final

NUREG-75/097

environmental statement

related to operation of

DAVIS-BESSE NUCLEAR POWER STATION UNIT 1

Proposed by

TOLEDO EDISON COMPANY

OCTOBER 1975

Docket No. 50-346

U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation

SUMMARY AND CONCLUSIONS

This Environmental Statement was prepared by the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation (the staff) in accordance with 10 CFR §51.23(e). This Summary and Conclusions reflects the staff's evaluation and position. The staff's basic evaluation is presented in the Final Environmental Statement, Construction Permit Stage (FES-CP) for the Davis-Besse Nuclear Power Station Unit 1 issued in March 1973. Changes in staff evaluation due to the development of new information, results of preoperational programs, or plant design changes are addressed in this Environmental Statement.

1. This action is administrative.

2. The proposed action is the issuance of an operating license to the Toledo Edison Company and the Cleveland Electric Illuminating Company for the startup and operation of the Davis-Besse Nuclear Power Station Unit 1 (the station) located near Port Clinton in Ottawa County, Ohio (Docket No. 50-346).

   The station will use a pressurized water reactor (PWR) to produce about 2772 megawatts thermal (MWt) to generate a net electrical output of 906 megawatts electrical (MWe). The steam condenser for the turbine will be cooled by water circulated through a single hyperbolic natural-draft cooling tower. Makeup water for the cooling tower will be taken from Lake Erie and the tower blowdown will be discharged into Lake Erie.

3. Summary of environmental impacts and adverse environmental effects:

   Attendant with the furnishing of electrical energy, and the benefits to be derived therefrom, the proposed facility will cause certain adverse environmental effects. The more significant of these effects are listed below:

   a. The total site area is 954 acres of which 160 acres have been removed from production of grain crops and converted to industrial use. Approximately 600 acres of the area is marshland which will be maintained as a wildlife refuge.

   b. The disturbance of the lake shore and lake bottom during construction of the station water intake and discharge pipes resulted in temporary turbidity, silting, and destruction of bottom organisms. Since completion of these activities, evidence of improvement in turbidity and transparency measurements, and the reestablishment of the bottom organism has been obtained.

   c. Because of the location of the station in a migratory bird flyway and close proximity to bird refuges, there is a possibility of occasional occurrences in which birds are killed by flying into the station structures. Results of the monitoring program to date have not revealed any significant bird kills.

   d. The cooling tower blowdown and service water which the station discharges to Lake Erie, via a submerged jet, will be heated no more than 20°F above the ambient lake water temperature. Although some small fish and plankton in the discharge water plume will be disabled as a result of thermal shock, exposure to chlorine and buffeting, few adult fish will be affected. The thermal plume resulting from the maximum thermal discharge is calculated to have an area of less than one acre within the 3°F isotherm (above lake ambient).

   e. The station's natural-draft cooling tower has a visual impact on the surrounding areas. There is a possibility that the cooling tower may augment natural fog (estimated to be 1 hour/year compared with 831 hours/year natural) within several miles of the station particularly in the winter months.

   f. Approximately 101 miles of transmission lines have been constructed, primarily over existing farmland, requiring about 1800 acres of land for the rights-of-way. Land use will essentially be unchanged since only the land required for the base of the towers is removed from production. Herbicides will not be used to maintain the rights-of-way.

g. It is calculated that the station may discharge approximately 0.3 curies per year of mixed isotopes in liquid wastes excluding tritium and 350 curies per year of tritium to Lake Erie. (The previous staff calculations were 5 curies per year of mixed isotopes in liquid waste and 1,000 curies of tritium.) Approximately 9000 curies per year of gaseous radioactive wastes may be discharged to the atmosphere. (Compared to 3,000 curies, previously calculated.)

h. The risk associated with accidental radiation exposure is very low.

i. No significant environmental impacts are anticipated from normal operational releases of radioactive materials. The upper bound estimate of dose to the population from operation of the plant is 140 man-rem/yr, which is a very small fraction of the population dose (21,000,000 man-rem/yr) that persons living in the United States normally receive from natural background.

j. The meteorological,hydrological, biological and radiological monitoring programs initiated in the station's vicinity will provide data on the impact of the plant and be of interest to the scientific community, particularly in regard to the ecology of Lake Erie.

4. The following Federal, State and local agencies were requested to comment on the Draft Environmental Statement:

Advisory Council on Historic Preservation
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of Interior
Department of Transportation
Environmental Protection Agency
Federal Energy Administration
Federal Power Commission
Great Lakes Basin Commission
Governor of the State of Ohio (State Clearinghouse)
Ohio Environmental Protection Agency
Ohio Department of Health
Ohio Power Siting Commission
Ottawa County Commission

Comments on the Draft Environmental Statement were received from the following:

Department of Commerce
Energy Research and Development Administration
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation, U.S. Coast Guard
Ohio Environmental Protection Agency
Joanne L. Campbell
Daniel E. Doepker
Ted J. Ligibel
Toledo Edison Company
U.S. Environmental Protection Agency

The location of changes in text between the DES and FES are identified by a vertical line in the margin.

5. This Environmental Statement was made available to the public, to the Council on Environmental Quality, and to other specified agencies in April 1975.

6. On the basis of the analysis and evaluation set forth in this statement, and after weighing the environmental, economic, technical and other benefits of the Davis-Besse Nuclear Power Station Unit 1 against environmental costs and considering available alternatives at the construction stage, it is concluded that the action called for under NEPA and 10 CFR Part 51, is the issuance of an operating license for Unit 1 of the Davis-Besse Nuclear Power Station subject to the following conditions for the protection of the environment:

(A) License Conditions

(1) The applicant shall operate Davis-Besse Unit No. 1 within applicable Federal and State air and water quality standards and the Environmental Technical Specifications which will include nonradiological and radiological monitoring programs, limits on effluent releases, an appropriate comprehensive ecological surveillance study, and reporting requirements.

(2) Before engaging in an operational activity not evaluated by the Commission, the applicant will prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not evaluated, or that is significantly greater than that evaluated in this Environmental Statement, the applicant shall provide a written evaluation of such activities and obtain prior approval of the Director, Office of Nuclear Reactor Regulation for the activities.

(B) Significant Technical Specification Requirements

(1) The applicant will carry out the environmental monitoring programs outlined in Section 6 of this Statement. A comprehensive program to monitor fish eggs and larvae entrained by the operation of the station and a comprehensive program to determine impingement of fish at the intake structure of the station shall be included.

(2) A study shall be conducted to determine the extent to which the intake canal supports a fish population and thus contributes to impingement losses. The details of this study shall be included in the Environmental Technical Specifications.

(3) Continued monitoring of bird impactions on the cooling towers and other station structures will be required.

(4) Special studies to determine the offsite sound levels during station operations and to determine the effectiveness of the bubble screen installed at the intake crib to reduce impingement losses will be required.

(5) If other harmful effects or evidence of irreversible damage are detected, the applicant will provide to the staff an analysis of the problem and a proposed course of action to alleviate the problem.

(6) The applicant will conduct a study to confirm that such toxic conditions do not exist in the mixing zone where fish and other aquatic biota can maintain themselves. This confirmatory program will encompass the provisions regarding chlorine releases cited in the NPDES permit when issued and will be made a part of the ETS for the facility.

(c) Other Conditions

The staff requires that the data from the upgraded meteorological program be submitted prior to final staff approval of Environmental Technical Specifications.

TABLE OF CONTENTS

TABLE OF CONTENTS (Con't)

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES Cont'd)

FOREWORD

This environmental statement was prepared by the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, in accordance with the Commission's regulation, 10 CFR Part 51, which implements the requirements of the National Environmental Policy Act of 1969 (NEPA).

NEPA states, among other things, that it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice.
- Achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Further, with respect to major Federal actions significantly affecting the quality of the human environment, Section 102(2)(C) of NEPA calls for preparation of the detailed statement on:

(i) the environmental impact of the proposed action;

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented;

(iii) alternatives to the proposed action;

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and,

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

An environmental report accompanies each application for a construction permit or a full-power operating license. A public announcement of the availability of the report is made. Any comments by interested persons on the report are considered by the staff. In conducting the required NEPA review, the staff meets with the applicant to discuss items of information in the environmental report, to seek new information from the applicant that might be needed for an adequate assessment, and generally to ensure that the staff has a thorough understanding of the proposed project. In addition, the staff seeks information from other sources that will assist in the evaluation and visits and inspects the project site and surrounding vicinity. Members of the staff may meet with State and local officials who are charged with protecting State and local interests. On the basis of all the foregoing and other such activities or inquiries as are deemed useful and appropriate, the staff makes an independent assessment of the considerations specified in Section 102(2)(C) of the NEPA and 10 CFR Part 51.

This evaluation leads to the publication of a draft environmental statement, prepared by the Office of Nuclear Reactor Regulation, which is then circulated to Federal, State and local government agencies for comment. A summary notice is published in the Federal Register of the

availability of the applicant's environmental report and the draft environmental statement. Interested persons are requested to comment on the proposed action and the draft statement. Interested persons are also invited to comment on the draft statement.

After receipt and consideration of comments on the draft statement, the staff prepares a final environmental statement, which includes a discussion of questions and objections raised by the comments and the disposition thereof; a final benefit-cost analysis, which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects with the environmental, economic, technical, and other benefits of the facility; and a conclusion as to whether--after the environmental, economic, technical, and other benefits are weighed against environmental costs and after available alternatives have been considered, the action called for, with respect to environmental issues, is the issuance or denial of the proposed permit or license or its appropriate conditioning to protect environmental values. This final environmental statement and the safety evaluation report prepared by the staff are submitted to the Atomic Safety and Licensing Board for its consideration in reaching a decision on the application.

This environmental review deals with the impact of operation of Davis-Besse Unit 1. Assessments that are found in this statement supplement those described in the Final Environmental Statement (FES-CP) that was issued in March 1973 in support of continuation of the construction permit for Unit 1. The information to be found in the various sections of this Statement updates the FES-CP in four ways: (1) by identifying differences between environmental effects of operation (including those which would enhance as well as degrade the environment) currently projected and the impacts that were described in the preconstruction review; (2) by reporting the results of studies that had not been completed at the time of issuance of the FES-CP and which were under mandate from the AEC/NRC staff to be completed before initiation of the operational review; (3) by evaluating the applicant's preoperational monitoring program; and factoring the results of this program into the design of the post-operational surveillance program and into the development of Environmental Technical Specifications; and (4) by identifying studies being performed by the applicant that will yield additional information relevant to the environmental impacts of operating the Davis-Besse Nuclear Power Station, Unit 1.

Effective January 19, 1975, activities under the U.S. Atomic Energy Commission regulatory program were assumed by the U.S. Nuclear Regulatory Commission in accordance with the Energy Reorganization Act of 1974. Any references to the Atomic Energy Commission (AEC) contained herein should be interpreted as Nuclear Regulatory Commission (NRC).

Single copies may be obtained as indicated on the inside front cover. Dr. P. C. Cota is the NRC Environmental Project Manager for this statement. Should there be questions regarding the contents of this statement, Dr. Cota may be contacted at the following address:

Division of Reactor Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555
(301) 443-6951

1. INTRODUCTION

1.1 STATUS OF PROJECT

The Toledo Edison Company (TEC) and the Cleveland Electric Illuminating Company (CEIC) are both privately owned public utility companies engaged in supplying electrical energy to the public. These two companies, hereafter referred to as the applicant, will jointly own the Davis-Besse Nuclear Power Station (the station) as tenants in common, with TEC having a 52.5% share of ownership and CEIC owning the remaining 47.5%. TEC is responsible for the design, construction and operation of the station. Both companies are members of the Central Area Power Coordination Group (CAPCO), a group of four electric utilities in Ohio and Pennsylvania that pool their generating and transmission capabilities, to benefit from the economy and increased reliability of large-scale operation. CAPCO has an installed generating capacity of about 12,000 megawatts electric (MWe) in 1975. The Davis-Besse Station is the fourth generating facility constructed under the CAPCO group agreement.

The station is being constructed on a 954-acre tract, located in northwestern Ohio on the shore of Lake Erie in Ottawa County, about 21 miles east of Toledo, Ohio. The site terrain is relatively flat and contains about 600 acres of marshland, the remainder being, or having been, marginal farmland. The site has a 7500-foot frontage on Lake Erie, and is generally only slightly higher than the normal lake water level.

The station will have a net electrical capacity of 906 MWe and will utilize a pressurized water reactor (PWR) supplied by the Babcock & Wilcox Company. The construction permit application had indicated an initial, electrical output of 872 MWe with an ultimate capability of 906 MWe. The FES-CP evaluated the environmental impacts of the higher power level but evaluated the benefits at the lower power level. Thus, as a result of the applicant's request for 906 MWe operating license, the only change is an increase in the benefits of the proposed action. Most of the heat from the turbine steam condenser will be dissipated to the atmosphere by means of a natural-draft cooling tower, 493 feet high and 415 feet in diameter. Water for the station will be drawn from Lake Erie via a submerged intake crib and a pipe buried under the lake bottom. Construction at the station is now over 90% complete and the current schedule calls for startup by mid 1976.

1.2 STATUS OF REVIEWS AND APPROVALS

On August 1, 1969, the applicant filed for all necessary AEC licenses to construct and operate the station. On September 10, 1970, an AEC exemption was granted allowing the applicant to do below-grade work before issuance of the construction permit. The Advisory Committee on Reactor Safeguards (ACRS) reported favorably on the application on August 20, 1970, and the AEC completed the construction permit review and issued its formal Safety Evaluation Report on November 2, 1970. The construction permit stage public hearing before an Atomic Safety and Licensing Board (ASLB) was held on December 8-10, 1970. This hearing was contested and subsequent sessions were held, with the final one finishing on February 12, 1971. A favorable decision was reached by the ASLB on March 23, 1971, and Construction Permit No. CPPR-80 was issued by the AEC on March 24, 1971.

As required by the Commission's implementation of the National Environmental Policy Act (NEPA) outlined in 10 CFR Part 50, Appendix D (now 10 CFR Part 51), an Environmental Report (ER) was submitted on August 3, 1970. On November 5, 1971, the applicant submitted a two-volume Environmental Report Supplement.

The Atomic Safety and Licensing Board Hearings as to whether the construction of the Davis-Besse Station should be suspended until the final NEPA review had been completed was held on May 2-4, 1972 and subsequent sessions were held July 7-8, 1972. The ASLB decision that construction should not be suspended pending completion of the NEPA review was issued July 13, 1972.

