by 1985.

To satisfy the requirements of the law, I am taking this opportunity to inform you that pursuant to Section 303(a)(1) of the 1972 Amendments, all Illinois interstate water quality standards are approved except for the changes specifically noted in the attachments to this letter. It is my determination that to meet the requirements of the 1972 Amendments, the noted changes to Illinois water quality standards must be adopted as shown. The required modifications have been discussed with the Illinois Environmental Protection Agency staff in several meetings since December 1, 1972, and our two Agencies have been actively cooperating in developing legally adequate water quality standards for Illinois.

The requirements as listed in the attached Standards Revisions Requirements - State of Illinois must be adopted by the State within 90 days following the date of this letter (Section 303(a)(1). Should the State fail to do so, it is the Administrator's obligation under the law to publish the necessary standards in the Federal Register as a preliminary step toward Federal promulgation. The published standards would be promulgated as Federal standards 190 days after publication, unless prior to that date Illinois adopts water quality standards which are determined by me to be in accordance with the requirements of the Act as in effect immediately prior to the enactment of the Amendments of 1972, or unless requests for exceptions are supported by adequate analysis as provided for in Guidelines for Developing or Revising Water Quality Standards attached with this letter. For the sake of uniformity and consistency between State standards, and for ease of evaluation, it is suggested that the water quality standards format embodied in the attached guideline be adopted. You may anticipate that the requirements for intrastate waters will be consistent with those outlined in the attachment for interstate waters. Our official evaluation of intrastate waters will be forwared to you by March 18, 1973 as required by the new law.

We have every confidence that Illinois will adopt the necessary standards revisions required to satisfy the provisions of the new legislation. The cooperative attitude which the Illinois Pollution Control Board has displayed in past revisions is a tribute to the Board and the Agency staff. It will be our pleasure to work together in the continuing effort to enhance and protect the waters of Illinois.

Sincerely yours,

Francis T. Mayo

Francis T. Mayo
Regional Administrator

Attachments:

(1) Standards Revisions Requirements - State of Illinois
(2) Guidelines for Developing or Revising Water Quality Standards

CC: Region VII, Region IV, Mount Pemberton, DPI (Polikoff)
Blomgren, Samsom, Sabock, Schneider
McDonald, Zeller, Adamkus, WQS Staff
Kovalik, D.O.D., IPCB, IEPA

A-15

STANDARDS REVISIONS REQUIREMENTS

STATE OF ILLINOIS

Classification (General) -

All waters must be designated to support desirable aquatic biota and recreational uses. Use and value of water for public water supplies, agriculture, industrial, and other purposes can be considered in setting standards, but in no case except as provided for in Guidelines for Developing or Revising Water Quality Standards (Guidelines) shall the criteria supporting these uses interfere with recreational uses and the preservation of desirable species of aquatic biota. All restricted use waters (Illinois 302) must be designated to the general standards classification (Illinois 301) unless requests for exceptions are supported by adequate analysis as provided for in the Guidelines.

Mixing Zones (General) -

The reasonable zone of passage alluded to in Illinois 201(b) must be further defined to include the National Technical Advisory Committee recommendation that the total mixing zone, at any transect of the stream should contain no more than 25% of the cross-sectional area and/or volume of flow of a stream. In addition, mixing zone characteristics must not be lethal to aquatic organisms. The 96 hr TLm for indigenous fish or fish food organisms, whichever is more stringent, should not be exceeded at any point in the mixing zone.

Total Phosphorus as P -

A maximum single value of 0.1 mg/l must be applied to all streams.

Toxic Substances -

The following must be added: Not to exceed one-tenth of the 96 hr. TLm, except that other more stringent application factors shall be used when justified on the basis of available evidence.

*Where numerical values are adopted the minimum approvable criteria for specified water use classifications are the minimum recommended levels set by the National Technical Advisory Committee in its report to the Secretary of Interior on Water Quality Criteria April 1, 1968.

APPENDIX B. OXYGEN DEMAND IN THE ILLINOIS RIVER

Organic wastes discharged from the Chicago metropolitan area into the Sanitary and Ship Canal are acted upon by microorganisms in the water. Bacteria which use carbonaceous substances (heterotrophs) have a generation time of minutes, and a population commensurate with the carbonaceous load is built up almost immediately. These organisms require one part of oxygen for each part of substance oxidized to CO_2, and thus contribute to the oxygen demand of the water (carbonaceous oxygen demand). Oxidation of ammonia in the waste discharge requires two groups of bacteria, *Nitrosomonas* (converts ammonia to nitrate) and *Nitrobacter* (converts nitrite to nitrate). These nitrifiers require about 4.6 parts of oxygen for one part of ammonia oxidized (nitrogenous oxygen demand) and their generation time of 30 to 40 hours means that five to six days are required to build up a population commensurate with the nitrogenous load. This time of travel during moderately low flows of the Illinois River infers that the area of maximum demand load is about 45 miles downstream of Lockport, near Marseilles (see Fig. 9 in "A Water Quality Investigation of the Upper Illinois Waterway," Illinois State Water Survey, July 1972).

APPENDIX C. ABUNDANCE OF PHYTOPLANKTON

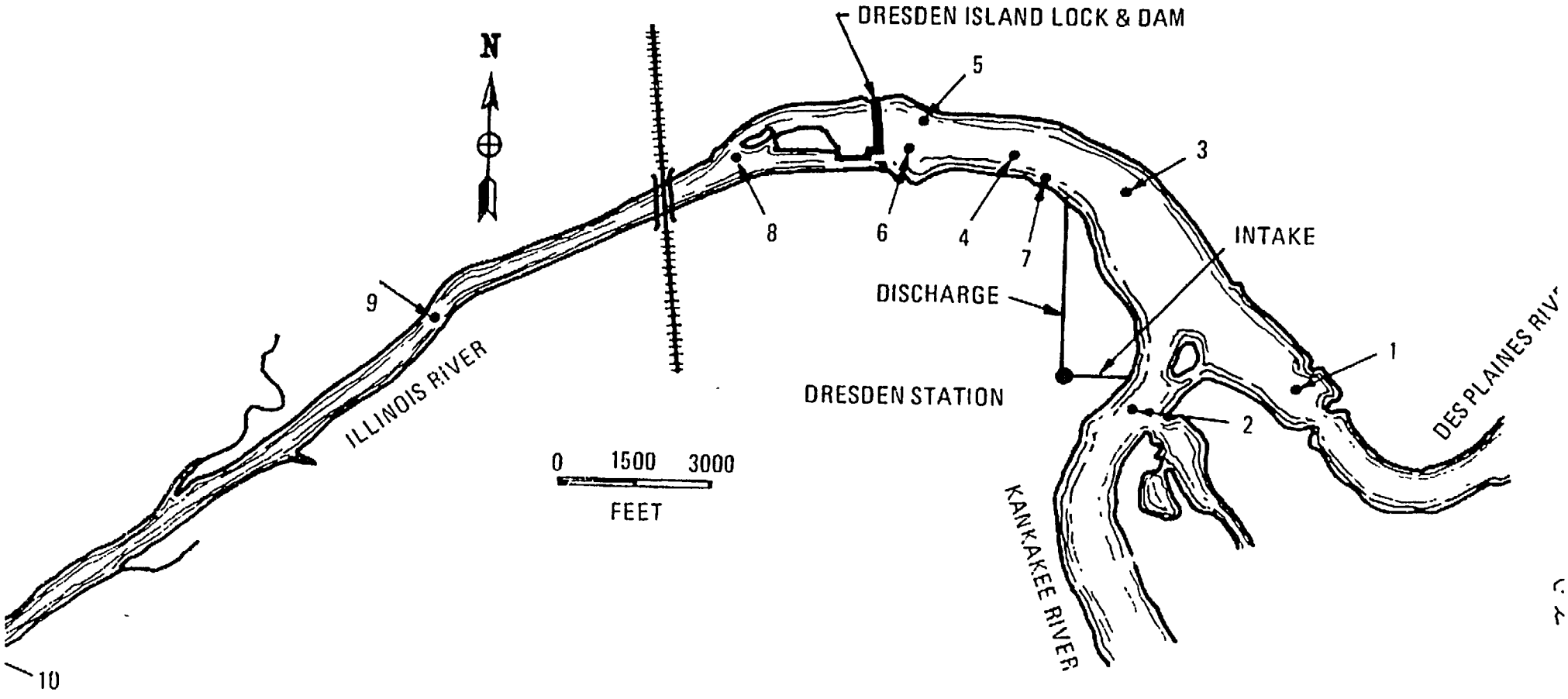


Fig. C.1. Benthic Sampling Locations (1–10) at the Dresden Site, July 1969–June 1970. From "Preoperational Environmental Monitoring (thermal) of the Illinois River near Dresden Nuclear Power Station, July 1969–June 1970." Industrial Bio-Test Laboratories, Inc.

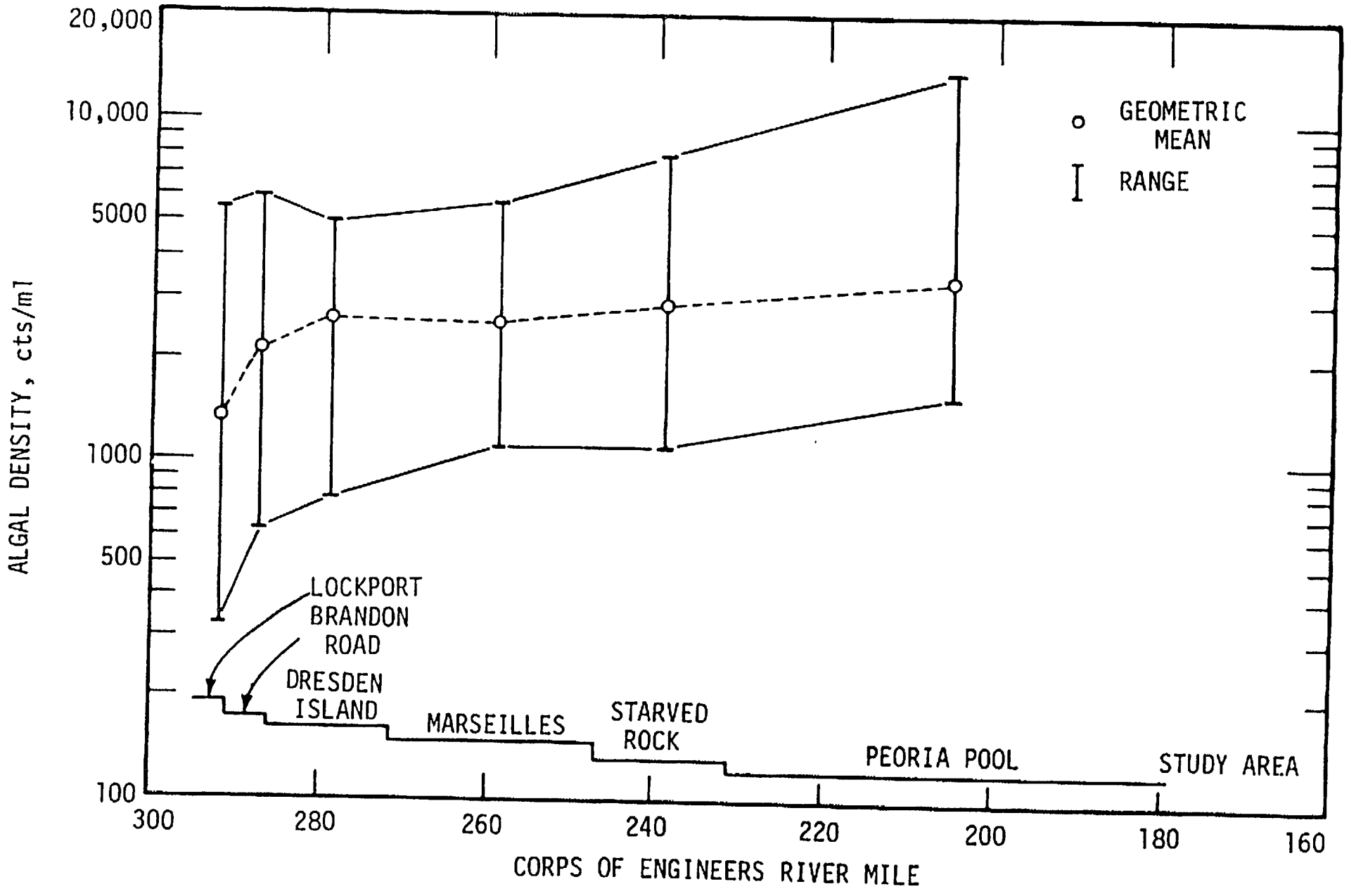
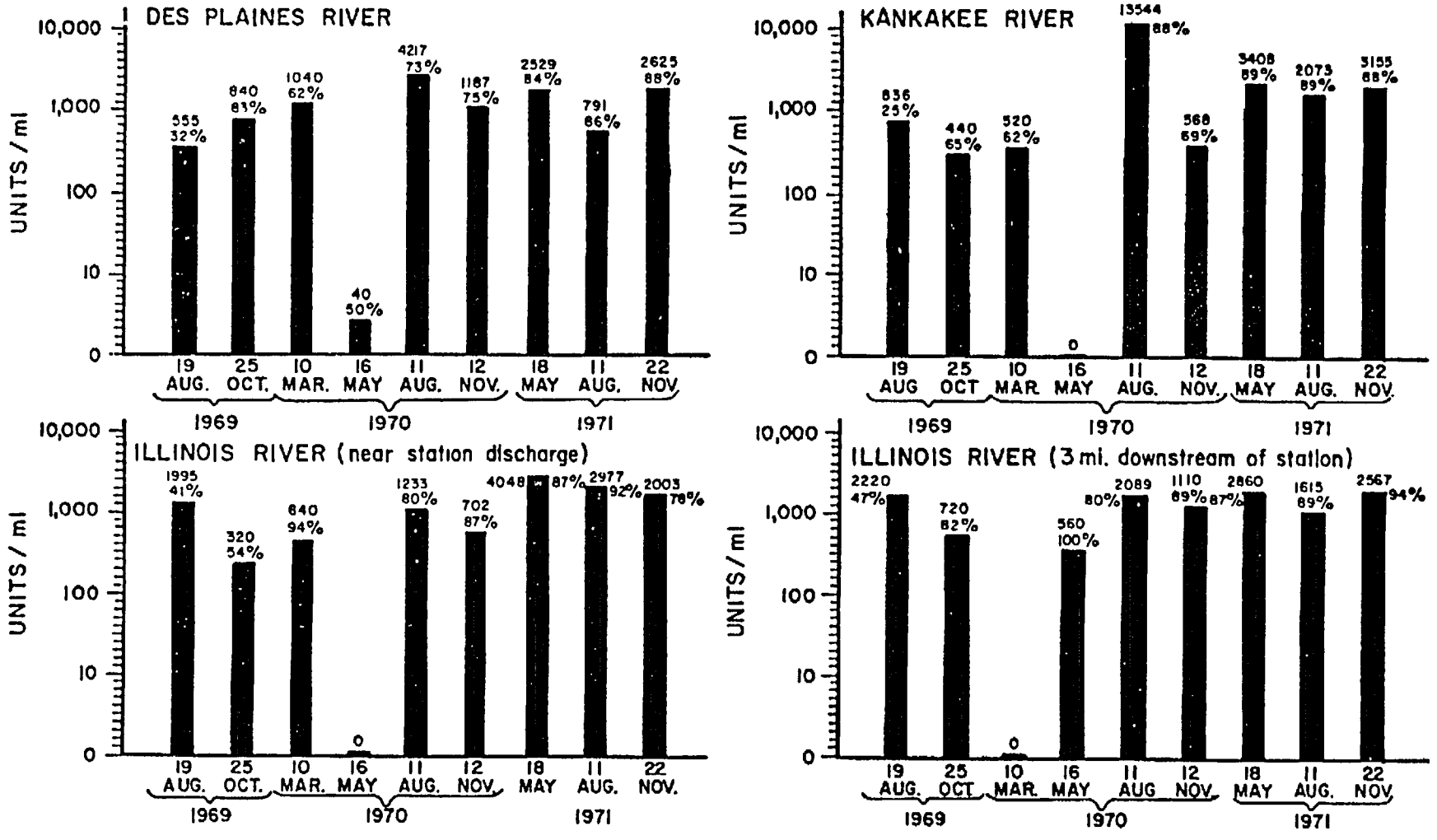
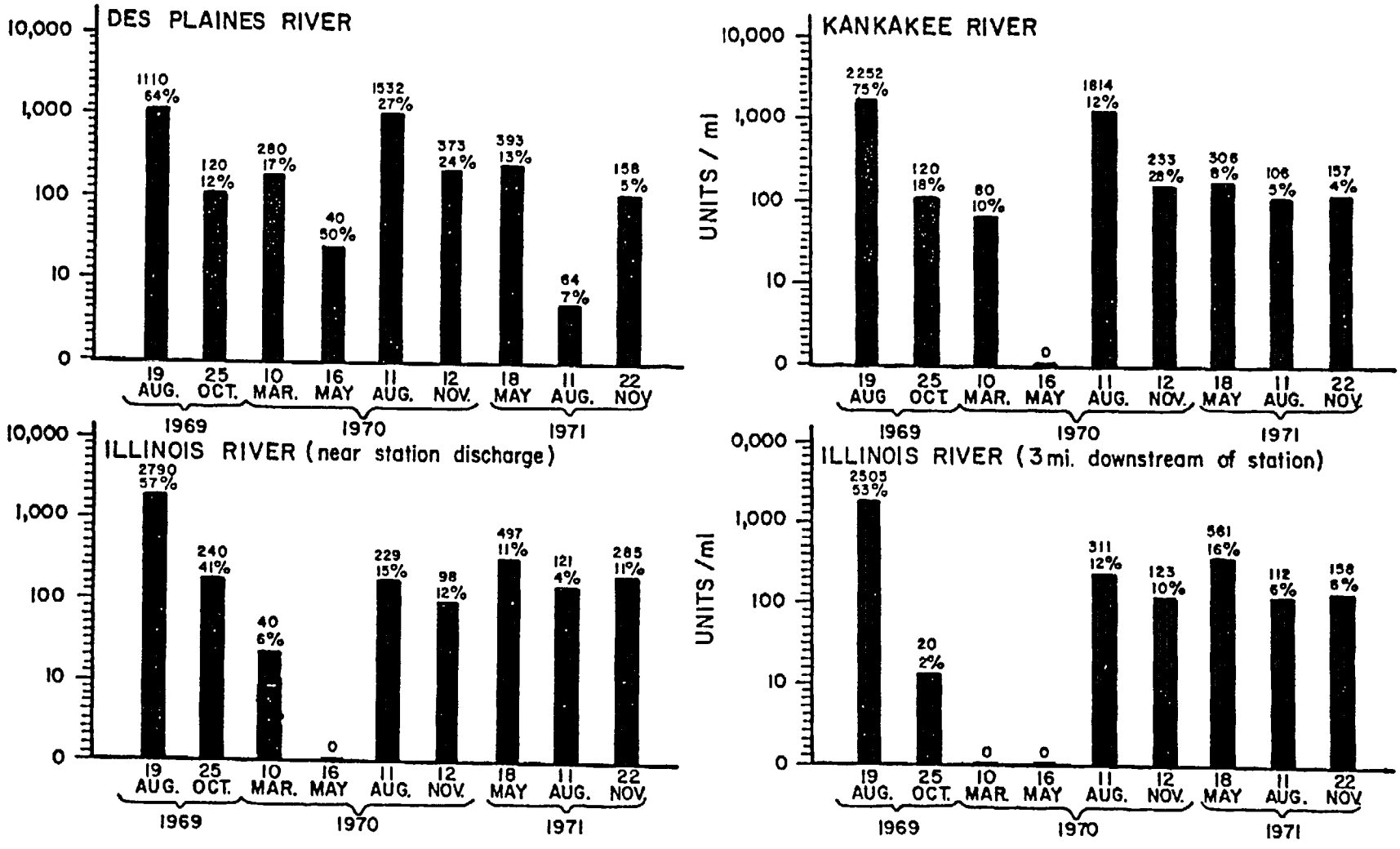