The Commission's NEPA review related to the continuation of the construction permit for the Davis-Besse Station was completed and the Final Environmental Statement was issued in March 1973. The environmental hearing related to the continuation of the construction

permit was held before an Atomic Safety and Licensing Board on July 23-26, 1973 and a subsequent session was held August 6-7, 1973. The ASLB's initial decision that the construction permit should be continued was issued September 14, 1973.

On March 30, 1973, the applicant's Final Safety Analysis Report and the Environmental Report - Operating License Stage was docketed. The Environmental Report - Operating License Stage was a one page document indicating that there were no changes from their previous Environmental Report (ER), as supplemented and amended. On December 20, 1974, the applicant submitted a one volume supplement to the ER which updated the status of the project and superseded the previous one page ER.

The following is a history of the Federal, State, and local permits that have been applied for by the applicant and which have either been received or are pending:

1.2.1 Federal

	Permit	Status
a.	U.S. Atomic Energy Commission Construction Permit No. CPPR-80.	Received on March 24, 1971
b.	Army Corps of Engineers permit for dredging a temporary barge channel.	Received on August 4, 1972
c.	Army Corps of Engineers permit to construct offshore facilities (submerged water intake, intake pipe, discharge pipe, and rockfills) under the Rivers and Harbors Act of 1899.	Received March 27, 1973
d.	Federal Aviation Administration approval for station (without cooling tower)	Received May 21, 1970
e.	Federal Aviation Administration approval for cooling tower.	Received August 11, 1971

1.2.2 State of Ohio

	Permit	Status
a.	Ohio Department of Industrial Relations approval of plans and specifications and building permit.	Received October 20, 1970
b.	Ohio Department of Health permit for potable water supply to be used during construction period.	Received November 9, 1971
c.	Ohio Department of Health permit for sewage treatment plant for construction period, and also for completed station.	Received June 21, 1971
d.	Ohio Department of Health permit for installation of building sanitary and drain systems.	Received July 27, 1971
e.	State Water Quality Certification (Federal Water Pollution Control Act Section 21(b))	Received March 21, 1972
f.	Federal Water Pollution Control Act Amendments Section 402 Discharge Permit (NPDES Permit)	Proposed permit received September 26, 1975. It becomes effective November 23, 1975.

g.	Ohio Turnpike Commission permit for turnpike crossing with transmission line.	Received May 26, 1971
h.	Ohio State Highway Department permits for transmission line crossings of state highways.	Received March 3, 1971
i.	State Department of Highways permits for grade crossing of state highways for railroad spur.	Received August 3, 1971

1.2.3 Local

	Permit	Status
a.	Ottawa County building permit	Received October 14, 1970
b.	Ottawa County Engineer permits for grade crossings of roads and highways for railroad spur.	Received August 30, 1971
c.	City of Oregon building permit and certificate of occupancy for transmission lines.	Received January 19, 1973

1.2.4 Public Hearings

	Hearings	Date
a.	Atomic Safety and Licensing Board (ASLB) Construction permit hearings.	Commenced December 8, 1970 - finished February 12, 1971
b.	Ohio Water Pollution Control Board hearing.	July 28 & 29, 1971
c.	Atomic Safety and Licensing Board (ASLB) hearings as to whether the construction of Davis-Besse should be suspended until the final NEPA review.	May 2-4, 1972
d.	Atomic Safety and Licensing Board (ASLB) hearing re-opened to receive additional evidence relating to environmental effects that may occur subsequent to NEPA review and relating to environmental effects of operation of the plant.	July 7 & 8, 1972
e.	Atomic Safety and Licensing Board decision that construction should not be suspended pending completion of the NEPA review.	July 13, 1972
f.	Atomic Safety and Licensing Board (ASLB) Environmental hearing	Commenced July 23, 1973 finished August 7, 1973
g.	Atomic Safety and Licensing Board decison that the construction permit should be continued.	September 14, 1973

2. THE SITE

Resume

The staff has revisited the site to determine if there have been any significant changes at the Davis-Besse site which would alter the staff's evaluation presented in the FES-CP stage issued in March 1973. Information concerning changes in population projections, development of Lake Erie Water Quality Standards, identification of new endangered or rare species, the results of preoperational surveys, and the background noise levels has been evaluated by the staff since issuance of the FES-CP and are addressed in the following sections.

2.1 SITE LOCATION

The description of the site location in the FES-CP stage is still valid.

2.2 DEMOGRAPHY AND LAND USE

2.2.1 Residential

There has been a downward revision in the population projections for the 50-mile area surrounding the site. The principal reason for the revision is that the FES-CP projections were made by the applicant prior to the availability of the 1970 census data. The new projections used the revised net migration patterns experienced over the last decade and the revised birth and death rates. Table 2.1 shows a comparison between the population projections between the FES-CP and more recent projections. The projections within 20 miles of the site are only slightly decreased with the large decreases occurring outside the 20-mile radius for the year 2000 and beyond.

TABLE 2.1

COMPARISON OF POPULATION PROJECTIONS WITHIN 50 MILES

Radius (in miles)	Cumulation Populations - FES-CP[1] 1980	2000	Recent Projections[2] 1980	2000
5	2,328	3,258	1,571	1,743
10	15,902	22,662	17,740	19,672
20	121,143	175,969	116,223	132,927
30	829,022	1,197,552	747,284	873,874
40	1,397,422	2,279,251	1,111,970	1,307,325
50	2,672,070	4,252,844	2,224,772	2,621,603

2.2.2 Industrial Population and Land Use - Zoning

The description presented in the FES-CP stage is still valid. As stated therein, the only industries within five miles of the site are located in Erie Industrial Park. While there have been some changes in industrial firms located there, Table 2.3 in the FES-CP is representative of the type industries located there. The estimated employment is now 900 instead of 850.

2.2.3 Agriculture Land Uses

The general description of the agriculture land uses in the vicinity of the site is still valid. Table 2.2 reflects the typical changes that will occur in acreage under cultivation. (Compare with Table 2.4 in the FES-CP.)

Table 2.2[3]
Agriculture Land Use for Ottawa County-1973

Crop	Acres
Corn	11,409
Wheat	13,109
Soybeans	37,348
Hay	12,058
Alfalfa	8,840
Small Grain	5,939

2.2.4 Recreation and Conservation Areas

The description presented in the FES-CP stage is still valid except for the identification and location of campgrounds within ten miles of the site. Table 2.3 identifies the present campgrounds.

TABLE 2.3[4]

Campgrounds Within Ten Miles of The Site

Name	Distance Direction	Attendance/Spaces
KOA- Paradise Acres	2 SSE	6600 car nights/yr.
Camp Sabroski	4 WSW	3004/yr.
E&C Camp Site	2 SSE	5 spaces
Anderson's Camp	2 SSE	6 spaces
East Side Marina	2 WNW	43 spaces
Turtle Point Marina	2 WNW	44 spaces

2.2.5 Hospitals, Schools, Military Installations

The description presented in the FES-CP stage is still valid.

2.2.6 Transportation

The description presented in the FES-CP stage is still valid, except that State Route 2 has been widened at the point of intersection with Township Road 216 to provide turning and passing lanes at the site entrance.

2.3 HISTORIC AND NATURAL LANDMARKS

The information presented in the FES-CP stage is still valid.

2.4 GEOLOGY

The information presented in the FES-CP stage is still valid.

2.5 ♦ HYDROLOGY

2.5.1 Lake Erie Water Quality

The applicant supplied a summary of water quality data taken during the period of November 1968 to October 1970 and it was reproduced as Table 2.11 in the FES-CP. Additional data have been taken as part of a pre-operational environmental monitoring program. A summary of these water analyses is presented in Table 2.4.[5] Further discussion of the water quality may be found in reference 5.

The applicants' 1974 Semi-Annual Reports[6,7] of the pre-operational environmental montioring program have not revealed any significant changes in Lake Erie water quality in the vicinity of Locust Point from the 1972 and 1973 records with the exception of improvement in water conductivity, transparency and turbidity. This is believed due to the cessation of activities on the lake bottom related to the installation of the intake and discharge structures. Figures 2-1 through 2-3 illustrate the Lake Erie water quality parameter trends for the period 1972-1974.[7]

2.5.2 Groundwater

The information in the FES-CP stage is still valid.

2.5.3 Water Quality Standards

The water quality standards applicable to Lake Erie have been recently changed and are contained in Ohio EPA Regulation EP-1[8] adopted by the state on January 8, 1975. This regulation contains both general standards which recognize specific criteria for Lake Erie uses such as public water supply, industrial water supply, maintenance of aquatic life, recreation and specific standards for a number of physical and chemical parameters in the lake. A significant provision in the regulation is that the near shore area (from the lake shoreline outward for a distance of approximately 2100 ft) in the Magee Marsh Area (which encompasses the entire plant site) has been designated as an "excepted area" where only the General Standards of Regulation EP-1-02 apply.

2.6 METEOROLOGY

The general description of the site meteorology is still valid. (See Section 6.1.1 for a description of the upgraded meteorological measurement program and staff evaluation concerning site suitability.)

TABLE 2.4[5]

WATER ANALYSES

	Lake Erie Site Samples*	Lake Erie Site Samples (FES-CP)**	Extremes High	Extremes Low
Calcium (Ca)	42	45	65	29
Magnesium (Mg)	9	11	15	3
Sodium (Na)	15	12	22	7.9
Chloride (CL)	22	22	40	14
Nitrate (NO_3)	6	12	18.1	0
Sulfate (SO_4)	41	37	58	28
Phosphate (PO_4)	0.3	1.5	1.38	0
Silica (SiO_2)	1.0	2	7.5	0.1
Alkalinity as $CaCo_3$	98	101	128	80
Suspended Solids	28	131	178	4
Dissolved Solids	234	225	488	102
Dissolved Oxygen**	10	10	14	7
B.O.D.	2	-	7.6	0.1
pH	8.1	8.1	8.4	7.35

* Average of samples from April 20, 1971, through February 12, 1974, taken 2700 ft from shore at approximately 7 ft water depth 3 ft from the lake bottom.

** Average of samples from November 1968 to October 1970 taken 50 to 100 ft from shore.

General Note: All values mg/l except pH.

FIGURE 2 - 1[7]

TRENDS IN MEAN MONTHLY TEMPERATURE, DISSOLVED OXYGEN, AND HYDROGEN IONS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974

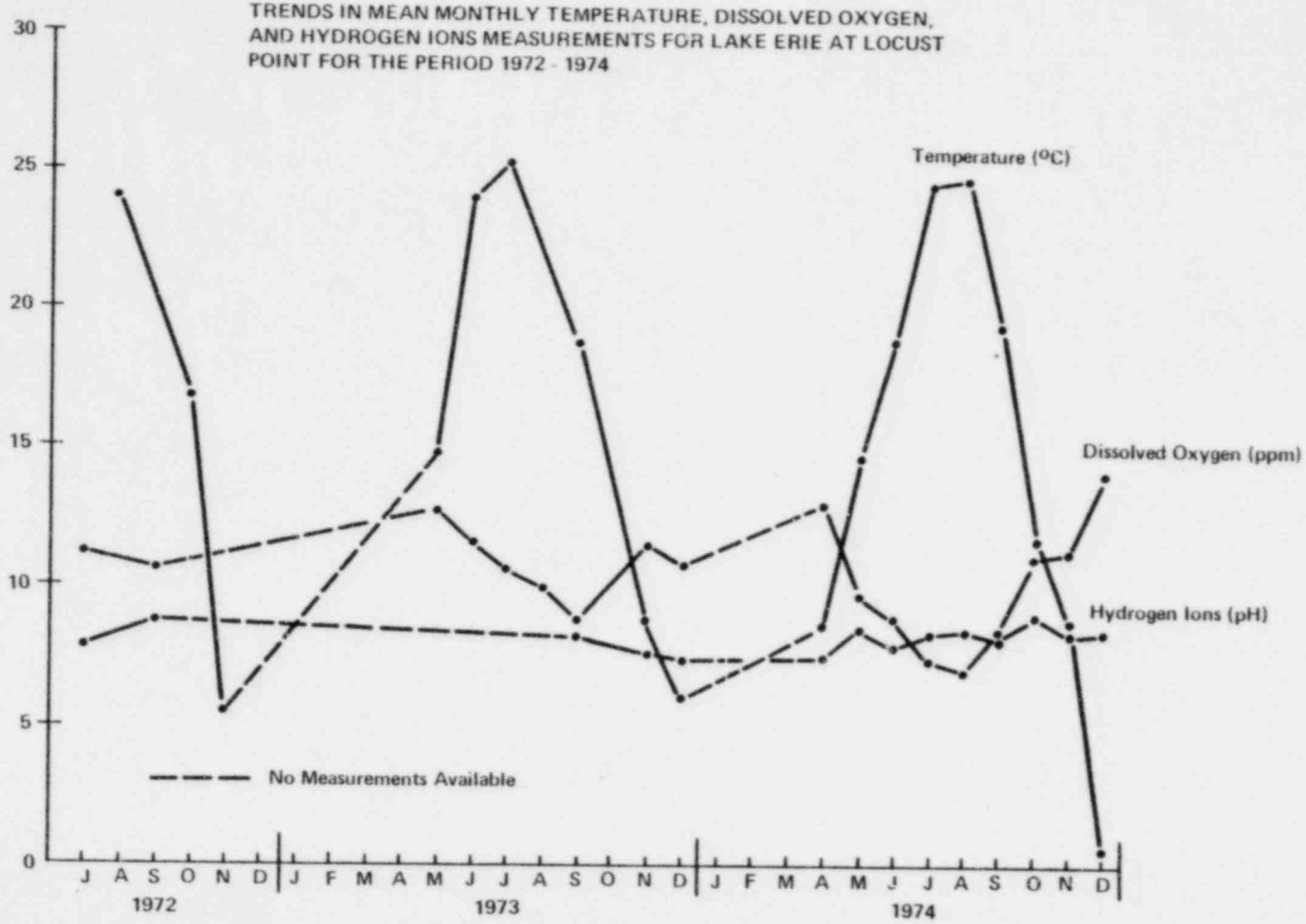


FIGURE 2 - 2

TRENDS IN MEAN MONTHLY TRANSPARENCY AND PHOSPHORUS MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974

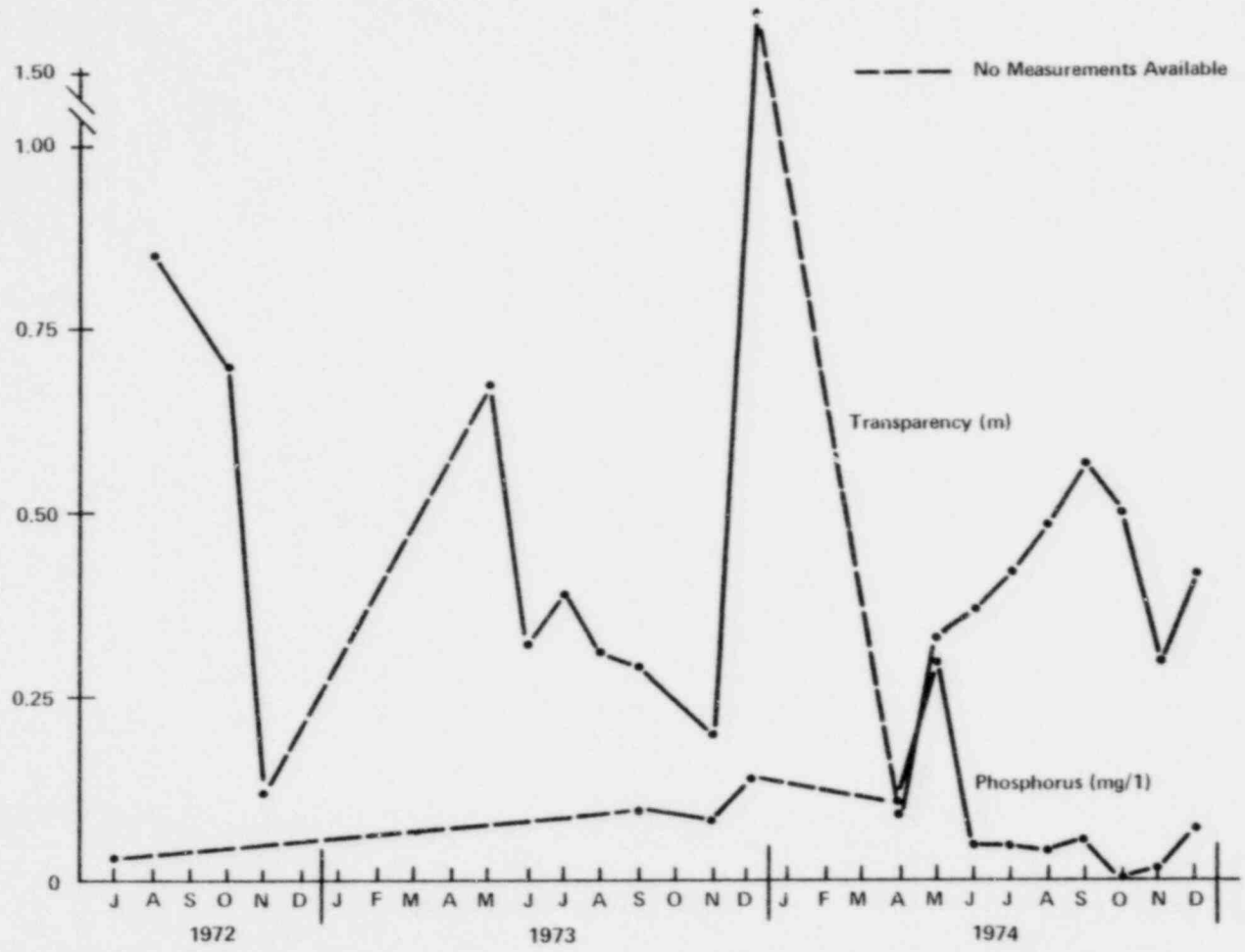
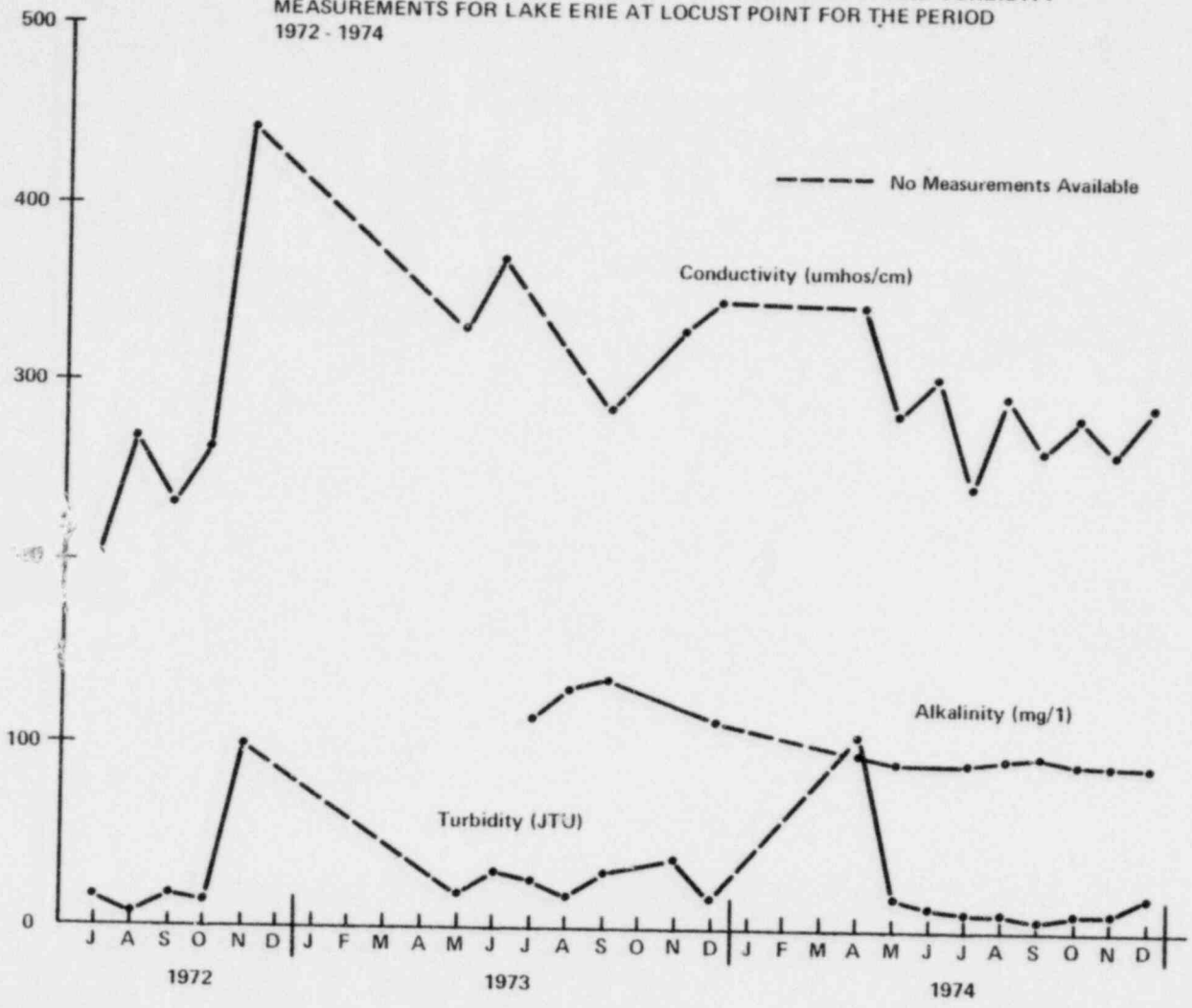


FIGURE 2 - 3

TRENDS IN MEAN MONTHLY CONDUCTIVITY, ALKALINITY AND TURBIDITY MEASUREMENTS FOR LAKE ERIE AT LOCUST POINT FOR THE PERIOD 1972 - 1974



2.7 ECOLOGY

2.7.1 Aquatic Ecology

2.7.1.1 Phytoplankton

The applicant initiated comprehensive and quantitative monitoring of phytoplankton in April 1974. Recent data verify qualitative observations made in the ER-CP (App. C.), FSAR (App. 2B), and FES-CP. Phytoplankton populations were highest in fall and spring and lowest in summer (See Table 2.5). Species density and diversity among 12 sampling stations did not correlate consistently with depth or distance from shore. This probably resulted from variable winds, currents, and wave action, rather than inadequate sampling. Diatoms, especially Melosira sp., Asterionella sp., Tabellaria sp., and Fragilaria sp. comprised 95% and 99% of the phytoplankton during April and the May bloom, respectively (see Table 2.5). The green algae Pediastrum sp. and, to lesser degrees, Asterionella sp., Melosira sp., and Microcystis sp. were abundant in June, when the phytoplankton was divided almost equally between diatoms and green algae. Although blue-green algae were not collected, they are expected to be present in measurable numbers in the heated effluent of the plant. An extensive consideration of the seasonal composition and dynamics of phytoplankton populations at the Davis-Besse site appears in the ER-CP for Units 2 & 3.

2.7.1.2 Zooplankton

Substantial differences in techniques and stations used to sample zooplankton at Locust Point preclude direct comparison of data collected prior to 1973. Consistent methodology has been used to collect monthly samples at the site since May 1973, although sampling stations differed slightly between 1973 and 1974. The populations of 1974 were probably more representative of a "typical" year, since dredging for the intake and discharge pipelines undoubtedly affected the 1973 populations. Rotifers, copepods, and cladocerans dominated in both years, peaking in late spring or summer and declining in late autumn (See Table 2.6). Changes in abundance of zooplankton in 1974 correlated well with fluctuations in phytoplankton abundance. The rotifer populations were the largest of the major groups and showed the greatest variability between years. Copepod populations were very similar in 1973 and 1974. The applicant identified 39 taxa (23 rotifera, 7 copepoda, and 9 cladocera) in 1973. Taxa occurring in more than 50% of the year's samples included (1) Rotifera: Asplanchna Priodonta (70.7%), Brachinous angularis (ul.4%), Keratella cochlearis (97.1%). and Polyarthasp. (98.6%); (2) Copepoda: Diaptomus sp. (64.3%), Cyclops sp. (75.7%), immature cyclopoids (100.0%), and nauplii (100.0%); (3) Cladocera: Bosmina sp. (98.6%), and Daphnia retrocurva (71.4%). The largest zooplankton populations in 1974 were found closest to shore, most likely indicating that they were concentrated at the surface. Lower densities of zooplankton obtained by vertical tows at deeper stations probably reflect dilution of surface water by bottom water. Patterns in abundance and distribution of zooplankton are discussed in greater detail in the ER-CP for Davis-Besse Units 2 & 3.

2.7.1.3 Ichthyoplankton

Ichthyophankton was sampled monthly in the immediate vicinity of the intake and discharge structures from May through November of 1974. Data support results of previous studies which indicate that the immediate site is not an important spawning and nursery area. Eggs and larvae of emerald shiner and gizzard shad dominated collections in summer and fall (Table 2.7). Yellow perch, walleye, and smallmouth bass were collected in late spring, but in very much lower numbers. The largest number of individuals taken in any one sample at the site was 3821 and these were mostly emerald shiner. Over 13,000 individuals were taken by similar methods in Sandusky Bay (a known spawning and nursery area). For further discussion, see section 12.3.1.

2.7.1.4 Benthos

The spatial and temporal distributions and life histories of benthic organisms found at the Davis-Besse site are discussed in more detail in the FSAR (App. B) for Unit 1 and the ER-CP for Units 2 & 3. Benthic monitoring programs conducted in 1973 and 1974 did not identify additional species of concern nor major differences in the occurrence and distribution of dominant taxa, except recolonization of areas affected by dredging in 1973. Oligocheates and chironmids dominated the benthos in 1973 and 1974, being more abundant in 1974 (Table 2.8). This probably

*For scientific names, see: Bailey, R. M. (chrmn). 1970. A list of common and scientific names of fishes from the United States and Canada (3rd ed.) Amer. Fish, Soc., Spec. Pub. 6, 150p.

9

TABLE 2.5

MEAN NUMBERS OF PHYTOPLANKTERS PER STATION SAMPLED (1974)
– IN NO. CELLS/L –

TAXA	April 18	May 22	June 19	July 17	Aug 22	Sept 10	Oct 9	Nov 7
BACILLARIOPHYCEAE								
(Diatoms)								
Asterionella sp.	1735	1600	551	11	2	2	65	105
Centric diatom				10		0	49	63
Cyclotella sp.	4			2		43	0	0
Cymatopleura sp.	14	25	3		6	0	6	9
Fragilaria sp.	435	4555	60		21	38	388	2160
Gyrosigma sp.	1			2	6	6	5	10
Melosira sp.	3990	85597	350	238	719	754	3600	3038
Naviculoid	12		21	9	16	43	58	120
Stephanodiscus sp.				1		0	1710	4780
Surirella sp.		12	19	4		0	1	7
Synedra sp.	5	23		2		20	23	39
Tabellaria sp.	1335	6259	81	6	2	1	18	66
Unidentified Diatom							55	
CHLOROPHYCEAE								
(Green Algae)								
Actinastrum sp.						9	68	34
Ankistrodesmus sp.							36	17
Binuclearia sp.						22	384	628
Chlamydomonas sp.						38		
Closteriopsis sp.	43	11		2	25	0	185	832
Closterium sp.						248	10	23
Coelastrum sp.		3		62		56	32	21
Cosmarium sp.				4		4	5	11
Crucigenia sp.							24	
Crucinigenia sp.						4		
Oocystis sp.						6	111	124
Dimorphococcus sp.							9	8
Eudorina sp.				61	107	19	3	0
Lagerheimia sp.							3	
Micractinium sp.	2					0	55	36
Mougeotia sp.	6				2	935	4140	17770
Oocystis sp.							47	
Pandorina sp.	2	12	27	26		64	47	39
Pediastrum sp.	37	392	841	774	557	1400	1982	1351
Platydorina sp.						6		
Rhizoclonium sp.				3			2	0
Scenedesmus sp.	1	9	10	7	9	29	113	182
Selenastrum sp.							3	
Spirogyra sp.	4		3			0	0	0
Staurastrum sp.			5	82	90	83	74	120
Ulothrix sp.								3
Volvox sp.	7	5	18	3	3	1	33	4
CHRYSOPHYCEAE								
Dinobryon sp.							3	
DINOPHYCEAE								
(Dinoflagellates)								
Ceratium hirundinella	3	14	8	1757	17	23	11	3
Glenodinium sp.				41		0	0	0
Peridinium sp.						14		
EUGLENOPHYCEAE								
Euglena sp.						8	23	28
Trachelomonas sp.				4		0	4	0
MYXOPHYCEAE								
(Blue-green algae)								
Anabaena sp.				7	8	23	98	29
Anhanizomenon sp.				204		1547	5444	1322
Chroococcus sp.				61	14	48	22	23
Merismopedia sp.				2		0	0	0
Microcystis sp.			99	39	13	265	307	124
Spirulina sp.								
Unidentified Bacteria	182					0		5
Unidentified Phytoplankter				24		2		3
TOTAL	7860	98517	2092	3461	1603	5751	18232	33499