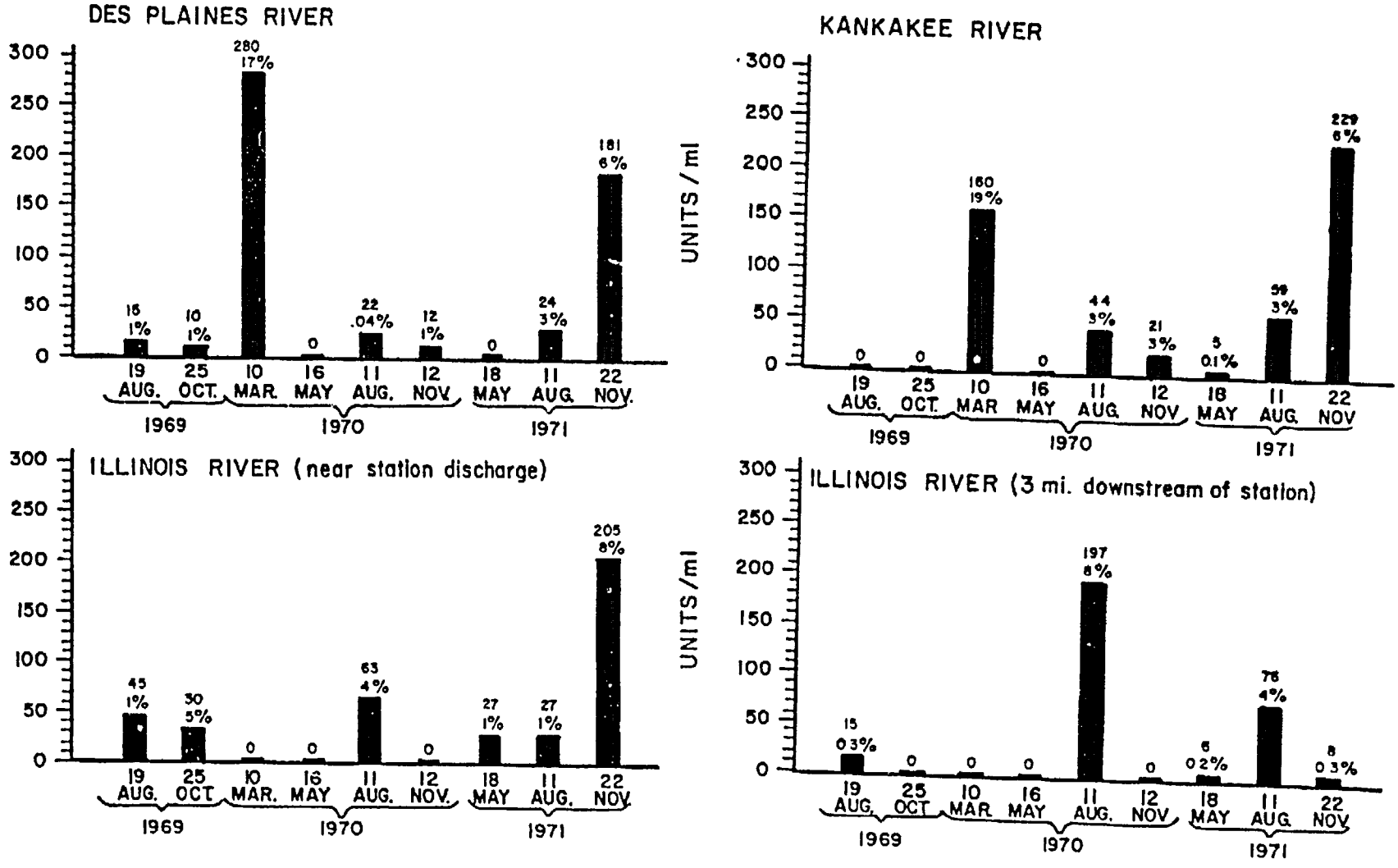
Fig. C.2. Density of Algae in the Illinois Waterway. From "A Water Quality Investigation of the Upper Illinois Waterway," Preliminary Report, Water Quality Section, Illinois State Water Survey, July 1972.



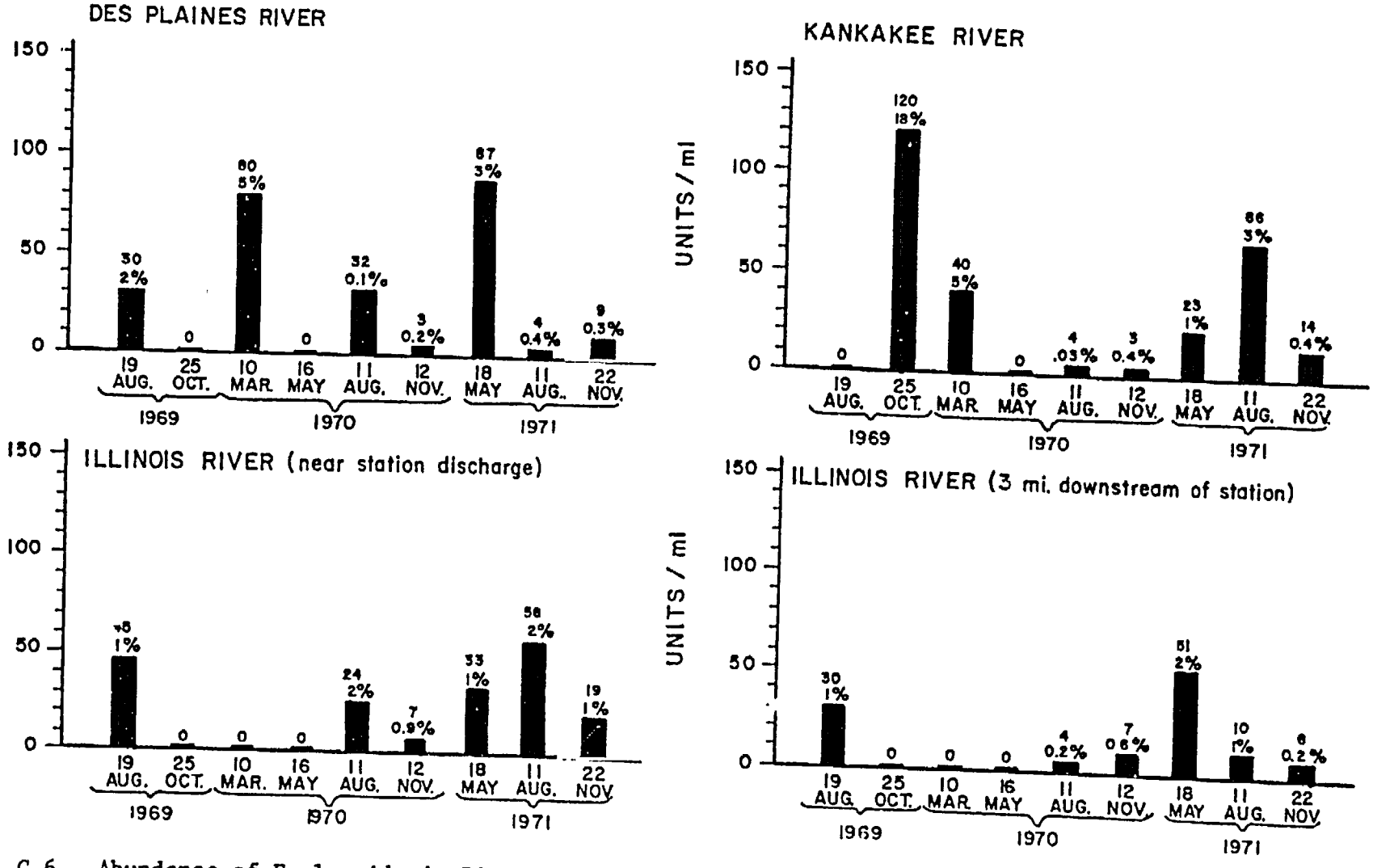
g. C.3. Abundance of Diatoms in Rivers near Dresden. Bars represent frequency of individuals found per milliliter of sample and plotted on a logarithmic scale. Percentages represent proport of diatoms making up total phytoplankton populations.



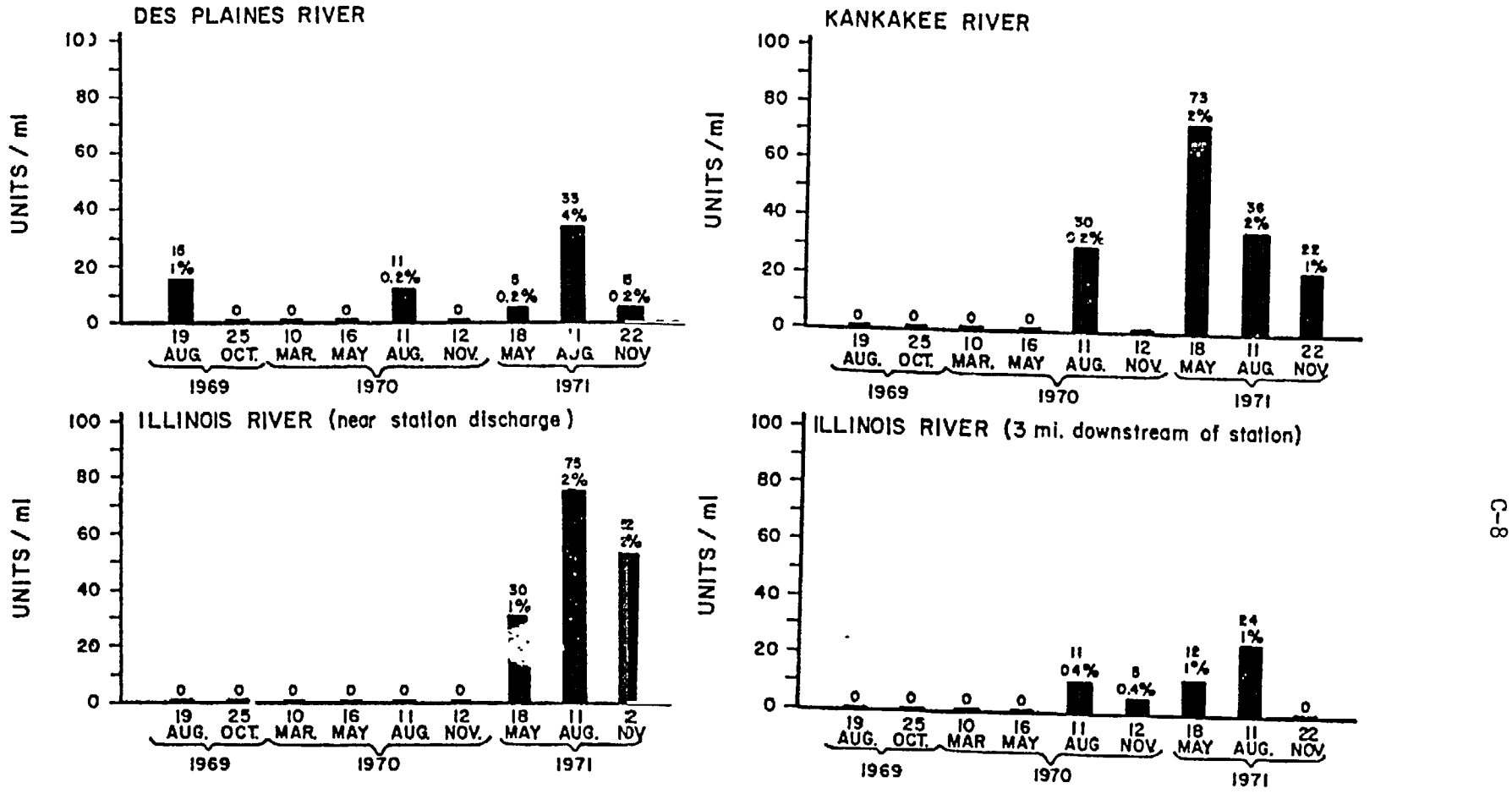
. C.4. Abundance of Green Algae in Rivers near Dresden. Bars represent frequency of individuals found per milliliter of sample and plotted on a logarithmic scale. Percentages represent proportion of green algae making up total phytoplankton population.



C.5. Abundance of Blue-green Algae in Rivers near Dresden. Bars represent frequency of individuals found per milliliter of sample plotted on an arithmetic scale. Percentages refer to proportion of blue-green algae making up total phytoplankton population.



C.6. Abundance of Euglenoids in Rivers near Dresden. Bars represent frequency of individuals found per milliliter of sample and plotted on an arithmetic scale. Percentages refer to proportion of euglenoids making up total phytoplankton population.



g. C.7. Abundance of Miscellaneous Phytoplankton in Rivers near Dresden. Bars represent frequency of individuals found per milliliter of sample and plotted on an arithmetic scale. Percentages refer to proportion of miscellaneous agae making up total phytoplankton population.

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om B. G. Johnson and L. P. Beer, "EnvironmentalMonitoring (thermal) of the Des Plaines, Kankakee, and .inois Rivers near Dresden Nuclear Power Statio, July 1970-Dec. 1971," Industrial Bio-Test Laboratories, :.

TABLE C.1. Benthic Organisms near the Dresden Nuclear Power Station (% Composition)

Sampling Station No.[a]	Sediment	Oligochaeta (worms)			Pelecypoda (clams)			Gastropoda (snails)			Insecta (insects)			Others		
		8/69	10/69	5/70	8/69	10/69	5/70	8/69	10/69	5/70	8/69	10/69	5/70	8/69	10/69	5/70
1	Gravel, Mud	4	75.0	100	0	0	0	36	25.0	0	0	0	0	60	0	0
2	Black Mud	68.4	0	100	15.8	0	0	0	0	0	15.8	100	0	0	0	0
3	Sand and Rubble	4.5	75.0	83.3	31.1	0	0	51.6	0	11.1	8.3	25.0	0	4.5	0	0
4	Mud and Gravel	50.0	0	100	12.5	0	0	0	0	0	37.5	0	0	0	0	0
5	Thick Mud	64.4	90.5	97.9	0	0	0	0	0	0	28.9	9.5	1.1	6.7	0	1.1
6	Mud and Sand	37.3	0	-	9.8	100	-	41.2	0	-	0	0	-	11.8	0	-
7	Thick Mud	0	0	0	28.6	0	0	0	0	0	71.4	0	0	0	0	0
8	Gravel	0	0	100	0	0	0	100	100	0	0	0	0	0	0	0
9	Rock and Gravel	0	0	100	0	100	0	100	0	0	0	0	0	0	0	0
0	Rock and Sand	0	0	0	33.3	0	0	0	0	0	66.7	0	0	0	0	0

om "Preoperational Environmental Monitoring (thermal) of the Illinois River near Dresden Nuclear Power Station, July 1969-June 1970." dustrial Bio-Test Laboratories, Inc.

or location of sampling sites, see Figure 2.11.

TABLE C.2. Algae Genera and Occurrence - Upper Illinois Waterway
July 14 - September 30, 1971

Algal Genus	Total Occurrence	No. of Stations Occurred	Average Occurrence per Station
Blue-green algae			
1. *Aphanizomenon*	15	12	1.3
Green algae			
1. *Actinastrum*	23	14	1.7
2. *Ankistrodesmus*	2	2	1.0
3. *Chlorella*	8	7	1.1
4. *Coelastrum*	1	1	1.0
5. *Oocystis*	6	6	1.0
6. *Pediastrum*	22	14	1.6
7. *Scenedesmus*	75	18	4.2
8. *Ulothrix*	7	6	1.2
Diatoms			
1. *Caloneis*	8	6	1.3
2. *Cyclotella*	143	18	8.0
3. *Diatoma*	2	2	1.0
4. *Fragilaria*	6	5	1.2
5. *Gyrosigma*	28	14	2.0
6. *Melosira*	41	17	2.4
7. *Navicula*	114	18	6.3
8. *Nitzschia*	4	4	1.0
9. *Stephanodiscus*	3	2	1.5
10. *Surirella*	17	12	1.4
11. *Synedra*	8	8	1.0
12. *Tabellaria*	27	13	2.1
Pigmented flagellates			
1. *Chlamydomonas*	1	1	1.0
2. *Euglena*	48	18	2.7

From "A Water Quality Investigation of the Upper Illinois Waterway." Preliminary Report.

TABLE C.3. Abundance of Zooplankton Collected at Seven Locations in the Illinois, Des Plaines, and Kankakee Rivers near the Dresden Nuclear Generating Station, November 20, 1972

TAXON	LOCATIONS													
	1 (Des Plaines)		2 (Kankakee)		5 (Illinois)		6 (Illinois)		9 (Illinois)		12 (Illinois)[a]		15 (Illinois)[a]	
	Number[b]	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
COPEPODA														
Nauplii	116	5.2	42	34.4	3?	28.5	39	52.0	196	57.0	17	7.9	1[illegible]	[illegible].6
Calanoid Copepodites	3	0.1	1	0.8	1	0.8	1	1.3	3	0.9	6	2.8	3	1.3
Cyclopoid Copepodites	55	2.5	15	12.3	1[illegible]	8.5	15	20.0	57	16.6	50	23.1	52	22.6
Cyclops bicuspidatus thomasi	27	1.2	2	1.6	1	0.8	0	0	1	0.3	53	24.5	3	1.3
Cyclops vernalis	0	0	2	1.6	2	1.5	1	1.3	2	0.6	0	0	6	2.6
Diaptomus spp. (female)	19	0.9	0	0	1	0.8	0	0	1	0.3	0	0	6	2.6
Diaptomus pallidus	3	0.1	0	0	4	0	1	1.3	0	0	0	0	6	2.6
Diaptomus sicilodies	3	0.1	0	0	1	0.8	0	0	0	0	6	2.8	12	5.2
Eucyclops agilis	0	0	1	0.8	1	0.8	0	0	1	0.3	0	0	0	0
Eucyclops speratus	0	0	1	0.8	0	0	0	0	1	0.3	0	0	0	0
Harpacticoids	0	0	1	0.8	1	0.8	0	0	0	0	0	0	6	2.6
Mesocyclops edax	0	0	0	0	1	0.8	0	0	0	0	0	0	0	0
Tropocyclops prasinus	4	0.2	5	4.1	3	2.3	7	9.3	11	3.2	0	0	3	1.3
Total Copepoda	230	10.3	70	57.2	60	46.5	64	85.2	273	79.4	132	61.1	115	50.0
CLADOCERA														
Alona sp.	0	0	1	0.8	0	0	0	0	0	0	0	0	0	0
Alona guttata	0	0	0	0	1	0.8	0	0	0	0	0	0	0	0
Alonella sp.	0	0	1	0.8	0	0	0	0	0	0	0	0	0	0
Bosmina longirostris	15	0.8	22	18.0	25	19.2	6	8.0	44	12.8	10	4.6	16	7.0
Ceriodaphnia quadrangula	0	0	1	0.8	2	1.5	0	0	3	0.9	0	0	3	1.3
Chydorus sphaericus	4	0.2	5	4.1	6	4.6	2	2.7	7	2.0	8	3.7	6	2.6
Daphnia galeata mendotae	0	0	1	0.8	1	0.8	1	1.3	0	0	0	0	0	0
Daphnia pulex	0	0	0	0	0	0	1	1.3	0	0	0	0	0	0
Ilyocryptus sordidus	0	0	0	0	0	0	0	0	0	0	2	0.9	0	0
Pleuroxus denticulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Cladocera	19	0.9	31	25.4	35	27.1	10	13.3	54	15.7	20	9.3	25	10.7
ROTIFERA	1981	88.8	21	17.2	34	26.4	1	1.3	17	4.9	64	29.6	90	39.1
Total zooplankton	2230		122		129		75		344		216		230	

From Applicant's Environmental Report, Supplement IV.
[a]See Section 6.2 for map of sampling location.
[b]"Number" represents the mean of two replicate samples and indicates the number of organisms per cubic meter of water sampled.