Data averaged over all stations sampled

10

TABLE 2.6

MEAN NUMBERS OF ZOOPLANKTERS PER STATION SAMPLED (1974) – IN NO. OF ORGANISMS CELLS/L –

TAXA	April 18	May 22	June 19	July 17	Aug 22	Sept 12	Oct 9	Nov 7
ROTIFERA								
Asplanchna girodi	0.3							
A. priodonta	0.0	2.2	1.8	2.6	57.3	29.8	3.1	2.2
Brachionus angularis	9.0	3.7	8.8	25.4	46.4	3.1	2.2	1.1
B. calyciflorus	3.7	5.2		0.3	0.1	1.0	9.3	27.4
B. havanaensis			0.1	0.2	1.3	1.0	0.1	
B. (Platylas) patulus						0.2		
B. urceolaris	1.2	0.1					0.0	
Chromogaster ovalis	1.0					2.3		0.0
Conochiloides sp.			34.9	7.3	0.3	0.2	5.8	2.3
Euchlanis sp.						0.1	0.0	0.0
Filinia terminalis	1.8	12.7	0.4	5.4	0.7	0.3	0.3	0.1
Hexarthra mira						0.4	0.1	
Kellicottia longispina	0.6	4.6	3.2					0.1
Keratella cochlearis	3.1	155.0	26.1	18.8	11.6	21.8	12.4	90.2
K. quadrata	3.9	35.4	8.1	1.1	2.0	0.5	1.0	9.3
Lecane (Monostyla) bulla							0.0	
L. (Monostyla) lunaris				0.0		0.1		
Notholca squamula	6.5	13.1						
Pleuroma sp.							0.3	
Polyarthra sp.	5.8	73.1	128.5	512.8	105.5	215.0	37.1	33.1
Pompholyx sulcata						1.1		
Synchaeta sp.	1.8						0.1	0.1
Tesadinella sp.	0.1							
Triphocerca cylindrica		0.0		0.4		0.7	0.2	
T. multicrinis		1.1	7.1	0.2	11.8	8.2	0.1	
Unidentified Rotifer A	0.1	1.8			2.7	39.1	0.3	27.5
Unidentified Rotifer B						7.0		
COPEPODA								
Calanoid copepods								
Diaptomus sp.	0.5	15.5	13.1	5.1	1.0	0.9	1.0	0.6
Eurytemora sp.								0.0
Immatures	0.1	5.2	1.3	2.4	0.7	1.3	4.2	1.0
Cyclopoid copepods								
Cyclops sp.	1.2	12.4	115.1	55.0	18.4	3.2	1.4	1.5
Mesocyclops sp.	0.1	0.4	0.1	0.0	0.4	0.1	0.1	0.0
Tropocyclops prasinus								0.1
Immatures	1.3	18.4	13.8	27.9	9.3	8.1	8.5	5.3
Nauplius	28.5	160.7	268.1	128.6	48.1	78.8	59.3	15.0
CLADOCERA								
Bosmina sp.	0.0	3.3	155.7	49.1	17.0	19.0	54.3	7.4
Ceriodaphnia sp.					0.0	0.2		
Chydorus sp.	0.1	0.1	0.1		0.0	4.8	12.8	15.1
Daphnia galeata			0.1	0.4	0.0	0.0		
D. pulex	0.0	10.5	0.1	0.2				
D. retrocurva			74.5	137.8	2.8	2.2	0.1	
Diaphanosoma sp.				0.0	0.0	1.4	0.2	
Holopedium sp.			0.0	0.2	0.1	1.2		
Leptodora kindtii			0.1	0.2	0.1	0.2		
PROTOZOA								
Actinetа sp.	0.1							
Amphileptus sp.	0.1							
Diffugia sp.				69.0	26.9	99.3	42.2	15.8
Dinobryon sp.	0.1							
Staurophyra sp.	5.6							
Vorticella sp.							0.6	0.5
Zoothamnium sp.						0.4	0.8	0.4
TOTAL	75.1	522.8	787.8	1131.8	394.5	553.0	259.2	256.0

Data averaged over all stations sampled

TABLE 2.7

ICHTHYOPLANKTON COLLECTED AT LOCUST POINT
MAY - NOVEMBER, 1974

Date	Species	Length (mm)	Nos. of Individuals Collected			
			Sta. 8 (Intake)		Sta. 12 (Discharge)	
			Surface	Bottom	Surface	Bottom
May 21, 1974						
	Yellow Perch	6-8	190	18	3	9
	Walleye	9-12	0	1	0	21
	Subtotal		190	19	3	30
June 14, 1974						
	Gizzard Shad	10-21	1	9	409	256
	Yellow Perch	12-17	2	1	33	7
	Smallmouth Bass	9	0	0	0	1
	Unidentified	-	36	0	11	16
	Subtotal		39	10	453	280
July 10, 1974						
	Goldfish	6.5			1	
	Gizzard Shad	7-18	6	8	45	39
	Emerald Shiner	8-18	3815	8	549	10
	Subtotal		3821	16	595	49
August 10, 1974						
	Alewife	18			1	
	Emerald Shiner	9-17	3		1	1
	Subtotal		3	0	2	1
September 12, 1974						
	Brook Silverside	47			1	
	Emerald Shiner	52-53			3	
	Subtotal		0	0	4	0
October 16, 1974						
	Emerald Shiner	28-57			8	1
	Subtotal		0	0	8	1
November 26, 1974						
	Emerald Shiner	48-85				56
	Subtotal		0	0	0	56
	TOTAL		4053	45	1065	417

12

TABLE 2.8

BENTHIC MACROINVERTEBRATE POPULATIONS AT LOCUST POINT – 1974 MONTHLY MEANS – IN NO./M^2 –

TAXA	April 17-18	May 22-23	June 19-20	July 17	Aug 14	Sept 8	Oct 10	Nov 7
COELENTERATA								
Hydra sp. (budding polyp)	2	7	54		1	0	4	6
Hydra sp. (single polyp)		5	68		1	1	11	11
NEMATODEA						3	4	
ANNELIDA								
Hirudinea								
Helobdella elongata						2	2	
H. stagnalis		1			1		2	0
Oligochaeta (unidentified)				21				
Immatures (hair setae)	3			5	1		4	1
Immatures (no hair setae)	1168	1109	534	688	1071	941	870	750
Branchiura sowerbyi	13	14	6	2	7	12	14	15
Limnodrilus cervix		4	3	7	39	21	3	10
L. claparedeanus	1	10	33	15	22	11	4	6
L. claparedianus-cervix		1		1	1	13	5	11
L. hoffmeisteri	0	3						
L. maumeensis		1		0	1	1		1
L. udekemianus	2	10						
Nais sp.							1	5
Potamothrix moldaviensis	9	0	21	24	31	11	11	
P. vejdovskyi	2	1						
Stylaria sp.						0	7	
ARTHROPODA								
Cladocera								
Leptodora kindtii			16	136	40	185	14	0
Amphipoda								
Gammarus fasciatus	3	0	9	13	6	10	22	38
Hyalella azteca				1				
Decapoda								
Orconectes sp.			0					
Chironomidae								
Chironomus (chironomus) sp.	111	40	69	29	199	87	45	23
Chironomus pupa		0						
Coelotanypus sp.					20	2	3	1
Cricotopus sp.								1
Cryptochironomus sp.	4	6	3	3	8	2	13	17
Polypedilum sp.		1	1	1			1	
Procladius sp.	23	18	32	6	57	8	12	31
Procladius pupa		2	0	1	0			
Pseudochironomus sp.	0	1	0			1		
Tanypodinae pupa		1						
Tanytarsus sp.	8		558	52	17	202	160	62
Tanytarsus pupa			2					
Ephemeroptera								
Caenis sp.		2		1		0		
Trichoptera								
Hydropsychidae	0							
MOLLUSCA								
Gastropoda								
Bulimus sp.	0	0	0					
Pelecypoda								
Amblema plicata		1			2		1	
Sphaerium sp.		3	1	3	2	2	1	3
Station Total	1355	1216	1928	954	1527	1543	1309	992

Data averaged over all stations sampled

reflects recolonization of areas disturbed by dredging and the ability of oligocheates and chironmids to burrow out when buried by sediment and dredge spoil. The size and diversity of most benthic populations tended to be highest from 500 to 1000 feet offshore and were correlated with substrate composition.

2.7.1.5 Fishes

Use of experimental gill nets, shore seines, and otter trawls at Locust Point since 1973 has provided data which verify descriptive statements in the FES-CP. Discussions of earlier studies of fish populations in western Lake Erie appear in the FSAR (App. 2B) for Unit 1 and the ER-CP for Units 2 & 3. Differences in the use, selectivities, and efficiencies of sampling gear preclude ranking of species collected in 1973 and 1974. Catches, by gear, for 1973 appear in Table 2.9. Forage fishes, especially gizzard shad, alewife, and spottail and emerald shiners, were generally more abundant in catches than game fishes, regardless of sampling gear. Catches in early spring were dominated by adult fishes, while young-of-the-year of several species, most notably alewife, gizzard shad, emerald shiner, and white bass were taken in increasing numbers throughout summer. Otter trawls were towed between the intake and discharge structures and caught mostly freshwater drum, yellow perch, channel catfish, and spottail shiner. Gill nets were set parallel to the intake and discharge pipelines. Gizzard shad, yellow perch, and alewife were the prominent species captured. Shore seining at the site identified gizzard shad, white bass, alewife, and emerald and spottail shiners as the predominant species. Data collected from April through November of 1974 showed that fewer game fishes, especially yellow perch, and more forage species, especially gizzard shad, seemed to be present at Locust Point than in 1973; but this is not believed to be a result of plant construction. Lower catches of game fishes elsewhere in the lake by the Center for Lake Erie Research indicate a general lakewide decline in abundance. The precise cause of the increase of forage populations is not known. Trawls taken in the intake canal in 1974 revealed the presence of white crappie, brown bullhead, goldfish, channel catfish, blackcrappie, and gizzard shad.

Commercial catches of fish from waters in the vicinity of the site have historically have been included in Ohio District No. 1, and more recently as Grid Nos. 903 and 904 under the new reporting system of the U.S. Fish and Wildlife Service. Carp, yellow perch, white bass, catfish, sheepshead, suckers, drum and quillback are taken in greatest numbers (Table 2.10). White bass are becoming increasingly important to the Ohio Lake Erie catch. The areas of Grids Nos. 903 and 904 produced 37.5% and 45.7% of the total Ohio District No. 1 catch in 1973 and 1974, respectively. Most of the catch was taken with seines and trapnets in the extensive shallow inshore areas of the District.

Longjaw cisco (Coregonus alpanae) and blue pike (Stizostedion vitreum glaucum), both on the U. S. Department of Interior's List (May, 1974) of Endangered Fauna, are present in Lake Erie but are seldom found in the western basin.

2.7.2 Terrestrial Ecology

The FES-CP described the physiographic setting, and the major biota of the site and its environs (FES-CP page 2-40). Additional detailed description of biota and soils is found in the applicant's environmental report, CP stage, for Davis-Besse Units 2 and 3.

Since the previous review, new information on threatened or endangered species has been made available (applicant's ER-Units 2-3). Most of those so designated were birds, however, one mammal, the Indiana bat, and two reptiles the spotted turtle and smooth green snake could occur at the site although no observations have actually been made. A list of threatened, declining, or endangered species of birds which occur in the region is presented in Table 2.11. Only the American Peregrine Falcon is listed as endangered in the United States.

2.8 BACKGROUND RADIOLOGICAL CHARACTERISTICS

The information presented in the FES-CP is still valid. The results of the preoperational radiological monitoring program[13] support the staff's previous evaluation that the tritium levels would be lower than the 1,100 pCi/l mean value reported in the small scale study.

2.9 OTHER ENVIRONMENTAL FEATURES

ENVIRONMENTAL NOISE SURVEY

The applicant conducted a background noise survey in the site vicinity during May 16-18, 1974 (ER Suppl. p2.9-1). The survey included both daytime and nighttime periods with sampling distances ranging from less than one-half mile to 1.8 miles from the site. Major outdoor construction activities for Unit No. 1 had been completed prior to the survey, and although some construction activities were still ongoing at the time of the survey, the survey results are primarily indicative of the existing sound conditions in the site vicinity without plant presence.

TABLE 2.9

RANKINGS BY NUMBER AND BIOMASS OF MAJOR SPECIES TAKEN BY OTTER TRAWL, GILL NET AND SHORE SEINE AT DAVIS-BESSE SITE, JUNE-NOV., 1973

OTTER TRAWL	
Freshwater drum (250)	Carp (8081g)
Yellow perch (170)	Yellow perch (7802g)
Channel catfish (143)	Channel catfish (6920g)
Spottail shiner (117)	Freshwater drum (4540g)
All species (996)	All species(33,469g)
GILL NET	
Gizzard shad (852)	Yellow perch (20,555g)
Yellow perch (812)	Gizzard Shad (49,202g)
Alewife (495)	Carp (31,877g)
Freshwater drum (182)	Freshwater drum (21,886g)
All species (2596)	All species (193, 880g)
SHORE SEINE	
Emerald shiner (1124)	Carp (3751g)
Alewife (237)	Emerald shiner (2109g)
Spottail shiner (129)	Gizzard shad (1462g)
White bass (127)	Spottail shiner (997g)
All species (1715)	All species (11, 465g)

g = grams

TABLE 2.10

FISH PRODUCTION IN OHIO DISTRICT NO. 1,* 1971-74
(IN THOUS OF LBS)

	1971	1972	1973	1974
Carp	2236	2071	1978	1600
Yellow Perch	692	402	229	200
White Bass	676	926	1266	1700
Catfish	424	478	196	208
Sheepshead	245	385	396	250
Suckers	67	62	40	54
Quillback	28	44	43	41
TOTAL	4393	4096	3530	4060

*NMFS, Stats and Market News Div.

FISH PRODUCTION IN GRID NOS. 903 AND 904,
OHIO LAKE ERIE, 1973-74
(IN THOUS OF LBS)*

	1973		1974	
	903	904	903	904
White Bass	548	202	478	237
Carp	185	106	435	302
Catfish	42	29	57	79
Yellow Perch	43	24	51	18
Drum	36	54	27	89
TOTAL	884	419	1101	754

*U. S. Fish and Wildlife Service, Ann Arbor, Michigan.