TABLE C.4. Electrofishing Catch Data for Dresden Lake on August 17, 1972[a]

Species	No.	Relative Abundance
Gizzard shad	465	35.7
Carpsucker	122	9.4
Carp	259	19.9
Green sunfish	33	2.5
Mirror carp	4	0.3
Goldfish	219	16.8
Largemouth bass	27	2.1
Bluegill	25	1.9
Hybrids (mostly bluegill-Green sunfish)	56	4.3
Log perch	4	0.3
Bluntnose minnow	47	3.6
Shiners	38	2.9
Brook silverside	4	0.3
Total	1303	100

From "Interim Report for the Dresden Lake Biological Study," Environmental Analysts, Inc., September 6, 1972.
[a]Data for the five pools were combined.

TABLE C.5. Species List of Phytoplankton Collected in Dresden Lake on August 9, 1972

Pool 1[a]	Pool 5[b]
Euglenophyta (euglenoids)	Euglenophyta (euglenoids)
Euglenales	Euglenales
Euglena sp.	*Euglena* sp.
Trachelomonas sp.	*Trachelomonas* sp.
Strombomonas sp.	*Strombomonas* sp.
Chlorophyta (green algae)	Chlorophyta (green algae)
Chlorococcales	Chlorococcales
Scenedesmus sp.	*Scenedesmus* sp.
Chrysophyta (diatoms)	Chrysophyta (diatoms)
Bacillariophyceae	Bacillariophyceae
Centrales	Centrales
Cyclotella meneghiniana	*Cyclotella meneghiniana*
	Cyclotella atomus
	Cyclotella pseudostilligera
	Stephanodiscus minutula
	Stephanodiscus subtilis
	Microsiphona potamous
	Pennales
	Nitzchia

From "Interim Report for Dresden Lake Biological Study," Environmental Analysts, Inc., September 6, 1972.

[a]Temp. = 27.5°C (81.5°F) on date of sampling.

[b]Temp. = 24.0°C (75.2°F) [illegible]

TABLE C.6. Zooplankton Collected from Dresden Lake on August 9, 1972

Rotifera
Branchionus sp.
Keratella sp.
Asplanchna sp.
Monostyla sp.
Crustacea
Cyclops sp.
Protozoa
Centrophyxis sp.

From "Interim Report for the Dresden Lake Biological Study," Environmental Analysts, Inc., September 6, 1972.

APPENDIX D. THEORETICAL PREDICTIONS OF DRESDEN COOLING LAKE PERFORMANCE

There are two extreme classifications of cooling lakes. In a completely mixed pond, the flow between the intake and discharge, combined with wind effects, tends to maintain the pond at nearly uniform temperature throughout. In a flow-through (plug-flow) pond, the temperature decreases continually along the flow path from intake to discharge. Any given lake will fall somewhere between these two extremes. Dresden Lake, as a result of the internal diking, would be expected to perform more like a flow-through pond.

The principle mechanisms by which heat is exchanged between the water and the atmosphere are:

a. incoming short-wave solar radiation,

b. incoming long-wave atmosphere radiation,

c. outgoint long-wave back radiation,

d. reflected solar and atmospheric radiation,

e. heat loss due to evaporation, and

f. heat loss or gain by conduction.

The equilibrium temperature, E, is defined as the temperature a body of water would eventually reach when cooled or heated naturally under constant meteorological conditions. A body of water at a temperature different from E will tend to approach E asymptotically. The equilibrium temperature is not a constant but varies throughout the day and throughout the year as the meteorological variables change.

Although the temperature of a natural body of water continually approaches the equilibrium temperature, it lags behind the short-term changes. It is usually close to the equilibrium temperature during the summer and winter, lower during the spring and higher during the fall.

The simplified model for predicting temperatures in a cooling pond assumes that the net rate of heat exchange, ΔH, across the surface of the pond is proportional to the difference between the surface temperature of the lake, T_S, and the equilibrium temperature, E.

$$\Delta H = -K(T_S - E) \qquad (1)$$

The proportionally factor, K is a complicated function of the meteorological variables, as is E. When appropriate averages are used (e.g., monthly averages), the temperature T_s may be calculated within $\pm$ 5°..

For a flow through pond, the differential equation that relates the transient temperature response to the heat input to the lake is[1]

$$\rho C_p L \frac{dT}{dt} = -K(T-E), \tag{2}$$

where ρ = density of water (62.4 lb/ft^3),

C_p = specific heat of water (1 BTU/lb-°F),

L = average depth of lake (ft),

T = surface water temperature, and

t = time.

In Eq. (2), ρ and C_p are assumed to be constant.

If K and E are constant throughout the period of interest, the solution of Eq. (2) is

$$\frac{T-E}{T_o-E} = e^{-K(t-t_o)/\rho C_p L}, \tag{3}$$

where T and T_o are the surface temperatures at times t and t_o, respectively. If T_o is the discharge temperature (at time t_o), T_F is the temperature at the end of the lake and $t - t_o = t_F$ (resident time), then

$$\frac{T_F-E}{T_o-E} = e^{-Kt_F/\rho C_p L} \tag{4}$$

If the analysis is extended to a closed-cycle pond, then the water that has cooled to a temperature T_F now passes through the condenser and appears at the discharge canal with a temperature $T_F + \Delta T_c$, where ΔT_c is the temperature rise across the condenser. The above equations may then be reapplied.

In the case of Dresden, one must account for the effects of the spray canal. This is done by replacing $T_F + \Delta T_c$ by $T_F + \Delta T_c - \Delta T_s$, where ΔT_s is the temperature drop of water passing through the both spray canals. Although the performance of the sprays is a function of the meteorological conditions, a constant value of 8°F was chosen for this analysis. The small cooling effect due to dilution by the 66,000 gpm makeup flow has been neglected. The above expression thus becomes T_F + 23°F -8°F = T_F + 15°F.

Thackston and Parker have calculated the equilibrium temperatures and heat exchange coefficients for 88 locations throughout the country.[2] Figure D.1 is a plot of these parameters for Chicago for the twelve months of the year. The solid curve contains the values that correspond to average meteorological conditions. The dashed curve corresponds to extreme meteorological conditions, and results from assuming that all meteorological variables are at the value which is exceeded once in ten years. The probability that all these variables are at the extremes simultaneously is small.

The uncertainty in E is typically $\pm$ 5°F, and the uncertainty in K is approximately $\pm$ 40%. One of the largest contributors to the uncertainty is the specific form chosen for the wind formula which determines the heat loss due to evaporation. Thackston and Parker have employed a very conservative formula so that it is not unreasonable to expect that there will be more cooling than predicted using their values.

The residence time, t_F in (4) is given by

$$t_F = \frac{V}{Q} = \frac{AL}{Q} \tag{5}$$

where V = volume of lake (ft^3)

A = surface area of lake (ft^2)

L = average depth of lake (ft)

Q = flow rate (ft^3/day)

Using the values appropriate to Dresden Lake, the residence time is found to be approximately 3 days. The applicant gives a value of 2.4 days for the residence time.[3] Obviously, more cooling will be realized using this larger value.

If one applies Eq. (4) starting with January 1 with $T_o = E_{JAN} + 15°F$, t_F = 3 days, and $K = K_{JAN}$, then T_F in Eq. (4) corresponds to the temperature of the water at the cooler end of the lake. The water then passes through the spray canal, condenser, and the other spray canal, at which point the water temperature becomes T_F +15°F. The next step is to increment E_{JAN} and K_{JAN} by $(E_{FEB} - E_{JAN})/10$ and $(K_{FEB} - K_{JAN})/10$, respectively. In other words, E and K are allowed to change as they might be expected to do, rather than holding them constant for the entire month. This type of analysis continues until the temperature T_F at 3-day intervals throughout

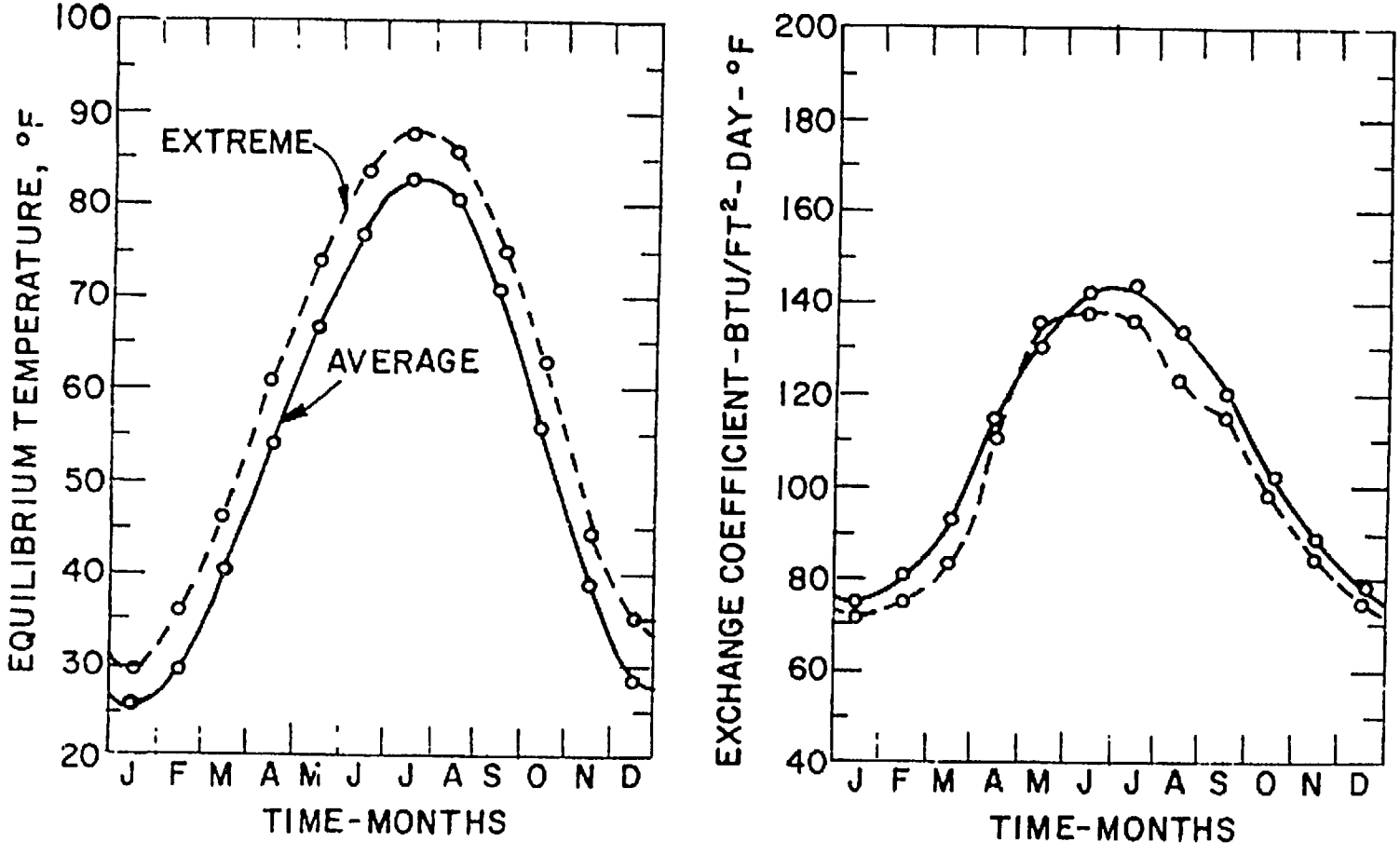


Fig. D.1. Equilibrium Temperatures and Heat Exchange Coefficients for the Chicago Region. From E. L. Thackston and F. L. Parker, "Effects of Geographical Location on Cooling Pond Requirements and Performance," Vanderbilt University, March 1971.

the year is obtained. In actuality the analysis must be continued for more than a year since the assumption, $T_o = E_{JAN} + 15°F$ was just an initial value needed to begin the process.

The analysis so far has assumed the Dresden Lake is a perfect flowthrough pond. No account has been made for the entrance mixing that occurs at the point where the heated effluent enters the lake. The dilution D_s can be defined by the relationship

$$D_s = \frac{Q_s}{Q_o}, \tag{6}$$

where Q_s = total flow rate (outlet flow plus entrained flow), and Q_o = outlet flow.

For no entrance mixing $D_s = 1$. Ryan states that in the field, the minimum value of D_s to be expected is about 1.5.[4]

The lake temperature predicted by the entrance mixing model used is given below.[5]

$$\frac{T_F - E}{T_o - E} = \frac{e^{-r/D_s}}{D_s - (D_s - 1)e^{-r/D_s}}, \tag{7}$$

where

$$r = \frac{Kt_F}{\rho C_p L} = \frac{KA}{\rho C_p Q_o} \tag{8}$$

As previously mentioned, $D_s = 1.$ corresponds to the flow-through case. The other extreme, $D_s >> 1.$ corresponds to a fully mixed pond. Figure D.2 displays the results of this calculation for $D_s = 1$ and $D_s = 1.5$ for both average and extreme meteorological conditions.

The 50,000 gpm blowdown from the lake passes through the return discharge canal and will presumably be mixed with the approximately 190,000 gpm Unit 1 effluent, which is about 19°F warmer than the ambient Kankakee River water. Information on Kankakee River water temperatures is very sparse. Sargent and Lundy[6] have compiled monthly averages of the highest Illinois River temperatures recorded from an eleven-year record at Morris, Illinois--1951 through 1961. Minimum River temperature at Marseilles have also been documented.[7] These values are plotted in Figure D.3.

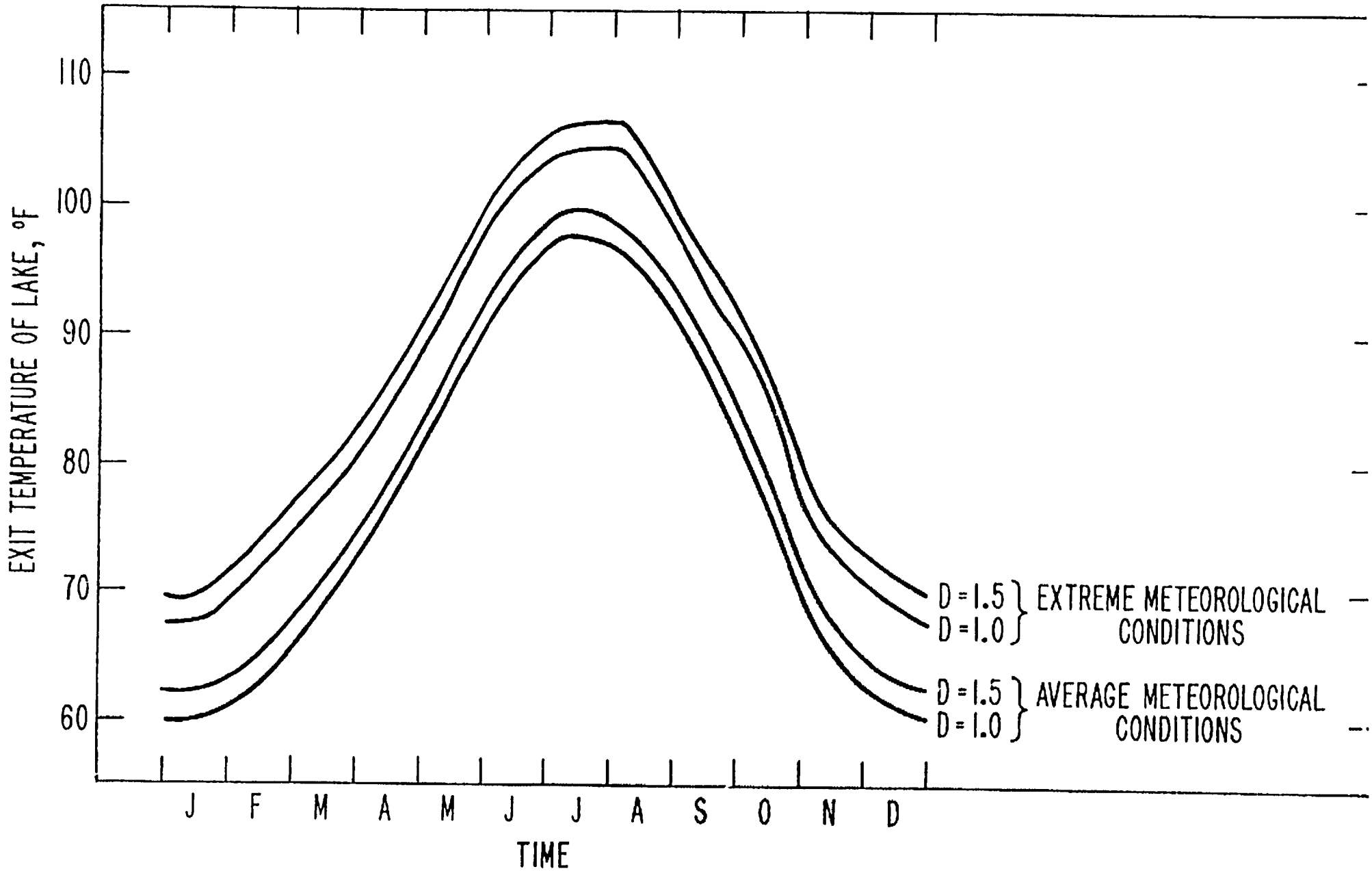


Fig. D.2. Thermal Performance of Dresden Lake under Closed-Cycle Operation

The excess temperature of the mixed effluent is given by

$$T_{mixed} \approx \frac{1}{5}(T_{out}) + \frac{4}{5}(T_{unit\ 1})$$

$$T_{mixed} = \frac{1}{5}(T_{out}) + \frac{4}{5}(T_R + 19°F) \qquad (9)$$

In (9), we have used $T_{out} = T_F - 3°F$, that is, we have assumed a 3°F cooling of the water in passing through the return spray canal. Table D.1 lists the values of T_{out}, T_{mixed} and $T_{mixed} - T_F$. Note that minimum river temperatures were used with the Tout corresponding to average meteorological conditions and maximum river temperatures with the T_{out} corresponding to extreme meterological conditions.

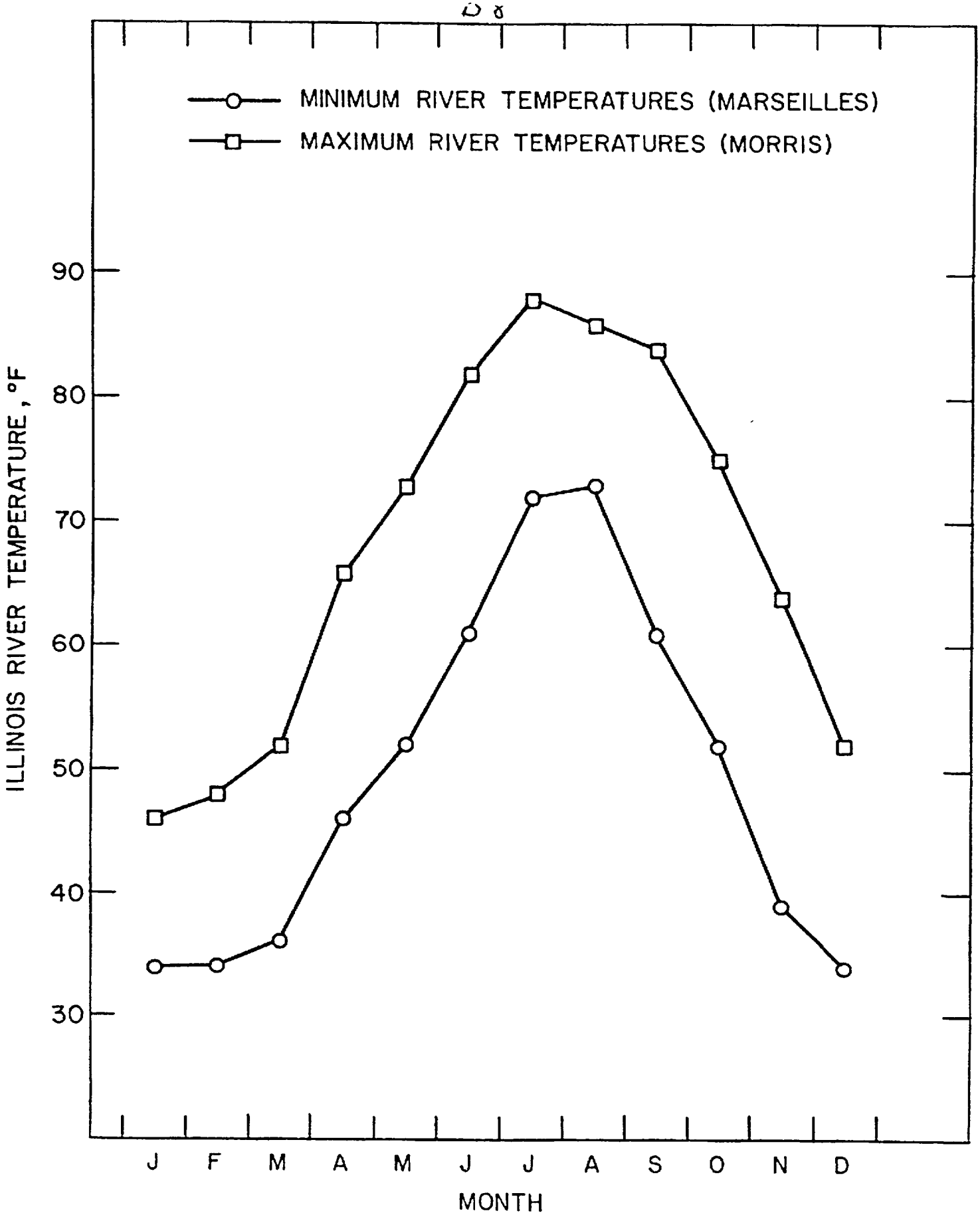


Fig. D.3. Maximum and Minimum Illinois River Temperatures

Table D.1. Estimated Blowdown Temperature (°F)

Month	T_{out}	$(T_{out})_e$	T_{mixed}	$(T_{mixed})_e$	T_{mixed} - (T_R) Min	$(T_{mixe}$ (T_R)
J	59.2	66.7	54.2	65.3	20.2	19.3
F	62.0	71.0	54.8	67.8	20.8	19.8
M	68.0	76.5	57.6	72.1	21.6	20.1
A	75.5	83.5	67.1	84.7	21.1	18.9
M	84.8	92.3	73.8	92.1	21.8	19.1
J	93.0	100.0	82.6	100.8	21.6	18.8
JL	96.5	103.3	92.1	106.3	20.1	18.3
A	93.5	101.0	92.3	104.2	19.3	18.2
S	86.0	92.5	81.2	100.9	20.2	16.9
O	76.0	83.8	72.0	92.0	20.0	17.0
N	65.0	72.2	59.4	80.8	20.4	16.8
D	60.2	68.2	54.5	70.4	20.4	18.4

where

T_{out} = Temperature of Unit 2 and 3 blowdown

$(T_{out})_e$ = The extreme value of T_{out}

T_{mixed} = The mixed temperature of the blowdown from Unit 2 and 3 and the discharge of Unit 1 assuming $T_{R\ min}$

$(T_{mixed})_e$ = The extreme value of T_{mixed} assuming $T_{R\ max}$

$(T_R)_{min,\ max}$ = The minimum and maximum temperature of the Illinois River (see Fig. D.3).

References

1. Edinger, J. R. and J. C. Geyer, "Heat Exchange in the Environment," Publication No. 65-902, Edison Electric Institute, New York, New York, 1965.

2. Thackston, E. L. and F. P. Parker, "Effects of Geographical Location on Cooling Pond Requirements and Performance, " Report for Project No. 16130-FDQ-03/71 to the EPA, March 1971.

3. DNPS/ER, Supplement IV (January 15, 1973).

4. Ryan, P. J. And D. R. F. Harleman, "An Analytical and Experimental Study of Transient Cooling Pond Behavior," Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Department of Civil Engineering MIT, Cambridge, Massachusetts, Report No. 161, January 1973, page 111.

5. Ibid., page 108

6. Dresden Cooling Lake Design and Operating Basin, Report SL-2677, Prepared for Commonwealth Edison Co., Sargent and Lundy, Engineers, Inc. (August 24, 1970).

7. Harmeson and Schnepper, "Report of Investigation 49, Temperatures of Surface Water in Illinois," Illinois State Water Survey, Urbana, Illinois, 1965.

APPENDIX E.

SAMPLING LOCATIONS

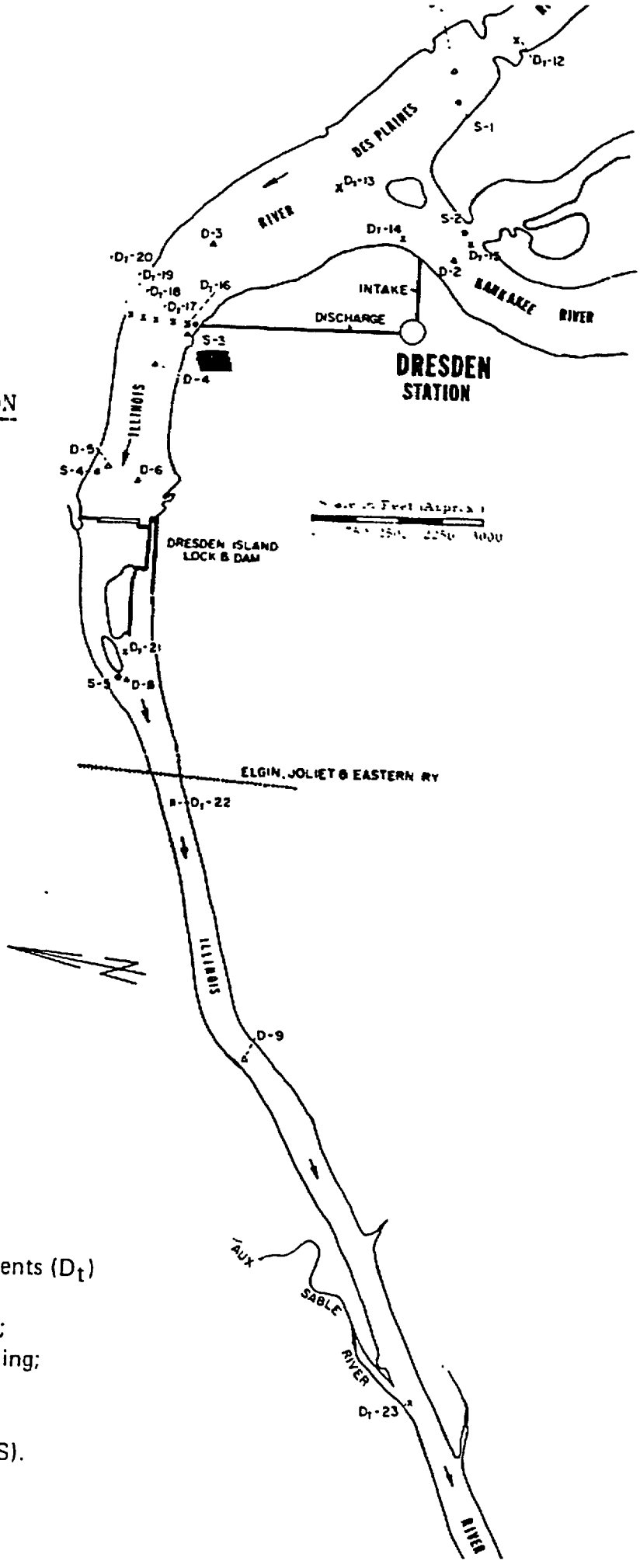
FOR THE

DRESDEN NUCLEAR POWER STATION

PREOPERATIONAL

MONITORING PROGRAM,

JULY 1969 - JUNE 1970.



KEY

× Location of Water Temperature Measurements (D_t)

Δ Water Temperature Observation Locations; Bottom Samples including Depth of Sampling; Water Chemistry; Plankton (D).

• Location of Artificial Substrate Samplers (S).

TABLE E.1. Preoperational Sampling Locations, Dresden Nuclear Power Station

Sampling Period	Site No.	Location
Aug. 1969, Oct. 1969, Mar. 1970, and May 1970.	D-1	Des Plaines River, mid-channel, R.M. 273.5
	D-2	Kankakee River, mid-channel, 1/2 mi from mouth
	D-3	Illinois River, SW edge, R.M. 272.5
	D-4	Illinois River, mid-channel, R.M. 272.0
	D-5	Illinois River, 200 ft off N shore, R.M. 271.8
	D-6	Illinois River near NE protection pier, R.M. 271.7
	D-7	Illinois River W of plant discharge, R.M. 272.2
	D-8	Illinois River below dam, W of Little Dresden Island R.M. 271.0
	D-9	Illinois River, mid-channel, R.M. 269.0
	D-10	Illinois River, N edge of channel, R.M. 267.2
Aug. 1969, Oct. 1969[a] and May 1970.	DT-12	Des Plaines River, R.M. 273.7
	DT-13	Confluence of Kankakee and Des Plaines Rivers, R.M. 272.9
	DT-14	Kankakee River 1/3 mi from mouth
	DT-15	Shallows of Kankakee River, 2/3 mi from mouth
	DT-16	Near gate in plume of discharge
	DT-17	Illinois River near buoy in plume of discharge, R.M. 272.2
Aug. 1969, Oct. 1969, and May 1970.	DT-18	Illinois River, mid-channel, R.M. 272.2
	DT-19	Illinois River, N channel edge, R.M. 272.2
	DT-20	Illinois River, N shore, R.M. 272.2
	DT-21	Illinois River below dam, R.M. 271.1
	DT-22	Illinois River below bridge, R.M. 270.5
	DT-23	Mouth of Aux Sable River, R.M. 268.2

[a]Except DT-15

Figure and table from "Preoperational Environmental Monitoring (thermal) of the Illinois River near Dresden Nuclear Power Station, July 1969–June 1970." Industrial Bio-Test Laboratories, Inc., IBT No. W7658.

APPENDIX F. WATER QUALITY ANALYTICAL PROGRAM

TABLE F.1. Water Quality Parameters Measured, Methods of Analysis, and Preservation Techniques Used on Water Samples Obtained in the Vicinity of the Station from July 1970 to December 1971

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Alkalinity, Total	Titrimetric Method p. 48[a] using a pH meter to detect the end point.	Measured upon sample collection.	1 mg/l-$CaCO_3$
Ammonia	Preliminary distillation, p. 187[a] followed by Nesslerization Method, p. 193[a].	$HgCl_2$ solution, refrigerated.	0.03 mg/l-N
Arsenic	Colorimetric Method, p. 56[a].		0.5 mg/l
Bacteria, Total Coliform	Multiple-tube fermentation technique, p. 594[a]. Beginning in November 1970 membrane filter technique, p. 610[a].		0 organisms/100 ml
Bacteria, Fecal Coliform	Multiple-tube fermentation technique, p. 594[a]. Beginning in November 1970 membrane filter technique, p. 610[a].		0 organisms/100 ml
Bacteria, Fecal Streptococci	Multiple-tube technique, p. 620[a]. Beginning in November 1970 membrane filter technique, p. 619[a].		0 organisms/100 ml
Biochemical Oxygen Demand (5-Day)	BOD Method, p. 415[a].	BOD water sealed bottles, refrigerated.	0.1 mg/l
Barium	Atomic absorption spectrophotometry/ direct aspiration	5 ml conc. HNO_3 added to 2 liters of sample.	0.1 mg/l

TABLE F.1. (Cont'd)

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Cadmium	Atomic absorption spectrophotometry/ chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Calcium	Atomic absorption spectrophotometry/ direct aspiration.	5 ml conc. HNO_3 added to 2 liters of sample.	0.1 mg/l
Chemical Oxygen Demand	Titrimetric Method, p. 510[a].		0.1 mg/l
Chloride	Mercuric Nitrate Method, p. 87[a].		0.5 mg/l
Chromium, Hexavalent	Atomic absorption spectrophotometry/ chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Chromium, Total	Oxidation/atomic absorption spectrophotometry/chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Color, Apparent	Colorimetric Method, modified, p. 127[a].		1 unit
Conductance, Specific	Conductance Bridge at 25°C, p. 280[a].		1 µmho/cm
Copper	Atomic absorption spectrophotometry chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	0.1 µg/l

TABLE F.1. (Cont'd)

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Hardness, Total	Titrimetric Method, p. 147[a].		1 mg/l-$CaCO_3$
Iron, Ferrous	Phenanthroline Method, p. 156[a].	Immediate filtration, 10 ml conc. HCl to 240 ml of sample.	0.002 mg/l
Iron, Total	Digestion/atomic absorption spectrophotometry/chelation/ direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Lead	Atomic absorption spectrophotometry/ chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Magnesium	Atomic absorption spectrophotometry/ direct aspiration.	5 ml conc. HNO_3 added to 2 liters of sample.	0.1 mg/l
Manganese	Atomic absorption spectrophotometry/ chelation/direct aspiration[c].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l
Methylene Blue-Active Substances	Methylene Blue Method, p. 297[a].	Glass container, refrigerated.	0.025 mg/l
Nitrate	Brucine Method, p. 199[a]. Beginning in January 1971 Jenkins' modified Brucine Method[d].	$HgCl_2$ solution, refrigerated.	0.01 mg/l-N

TABLE F.1. (Cont'd)

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Nitrite	Sulfanilic Acid Method, p. 205[a].	$HgCl_2$ solution, refrigerated.	0.0002 mg/l-N
Odor, Threshold	Method on p. 304[a].	Glass bottles, refrigerated.	
Organic Carbon, Total	Carbon analyzer	HCl to pH 2	1 mg/l
Organic Nitrogen, Total	Distillation, digestion, distillation, followed by Nesslerization Method, p. 193[a].	$HgCl_2$ solution, refrigerated.	0.03 mg/l
Orthophosphate, Soluble	Stannous Chloride Method, p. 234[a].	Immediate membrane filtration.	0.002 mg/l - PO_4
Oxygen, Dissolved	Modified Winkler Titration, p. 406[a]. Beginning in November 1970 Model 300 Weston and Stack Dissolved Oxygen Meter.	Measured at sampling location.	0.1 mg/l
Oxygen, Saturation	Calculated from D. O. and water temperature data using Table 25, p. 409[a].		
pH	Glass Electrode Method, p. 226[a] Sargent-Welch PBX pH Meter.	Measured at sampling location.	0.1 pH

TABLE F.1. (Cont'd)

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Phenols	Distillation and $CHCl_3$ Extraction Method, p. 517[a].	$CuSO_4$, conc. H_3PO_4 to pH 4.0, refrigerated.	0.001 mg/l
Phosphorus, Total	Digestion with sulfuric acid, p. 236[a] followed by the Aminonaphtholsulfonic Acid Method, p. 231[a].		0.03 mg/l - PO_4
Phosphorus, Total	Beginning in January 1971 Sulfuric acid - persulfate digestion followed by the Stannous Chloride Method, p. 234[a].		0.002 mg/l - PO_4
Silica	Heteropoly Blue Method, p. 264[a].		0.01 mg/l
Sodium	Atomic absorption spectrophotometry/ direct aspiration.	5 ml conc. HNO_3 added to 2 liters of sample.	0.01 mg/l
Solids, Total Dissolved	Filtrable Residue Method, p. 245[a].		1 mg/l
Solids, Total Suspended	Nonfiltrable Residue Method, p. 246[a].		1 mg/l
Sulfate	Turbidimetric Method, p. 291[a].	Filtration prior to analysis.	0.1 mg/l

TABLE F.1. (Cont'd)

Parameter	Method and Reference	Preservation Techniques	Detection Limit
Temperature	NBS Certified Thermometer. Beginning in November 1970 Whitney Model TC-5A Thermistor/Thermometer.	Measured at sampling location.	0.2 F (0.1 C)
Turbidity	Hach Turbidimeter Model 2100.	Measured at sampling location.	1 J.T.U.
Zinc	Atomic absorption spectrophotometry/ chelation/direct aspiration[b].	5 ml conc. HNO_3 added to 2 liters of sample.	1 µg/l

From B. G. Johnson and L. P. Beer, "Environmental Monitoring of the Des Plaines, Kankakee, and Illinois Rivers near Dresden Nuclear Power Station, July 1970–Dec. 1971," Industrial Bio-Test Laboratories, Inc.

[a] A.P.H.A., A.W.W.A. and W.P.C.F, "Standard Methods for the Examination of Water and Wastewater," 12th ed., Am. Public Health Assoc., 769 p. (1965)

[b] M. J. Fishman and M. R. Midgett, In R. F. Gould, Ed., "Trace Inorganics in Water," Am. Chem. Soc., 396 p. (1968)

[c] Personal communication, M. J. Fishman, U.S. Geological Survey, Denver, Colorado, October 1970

[d] D. Jenkins and L. L. Medsker, "A Brucine Method for the Determination of Nitrate in Ocean, Estuarine and Fresh Waters," Anal. Chem. 36:610 (1964)

APPENDIX C

Comments Received on the Draft Environmental Statement

CONTENTS

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

2200 Churchill Road
62706

Springfield, Illinois
Phone: 525-3397

Jack M. Marco, Acting Director

G-2

August 3, 1973

Re: Dresden Nuclear Power Station Units 2 and 3
Draft Environmental Impact Statement Comments

J. F. O'Leary, Director
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

50-237
50-249

Dear Mr. O'Leary:

The Environmental Protection Agency of the State of Illinois is pleased to have had the opportunity to review the Draft Environmental Statement relating to Dresden Nuclear Power Station Units 2 and 3 issued June, 1973.

The Permit Section of the Division of Water Pollution Control has reviewed the Draft Environmental Impact Statement prepared pursuant to the issuance of full term operating license to Commonwealth Edison Company for the Dresden Nuclear Power Station Unit 2 and the continuation of the operating license for Unit 3. Based on our review of the information submitted, this Section believes the operation of Units 2 and 3 may be carried out in such a manner as to not cause a violation of the applicable water pollution regulations once the cooling system alterations are complete and closed cycle mode of operation may be implemented. The following comments are offered:

Figure 3.13, entitled, "Winter Isotherms from Dresden Station during Low-River-Flow Conditions" indicates that the 5 degree isotherm in the discharge plume reaches from one shore of the Illinois River almost to the other shore. There may be some question concerning whether a discharge plume of this extent will allow a sufficient zone of free passage for aquatic life. Under most circumstances, this discharge plume will float on the surface and expand into the upper layers of the river only for the 5 degree isotherm range, thus allowing a sufficient zone of free passage for aquatic life underneath this plume.

The Permit Section, Division of Water Pollution Control, issued the operating Permit #1973-EB-664-OP, dated April 12, 1972 to Commonwealth Edison Company for the two discharges from the Dresden generating station. Discharge 1 contains condenser cooling water and process streams from Unit 1, and discharge 2 is the overflow from the cooling lake, which contains condenser cooling water and process streams from Units 2 and 3. This permit was issued for the period of one

Condenser cleaning is accomplished by the injection of a hypochlorite solution into the intake cooling water several times a day. This solution then passes through the condenser, the spray canal and the cooling lake before being discharged to the Illinois River. At the time of discharge to the Illinois River, only a trace of the chlorine is detectable. This trace amount of chlorine should not cause any undesirable effects on the aquatic organisms.

These comments appear to be the only ones that this Agency presently has responsibility for or concern.

Very truly yours,

Richard S. Nelle, P.E.
Chief Engineer

RSN/gr

OFFICE OF THE ASSISTANT SECRETARY OF COMMERCE
Washington, D.C. 20230

August 9, 1973

Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Muller:

The draft environmental impact statement for the proposed Dresden Nuclear Power Station, Units 2 and 3, which accompanied your letter of June 26, 1973, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

Section 2.7.2, Biota of the Illinois River, Fish

Page 2-22, The 1959-65 average annual commercial catch from the Illinois River was 1,800,000 pounds, valued at $100,000. This catch amounted to a yield of 34 lbs/acre for the entire river, 90 percent of the production originating from the lower section of the river. In recent years, as in the past, degradation of water quality has resulted in a reduction in the quality of the commercial catch.