TABLE 2.11[14]

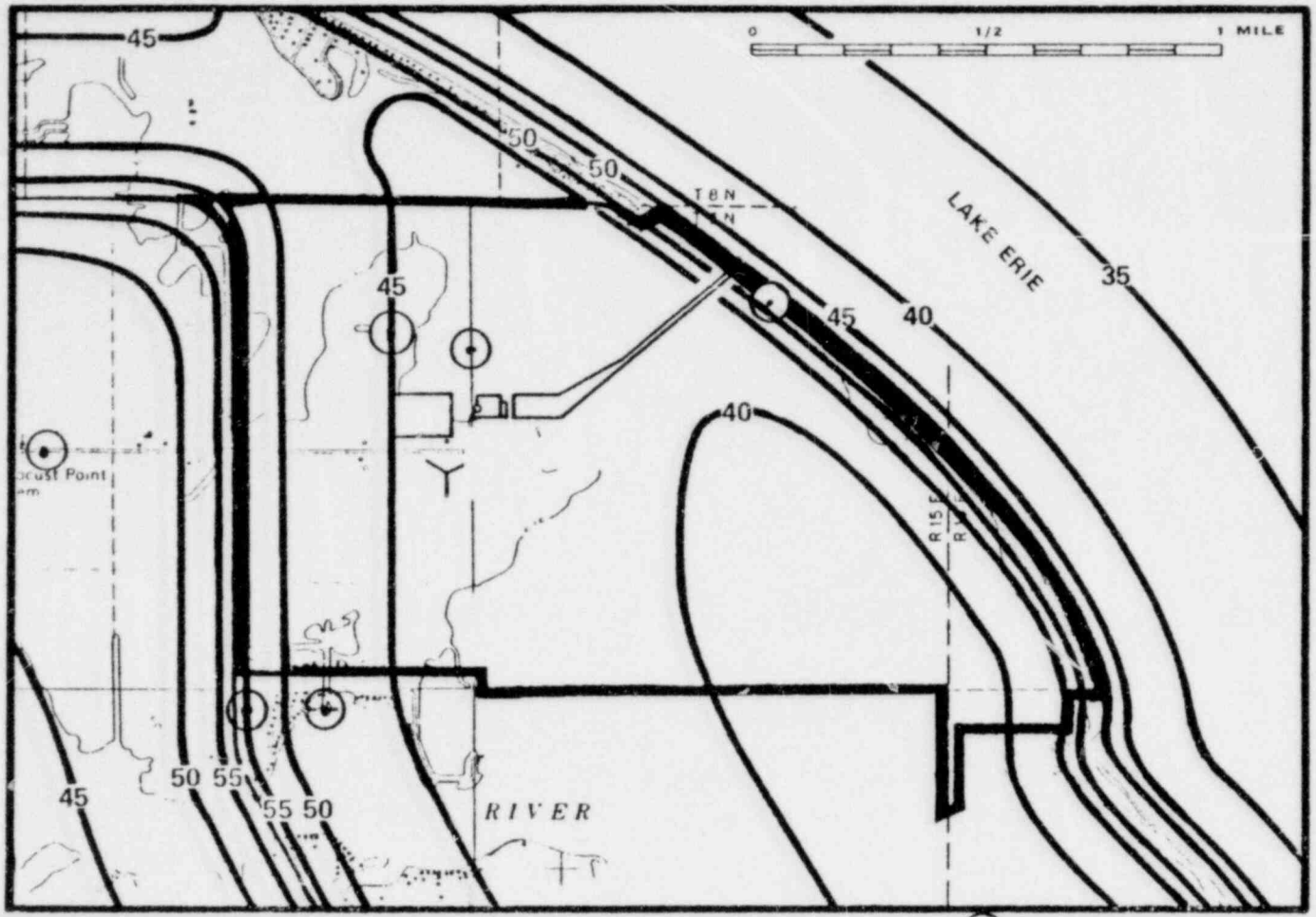
BIRDS IN THE REGION OF THE DAVIS-BESSE SITE CONSIDERED TO BE DECLINING, RARE, OR ENDANGERED

Common Name	Status*	Potential of Occurring on Site**
Double-crested Cormorant	D	G
Great Egret	R	G
Black-crowned Night Heron	D	G
Least Bittern	R	P
Hooded Merganser	R	G
Sharp-shinned Hawk	R - D	P
Cooper's Hawk	R - D	P
Bald Eagle	R	P
Marsh Hawk	D	P
Osprey	B	P
American Peregrine Falcon	E	P
American Kestrel	D	G
King Rail	R	G
Black Rail	R	P
Piping Plover	D	P
Common Tern	R	G
Least Tern	D	P
Barn Owl	R	P
Bewick's Wren	R - D	P
Short-billed Marsh Wren	R	P
Loggerhead Shrike	R - D	G
Prothonotary Warbler	R	P
Yellow Warbler	D	G
Pine Warbler	R	G
Orchard Oriole	R	P

*D = Listed as declining in Audubon Blue list
R = Listed as rare and endangered in Ohio
E = Listed as endangered in the United States

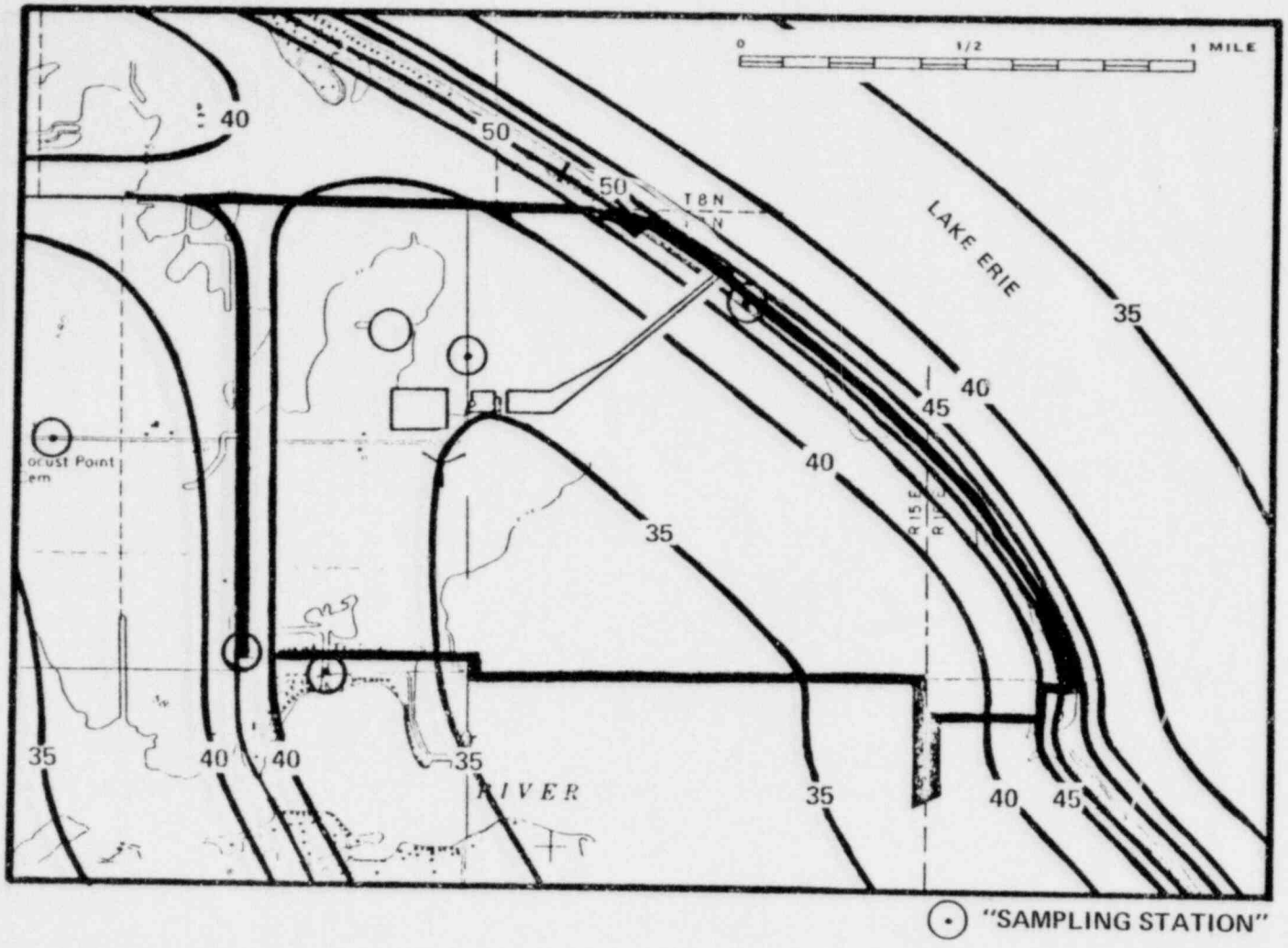
**G = Good, P = Poor

The L50 sound pressure levels (the sound pressure levels exceeded 50% of the time during the sampling period) of the various sampling stations were used to construct daytime and nighttime A-weighted sound level contours for the site vicinity. In constructing the contours, the highest L50 level for the period for each sampling location was used. These are shown in Figures 2.4 (daytime) and 2.5 (nighttime). The overall daytime average L50 for all sampling periods was 50dBA, while the corresponding nighttime average was 42dBA. (See Section 5.4.2 for additional staff evaluation.)



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 DAYTIME
NOISE LEVEL CONTOURS (dBA)

FIGURE 2 - 4 [15]



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 NIGHTTIME
NOISE LEVEL CONTOURS (dBA)

15

FIGURE 2 - 5

References

1. U.S. Atomic Energy Commission, Environmental Statement on Davis-Besse Nuclear Power Station Unit 1, Docket No. 50-346, March 1973, p. 2-13.

2. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit Nos. 2 and 3, Environmental Report, Construction Permit Stage, vols. 1, 2 and 3 Docket Nos. 50-500 and 50-501, issued August 30, 1974, p. 2.2-7.

3. Ibid., Response to General Question 2.

4. Ibid., p. 2.2-10.

5. Ibid., p. 2.5-31

6. Toledo Edison Company, Semiannual Preoperational Monitoring Report Unit 1, Vols. I & IA, January 1974 - June 1974, issued August 30, 1974.

7. Toledo Edison Company, Semiannual Preoperational Monitoring Report Unit 1, Vol II, July 1974 - December 1974, issued February 28, 1975, Aquatic p. 53.

8. Ohio EPA, Regulation EP-1, Water Quality Standards, January 8, 1975.

9. Op. Cit., Ref. 7, p. 8.

10. Ibid, p. 10.

11. Ibid., p. 31.

12. Ibid., p. 12.

13. Op. Cit., Ref. 7, Radiological p. 16.

14. Op. Cit., Ref. 2, p. 2.7-47.

15. Ibid., p. 2.9-1.

3. THE STATION

Resumé

There have been minor changes in the design of the station since the issuance of the FES-CP. These minor changes include the relocation of the chlorine injection connection in the condenser cooling water system and the increase in the intake area of the intake crib, and are described in the following sections. Since the issuance of the FES-CP, the staff has updated the parameters which are used to evaluate the radioactive waste treatment system based on more recent information. The results of the new evaluation of the radioactive waste treatment system are included in Section 3.4.

3.2 EXTERNAL APPEARANCE

The description of the external appearance presented in the FES-CP is still valid. Figure 3.1 is a more recent photograph of the site.

3.2 REACTOR AND STEAM-ELECTRIC SYSTEM

The description of the reactor and steam-electric system is still valid.

3.3 HEAT DISSIPATION SYSTEMS

3.3.1 Cooling Tower

The description of the cooling tower presented in the FES-CP is still valid. The design and water flow sequence of the main circulating water system has not been changed.

3.3.2 Other Cooling Water Systems

The general description of the other cooling water systems presented in the FES-CP is still valid. Figure 3.2 is a flow diagram for the service water system, Figure 3.3 is a flow diagram for the closed condenser cooling water system and Figure 3.4 is the station water use and discharge diagram. The water use flow values has been slightly revised in Figure 3.3 to indicate the new estimates of flows based on the site meteorology results. The slight increase in flow rates has been evaluated by the staff and the principal change identified is related to the cooling tower drift as discussed in Section 5.4.3.

Intake Crib, Intake Pumps and Screens, and Discharge Structure

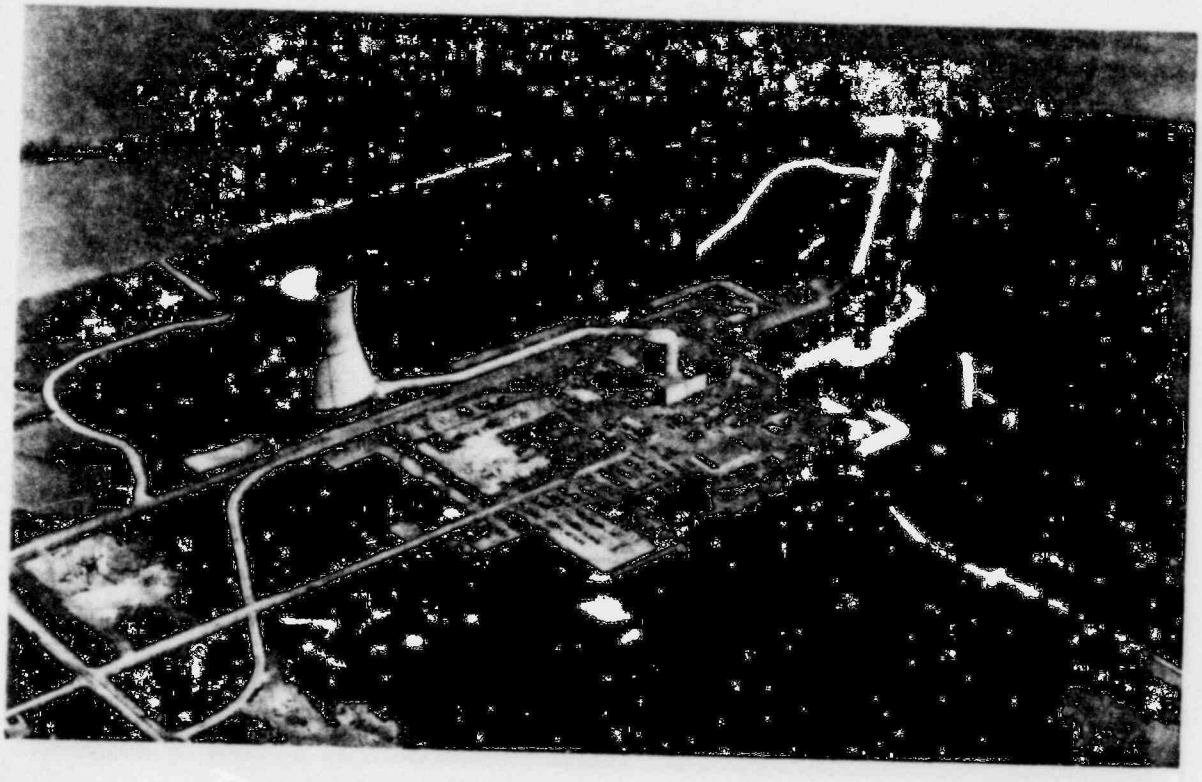
The description of the basic design and location of the intake pumps and screen and discharge structure presented in FES-CP is still valid. The applicant has doubled the area of the slots in the top of the wooden octagonal intake crib. Thus, the maximum intake velocity at the intake crib as shown in Figure 3.6 of the FES-CP has been decreased to approximately 0.25 fps at the design maximum intake flow rate of 42,000 gpm and approximately 0.12 at the nominal design flow rate of approximately 21,000 gpm. The expected average intake flow rate is approximately 16,700 gpm, which will produce an intake velocity of approximately 0.10 fps. An air bubble screen has been installed around the perimeter of the intake crib to discourage the entrance of fish. There have been no changes to the design of the discharge structure from the Davis-Besse Nuclear Power Station. The locations and configurations of the intake and discharge structures are shown in Figure 3.6 of the FES-CP.