Page 2-23, The use of a shoreline seine would tend to bias the fish collections in favor of certain species. With regard to Table 2.4, a discussion of the effects of this sampling bias on the "Relative abundance" of fish collected near the station would be desirable.

Section 2.7.7, Summary

This section refers to "about a dozen species of rough fish" that reside in the cooling lake. Table C.4, page C-12, indicates, however, that not all these species are "rough" fish (e.g., largemouth bass and bluegill).

Section 3.4.6, River Discharge

Page 3-26, It is stated that "the area within the 5°F isotherm will always be less than 26 acres." However, because the plume size and shape depends to a great extent on the river flow (velocity) and wind conditions, the total cumulative area covered by the plume in all its configurations may well be greater than 26 acres.

Section 3.6.2, Biocides

Page 3-43, The concentration of total chlorine in the cooling lake at the point of discharge should be mentioned.

Section 5.5.1, Intake Effects

Page 5-23, The staff's conclusion that the entrainment effects of the closed-cycle operation of Units 2 and 3, in conjunction with Unit 1, will "cause no long-term adverse effects on the river as a whole" may well be true. However, it would be desirable to discuss the potential adverse effects in the pools immediately downstream with respect to stock recruitment from the Kankakee River.

With regard to impingement of fish, the fish collection program for the traveling screens should be described, either in this section or in section 6. We recommend that this program include collection of data on number, length, and weight of each species impinged on the traveling screens.

Section 5.5.2,Thermal Discharge Effects

Page 5-29, In addition to the increased susceptibility to pesticides, the possibility that the rate of uptake of pesticides by fish may occur more rapidly at higher water temperatures should also be discussed.

Discussion of the possibility that mortality of fish may increase due to increased incidence of disease or formation of gas embolisms also seems warranted.

Section 6.2.1, Nonradiological Studies

Page 6-3, The location of sample stations depicted in Figures 6.1 and 6.2 appears adequate, although we feel that more emphasis should be placed on the area adjacent to the intake. With reference to the benthic samples, replicate grab samples should be taken to ensure an accurate representation of the benthic community.

Page 6-6, The use of the Kemmerer sampler at only one depth limits the usefulness of the data on phytoplankton. As suggested by the staff on page 6-7, this study should be expanded. We recommend that the program be additionally expanded to include the Des Plaines River and a minimum of two stations in each river.

The original River Monitoring Program for "fish measurement" was inadequate, as noted by the staff on page 6-7. However, this program has been improved, according to Table 6.3. We suggest further expanding this program to include sampling with gill nets and trap nets, if possible, and increasing the sampling frequency to once per week from April through September.

Section 6.2.2, Radiological Monitoring

Page 6-16, The "sample media" should include benthic animals, which are important in the food chain. Sediments and biota should also be sampled near the effluent discharge, as well as at the stations listed in Table 6.7. Sediments accumulate many radionuclides, and thus are a good indicator of environmental radioactivity.

We are unable to evaluate the average annual radiological impact on man via atmospheric dispersion as discussed in section 5.4. The atmospheric dispersion computations are explained as "done using the methods described in Reference 9." This reference apparently is a computer program, is described

reference is given to the source configuration (source height and type) nor on the meteorological data upon which the computations are made. It is stated that the relative concentration (chi/Q) is not applicable and that a unitless concentration ratio, K_c, is used to characterize the multi-source Dresden facility. This is misleading since according to the staff's reference (see footnote, page 5-15), $K_c = (chi/Q)(\bar{u}L^2)$ where $\bar{u}$ is wind speed and L a reference parameter for length. Thus, in order to determine the effective chi/Q needed to compute dose, a value for L is required as well as the wind speed. None of this information is specified directly or is available through a reference or in an appendix.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving a copy of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELF.
OFFICE OF THE SECRETARY

G-8

TO : Daniel R. Muller
Assistant Director for Environmental Projects
Directorate of Licensing
Atomic Energy Commission

DATE: August 13, 1973

50 - 237
50 - 249

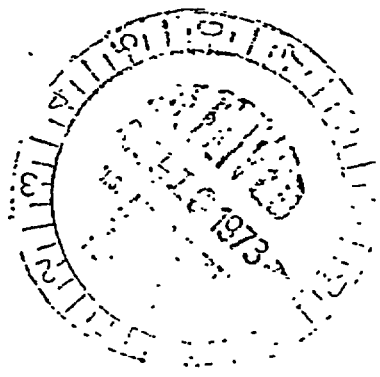
FROM : Paul Cromwell
Acting Director
Office of Environmental Affairs

SUBJECT: Dresden Nuclear Power Station, Units 2 & 3 - Draft Environmental Impact Statement

Attached please find our comments on the above-captioned draft environmental impact statement.

Thank you.

Attachment



MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
G-9 FOOD AND DRUG ADMINISTRATION

Special Assistant to the
Assistant Secretary for Health

DATE JUL 3 1 1973

FROM : Assistant Director for Special Projects
Bureau of Radiological Health

SUBJECT: Comments on Draft Environmental Impact Statement - Dresden Nuclear Power Station, Units 2 and 3.

The above draft document which was transmitted by the letter of June 26, 1973, from Mr. Daniel R. Muller, Assistant Director for Environmental Projects, Directorate of Licensing, USAEC, to the Department has been reviewed within the Bureau. The draft document states in part that Units 2 and 3 will be retrofitted with updated equipment to better process the radioactive gaseous and liquid effluents. Estimates of the radioactivity contained in the liquid effluent differ between those of the AEC staff and the applicant. The differences arise because the AEC staff based their estimates upon the waste treatment system installed (both present and augmented) and upon experiences obtained from other operating nuclear reactors. The estimates of the applicant were lower than those of the AEC staff because the applicant assumed lower concentrations of radioactivity in the wastes prior to treatment. The AEC staff has estimated that with the present treatment system the radioactivity contained in the liquid effluent discharged into the Illinois River would be sixty-six (66) Ci/yr/unit and five (5) Ci/yr/unit with the augmented system (tritium excluded). The tritium release would be twenty (20) Ci/yr/unit for both the present and augmented system. The applicant has estimated that with the present system the radioactivity contained in the liquid effluent and discharged into the Illinois River would be less than fifteen (15) Ci/yr/unit and less than 0.14 Ci/yr/unit with the augmented system (tritium excluded). The tritium released for the present system and augmented system was estimated to be less than thirty (30) Ci/yr/unit and less than fifteen (15) Ci/yr/unit respectively. Data on actual releases is said to be contained in Table 2.10; however there is no Table 2.10 in the draft document. AEC staff estimates of the radioactivity contained in the gaseous effluents from Units 2 and 3 by using the present system was 2×10^6 Ci/yr/unit for noble gases and six (6) Ci/yr/unit for Iodine-131; by using the augmented system the estimates were 4.8×10^4 Ci/yr/unit and 0.34 Ci/yr/unit respectively. These estimates agreed well with those of the applicant. The estimated maximum cummulative annual dose received by any member of the permanent population from the combined releases of Units 1, 2 and 3 (by assuming dilution flow) is less than 0.25 mrem and the corresponding population dose is less than one (1) man-rem/yr. The airborne annual population integrated dose commitment from Units 2 and 3 over a 50 mile radius

will be 160 man-rem/yr. The annual dose to a child's thyroid via the air-cow-milk pathway is approximately 1.3 mrem/yr for Units 2 and 3 and 4.4 mrem/yr from Unit 1. The annual dose to the thyroid of a child from milk from a cow pastured at any location will be less than 1.8 mrem/yr from Units 2 and 3 and 7.7 mrem/yr from Unit 1. The above mentioned doses are within the proposed guidelines. The direct and indirect doses to man from waterborne radionuclide is less than 0.25 mrem/yr for Units 1 and 2 and the corresponding population dose is less than 0.5 man-rem/yr. The dose received by any member of the permanent population due to the combined releases from Units 1, 2 and 3 is less than 0.25 mrem or less than 1 man-rem/yr (by assuming dilution flow from all three (3) units). Section 3.4.3 (Dresden Cooling Lake) references a Figure 2.14, however there is no such figure in the draft document. Section 3.4.4 describes the spray modules and states in part that each module consists of four (4) spray nozzles. However Figure 3.10 shows a spray module being installed in the canal and the module consists of five (5) spray nozzles. This could affect the cooling efficiency of the spray modules.

On the basis of the information contained in these documents it appears that this plant can be operated without undue impact on the health of the offsite population as a result of any environmental changes including exposure to the population from radiation.

E. C. Anderson

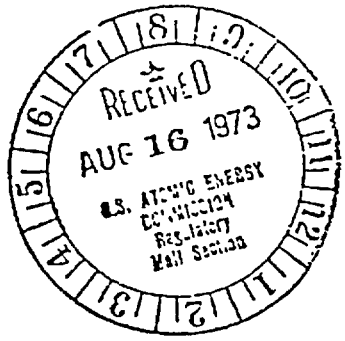
DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

G-11 .

MAILING ADDRESS
U S COAST GUARD (G-WS/
400 SEVENTH STREET SW
WASHINGTON D C 20590
PHONE 202 426-2262

1 4 AUG 1973

50-237/249



Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Muller:

This is in response to your letter of 26 June 1973 addressed to the Department of Transportation Water Resources Coordinator concerning the draft environmental impact statement, environmental report and other pertinent papers on the Dresden Nuclear Power Station, Units 2 and 3, Grundy County, Illinois.

The concerned operating administrations and staffs of the Department of Transportation have reviewed the material submitted. Region 5 (Homewood, Illinois) of the Federal Highway Administration commented as follows:

"It is noted that fogging and icing resulting from the operation of the cooling lake will continue to be a hazard to travel on adjacent roads. In this regard, the draft statement provides that serious consideration must be given to the fog problem. It is also noted that the statement provides that during periods of intense fogging and icing, the applicant shall assure travel safety on those roads. We assume these actions would include alerting the motorist of the fog-ice problem through adequate detecting and signing, closing certain sections of the existing highways to travel during uncontrollable periods and possible modification of the plant's operations during certain atmospheric conditions for achieving relief to this problem."

The Federal Railroad Administration commented as follows:

"The Federal Railroad Administration is extremely pleased to see, in section 5.1.3., the in-depth discussion of the inductive coordination problem as it relates to railroads. The Commission is to be commended on their excellent evaluation of the problem. To further the understanding on this problem, which unfortunately has received inadequate

research for the past several decades, we are enclosing an excellent technical paper by Messers Judkins and Thorson of the Northern States Power Company. This paper, entitled "A System Approach to Inductive Coordination" was presented at the September 1972 meeting of the Communication and Signal Section of the Association of American Railroads."

The U. S. Coast Guard has not as yet completed their review of the project. Their comments, if any, will be submitted prior to 23 August 1973.

The Department of Transportation has no further comments to offer. We have no objection to the project. However, the problem of intense fogging and icing of the highways in the area of the cooling lake must be addressed in the final statement. This should clearly indicate the positive action the applicant will take when fog and icing conditions exist. This Department concurs in the comments of the Federal Railroad Administration regarding the in-depth discussion of the inductive coordination relating to railroads. The report referred to in the Federal Railroad Administration comments on the project is enclosed.

The opportunity for the Department of Transportation to review and comment on the draft environmental impact statement for the Dresden Project is appreciated.

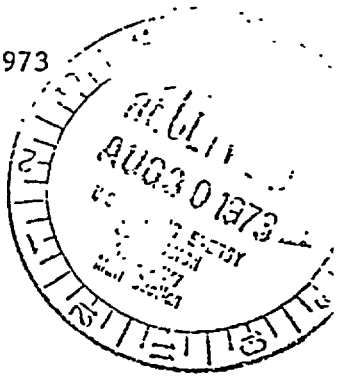
Sincerely,

R. I. PRICE
Captain, U. S. Coast Guard
[illegible]

ADVISORY COUNCIL
ON
HISTORIC PRESERVATION
WASHINGTON, D.C. 20240

50-237
50-249

August 22, 1973



Mr. Daniel R. Muller
Assistant Director for Environmental
Projects
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Muller:

This is in response to your request of June 26, 1973, for comments on the environmental statement for the Dresden Nuclear Power Station Units 2 and 3, Illinois. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that while you have discussed the historical, architectural, and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish additional data indicating:

a. Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470(f)).

1. Although your environmental statement indicates that there is a National Register property (the Illinois and Michigan Canal) in the immediate vicinity of the proposed power station, it lacks a determination as to whether or not the proposed undertaking will have an effect on the property.

2. Until such a determination is made by your agency, the Advisory Council cannot comment with respect to your project.

b. Compliance with Executive Order 11593, of May 13, 1971.

1. In the case of land under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will result in the transfer, sale, demolition, or substantial alteration of potential National Register properties. If such is the case, the nature of the effect should be clearly indicated.

2. In the case of lands not under the control or jurisdiction of the Federal Government, a statement should be made as to whether or not the proposed undertaking will affect any non-federally owned districts, sites, buildings, structures, and objects of historical, archeological, architectural, or cultural significance.

To insure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain a copy of Mr. Barnhauser's letter to your office dated September 19, 1972.

Should you have any questions on these comments or require any additional assistance, please contact Jordan Tannenbaum of the Advisory Council staff.

Sincerely yours,

Myron Harrison

Ken Lapman for KT
Compliance Officer

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

50-237
50-249

AUG 20 1973

Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
Atomic Energy Commission
Washington, D. C. 20545

Dear Mr Muller:

We have had the draft environmental statement for the Dresden Nuclear Power Station, Units 2 and 3, Commonwealth Edison Company of Illinois, reviewed in the relevant agencies of the Department of Agriculture, and comments from Forest Service, Soil Conservation Service and Agricultural Research Service, all agencies of the Department, are enclosed.

Sincerely,

Fred H. Tschirley

FRED H. TSCHIRLEY
Acting Coordinator
Environmental Quality Activities

Enclosures

U.S. DEPARTMENT OF AGRICULTURE

Forest Service

RE: DRESDEN NUCLEAR POWER STATION, UNITS 2 and 3,
COMMONWEALTH EDISON COMPANY, ILLINOIS

We suggest that the Illinois Department of Conservation be contacted for comments, because they would know more about the effect of the project on Illinois' natural resources than the other Illinois departments or the U.S. agencies.

In general, the Forest Service has no objection to the operation of Dresden Units 2 and 3. Effects on vegetation are estimated to be much less than those of coal-fired or oil-fired plants.

The environmental effects of mining and concentrating the uranium ore are not given, and there is no statement on the effect on vegetation of burying radioactive waste at Sheffield, Illinois.

In applying herbicides along transmission lines (pp. 5-35/ 5-34), care should be taken to avoid excessive amounts over roots of trees adjacent to power lines.

No effect on vegetation is anticipated from ozone that is formed around conductors.

SOIL CONSERVATION SERVICE - USDA
COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT PREPARED
BY THE DIRECTORATE OF LICENSING UNITED STATES ATOMIC ENERGY
COMMISSION FOR THE DRESDEN NUCLEAR POWER STATION
UNITS 2 AND 3 OF THE COMMONWEALTH EDISON COMPANY

Page 4-3 -- Soil survey information is included in the statement and it is noted that the average corn yield from the area inundated by the cooling reservoir is approximately 90 bushel per acre. The statement should also indicate that yields from this land in future years would have been greater and that the economic loss would therefore increase.

Page 5-5 -- The surveillance program should include inspection of the vegetative cover in the vicinity of the embankment.

The Soil Conservation Service, through the Will County Soil and Water Conservation District, is willing to provide technical assistance in matters concerning soils, control of erosion and sedimentation, and establishment and maintenance of vegetation suitable for soil protection, wildlife habitat enhancement and beautification.

Dresden Nuclear Power Station, Units 2 and 3

Commonwealth Edison Company, Illinois

The Agricultural Research Service has reviewed this Draft Environmental Statement and finds no significant adverse effects of agricultural importance.

Since these plants are already in operation, some adverse environmental effects have been noted. It is our view that the need for power greatly overrides the minor nature of the environmental effects cited or projected.

STATE OF ILLINOIS
NATURAL RESOURCE DEVELOPMENT BOARD

(CHAIRMAN)
Roger Bedford, Director

G-19

TECHNICAL SECRETARY
J R Webb, Chief, Div of Water

DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT
222 South College Street
Springfield, Illinois 62706
(217) 525 6135

RICHARD B. OGILVIE
Governor

50-249

August 21, 1973

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Dr. Morris:

The Projects Task Force of the Natural Resource Development Board has reviewed the Environmental Impact Statement for the following project and has no adverse comment to make thereon:

Environmental Statement for Dresden Unit 3, AEC
Dkt 50-249

Attached are comments from the Illinois Environmental Protection Agency and the Illinois Department of Transportation.

We appreciate the opportunity for review.

Sincerely,

James R. Webb
Technical Secretary

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:

50-237
50-249

AUG 2 3 1973

Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
U. S. Atomic Energy Commission
Washington, D. C. 20545

Dear Mr. Muller:

This is in response to your letter dated June 26, 1973, requesting comment on the AEC Draft Environmental Statement related to the issuance of a full term operating license to Commonwealth Edison Company, hereinafter referred to as the Applicant, for the Dresden Nuclear Power Station, Unit 2 (Docket No. 50-237), and the continuation of the operating license for Unit 3 (Docket No. 50-249).

These comments by the Federal Power Commission's Bureau of Power staff are made in compliance with the National Environmental Policy Act of 1969, and the April 23, 1971, Guidelines of the Council on Environmental Quality, and are directed to the need for the facilities and related bulk power supply matters.

In preparation of these comments, the Bureau of Power staff has considered the AEC Draft Environmental Statement; the Applicant's Environmental Report; related reports made in accordance with the Commission's Statement of Policy on Reliability and Adequacy of Electric Service (Docket No. R-362); and the staff's analysis of these documents together with related information from other FPC reports. The staff generally bases its evaluation of the need for a specific bulk power facility upon long-term considerations as well as upon the load-supply situation for the peak load period immediately following the availability of the new facility. The useful lives of Units 2 and 3 are expected to be 30 years or more. During that period, the units will make a significant contribution to the reliability and adequacy of the electric power supply in the Applicant's service area.

The Applicant is a member of the Mid-Ameri a Interpool Network (MAIN) which coordinates the planning and operation of bulk power generation and transmission facilities, for the electric systems of the regional area which includes the state of Illinois and portions of Wisconsin, Missouri and Upper Michigan. The Applicant is the largest utility n MAIN, and controlled approximately 43 percent of MAIN's dependable capacity as of December 31, 1972.

As projected, the Applicant would have in the summer of 1974 a net capacity of 16,309 megawatts (including 642 megawatts of non-firm purchases). The 1974 summer peak load is expected to be 13,470 megawatts (including 240 megawatts of firm sales). The resulting reserve would be 2,839 megawatts or 21.1 percent of peak load with Dresden Units 2 and 3. Without one of the two units, the reserve would be 2,030 megawatts or 15.1 percent. Without both units, the reserve would be 1,221 megawatts or 9.1 percent; this is below the Applicant's reserve criterion of 14 percent.

Gas turbines are unsuitable for meeting the Applicant's load growth since additional peaking generation is not considered to be an effective substitute for the base-load generation needed in the Applicant's system.

The discussion of transmission lines for Dresden Units 2 and 3 is presented adequately in the draft environmental statement.

The staff considers the continued operation of Dresden Units 2 and 3 essential to assist the Applicant in meeting its projected loads and to provide adequate reserve margins for reliability of electric service.

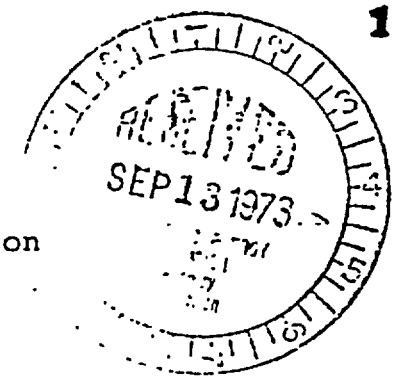
Very truly yours,

T. A. Phillips
Chief, Bureau of Power

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

13 SEP 1973

OFFICE OF THE ADMINISTRATOR



50-237
50-249

Mr. L. Manning Muntzing
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Muntzing:

The Environmental Protection Agency has reviewed the draft environmental statement for the Dresden Nuclear Power Station, and our detailed comments are enclosed. Inasmuch as the environmental impacts of nuclear power generation at this site are the result of the combined operation of all three units, we believe that the evaluation and modification of this plant's operation must include Unit 1 as well as Units 2 and 3.

The present gaseous waste treatment system for Unit 1 is not capable of limiting gaseous radioactive discharges to levels that are "as low as practicable." The final statement should discuss in detail the proposed modifications necessary to limit these emissions.

Although we concur with the proposal for closed-cycle operation of the cooling system for Units 2 and 3, a significant thermal discharge to the Illinois River from Unit 1 will continue. We recommend that the applicant consider conversion of Unit 1 from once through to closed-cycle cooling.

In light of our review of this draft statement, and in accordance with EPA procedure, we have classified the project as "ER" (Environmental Reservations), and rated the draft statement as "Category 2" (Insufficient Information). We would be pleased to discuss our comments or classification with you or members of your staff.

Sincerely yours,

Sheldon Meyers

Sheldon Meyers
Director
Office of Federal Activities

Enclosures

EPA-D-AEC-06111-IL

ENVIRONMENTAL PROTECTION AGENCY

Washington, D. C. 20460

September 1973

ENVIRONMENTAL IMPACT STATEMENT COMMENTS

Dresden Nuclear Power Station

TABLE OF CONTENTS

INTRODUCTION AND CONCLUSIONS

The Environmental Protection Agency has reviewed the draft environmental impact statement (EIS) for the Dresden Nuclear Power Station, Units 2 & 3 prepared by the U.S. Atomic Energy Commission and issued on June 26, 1973. The following are our major conclusions:

—1. In general, the proposed modified gaseous and liquid waste treatment systems for Units 2 & 3 are expected to be capable of limiting radionuclide releases, and subsequently offsite doses, to levels that are "as low as practicable" in accordance with the proposed 10 CFR Part 50 Appendix 1. However, our analysis indicates that the present gaseous waste treatment system for Dresden Unit 1 is not capable of limiting gaseous radioactive discharges to such levels. The draft statement indicated that modification would be made to the Dresden Unit 1 system in 1975. Since the discharge limits for gases apply to the site as a whole, the final statement should discuss in greater detail the proposed modified system for Unit 1, and the potential environmental impact from the operation of Unit 1 after the modifications are completed.

2. Since the cooling system for Units 2 & 3 is proposed to be closed-cycle by the Spring of 1974, we expect that these units will meet the thermal requirements on the Illinois River if Unit 1 does not violate water quality standards. However, once-through

cooling for Unit 1 will probably result in violation of water quality standards. Therefore, it is our recommendation that consideration also be given to converting Unit 1 to the closed-cycle system.

3. We are also concerned with the impact on aquatic life as a result of condenser cooling water intake. It is our opinion that the amount of water withdrawn from the Kankakee River and the velocity at which cooling water is withdrawn are excessive. Section 316(b) of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) requires that intake structures reflect the best technology available for minimizing adverse environmental impact. Therefore, we believe that the applicant should apply the best technology available to limit the aquatic impact.

RADIOLOGICAL ASPECTS

Radioactive Waste Treatment

The existing liquid and gaseous waste treatment systems for Dresden Units 2 & 3 are not capable of limiting radioactive discharges to levels that are "as low as practicable." However, in an effort to comply with the 10 CFR Part 50 regulations, the applicant is modifying both waste treatment systems. In general, the proposed modified systems should limit radionuclide releases, and subsequently offsite doses, to levels within those proposed in Appendix 1 to 10 CFR Part 50.

Although this is a draft statement for a licensing action associated with Dresden Units 2 & 3, we believe it is appropriate for us to address comments, as needed, to systems in Dresden Unit 1. This is particularly true for the gaseous effluents since the present and proposed regulations which govern gaseous effluent releases apply to the site as a whole. Furthermore, it is our understanding that there will be no seperate statement issued for Dresden Unit 1. The present gaseous waste treatment system for Dresden Unit 1 is not capable of limiting radiogas discharges and subsequently offsite doses (to individuals and to the population), to levels that are "as low as practicable." The draft statement indicated that the applicant is committed to install a modified off-gas system for Dresden Unit 1 in 1975. We commend this action

and encourage the applicant to expedite the plant's effluent control system modifications (especially since the population doses from Dresden Unit 1 are comparatively large; the Dresden Unit 1 population dose estimate is over an order of magnitude greater than any population dose estimate for a nuclear power plant for which statements have been prepared). Although the design details for the augmented systems may not be available, we believe that the final statement for Dresden Units 2 & 3 should include the design objectives for the proposed Unit 1 radioactive waste system modifications and any other descriptive information available.

Since Dresden Units 2 & 3 are operating, actual operating data would provide a basis for making estimates of plant performance. Actual operating data for Dresden Unit 1 were utilized to estimate the radiological environmental impact for that facility; however, the standard source term model was used to estimate discharges from Dresden Units 2 & 3. We request that the available operating data for Dresden Units 2 & 3 be utilized to evaluate the radiological environmental impact of the units and to compare the results with the assumptions used in the standard models. In particular, available operating data from the Dresden Units should be presented and utilized in the

final statement for:

1. Gaseous and liquid releases (on an isotopic basis, if available);

2. Leak rates from the coolant and power conversion systems;

3. Radionuclide concentrations in the reactor coolant as a function of time;

4. Radionuclide partition factors and waste treatment equipment decontamination factors (on an isotopic basis, if available);

and

5. Power generation history (either a histogram or a tabular presentation of effective full power days).

Dose Assessment

We have independently evaluated the potential doses to individuals which might result from the operation of all three Dresden units and our results were in substantial agreement with those of the draft statement. Once the modified waste management systems are operational at all three units, the offsite doses will be "as low as practicable" and are expected to be within the whole body dose guidelines of the proposed Appendix I and the interim Regulatory Guide 1.42. Furthermore, our series of cooperative field studies in the environs of

operating nuclear power facilities have greatly increased knowledge of the process and mechanisms involved in the exposure of man to radiation produced through the use of nuclear power. We expect that the results of current studies (including ones at this site in cooperation with the applicant) will provide additional data on the behavior of specific radionuclides in the environment, such as radioiodine. As more information is developed, the models used to estimate human exposures will be modified to reflect the best data and most realistic situations possible. Depending on the results of these cooperative studies, it is possible that the scope and extent of present environmental monitoring programs can be based on more realisitc data. In the interim, we believe that current dose models will provide conservative estimates of the potential whole body and thyroid doses.

Transportation

In our earlier reviews of the environmental impact of transportation of radioactive material, we agreed that many aspects of this problem could best be treated on a generic basis. On February 5, 1973, AEC published for comment in the Federal Register a rulemaking proposal concerning the Environmental Effects of Transportation of Fuel and Waste from Nuclear Power Reactors. We commented on the proposed rulemaking by letter dated March 22, 1973, and by an appearance at the

public hearing on April 2, 1973.

Until such time as a generic rule is established, we will continue to assess the adequacy of the quantitative estimates of environmental radiation impact resulting from transportation of radioactive materials provided in statements. The estimates provided for this station are deemed adequate based on currently available information.

Reactor Accidents

We have examined the analysis of accidents and their potential risks which have been developed in the course of engineering evaluation of reactor safety in the design of nuclear plants. Since these accidents are common to all nuclear power plants of a given type, we concur with the approach to evaluate the environmental risk for each accident class on a generic basis. Extensive efforts have continued to assure safety through plant design and accident analyses in the licensing process on a case-by-case basis. However, we favor the additional step now being undertaken of a thorough analysis on a more quantitative basis of the risk of potential accidents in all ranges. We believe this will result in a better understanding of the possible risks to the environment.

In order to provide a fuller understanding of the direction of these efforts, we request that the final statement provide information on the nature, expected schedule, and level of effort of those generic

studies which are expected to lead to a basis for a subsequent assessment concerning the risk from all potential accident classes in the Dresden Nuclear Power Station. We recognize that this subsequent assessment may be either generic or specific in nature depending on the outcome of the generic studies. In addition, the final statement should include a commitment that this assessment will be made publicly available within a reasonable time period following completion of the generic studies. If the above efforts indicate that unwarranted risks are being taken at the Dresden Nuclear Power Station, we are confident that appropriate corrective action will be taken.

NON-RADIOLOGICAL EFFECTS

Thermal Effects

The Dresden Nuclear Power Plant is located at the confluence of the Kankakee and Des Plaines Rivers, which form the Illinois River Condenser cooling water is obtained from the Kankakee via two intake canals, one for Unit 1 and the second for Units 2 and 3. Presently the condenser cooling is accomplished by once-through cooling for all three units. Unit 1 discharges a heated effluent directly into the Illinois River, and the heated condenser water from Units 2 and 3 is cooled through a spray canal and a 1275 acre cooling lake which discharges to the Illinois River via a discharge canal.

The draft statement indicates that, as soon as the rad-waste system is operable, the applicant intends to utilize a closed-cycle cooling system for Units 2 and 3. The estimated time for the closed-cycle operation for Units 2 and 3 is February 1974. Based on information in the statement, however, it appears that in some situations the closed-cycle system will not be used. The statement should detail the frequency and circumstances which would require operation in other than the closed-cycle mode, and evaluate the potential impacts on the biological and physical characteristics of the river.

At the present time the upstream temperatures on the Des Plaines River are sufficiently high during some periods of the year that the operation of the Dresden Nuclear Power Plant as planned will probably

violate the Water Pollution Regulations for the State of Illinois, which constitute existing federally approved water quality standards. Standards have been adopted for the lower Des Plaines River from the I-55 bridge to the confluence with the Kankakee River. These standards require that the following temperatures may not be exceeded: January, February - 60°F; March - 70°F; April - 77°F; May - 85°F; June, July, August, September, October - 90°F; November - 76°F; December - 70°F. The present standards for the Illinois River require the following temperatures not be exceeded: January, February, March and December - 60°F; all other months - 90°F. In addition, temperatures increases caused by thermal discharges must not exceed 5°F above ambient.

The State of Illinois is considering revising the lower Des Plaines limits to a somewhat more lenient standard. We have expressed our reservations whether such action would be Federally approvable in a letter dated June 15, 1973, to Mr. Samuel Lawton, Acting Chairman of the Illinois Pollution Control Board. In addition, our agency recommended in a letter to Mr. William Blaser, formerly of the Illinois EPA, dated December 14, 1972, a new and more stringent thermal standard for the Illinois River. Copies of both letters and the recommended standards are attached.

During the recent hearings by the Illinois Pollution Control

Board on the proposed amendment to the temperature standard for the Des Plaines River the applicant's witness indicated that temperatures at the Joliet Yacht Club (immediately upstream from Dresden) are already sufficiently high to violate the present standards. Considering this testimony and information related to the thermal discharge from Dresden in the draft statement, we must conclude that the operation of the three Dresden Units results in even worse temperature conditions downstream from the plant. An adequate evaluation of the impact of the waste heat contribution from Dresden requires additional information on the waste heat contributions upstream. We recommend that the applicant perform an evaluation of the waste heat loads and resultant stream impact created by the applicant's Joliet and Will County fossil fuel plants upstream of Dresden on the Des Plaines River. This evaluation should be included in the final statement. It is possible that the applican may have to consider limiting the thermal input of the Joliet and Will County plants as well as controls at Dresden.

Since EPA has recommended that Illinois adopt even stricter standards than the present ones, the situation concerning compliance of the Dresden discharge could be even more critical in the future. This fact, coupled with the provisions of the FWPCA requiring "best practicable control technology currently available" by July 1, 1977, and "best available technology economically achievable" by July 1, 1983

argue for modifications of the proposed cooling system. Although the guidelines defining the above terms have not yet been promulgated by EPA, it is likely they will require some form of closed-cycle evaporative cooling. Thus, we recommend that serious consideration be given to converting the once-through system currently employed for Dresden Unit 1 to closed-cycle as will be used for the other two units. In addition, we recommend that blowdown from all three units be taken from the cold side of the cooling system (i.e., after the water has been cooled by the cooling lake).

The final statement should include a detailed analysis of the operation of all three Dresden units with closed-cycle cooling and pertinent information should be submitted as part of the application for a Section 402 permit under the FWPCA (i.e., a permit under the National Pollutant Discharge Elimination System).

Information in the draft statement indicates to us that, if Dresden until continues operation with once thorough cooling, the water requirements from the Kankakee River will be equivalent to 117% of the 7-day-10-year-low-flow; under extreme conditions, this could rise as high as 260% of the river flow. These additional water requirements will be obtained from backflows from the Illinois and Des Plaines Rivers. Aside from recycling of heated discharge water which would hamper plant cooling, this backflow would result

in relatively poor quality water from these two rivers partially or totally infiltrating the mouth of the Kankakee River, which has water of much higher quality and supports a good fish and aquatic biota population. This problem argues in support of the recommendation made above that the cooling system for Unit 1 be coverted to closed-cycle whereby the water demands would be reduced to a fraction of that necessary for the once-through system.

We also understand that there has been difficulty with the operation of the spray modules in the cooling canal. Additional discussion of the performance of the closed-cycle system and the impact of failures of the spray system on the Illinois River thermal loads should be included in the statement.

Biological Effects

The discharge from the operation of the Dresden facility will aggravate the dissolved oxygen sag caused by the effluent from the Metropolitan Sanitary District of Greater Chicago and high temperature from the Joliet and Will County Stations. Any reduction in dissolved oxygen of the Kankakee water will cause further standards

violation. In our opinion, this operation also violates the non-degradation clause of the Water Pollution Regulations of Illinois since increased temperatures and lowered dissolved oxygen will further degrade the river.

The statement repeatedly rationalizes environmental impacts with the argument that the Illinois River as a whole will not be seriously affected. We do not agree with this supposition. The Illinois River is 439.25 kilometers (273 miles) long with numerous tributaries. An impact at its source may be hard to measure at its mouth. Nevertheless, any impact at any point along the river is important and must be considered individually and evaluated in the immediate area as well as further downstream.

A major concern in plant operation is the impact on the fish populations in the Kankakee River as a result of cooling water intake. The statement in Table 2.7 shows that there is a good fish population in the river with a significant number of small mouth bass and green sunfish as well as many minnows that serve as a food source for these game fish. Because of its good quality, (dissolved oxygen 10.7 mg/l, pH 7.1, total phosphorus 0.3 mg/l, and COD 6 mg/l) the Kankakee supports a high quality fishery. The statement on page 5-23 mentions that most fish populations can stand a certain harvest rate, and loss of fish through the predation of the traveling

screens can be considered part of the harvest. In our opinion, however, power plant traveling screens should not be considered as a useful tool in fisheries management. We recommend that the applican be required to protect all life stages of important game and forage fishes, using whatever technology is necessary at the intake structure to do this. Therefore, it is our opinion that a bypass be provided on both the canals in order to minimize fish loss and injury.

Furthermore, Section 316(b) of the FWPCA requires that intake structures reflect the best technology available for minimizing environmental impact. It is noted that velocities at the bar rack and traveling screens for Unit 1 are approximately .152 m/sec (0.5 ft/sec.). Also, it is noted that reference is made to the operation of Indian Point Nuclear Generating Plant No. 1 where data indicated that reducing the intake velocity from .366 m/sec to .244 m/sec (1.2 ft/sec to 0.8 ft/sec.) considerably reduced the number of fish killed. It is our opinion that the intake velocity should be reduced from the design value of .567 m/sec (1.85 ft/sec.) to .152 m/sec (0.5 ft/sec.).

Chemical Effects

Chlorination of the condenser cooling water for slime control, and chlorination of the effluent from the sanitary sewage trickling

filter plant may result in continuous discharge of chlorine to the Illinois River. The expected concentrations of chlorine in the receiving water from this source should be indicated in the final statement. In our opinion, the discharge of chlorine should be monitored to insure that the concentration in the river is limited to the following EPA recommendations:

Type of Criteria	Recommendation for Residual Chlorine
Continuous	0.002 mg/l
Intermittent	(1) 0.2 mg/l Not to exceed 30 minutes per day
	(2) 0.10 mg/l Not to exceed 2 hours per day

In addition, no mention is made of the handling and disposal of sludges arising from the treatment of the sanitary sewage. Sludge disposal procedures should be detailed. Also, the characteristics of the sanitary effluent are not included in the statement and no mention is made that the system conforms to the requirements of the State of Illinois.

The statement makes reference in the chemical and waste processing sections of operating procedures that waste will be held and monitored before release for either re-use or discharge to the Illinois River. It is not clear as to what reporting procedures will be developed and/or to whom these reports will be submitted. A very close surveillance of the monitoring program is necessary and should be coordinated with the AEC and the State Regulatory Agency. Assurance of

discharges within the allowable limits is important and can only be met if the reporting procedures are followed.

ADDITIONAL COMMENTS

In certain instances the draft statement does not provide sufficient information to substantiate the conclusions presented. We recognize that much of this information is not of major importance in evaluating the environmental impact of the Dresden Nuclear Power Station. The cumulative importance however, could be significant. It would, therefore, be helpful in determining the impact of the plant if the folloiwng topics were addressed in the final statement.

1. The bases for the AEC's estimate of the direct dose rate from the station should be presented. This information should include the type of concrete shielding around the turbines, the source-term in the turbine system, and the method used to calculate the direct shine doses at locations offsite. It would also be helpful if actual dose measurements of the direct dose are presented in the final statement. Even though direct shine doses should be low near the site, the statement should provide criteria governing offsite exposure to direct doses.

2. The environmental report for Dresden Unit 3 (Supplement 1 page 15) indicates the reactor's modified main condenser air ejector gaseous waste treatment system will include a spare recombiner system. However, the draft statement does not mention spare recombiners for either Dresden Unit 2 or Unit 3. This

discrepancy should be clarified. If Units 2 and 3 do not have spare recombiners, then Table 3.8 of the draft statement should include the gaseous discharge estimates for the periods of recombiner downtime, as has been previously included in similar cases.

3. Table 3.6 of the draft statement contains estimates of cesium discharges from the existing and modified liquid waste treatment system for Units 2 and 3. The table indicates that cesium discharges to the environment increase when the modified waste treatment system becomes operational. This apparent discrepancy should be resolved in the final statement, especially since the discharge of cesium to the environment results in the main contribution to whole body doses via the liquid discharge pathways.

4. The draft statement has contradicting information on the date of completion of the modified gaseous waste treatment system, and this should be clarified in the final statement.

5. The applicant indicates in the environmental report, Supplement IV (AEC Question 3) for Dresden Unit 3, that two waste concentrators will be included in the floor drain system of the

Dresden Units 2 and 3 liquid radwaste treatment system. The draft statement does not discuss or indicate the provision of the two waste concentrators. The final statement should clarify this discrepancy.

6. The final statement should present the primary coolant concentration of I-131 that was assumed in calculating I-131 releases from Dresden Units 2 and 3. Using assumptions presented in the draft statement for the proposed Appendix 1 and adjusting for plant size, we estimate releases that are twice those presented in Table 3.8 of the draft statement for Units 2 and 3.

7. The AEC detailed in the draft statement the applicant's environmental surveillance program that had been operating for fourteen years. The final statement should discuss the results of this extensive program and indicate any significant radiological findings.

8. Table 5.2 of the Statement presents estimates of the residential population near the site that were utilized for the integrated population doses presented in Table 5.4. However, there are many industrial workers employed within five miles of the site that were not considered in the population dose estimates.

The final statement should include estimates of the population and the population dose for these workers.