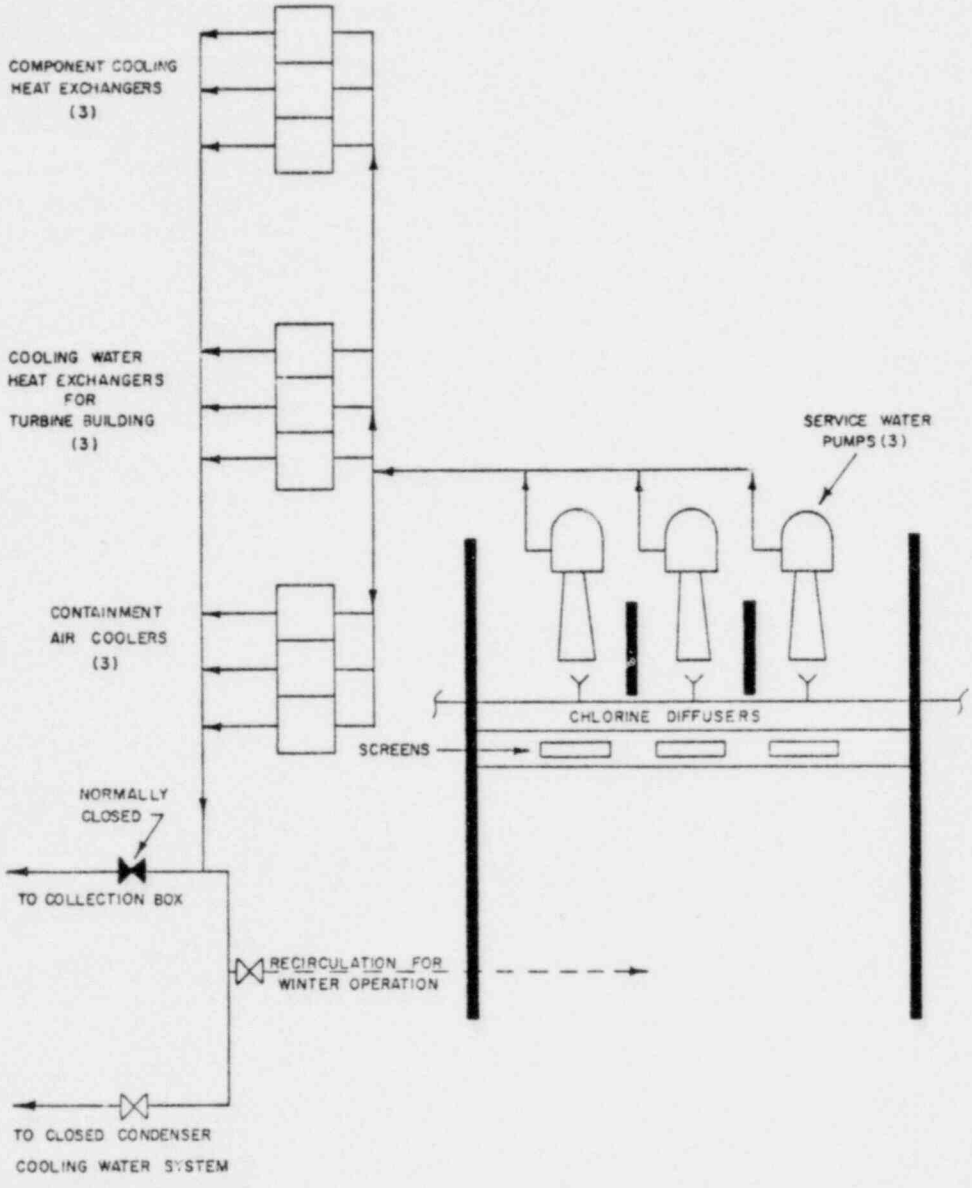
3.3.3 Thermal Discharges to Lake Erie

The general description of the thermal discharge to Lake Erie presented in the FES-CP is still valid.

FIGURE 3 - 1

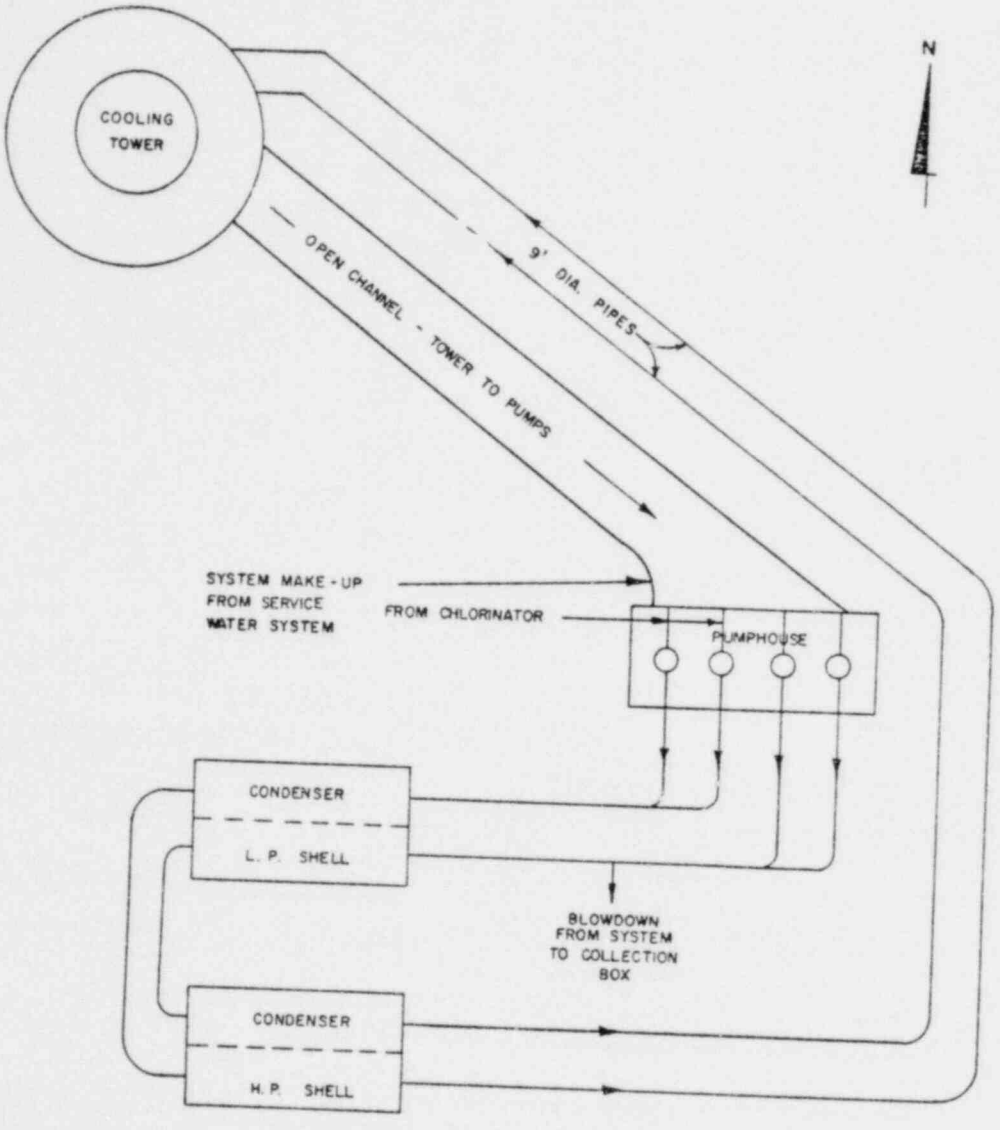
AERIAL VIEW OF THE SITE SHOWING UNIT NO. 1





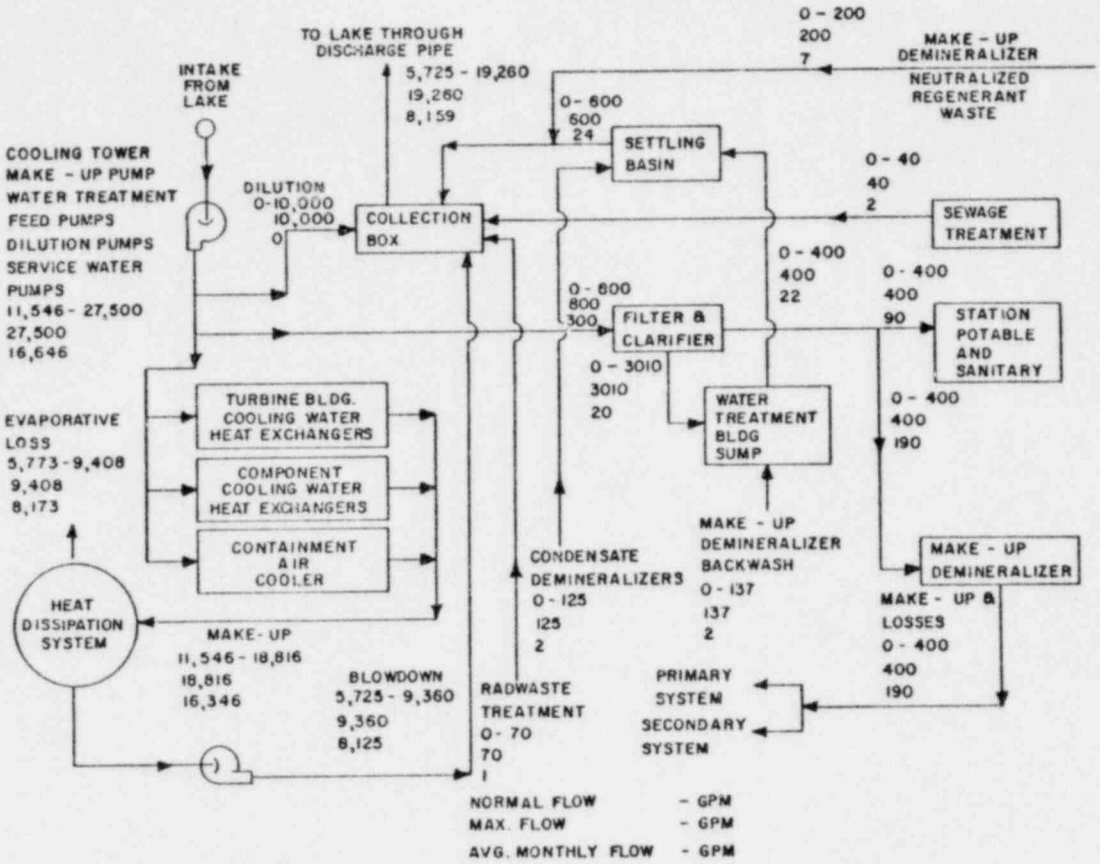
DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 SERVICE WATER SYSTEM

FIGURE 3 - 2



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 CLOSED CONDENSER COOLING WATER SYSTEM

FIGURE 3-3 [2]



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 UNIT WATER USE AND DISCHARGE DIAGRAM

FIGURE 3 - 4

3.4 RADIOACTIVE WASTE TREATMENT

The radwaste systems described in Section 3 of the FES-CP have not been modified in the applicant's Final Safety Analysis Report (FSAR).

The parameters which the staff uses in the evaluation of radwaste systems, however, have been updated to reflect more recent information, since the FES-CP was issued. The parameters and their bases are given in Draft Regulatory Guide 1.BB, "Calculation of Releases of Radioactive Materials in Liquid and Gaseous Effluents from Pressurized Water Reactors (PWR's)." Gaseous source terms have been revised based upon a modified version of the PWR-GASE code using parameters based on more current operating data. The original gaseous source terms have been included for comparative purposes. Parameters used in calculating the revised gaseous source terms which are different from those given in Table 2.1a are given in Table 3.1b. The staff believes the modified gaseous source terms produce a realistic estimate of radioactive material released in effluents from normal operations including anticipated operational occurrences averaged over the life of the plant.

For radioactive material released in liquid effluents, the source term previously set forth in the DES-OL on page 3-8 (Table 3.2) reasonably characterizes the annual average liquid releases that may be associated with the Davis-Besse facility. The staff would not expect the modifications of source terms that may result from our present reassessment of models and parameters to substantially increase the annual releases previously noted.

The liquid source term is 0.3 curies/yr excluding tritium, and 350 curies/yr of tritium, and the gaseous source terms calculated using the current parameters is 9000 curies/yr of noble gases and 0.31 curies/yr of I-131.

The staff has also estimated annual releases of 8 curies/y of C-14 and 0.06 of particulates. The particulate release number assumes that building ventilation air is treated through high efficiency particulate absolute HEPA filters, having a decontamination factor of 15 prior to release to the environment. An isotopic listing of the staff's calculated liquid and gaseous radioactive source terms is given in Table 3.3 and 3.5 respectively.

As discussed in section 5.3 of the DES. it can be said that the individual doses associated with the radioactive releases from the Davis-Besse Nuclear station, combined, will be in accord with the requirements stated in Appendix I to 10 CFR Part 50.