9. Information for pollutant emissions of hydrocarbons, aldehydes, and organic acids that result from operations of diesel generators, space-heating boilers and fire pumps was not provided. The final statement should provide information concerning fuel use rate, fuel analysis, equipment operation time, and individual pollutant emission factors for each type of equipment in order that independent calculations can be made to verify the applicant's air pollutant emission and ambient air estimates.

10. The subject of non-radioactive wastes are not given adequate consideration. Only one paragraph of Section 3.7.2 is devoted to this subject. Provisions for storage of non-radioactive solid wastes and means by which non-radiactive storage containers are identified to prevent accidental placing of radioactive contaminated materials in them are not discussed. Frequency of pick-up and contractual arrangements with the commercial contractor are not mentioned. Any contract with a private waste disposal company should clearly require that all non-radioactive wastes must be taken to a sanitary landfill or disposal facility holding a valid license for operation from the Illinois Environmental Protection Agency. Disposal of wastes at any other site should be grounds for

immediate cancellation of the contract.

11. Much of the information provided in this statement seems to be the "opinion of the staff." Section 4.2 Impacts on Water Use, Section 4.3 Ecological Effects, Section 5.1.3 Transmission Lines, and Section 5.2.1 Ground Water are some examples: Important data and conclusions, especially those concerning environmental matters, should be further substantiated.

12. The statement states on page 2-8 that the Kankakee-Des Plaines area is quite important archeologically and that one site is located on Dresden property. What is the status and importance of this site? How will the site be affected by future operations at Dresden?

13. On page 2-13 the statement states that the Dresden cooling lake and dike are partially located over an abandoned coal mine. Further, on page 3-15, it states that the extent of this mine is not known. Severe water pollution problems could result from a cave-in or seepage into or out from this mine. Problems of groundwate contamination and flood problems that may result from damage to the dike should receive additional study.

14. Erosion and sedimentation problems would be primarily

associated with construction activities, dike failures, concent of constituents, and silt deposits from flow-through volumes in cooling facilities. The latter category appears to be the most significant, since the silt deposits will tend to accumulate on the lake bottom and will require periodic dredging of the lake maintain its effective volume. The problem of disposal of the dredged material has not been considered in the statement. Whi it is stated that "There are methods of disposal that will have adverse impact," no specific method is stated.

15. The section entitled "Excessive Growth of Algae" (page 5-33) should be expanded. The disposal methods for alga and weeds removed from the cooling lake, the algicide to be us the method of containment in the lake and the impacts of the a on the Illinois River should be addressed.

c o p y

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

June 15, 1973

Mr. Samuel Lawton,
Acting Chairman
Illinois Pollution Control Board
309 West Washington, Suite 300
Chicago, Illinois 60606

Dear Mr. Lawton:

We have reviewed the proposed final draft with respect to R 72-4 Water Quality Standards revisions. We oppose the proposed revisions to the temperature standards for the lower Des Plaines River. In view of our present efforts to generally upgrade State water quality standards, it seems most inappropriate for Illinois to downgrade this stretch of river.

We believe that detailed review of the hearing record will reveal serious defects in the arguments used to support the proposed change. We note for instance, that the effects of increased temperature upon the dissolved oxygen levels in the Illinois River were not addressed in any great detail furing the hearing.

It is our opinion that the record does not justify the proposed changes, and that the changes, if accepted by the Board may not be Federally approvable.

Sincerely yours,

/s/

Francis T. Mayo
Regional Administrator

c o p y G-48

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

December 14, 1972

Mr. William L. Blaser, Director
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

Dear Mr. Blaser:

Enclosed you will find the temperature criteria for the Illinois River developed by our Duluth National Water Quality Laboratory, based upon the included list of indigenous fish species to be protected. We hope that you will agree to submit the criteria to the Illinois Pollution Control Board for consideration as State standards.

With a copy of this letter, the enclosed criteria are also being sent to Mr. John Parker, of the Illinois Pollution Control Board, for inclusion as exhibits to the testimony being received in the Commonwealth Edison's water quality standards proposal.

Sincerely yours,

/s/

Robert E. Pearson, Acting Chief
Water Quality Standards

Enclosure a/s

UNITED STATES GOVERNMENT G-49

Memorandum

National Water Quality Laboratory
6201 Congdon Boulevard
Duluth, Minnesota 55804

TO : Mr. Francis T. Mayo, Regional Admin.
Region V, EPA

DATE: December 11, 1972

FROM : Director, NWQL

SUBJECT: Recommended Temperature Criteria for the Illinois River

Enclosed is a copy of a memorandum to Mr. Chris Potos of your staff giving to him our recommendations for temperature criteria for the Illinois River. I want to emphasize that the list of species to be protected was selected by Region V as indicated in the memorandum from Dale Bryson dated October 11, 1972, and I also wish to emphasize that the inclusion of sauger and walleye in this list has caused the recommended permissible temperatures to be substantially lower than they otherwise might have been. In this memorandum it will be possible for you to select other weekly average temperatures, and by plotting them on the figure you can determine which species will be impaired by so doing.

I also wish to emphasize that these recommendations are in the form of maximum weekly average temperatures for the various months. This is a shift which is going to be recommended in the new "Green Book," but the other half of the standard, namely a maximum temperature which is time dependent, has not been included in our recommendations, but is definitely a part of the new "Green Book" temperature criteria formulation that will be forthcoming soon. It will be important for your staff to avoid matching these weekly average temperatures against maximum instantaneous values which we have so often used in the past. We are planning to do work on the sauger, but we remain firmly convinced at the present time, based on the data available, that 83 is the absolute upper maximum average temperature which should be permitted if sauger are to be protected.

Donald I. Mount

Donald I. Mount, Ph. D.

Enclosures

cc:
Chris Potos ✓

MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Mr. Chris Potos, Chief
Water Quality Stds, Enforcement Div., Region V

DATE: December 8, 19

FROM : Dr. Donald I. Mount, Director
NWQL, Duluth, MN

SUBJECT: Recommended temperature criteria for Illinois River fishes.

The following recommended temperature criteria for Illinois River fishes are based on temperature requirements for reproduction and growth of species to be protected for which data are available. The recommended maximum weekly average temperatures for maintenance of reasonably good populations of most species to be protected (Appendix I) in the Illinois River are:

January	40	July	83
February	40	August	83
March	48	September	78
April	60	October	68
May	72	November	50
June	78	December	40

The recommended maximum weekly average temperatures were derived from data in Tables 1 and 2. Table 1 contains optimum temperatures for growth, lethal temperatures, and calculated maximum weekly average temperatures suitable for good fish production according to Dr. C. C. Coutant in the draft revision of Water Quality Criteria, 1968. Table 2 contains temperature requirements for the reproductive functions of gonad development, spawning and incubation. The data for gonad

development and spawning in Table 2 are plotted in Figure 1 with a superimposed curve showing the recommended criteria in relation to requirements for reproduction of the various species. Incubation data are not plotted in Figure 1 since temperatures near the maximum for spawning, for most species, will be within the range of tolerance of the embryo. Data are not available for all species. However, it seems reasonable to expect conditions suitable for yellow perch which require prolonged exposure to low temperature in winter for development of gonads and successful spawning to be suitable for walleye and sauger. Extrapolation among species is also necessary to some extent among the bass-panfish, catfish and redhorse-buffalo groups.

Following recommendations forthcoming in the revised Water Quality Criteria, 1968 to provide maximum protection to indigenous fish populations, it is further recommended that (1) artificially induced temperatures above the maximum weekly average should not exceed short-term, time-dependent levels of temperature that permit survival of the species of concern. Acceptable time-dependent levels of lethal temperatures may be determined from the procedure and data set forth in the draft revision, Water Quality Criteria 1968 or additional research, (2) fish attracted to thermal plumes or canals by warm water should not be subjected to rapid drop in temperature of lethal proportions due to planned or accidental plant shutdown. The maximum weekly average temperature in thermal plumes or canals in winter should not exceed the normal ambient water temperature for

the season by more than about 12 C or an increment known to be within the range of tolerance minus 2 C of the species of concern, (3) thermal plumes should not block movement of fish, and (4) daily and seasonal temperature fluctuations that existed before addition of heat from artificial sources should be maintained.

Observed maximum temperatures by months for the Illinois River are tabulated in Table 3 for selected stations above and below mile point 196, at and below which river water temperatures are generally lower.

Should a less restrictive criteria providing a lesser degree of protection to fish populations be desired for certain stretches of the Illinois River, the curve for such criteria could also be plotted on Figure 1 to reveal the probable adverse effect on fish populations.

Donald I. Mount, Ph.D.

TABLE 1

Optimum Growth and Lethal Temperatures of Some Fishes of the Illinois River and Calculated Maximum Weekly Average Temperatures for good fish production [1]

Species	Optimum for Growth °F	Ultimate Upper Incipient Lethal Temp. °F	Maximum Weekly Average °F
Yellow Perch	80[2] McCormick, NWQL unpublished	85.5 Hart 1947	81 8
Northern Pike	69.8[3] Hokanson, et. al., NWQL unpublished	91.8 Scott 1964	77 1
Northern Redhorse[4]	80.6 McCormick, et al, NWQL unpublished	84.7 Hart 1947	82.0
Largemouth Bass	81.5 Strawn 1961	97.5 Hart 1952	86.7
Bluegill	84.6 McComish 1971 Anderson 1959	92.8 Hart 1952	85.3
Channel Catfish	86 Strawn 1970 Andrew & Stickney 1971	100.4 Allen & Strawn 1968	90.9
Smallmouth Bass	79.3 Horning & Pearson NWQL unpublished	95.0 Horning & Pearson NWQL unpublished	84.5

[1] Calculations and data, unless otherwise noted, are from draft revision, Water Quality Criteria, 1968, Dr. C. C. Coutant.

[2] Estimated from good growth of juvenile perch.

[3] MS in press, Trans. Am. Fish. Soc., 1973

[4] Based on data for the white sucker.

TABLE 2

Maximum Temperatures for Reproductive Functions of Some Fishes of the Illinois River

Species	Gametogenesis °F	Spawning °F	Incubation °F
Yellow Perch	40[1] Jones, et al, NWQL	55 Calhoun, 1966	66 Hokanson, et al NWQL, unpublishe
Sauger		58 Hall TVA, 1972	
Northern Pike		55 Rawson, 1932	66 Hokanson, et al NWQL, unpublish
Northern Redhorse		64[2] Duncan, BSFW, 1969	69[3] McCormick, et NWQL, unpublis
Largemouth Bass	73 Caldwell, 1955	80 Clugston, 1966	80 Kelly, 1968
Smallmouth Bass		70 Rawson 1945	77 Webster, 1948
Bluegill		87 Morgan, 1951	91 NWQL Contract
Channel Catfish		80 Clemens & Sneed 1957	82 Clemens & Sneed 1957
White Bass		75 Riggs, 1955	
Freshwater Drum		72 Wren TVA, 1969	78 Wren TVA, 1969
Smallmouth Buffalo		70 Wren TVA, 1969	
Rock Bass		79 Raney, 1965	
White Crappie		73 Siefert, 1968	73 Siefert, 1968

[1]Optimum temperature for exposure of approximately six months; spawning success substantially reduced at 43F and approximately five months exposure.

[2]Based on data for golden redhorse.

[3]Based on data for white sucker.

FIGURE 1

MAXIMUM TEMPERATURES FOR REPRODUCTION

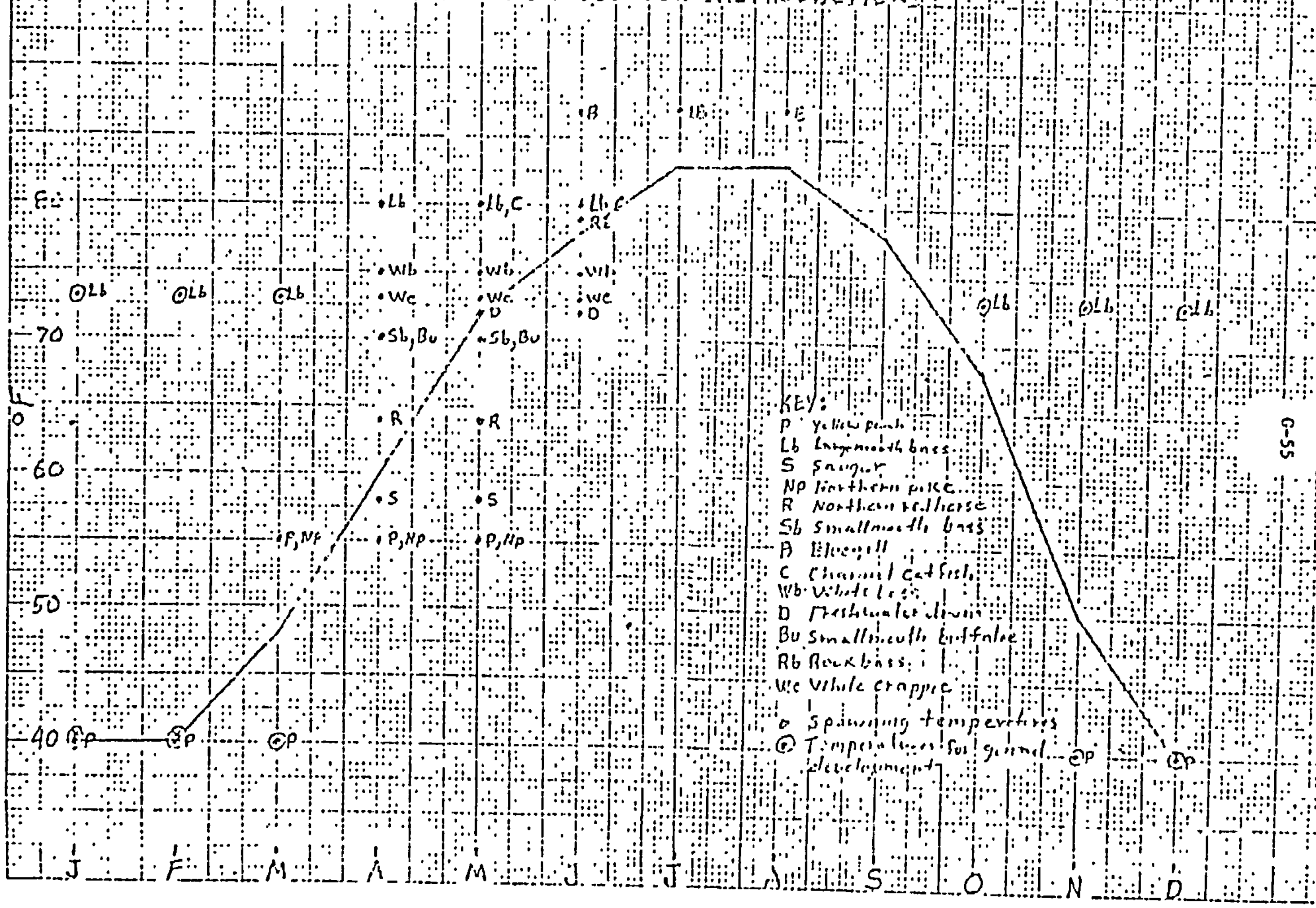


TABLE 3 G-56

Approximate Highest and Lowest Maximum Temperatures at Selected Points in the Illinois River[1]

Mile Point		Monthly Maximum Temperature											
		J	F	M	A	M	J	J	A	S	O	N	D
80 LaGrange Lock	highest	38	43	50	68	76	87	87	88	85	73	56	49
	lowest	33	33	40	43	59	66	75	76	66	51	39	34
162 Peoria	highest	40	45	52	67	74	84	87	86	84	73	60	47
	lowest	34	35	45	55	66	74	77	79	71	62	48	35
196 Henry	highest	40	45	57	65	74	84	88	87	84	74	62	46
	lowest	34	34	45	52	65	73	77	77	74	64	48	35
231 Starved Rock	highest	43	40	59	68	75	86	86	87	85	75	59	52
	lowest	32	32	37	44	59	62	71	75	63	54	38	34
272 Dresden Island	highest	45	48	62	68	78	94	91	92	87	78	65	54
	lowest	36	35	37	41	58	64	72	75	64	53	41	32
291 Lockport	highest	51	52	58	66	74	83	89	90	86	76	68	58
	lowest	42	45	52	59	68	73	78	79	77	70	57	45

[1]Data from figures 1, 4, 7, 8, 10, 12 in Technical Memorandum, "Maximum Water Temperatures in the Illinois River" RHH-72-1, Illinois State Water Survey.

TO : Director, National Water Quality Laboratory G-57 DATE OCT 11

FROM : Deputy Director, Enforcement Division

SUBJECT: Temperature Standards for the Illinois River

As you requested in your memo of 10/2/72, the following species are to be protected in the Illinois River:

1. Shovelnose Sturgeon
2. Paddlefish
3. Northern Pike
4. Smallmouth Buffalo
5. Bigmouth Buffalo
6. Northern Redhorse
7. Blue Catfish
8. Channel Catfish
9. Flathead Catfish
10. White Bass
11. Rock Bass
12. Bluegill
13. Smallmouth Bass
14. Largemouth Bass
15. White Crappie
16. Black Crappie
17. Yellow Perch
18. Sauger
19. Walleye
20. Freshwater Drum

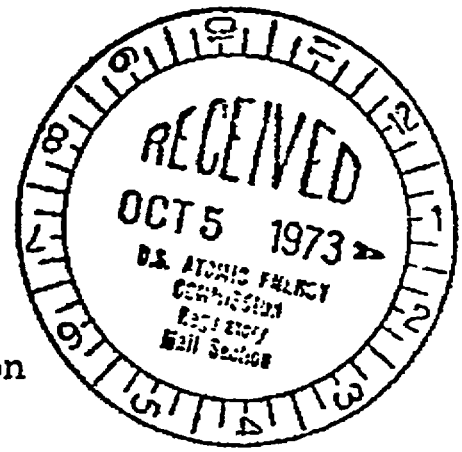
We are enclosing a copy of a letter to Mr. Jacob Dumelle of the Illinois Pollution Control Board, which confirms that the temperature criteria will be developed for these species.

Dale S. Bryson

Enclosures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

50-237
50-249



OFFICE OF THE
ADMINISTRATOR

Mr. L. Manning Muntzing
Director of Regulation
U. S. Atomic Energy Commission
Washington, D.C. 20545

OCT 5 1973

Dear Mr. Muntzing:

Reference is made to our comments on the Dresden Nuclear Power Plant dated September 13, 1973. One part of the section of our letter on Thermal Effects is in error and should be corrected. The part of concern begins with the last paragraph on page 9 and continues through the first paragraph on page 10. The following constitutes a correction and we have underlined the changed sentences for ease of identification:

> At the present time the upstream temperatures on the Des Plaines River are sufficiently high during some periods of the year that the operation of the Dresden Nuclear Power Plant as planned will probably violate the Water Pollution Regulations for the State of Illinois, which constitute existing federally approved water quality standards. These standards presently apply to the Des Plaines and Illinois Rivers and require the following temperatures not to be exceeded: January, February, March and December - 60°F, all other months - 90°F. In addition, temperature increases caused by thermal discharge shall not exceed 3°F above ambient during one percent of the hours in a 12 month period.
>
> The State of Illinois has revised the temperature limits for the Lower Des Plaines River, from the I-55 Bridge to the confluence with the Kankakee River. This standard would require that the following temperatures shall not be exceeded by 5°F more than 4% of the time over a 12 month period: January, February - 60°F, March - 70°F, April - 77°F, May - 85°F, June, July, August, September, October - 80°F, November - 76°F, and December - 70°F. We have, however

expressed our reservations whether such standards would be federally approvable in a letter dated June 15, 1973, to Mr. Samuel Lawton, Acting Chairman of the Illinois Pollution Control Board. In addition, our agency recommended in a letter to Mr. William Blaser, formerly of the Illinois EPA, dated December 14, 1972, a new and more stringent thermal standard for the Illinois River. Copies of both letters and the recommended standards are attached.

We apologize for the errors in our original comments and hope this letter clarifies the situation. If you have any questions, please don't hesitate to contact us.