3.5 CHEMICAL AND BIOCIDES

3.5.1 Plant Chemical Usage

In addition to the chemicals identified for use at the plant in the FES-CP, the applicant has identified the following chemicals to be used in systems from which there will be no routine releases: boric acid (reactor coolant system), lithium hydroxide (reactor coolant system), and organic corrosion inhibitor (turbine building closed cooling water system) and morpholine (building closed heating system). These chemicals are typical of those used in reactor and high purity water systems. Releases of these chemicals to the environment is only expected to occur if at all, through system pipe and heat exchanger leaks. Resultant concentrations in the plant discharge are expected to be very small. If any of these systems were examined for maintenance purposes, the coolant would be collected, saved for reuse or disposed of in an approved, controlled manner. Other newly identified chemicals to be used in the systems whose discharges reach Lake Erie are: calcium hydroxide (water treatment system), and sodium aluminate (water treatment system). Concentrations of the various ions in the discharge as a result of the use of these chemicals are given in Tables 3.4 and 3.5.

The use of chlorine in the plant has been changed from that reported earlier. The service water system will be chlorinated continuously to a free residual chlorine level of 0.5 ppm rather than in four 30 minute periods, except during unit shutdown, when the service water system discharge goes directly to the collection box and then to Lake Erie, in which case the chlorination will be limited to 2 hrs/day (ER Supp, p. 3.6-5). The injection point for chlorination of the closed condenser cooling water system has been moved from immediately upstream of the condensers to immediately upstream of the closed circulating water system pumps (ER supp. p. 3.6-5). The intakes of any two of the four pumps will be chlorinated simultaneously. Other uses of chlorine remain as previously stated in the FES-CP. Control of the discharge of residual chlorine will be accomplished by removal of closed cooling water system blowdown from the discharge of the two pumps whose intakes are not currently being chlorinated (requiring a complete circuit of the chlorinated cooling water prior to release, thereby allowing degradation of existing residual from sunlight exposure, removal in the cooling tower and through action of chlorine demanding substances in the makeup and dilution waters). Total residual chlorine in the discharge prior to mixing with dilution flow will be held to less than 0.5. For further discussion, see section 12.3.12.

3.5.2 Chemical Discharge

The following systems will normally discharge effluents through the collection box to Lake Erie (unchanged from FES-CP):

1. Blowdown from the closed condenser cooling water system
2. Service water discharge (during unit shutdown)
3. Neutralized regenerant waste from makeup demineralizers
4. Pumped effluent from the settling basin (water treatment system backwash effluent)
5. Sewage treatment plant effluent
6. Processed liquid radwaste
7. Dilution water from Lake Erie.

Table 3.1a Principal Parameters and Conditions Used in Calculating Releases of Radioactive Material in Liquid and Gaseous Effluents from Davis-Besse Nuclear Station, Unit 1

Reactor Power Level (MWt)	2772
Plant Capacity Factor	80%
Failed Fuel	0.25%(a)
Primary System	
Mass of Coolant (lbs)	5.09×10^5
Letdown Rate to MPS (gmp)	45
Shim Bleed Rate (gpm)	1.65
Leakage to Secondary System (lbs/day)	110
Leakage to Containment Vessel (lbs/day)	240
Leakage to Auxiliary Buildings (lbs/day)	160
Frequency of Degassing for Cold Shutdowns (per year)	2
Secondary System	
Steam Flow Rate (lbs/hr)	1.18×10^7
Mass of Steam/Steam Generator (lbs)	5.0×10^4
Mass of Liquid/Steam Generator (lbs)	4.9×10^4
Secondary Coolant Mass (lbs)	2.93×10^6
Rate of Steam Leakage to Turbine Building (lbs/hr)	1700
Fraction of Feedwater Processed through Condensate Demineralizers	0.67
Dilution Flow (gpm)	10,000
Containment Vessel Volume(ft^3)	2.83×10^6
Annual Frequency of Containment Purges	4
Iodine Partition Factors (gas/liquid	
Leakage to Containment Building	0.1
Leakage to Auxiliary Building	0.001
Steam Leakage to Turbine Building	1
Steam Generator (carry over)	1.0
Main Condenser/Air Ejector	0.0005

Decontamination Factors (Liquid Wastes)

	CLRWS	MLRWS
I	1×10^4	1×10^4
Cs, Rb	2×10^5	1×10^5
Mo, Tc	1×10^4	1×10^6
Y	1×10^4	1×10^6
Others	1×10^5	1×10^5

	All Nuclides Except Iodine	Iodine
MLRWS Evaporator DF	10^4	10^3
CLRWS Evaporator DF	10^3	10^2

	Cation(b)	Anions(b)	Cs, Rb
MPS Mixed Demineralizer DF	10_2	10	2
MPS Cation Demineralizer DF	10^2	1_3	10
Condensate Demineralizer DF	10^3	10^3	10
CLRWS Primary Demineralizer (H^+BO^3) DF	10	10	2
Evaporator Condensate Polishing Deminerlizers (H^+OH^-) DF	10	10	10

	Removal Factor
Removal by Plateout	
Mo, Tc	10^2
Y	10
Charcoal Filter DF(Gaseous Radwaste System)	10

(a) This value is constant and corresponds to 0.25% of the operating power fission product source term.
(b) Does not include Cs, Mo, Y, Rb, Tc.

Table 3.1b Parameters used in calculating the revised releases of radioactive material in gaseous effluents from Davis-Besse Nuclear Station which are different from those listed in Table 3.1a.

Failed Fuel	0.12%[a]
Leakage Rate to Secondary System	100 lb/day
Continuous Containment Purge	1000 cfm
Iodine Partition Factor	
Leakage to Auxiliary Building	0.0075
Main Condenser Air Ejector	0.15 (for volatile species only)

[a]This value is constant and corresponds to 0.12% of the operating power fission product source term.

TABLE 3.2

CALCULATED RELEASE OF RADIOACTIVE MATERIAL FOR
LIQUID EFFLUENT FROM THE DAVIS-BESSE NUCLEAR STATION UNIT 1

RADIONUCLIDE	NORMALIZED Ci/yr
ACTIVATION-CORROSION PRODUCTS	
Na-24	0.00003
P-33	0.00003
Cr-51	0.00011
Mn-54	0.0010
Mn-56	0.00059
Fe-55	0.00011
Fe-59	0.00006
Co-58	0.0048
Co-60	0.0088
Ni-63	0.00001
Nb-92	0.00002
Mo-99	0.00045
Te-99m	0.00043
W-187	0.00012
Np-239	0.00001
Fission Products	
Br-82	0.00003
Rb-88	0.00043
Sr-89	0.00001
Y-90	0.00002
Y-91	0.034
Y-93	0.00001
Mo-99	0.047
Tc-99m	0.045
Te-127m	0.00001
Te-127	0.00002
Te-129m	0.00006
Te-129	0.00004
I-130	0.00012
Te-131m	0.00004
I-131	0.048
Te-132	0.00065
I-132	0.0009
I-133	0.012
Cs-134m	0.00002
Cs-134	0.017
I-135	0.002
Cs-136	0.00088
Cs-137	0.025
Ba-137m	0.0012
Ba-140	0.00001
All others	0.00012
TOTAL (except tritium)	0.3
Tritium	350

TABLE 3.3a

ORIGINAL CALCULATED RELEASES OF RADIOACTIVE MATERIAL AND GASEOUS EFFLUENT FROM DAVIS-BESSE NUCLEAR STATION UNIT 1
(Ci/Yr)

Radionuclide	Decay Tanks	Containment Vessel	Auxiliary Building	Turbine Building	Air Ejector Off-gas	Total
Kr-83m	a	a	2	a	2	4
Kr-85m	a	a	8	a	8	16
Kr-85	760	10	5	a	5	780
Kr-87	a	a	4	a	4	8
Kr-88	a	a	14	a	14	28
Kr-89	a	a	a	a	a	a
Xe-131m	12	2	6	a	6	26
Xe-133m	a	1	15	a	15	31
Xe-133	22	100	1100	2	1100	2400
Xe-135m	a	a	a	a	a	a
Xe-135	a	a	23	a	23	46
Xe-137	a	a	a	a	a	a
Xe-138	a	a	3	a	3	6
I-131	a	0.5	0.019	0.004	0.0014	0.52
I-133	a	0.07	0.023	0.005	0.0017	0.10

NOTE: "a" appearing in the table indicates release is less than 1.0 Ci/yr for noble gas, 0.001 Ci/yr for I.

TABLE 3.3b

REVISED GASEOUS RADIOACTIVE SOURCE TERM Ci/y

Radionuclide	Decay Tanks	Reactor	Auxiliary	Turbine	Air Ejector Exhaust	Total
Kr-83m	a	a	a	a	a	a
Kr-85m	a	8	2	a	1	12
Kr-85	320	49	2	a	a	370
Kr-87	a	1	1	a	a	3
Kr-88	a	10	4	a	2	16
Kr-89	a	a	a	a	a	a
Xe-131m	5	49	2	a	1	57
Xe-133m	a	81	4	a	3	87
Xe-133	9	7900	300	a	190	8400
Xe-135m	a	a	a	a	a	a
Xe-135	a	47	7	a	4	58
Xe-137	a	a	a	a	a	a
Xe-138	a	a	a	a	a	a
I-131	a	0.21	0.057	0.0012	0.036	0.31
I-133	a	0.12	0.07	0.0014	0.044	0.23
C-14						8
H-3						890
Particulates						0.06

NOTE: a = less than 1.0 Ci/yr noble gases, less than 10^{-4} Ci/yr for iodine.
b . rounded to two significant figures

The chemical waste composition resulting from simultaneous maximum flows from all systems is presented in Table 3.4. The annual average composition is presented in Table 3.5.

The estimated composition of the drift from the cooling tower (estimated to be 0.01% of the circulating water flow rate, containing 270 lbs of dissolved solids per day) is presented in Table 3.6. This table assumes a concentration factor of two, except for sulfate (increased more than two-fold by addition of sulfuric acid for alkalinity control) and bicarbonate (decreased to 100 mg/l by sulfuric acid addition).

3.6 SANITARY AND OTHER WASTE SYSTEMS

The Davis-Besse Nuclear Power Station will provide secondary sewage treatment which must meet all Ohio EPA standards for sewage treatment. The effluent will be continuously chlorinated (to a level of 0.5 ppm free residual chlorine) for fecal coliform organism control prior to mixing with other wastes in the collection box. With other releases at minimum and sewage plant releases at maximum (40 gpm), a dilution factor of greater than 200 will be realized before mixing in the lake. The auxiliary boiler blowdown, resulting from operation of a 175,000 lb per hour, 234 psig oil fired boiler will be discharged approximately once per year to a blowdown tank. The condensate from this tank will be discharged to the storm sewer system (to the Toussaint River). An estimated operation time of 725 hours per year (operation only during unit startup or shutdown), utilizing demineralized water and deaerated condensate from the main condensate system as feedwater, was used as the basis for estimating condensate composition as shown in Table 3.7.

3.7 TRANSMISSION LINES

The description of the transmission lines associated with Davis-Besse Unit 1 is as presented in FES-CP Section 3.7. The network as shown in Figure 3.10 of the FES-CP has been completed except for the construction of two towers bases at the Toussaint River crossing and the stringing of wire for approximately one mile of transmission line wire associated with those towers.

TABLE 3.4

MAXIMUM CHEMICAL DISCHARGE COMPOSITION UNIT 1

	Cooling Tower Blowdown	Dilution Flow	Neutralized Regenerant Wastes	Settling Basin Effluent	Sewage Treatment Plant	Discharge To Lake Erie
Flow (gpm)	8,350	10,000	200	600	40	19,260
pH	8.0	8.0	7.0	9.6	9.0	8.0
Calcium (Ca)	108	54	324	15	15	79
Magnesium (Mg)	18	9	61	9	9	13
Sodium (Na)	24	12	2,205	12	12	40
Chloride (Cl)	80	40	273	40	40	60
Nitrate (NO_3)	14	7	25	7	7	10
Sulfate (SO_4)	244	58	5,100	58	58	191
Phosphate (PO_4)	2	1	6	1	1	1
Silica (SiO_2)	2	1	31	1	1	2
Total Alkalinity as $CaCO_3$	80	107	52	29	29	92
Suspended Solids	50	37	5	5	15	41
Dissolved Solids	572	289	8,077	172	172	488
BOD	2	1	1	1	14	1
Dissolved Oxygen	7	10	9	9	0	9

All values in mg/l except pH

This table represents the maximum concentrations corresponding to the worst ambient lake water chemical conditions at times of high dilution flow. The total flow to Lake Erie includes 70 gpm (maximum) of processed effluents from nuclear areas. This waste stream contains essentially zero dissolved solids and has a pH of 7.0.

Although calculations assume all these maximums occurring at the same time, it is highly unlikely to happen. If it did occur, it would be for only a short period of time.

TABLE 3.5

AVERAGE CHEMICAL DISCHARGE COMPOSITIONS UNIT 1

	Cooling Tower Blowdown	Dilution Flow	Neutralized Regenerant Wastes	Settling Basin Effluent	Sewage Treatment Plant	Discharge To Lake Erie
Flow (gpm)	8,125*	0	7	24	2	8,159
pH	8.0		7.0	9.6	9.0	8.0
Calcium (Ca)	84		481	15	15	84
Magnesium (Mg)	18		114	9	9	18
Sodium (Na)	30		1,784	15	15	31
Chloride (Cl)	44		300	22	22	44
Nitrate (NO_3)	12		42	6	6	12
Sulfate (SO_4)	174		4,890	41	41	178
Phosphate (PO_4)	0.6		3	0.6	0.6	0.6
Silica (SiO_2)	2		5	1	1	2.0
Total Alkalinity as $CaCO_3$	100		89	29	29	100
Suspended Solids	45		5	5	15	45
Dissolved Solids	465		7,708	139	139	470
BOD	4		2	2	14	4
Dissolved Oxygen	7		9	9	0	7

All values in mg/l except pH

This table represents the average annual concentrations and flows. The total flow to Lake Erie includes 1 gpm of processed effluent from the nuclear area. This waste stream contains essentially zero dissolved solids and has a pH of 7.0.

*Average cooling tower blowdown was computed using blowdown flows for February thru December. The flow for January was not used because of abnormally cold weather, during the period which onsite meterological data was collected, resulting in an unrepresentative blowdown flow.