Sincerely,

Sheldon Meyers
Director
Office of Federal Activities

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF RADIOLOGY
950 EAST FIFTY-NINTH STREET
CHICAGO • ILLINOIS 60637

AREA CODE 312

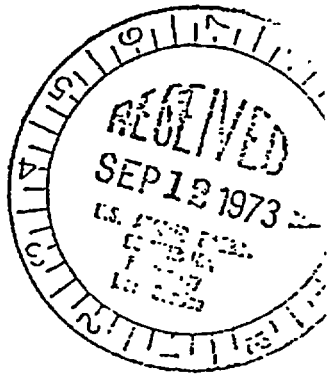
n of Diagnostic Radiology (947-6141)
n of Special Radiologic Procedures (947-6135)
n of Medical Physics (947-6009)
n of Nuclear Medicine (947-6173)
n of Radiological Sciences (947-6134)

Section of Therapeutic Radiology (947-601
Chicago Tumor Institute
Section of Radiobiology (947-6541)
Radiation Protection Service (947-5031)
Research and Development Shop (947-611
Biomedical Electronics (947-5158)

G-60

50-237
50-249

September 6, 1973



Mr. Daniel R. Muller, Assistant Director
for Environmental Projects
Directorate of Licensing
The United States Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Muller:

On behalf of the Illinois Commission on Atomic Energy, I have now reviewed the "Draft Environmental Statement by the United States Atomic Energy Commission Directorate of Licensing Related to the Dresden Nuclear Power Station Units 2 and 3", Dockets No's. 50-237 and 50-249 of June 1973. My judgement is related only to those matters related to nuclear safety, nuclear wastes, nuclear transport and environmental radiation hazards. It is to the best of my knowledge and my opinion that there is no reason that this statement should not be accepted as a factual and accurate appraisal of the situation at the Dresden Nuclear Power Stations #1 and #2. It is my belief that it fulfills the requirements and objectives (within the limits that I have competence to judge) of the National Environmental Policy Act of 1969.

Sincerely yours,

John H. Rust
Professor, Department of Radiology
and Pharmacology
and
Co-chairman, Illinois Commission on
Atomic Energy

JHR:sd

Illinois Department of Transportation
2300 South 31st Street Springfield Illinois 62764

G-61

August 9, 1973

Dresden Nuclear Power Station Units 2 and 3

Mr. James Webb
Chairman
Natural Resources Development Board
Projects Task Force
222 South College
Springfield, Illinois

Dear Mr. Webb:

Our review of the Environmental Report concerning Commonwealth Edison Company Dresden 2 and 3 plants as prepared by the U. S. Atomic Energy Commission and issued June 1973 has been completed with the following comments pertaining:

a. Illinois Department of Transportation does not concur that fog and icing will be restricted to within a few hundred feet of the cooling lake. Experience with fog and icing has indicated that a serious safety hazard to motor vehicle traffic has resulted from the close proximity of cooling lakes, particularly in winter. Interstate Route 55 is located approximately 3000 feet from the east edge of the Dresden cooling lake and in the prevailing wind direction from the lake. Under stable conditions (E and F Classes of Pasquille stability) the potential exposure of Interstate 55 to fog and icing under normal weather conditions is approximately 30 hours per month in winter (computed from weather data and Pasquille/Wind Rose studies of Chicago-O'Hare and Midway Airports, Peoria Airport and Rockford Airport). The added influence of the cooling lake at Dresden increases this potential exposure by its presence and injection of considerably more water vapor into the air. This influence reasonably will intensify existing fog and icing conditions and, to a slight extent, create fog situations that would not normally occur. The distance of 3000 feet (Interstate 55 to cooling lake) is no assurance that Interstate 55 will not be affected. Fog and supercooled fog will migrate several miles under light winds. (Supercooled fog problems and studies in Washington, Oregon, Alaska, West Germany, France, and England support this fact.)

b. The environmental report does not address the problem of steam fog on the Illinois River. Water injected into this river in winter at temperatures of more than 80°F will undoubtedly create steam fog of significant density. Since the Illinois River is considered a "year round" navigable river for commerce purposes, this problem should be addressed in the environmental report as a potential hazard to safety and navigation on the river.

As a result of comments a and b above, it is requested that Commonwealth Edison Company study the cited problems and develop contingency plans to minimize the safety hazards involved in both river navigation and in vehicle traffic on Interstate Route 55.

Very truly yours,

Earl H. Bowman

Earl H. Bowman
Acting Chief
Bureau of Environmental Science

50-237
50-249

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In reply refer to:
ER-73/868

OCT 18 1973

Dear Mr. Muller:

Thank you for your letter of June 26, 1973, transmitting copies of the Atomic Energy Commission's draft statement, June 1973, on environmental considerations for Dresden Nuclear Power Station Units 2 and 3, Grundy County, Illinois.

Summary and Conclusions

We suggest that the area of land purchased for the operation of Dresden 1 be indicated on page i in addition to the approximately 1,573 acres purchased for the operation of Units 2 and 3. We also suggest that the area involved in the approximately four miles of new transmission line right-of-way be identified.

According to Condition a. to the operating license, Units 2 and 3 will be allowed to operate on a once-through condenser cooling basis in "unusual circumstances." We suggest that "unusual circumstances" be defined to the extent possible. The potential adverse impacts relating to these exceptions should be described in the appropriate sections of the statement.

Condition e. to the operating license requires the applicant to implement Environmental Technical Specifications that are acceptable to the AEC staff. Identification and implementation of these programs is needed, however, we do not believe it is proper to defer detailed discussions of major programs for environmental protection to the Environmental Technical Specification phase of AEC licensing procedure.

Most programs identified in this paragraph could significantly affect environmental quality and must be described in the environmental statement.

Historical Significance

Since the powerplant is constructed, many effects on cultural (historic, archeological, architectural) resources have already been experienced. We regret that a direct examination of the plant site and vicinity was not performed by trained professionals prior to construction to quantify the impacts on cultural resources.

We request that particular caution be taken during plant operation to insure the integrity of the 1,513-acre Goose Lake Prairie Nature Preserve owned by the State of Illinois. This tract is less than one mile southwest of the Dresden Nuclear Power Station and was recommended as a potential natural landmark in the National Park Service's "Island Wetlands" theme study. It has since been evaluated but not recommended due to the presence of certain unnatural conditions. The evaluator does however, state, "it is hoped that management over the next 4-5 years will upgrade at least some sites to a more original and natural condition, and at that time the area should be reevaluated for this (Natural Landmark) designation." A study of the Central Lowlands Natural Region is scheduled to begin in FY 1974. The Goose Lake Prairie Nature Preserve will be reconsidered in this study.

Geology

The statement is made on page 2-13 that faults and seismic conditions in general are not considered to be of major importance to the environmental effects of nuclear powerplants. We emphatically do not agree. The careful assessment of geologic site characteristics and the proper design of critical structures to accommodate these characteristics and assure structural integrity is essential to preventing or mitigating the consequences of potential accidents, including the class 9 accident, which could result in the release of radioactive materials to the environment. Therefore, we strongly recommend that the environmental statement present a more comprehensive summary of the regional and local site geology,

and specify how the geologic and seismologic analyses have been taken into account. In this respect, we note that the AEC has published "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (Proposed Appendix A, 10 CFR 100, Federal Register, November 25, 1971) which prescribes the nature of required investigations. The impact statement should clearly specify whether these criteria have been applied to the Dresden site.

The necessity for careful geologic investigations and engineering design and construction to accommodate the natural characteristics is illustrated by problems that have been experienced with the cooling lake, including the failure of a 50-foot section of the cooling lake dike on October 13, 1972, that resulted in a total loss of the impounded water. Although the soil conditions were taken into account in the repair of the dike, we note that the dike was not analyzed for the effect of a seismic event. The draft statement indicates on page 5-4 that "it is felt an acceleration factor of 0.1 to 0.15g would not imperil the integrity of the cooling lake." In our view, such an assertion requires additional explanation and justification.

An analysis should be presented to show what consequences a postulated massive dike failure would have on the reactors or on their operations if it occurred after the lake becomes an integral part of the cooling system. It has not been made clear whether dike failure could result in loss of coolant to the reactors, and how serious the consequences of such an accident would be. We believe the document should be amended accordingly.

In analyzing possible causes of dike failures, internal causes resulting in overflow of the cooling lake appear to have been fully considered on pages 7-9 through 7-11. We recommend that the statement include an evaluation of the possible impacts that flooding of the Kankakee River may have on the integrity of the north dike. This seems advisable and appropriate since parts of the cooling lake occupy the former floodplain of the river, and the top of the dike is within 22 feet of the average river level at its eastern end. We are concerned that there may be increased backwater or flooding for a given river flow now, which did not exist under pre-construction conditions, due to the encroachment of the dikes on the floodplain. The applicant could determine this by comparing before-and-after flood profiles through this region and in the upstream reach

of the river. It may well be that the railroad embankment also encroaches on the left floodplain.

The Atomic Energy Commission recognizes that the possible environmental effects related to the abandoned coal mine beneath the cooling lake have not been fully considered and, as a condition to the issurance of the operating license has required the applicant to make additional core borings. We recommend that an analysis be made of the effects of the mine on the structural integrity of the dikes, and also any potential pollutional effects on ground water or surface water on or off the site as a result of impounding water above the mine.

Ecology

As indicated on page 2-8, the State of Illinois has reclassified the Illinois, Des Plaines, and Kankakee Rivers as "Public and Food Processing Water Supplies." This reclassification is expected to provide the impetus for cleaning up the water cources and reclamation of the rivers and their resources. Based on the State's plan to improve the quality of these waters, we believe that this section should describe the anticipated impact that the plant will have on the improved water quality and the associated fish and wildlife of the area.

The relative numbers of coliform bacteria and fecal coliform bacteria given on page 2-28 for the years 1958-1971 are incorrect. The total coliform bacteria should exceed that of fecal coliform bacteria.

The sixth paragraph on page 2-33 should be expanded to indicate the relative quality of the "inputs" to the Dresden Pool. Based on temperature data given on page 3-21 when all units are operating, most of the organisms identified may be eliminated from cooling pond during substantial periods of the year.

River Discharge

We share the concern expressed by the AEC staff on page 3-26 that the thermal plume may seriously restrict free fish passage in the river. We are also concerned with the performance of the spray canal cooling system and believe that careful monitoring of this system and of the heated water discharged to the river should be mandatory.

Solid Radioactive Wastes

The solid wastes that result from operations of Units 2 and 3 are discussed briefly on pages 3-37 and 3-41. The wastes are described in very general terms as being evaporator bottoms, spent resins, filter sludge, filters, miscellaneous paper, rags, and contaminated clothing. Estimates are given that about 2,000 55-gallon drums of solid radioactive waste will be shipped offsite annually to a burial site at Sheffield, Illinois. The draft statement contains an inconsistency in the estimated radioactivity of this waste, the figure being given both as 4,800 and 5,700 curies of activity on pages 3-37 and 3-41 respectively.

We believe that the offsite disposal of the operational solid radioactive wastes from the Dresden Nuclear Power Station constitutes an important long-term environmental impact, and the AEC must satisfactorily solve the problem of these proliferating operational wastes from all nuclear plants before they present a major problem. Therefore, we strongly recommend that the environmental statements for all reactors, including Dresden Units 2 and 3, should specify the kinds of radionuclides their physical states, and their concentrations in the wastes, and the estimated total volume of wastes for the expected operating life of the reactor. Additionally, if an environmental impact statement has not been prepared for the proposed burial or disposal site, or if such a statement does not fully consider wastes of the nature and quantity of those generated at the Dresden station, then we believe it is incumbent on the AEC to include an evaluation of the disposal site in this present environmental statement. We believe such an evaluation should discuss the Federal and State licensing provisions, criteria, and responsibilities for the site in connection with: (1) determination of the hydrogeologic suitability of the site to isolate the wastes of the Dresden station and any other wastes accumulating or expected to accumulate at the site from the biosphere for specific periods of time; (2) current and continuing surveillance and monitoring of the site; and (3) any remedial or regulatory actions that might be necessary throughout a specific period of time in which all the wastes will be hazardous.

In connection with the above, we note that "radioactive wastes other than high-level," which apparently include reactive operational solid wastes, have been discussed on pages G-2 through

G-1 of the AEC document "Environmental Survey of the Nuclear Fuel Cycle." We do not consider the generalized descriptions in that document of the management and disposal of these wastes as being adequate to cover the concerns expressed above because the descriptions on pages G-2 through G-9 and G-12 through G-14 are not specific to a particular site or to the particular wastes being disposed there. Similarly, the environmental considerations on pages G-16 through G-21 are not specific to a particular site or to particular wastes.

Chemical and Biocide Effluents

In view of the recognized detrimental environmental impacts of chlorine on the aquatic environments, the use of this element should be minimized. We suggest that considerable care be given to reducing the use of chlorine and specifically chlorine concentrations in the plant effluent.

Ecological Effects

This section should indicate that 1,573 acres of agricultural land which previously supported wildlife has been converted to an industrial use and that the wildlife associated with this habitat has been lost.

Impacts on Water Use

Based on information available to us, there is a great probability that substantial amounts of chloramines will be discharged to receiving waters. The cumulative effect of chloramines from the cooling pond of Dresden Units 2 and 3, the discharge from Unit 1, and effluent from Collins Electrical Generating Station may individually or in combination cause severe damage to present or future fish and wildlife resources. Therefore, we suggest that the cumulative effects from all sources that would interact with those from this plant should be discussed in this section.

We believe that this section should also acknowledge the implication of the Federal Water Pollution Control Act as amended in 1972. As stated in the Act "it is the national goal to eliminate the discharge of pollutants into navigable waters by 1985."

The references on pages 5-8 and 5-3-7 to tables 2.8 and 2.5, respectively, should apparently be changed to tables 2.3 and 2.6

Nonradiological Effects on Ecological Systems

Entrainment of aquatic organisms into the cooling water system is discussed on page 5-21. The magnitude of these effects which occur during low or critical summer flow periods should be mentioned since these periods often coincide with peak metabolic activity for most aquatic organisms. Removal of biomass from the system during critical environmental periods could control the magnitude of downstream fish resources or subject these populations to unacceptable stresses.

Cooling Lake and Spray Canal Effects

It is indicated on page 5-33 that the problem of disposal of the dredged material from the cooling lake and spray canal has not been considered by the applicant. According to condition d., the applicant is required to implement Environmental Technical Specifications including a program for disposal of dredgings.

Since this activity could have a major environmental impact, we recommend that an estimate of dredging requirements and probable disposal methods be included in the final environmental statement.

The warm water of the 1,275 acre cooling lake built for the closed-cycle cooling system scheduled for use after February 1974, is a potential resource the beneficial uses of which should be considered. We recommend that the applicant be encouraged to consider possible uses of the water for such things as aquaculture, which might have the added benefit of helping to maintain the lake free of "nuisance growths of aquatic organisms. Relative to costs of plant construction and operation, any short-term monetary benefits from using the thermal effluents are likely to be insignificant, but long-term benefits may include: (1) increased knowledge gained from experimentation with use of thermal effluents by local educational or other institutions; (2) significant benefits to the small segment of the community involved in use of the water.

The importance of proper care in the use of algicides is discussed on page 5-33. The Department of the Interior's 1967 publication entitled "Biological Associated Problems in Freshwater Environments" is referred to as discussing methods for the physical removal of aquatic weeds and the use of microstrainers for algae. However, the particular methods which will be used to control growths of nuisance aquatic

organisms and procedures for their disposal are not described in the statement. The methods that will be used and the associated environmental impacts of the selected control program should be identified in this section.

We suggest that this section be expanded to include important dissolved gases in addition to effects on dissolved oxygen. For example, supersaturation of nitrogen gas in water has produced fish kills at several steam-electric powerplants.

The potential for the dispersal of viable fecal organisms in aerosols as a result of the spray system is recognized on page 5-34. It is also indicated that if bacterial counts in the spray canals exceed state standards, the applicant will take appropriate action. We suggest that measures which would contrc this problem should be identified and the potential impacts resulting from implementation of these controls on fish and wildlife resources should be described.

Transmission Line Effects

The fourth paragraph on page 5-35 should be updated by deleting the indication that the Bureau of Sport Fisheries and Wildlife has approved for certain applications the use of 2,4,5-T. This Department's approval for the use of this herbicide was withdrawn in 1970. The Department of the Interior has prohibited the use of 2,4,5-T on lands under its control and has also prohibited its use in any program it funds since 1970.

Although the economical cost is sometimes more for hand or mechanical clearing methods, the cost to the environment is usually must less. Therefore, we suggest that the applicant seriously consider mechanical clearing methods which would eliminate or reduce the need for herbicides.

Chemical Discharge Effects

We suggest that this section identify and describe the impact of heavy metals which will be discharge by the plant.

Nonradiological Studies

The sampling program should be reviewed periodically to determine if sampling equipment and techniques will result in the collection of adequate and quantitative data especially as related to impingement of fish.

9

Environmental Effects of Accidents

This section contains an adequate evaluation of impacts resulting from plant accidents through class 8 for airborne emissions. However, the environmental effects of releases to water is lacking. Many of the postulated accidents listed in tables 7.1 and 7.2 could result in releases to the Kankakee and Illinois Rivers and should be evaluated.

We also think that class 9 accidents resulting in both air and water releases should be described and the impacts on human life and the remaining environment discussed as long as there is any possibility of occurrence. The consequences of an accident of this severity could have far reaching effects and could persist for centuries. The AEC recognition of the severe consequences of such an accident is indicated in USAEC Regulatory Guide 4.2.

Alternative Energy Sources

The basic assumptions necessary to determine the amount of air pollutants which would be emitted by a comparable sized fossil-fueled powerplant are not given in the text. We think that these data which would allow the reviewer to confirm the appropriateness of such assumptions, should be given in the environmental statement.

We hope these comments will be helpful to you in the preparation of the final environmental statement.

Sincerely yours,

Deputy Assistant Secretary of the Interior

Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
Atomic Energy Commission
Washington, D. C. 20545

STATE OF ILLINOIS

DEPARTMENT OF PUBLIC HEALTH

SPRINGFIELD, ILLINOIS 62761

50-237
50-249

October 4, 1973

VICE C. LASHOF, M.D.
~~DIRECTOR~~ DIRECTOR

BUREAU OF
ENVIRONMENTAL HEALTH
VERDUN RANDOLPH, M.P.H., CHIEF
(AREA CODE 217) 525-6550

IN REPLY REFER TO: EH/RH

Mr. Gordon L. Chipman
Environmental Project Branch
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Chipman:

The purpose of this letter is to comment on one aspect of the draft Environmental Statement prepared by the U.S. AEC's Directorate of Licensing as it relates to the Dresden Nuclear Power Station's units II and III, Docket numbers 50-237 and 50-249. This comment will be directed toward paragraph e, Dispersal of Microorganisms which is under section 5.5.3, Cooling Lake and Spray Canal Effects.

We have reviewed the statement concerning the effect of spray canals used to cool water discharged from Commonwealth Edison's Dresden units II and III as it relates to possible dispersion of microorganisms, particularly fecal coliforms, which are normally found in water in the Kankakee River. It is this Department's opinion that the possibility of health hazards from the operation of these spray canals and the possible dispersion of fecal coliform into the air would be at most a minimal health hazard. Our decision is based upon the relative low amount of human fecal coliforms that have been observed in this river and that there have been no reported incidents of disease around sewage treatment plants which use aeration techniques on raw sewage containing much higher concentrations of microorganisms.

It is our further belief that if studies were carried out in any area in which people congregate such as office buildings that one could detect airborne coliforms within the atmosphere of the sample location. At present there is no evidence that this constitutes a public health hazard or is a viable mechanism for the transmission of disease. As a public health agency we feel, however, that it would be prudent to do limited sampling to determine levels of microorganisms in the intake water even though the degree of possible health hazard appears remote.

Thank you for allowing us to comment on this particular topic and if we can be of other assistance, please feel free to contact us.

Very truly yours,

Verdun Randolph, Chief
Bureau of Environmental Health

7501