6

TABLE 3.6

DISSOLVED SOLIDS DISCHARGED IN COOLING TOWER

	Concentration in Drift (mg/l)	Percentage of Total	Deposits (lb/day)
Total Dissolved Solids	465	100.0	270.0
Calcium	84	18.1	48.9
Magnesium	18	3.9	10.4
Sodium	30	6.5	17.4
Chloride	44	9.5	25.4
Nitrate	12	2.6	6.9
Sulfate	174	37.4	101.2
Phosphate	1	0.2	0.6
Silica	2	0.4	1.2
Bicarbonate	100	21.4	58.0

7

TABLE 3.7

TYPICAL AUXILIARY BOILER FEEDWATER AND BLOWDOWN ANALYSES

	Auxiliary Boiler Feedwater	Boiler Blowdown Water
Fe, max	0.1 mg/l	1.0 mg/l
Cu, max	0.05 mg/l	0.5 mg/l
SiO_2, max	0.02 mg/l	0.2 mg/l
Dissolved O_2	0.007 mg/l	0.007 mg/l
Total Dissolved Solids and Suspended Solids, max	10 mg/l	100 mg/l
pH at 77°F	9.3-9.5	9.3-9.5

REFERENCES

1. Toledo Edison Company. Davis-Besse Nuclear Power Station Unit 1, Supplement to Applicant's Environmental Report, Operating License Stage, Docket No. 50-346.

2. Ibid., p. 4-9.

3. Ibid., p. 3.3-10.

4. Ibid., p. 3.6-8.

5. Ibid., p. 3.6-3.

6. Ibid., p. 3.6-13.

7. Letter from L. Roe, Vice President Toledo Edison Company to George W. Knighton, U. S. Nuclear Regulatory Commission, June 30, 1975.

4. ENVIRONMENTAL IMPACT OF SITE PREPARATION AND CONSTRUCTION

Résumé

Section 4 of the FES-CP described the environmental impacts that had taken place due to site preparation and construction through March 1973 and the staff's evaluation of those impacts. At that time, the station was approximately 45% complete. The following sections present additional information related to the continued construction of the facility.

As of March 1975, the construction of Unit No. 1 was over 80 percent complete. Commercial operation had been projected by the applicant for the spring of 1975, but now is projected for mid 1976. The applicant indicates that the original construction schedule has not been maintained due to a combination of the following:[1]

1. Receipt of a Construction Permit was five months later than the original schedule allowed for, delaying work on the containment vessel which was not included in the Construction Permit exemption.

2. The continuing evolution of NRC requirements has resulted in design changes to assure that the unit is acceptable for issuance of an Operating License. (Any change that would have altered the environmental impacts are addressed in this Environmental Statement.)

3. Delayed availability of materials and equipment for installation has been experienced. This is due in part to the complexity of the equipment; stringent quality assurance/quality control requirements; additional requirements of ASME code; the lack of basic material availability such as valve forgings, pump casing castings, and steel plate (particularly that associated with stainless steel tanks); and the lack of manufacturing space availability nationally during the period.

4. General unavailability of skilled craftsmen in critical areas contributed to schedule delay and decreased productivity. In particular, shortages of qualified pipe fitters and welders existed, and continues to exist, at various stages during the project.

5. Lower productivity than expected has transacted, due in part to cramped working quarters and to fulfillment of detailed quality assurance requirements. Rework resulting from design modification also contributed to lower productivity than originally expected.

6. The complexity of designing, procuring, and constructing a large nuclear unit has exceeded previous expectations, with a resulting lag in release of design/construction details in some areas.

4.1 EFFECT OF SITE PREPARATION ON TERRESTRIAL ECOLOGY

Construction of the station required the use of 56 acres of land for buildings exclusive of the cooling tower and 46 acres for borrow pits which will be filled with water for ponds. Habitats vital for important species were not preempted by construction nor was any other specially important natural resource. The major effects of construction, which consist primarily of removal of natural resources such as wildlife habitat and farmland and conversion to industrial use, have already taken place.

Marshes of the site are under control of the Bureau of Sport Fisheries and Wildlife and are being preserved for water fowl habitat. About 600 acres of the wildlife refuge marsh are under Bureau management. This is on balance a net benefit to wildlife of the area.

Acquisition of transmission right of way and corridor clearance is virtually complete. The staff assessment of route selection and impacts on biota remains unchanged from that of the FES-CP stage (p.4-1). No unacceptable adverse effects on biota are anticipated. Herbicides will not be used for corridor maintenance.

4.2 EFFECTS OF SITE PREPARATION ON WATER QUALITY

The staff has presented their analysis of the expected effects of construction of the temporary barge channel, the installation of the intake and discharge pipelines and the preparation of the main station area in the construction permit environmental review (CP FES pp. 4-2 thru 4-5). At that time, only short term effects on water quality in the plant vicinity were predicted. The results of the preoperational environmental monitoring program as reported in the semi-annual environmental monitoring reports covering the period from January 1, 1974 thru December 31, 1974,[2,3] indicate that there is evidence of improvement over data for 1973 in factors relating to turbidity in the Locust Point vicinity of Lake Erie. Conductivity has decreased, turbidity measurements have decreased and correspondingly, transparency has increased. As anticipated, these changes are related to the cessation of activities relating to the installation of the intake and discharge structures and pipelines.

4.3 EFFECT OF SITE PREPARATION AND CONSTRUCTION ON AQUATIC ECOLOGY

At the time the FES-CP for the Davis-Besse Nuclear Power Station Unit 1 was issued, the staff indicated that the construction of the barge channel for delivery of the reactor pressure vessel to the site, and dredging and backfilling of the trenches for the intake and discharge piping would produce some slight short-term damage to aquatic life in the immediate vicinity, but no lasting effects on the aquatic environment were expected. No additional site preparation or construction impacts on Lake Erie ecology beyond those mentioned above were identified during the OL review. The applicant's environmental monitoring of dredging and backfilling operations suggests that decreases in benthic populations occurred in the immediate vicinity during late spring and summer of 1973. Results from 1974 monitoring indicate recolonization of these areas by benthic organisms and the presence of populations greater than those measured in 1973 during construction. The staff concludes that temporary changes in benthic populations resulting from construction-related activities have not had a significant adverse impact on aquatic populations in the vicinity of the station.

4.4 EFFECTS ON THE COMMUNITY

Fuel loading is presently scheduled for 1976. The transmission system has been virtually completed and although the construction schedule has been extended approximately eighteen months, the impacts on the community presented in the FES-CP stage are still valid.

REFERENCES

1. Letter from L. Roe, Vice-President, Toledo Edison Company to E. G. Case, U. S. Nuclear Regulatory Commission, February 11, 1975.

2. Toledo Edison Company, Semiannual Pre-operational Monitoring Report Unit 1, Vols. I and IA, Jan. 1974 - June 1974, issued August 30, 1974.

3. Toledo Edison Company, Semiannual Pre-operational Monitoring Report Unit 1, Vol. II, July 1974 - December 1974, issued February 28, 1975.

5. ENVIRONMENTAL EFFECTS OF STATION OPERATION

Resume

There have been two major changes related to the staff's evaluation of environmental effects of station operation since the issuance of the FES-CP. The radiological impact sections have been completely revised due to the calculation of new source terms. Major changes to applicable water quality criteria for Lake Erie have been made, requiring a new staff evaluation of the ability of the station to meet the new criteria. These changes, as well as minor revisions, such as reduced intake velocity, are addressed in the following sections.

5.1 EFFECT ON LAND USE

The staff considered the environmental effects of station operation on land use in the FES-CP, Section 5.1. It was concluded that the station would produce a very small effect on land use, that the presence of the station would not affect access to Lake Erie, and that the cooling towers would have a visual impact in the surrounding area. The information relied on for those conclusions is still considered valid and the staff's conclusion remains unchanged.

5.2 EFFECT ON WATER USE

5.2.1 Water Flow Plan

The description of the water flow plan presented in the FES-CP is still valid.

5.2.2 Water Consumption

The estimate of consumptive use of water by the plant has been revised and is shown in Figure 3.4 based on updated meteorological information of the site. The evaporative loss in the cooling tower is expected to range from 5,773 gpm to 9,408 gpm with an average of 8,173 gpm (~17 cfs) depending on climatic conditions and plant load. This is below the previous estimate (FES-CP p. 5-2) of 9,225 gpm, (21 cfs), and will have no significant impact on the overall water balance of Lake Erie. There will be no use of groundwater by the station.

5.2.3 Thermal Discharges

The Ohio Environmental Protection Agency has recently revised the water quality standards for the State as published in Regulation EP-1.[1] These new standards became effective on January 8, 1975. A major change to the applicable water quality criteria for the Davis-Besse Nuclear Power Station is the allowable thermal discharge to Lake Erie. These new criteria appear in the Ohio EPA water quality standards Section EP-1-03(b)(4)(c). The acceptability of a thermal discharge in Ohio waters is determined after consideration of such factors as the acclimation temperatures for important aquatic species at various life stages and times of the year. The necessary information in these subject areas for the designated aquatic species have been presented by the applicant in the application to the State of Ohio for a discharge permit (FWCA Sec. 402). The Ohio EPA has indicated tentative acceptance that the applicant has successfully demonstrated that the thermal discharge does comply with the mixing zone provisions of regulation EP-1-03(B)(4)(c) by issuing a proposed National Pollutant Discharge Elimination System (NPDES) permit to the applicant (see Appendix B). There has been no change to the staff analysis of the temporal and spatial distribution of waste heat from the Davis-Besse Nuclear Power Station. The staff believes that the volume of water in Lake Erie subjected to small increases above lake ambient temperature ($\leq$5°F) will result in small time-temperature exposures for both motile and planktonic aquatic species. Therefore, the staff believes that the station will operate within the revised standard's limitations.

5.2.4 Scouring of Lake Bottom

Because there have been no changes in the location or design of the discharge structure for the plant, there is no change in the staff assessment of little potential for scouring of the lake bottom due to discharge of plant effluent at a maximum of 6.4 fps over approximately 200 ft of riprap.

5.2.5 Chemical Effluents

The character of the routine chemical effluent from the Davis-Besse Nuclear Power Station has changed very little from that presented in the FES-CP. None of these changes (e.g., an expected pH of 8.0 vs. 7.3 in the FES-CP; an increase in total dissolved solids in the effluent from 427 ppm to 488 ppm) is sufficient to alter the previous staff assessment of the effects of the chemical release of the plant on lake water quality or water use. No detectable effect is expected.

The plant discharge, a submerged single slot jet diffuser, is located approximately 1200 ft. offshore, well within the excepted zone designated for Magee Marsh by the Ohio Water Quality Standards (see sec. 2.5.3). This zone extends approximately 2100 ft. offshore. The allowable mixing zone for the chemical discharge extends a maximum distance from the diffuser of one-tenth of the width of the near shore zone of the western basin of Lake Erie, which is the distance from the shoreline to the 18 foot depth contour line. This distance is approximately 4.0 statute miles or 21,120 ft. at the site vicinity. Thus, the allowable chemical mixing zone length is 2112 ft. The edge of the chemical mixing zone will then be beyond the boundary of the excepted area, but within the boundary of the near shore zone. Therefore, the chemical water quality standards that apply in the mixing zone are those of regulation EP-1-03(C)(1)(a) and those that apply at the edge of the mixing zone are contained in EP-1-07. Even though the discharge is in relatively shallow water (approx. 12 ft.), the chemical releases, being concentrated to approximately twice the ambient lake levels, will not violate the applicable standards for the mixing zone. Due to the large size of the mixing zone and the dilution of the releases by virtue of the jet type discharge, water quality standards outside the mixing zone will be met.

The staff has considered the compliance of the operation of the plant with recent EPA "Effluent Limitations and Guidelines for the Steam Electric Power Generating Point Source Category" (39 FR 36186). The applicable paragraphs of these guidelines are 423.12, and 423.13 (see Appendix C). The staff evaluation of the expected station performance with each subpart of these paragraphs is discussed below:

Paragraph No.	Description of Compliance
423.12(b)(1) 423.13(a)	The pH of Unit 1 discharges to Lake Erie will be 8.0 under all conditions. This is in compliance with this requirement. However, the proposed NPDES permit for Unit 1 indicates that there is no pH limitation on the discharge stream to the Toussaint River. Thus, waste streams such as the auxiliary boiler blowdown condensate, an infrequent and low volume waste source, are not presently controlled to meet the provisions of this part.
423.12(b)(2) 423.13(b)	The applicant will comply with this provision by stipulation in the discharge permit.
423.12(b))(3) 423.13(c)	The applicant will intercept all oil attempting to leave the facility through oil interceptors in all drains and expects to remove virtually all of it. The staff believes that the limitation on oil and grease will be met with the present system. The staff believes that the limitation on TSS (total suspended solids) in the guidelines will be met by the individual plant systems that characteristically contain TSS in their effluent (e.g., sewage treatment effluent, settling basin effluent).
423.12(b)(4) 423.13(d)	Not applicable.
423.13(e)	Not applicable.
423.12(b)(5) 423.13(f)	The applicant has stated that the initial plant startup cleaning solutions and wastes will not be discharged to the receiving waters, but will be trucked off site for disposal in an approved manner. Therefore, the applicant will comply with this requirement. (ER Suppl. 1 CP Stage p. 4-40). Periodic cleaning of the steam generator and the service water system heat exchangers will be required. Although these processes are not specifically identified by the applicant, the staff believes that they would be treated in a similar manner to those startup wastes, thus complying with the limitations of this part.

423.12(b)(6) 423.13(g) As stated earlier in Section 3.6, the applicant plans to discharge these wastes to the Toussaint River approximately once each year. The discharge concentration will be in compliance with the provision of this part (See Table 3.7).

423.12(b)(7) 423.13(h) Not applicable.

423.12(b)(8) The applicant will periodically chlorinate the closed condenser circulating water system to maintain, during periods of chlorination, a maximum of 0.5 mg/l and an average of 0.2 mg/l free chlorine residual. Even without the expected degradation of free residual chlorine in the cooling tower circuit, this will comply with the limitations for chlorine releases of this part. The chlorination of the service water system will be controlled to a free residual chlorine level of 0.5 mg/l during normal operation of the plant. This residual is expected to degrade significantly during passage through the closed condenser circulating water system due primarily to chlorine demand in the system's waters and also exposure to sunlight in the cooling tower. This action is expected to bring the releases of free residual chlorine within the limitations of this part.

During unit shutdown, when the service water system discharge is directed to the collection box, chlorination will be limited to 2 hours per day to a level of 0.5 mg/l free residual chlorine maximum. However, this discharge will be controlled to comply with the limitations of this part by stipulation in the NPDES permit.

423.13(i) Since the applicant will not use any corrosion inhibitors in the closed condenser cooling water system the limitations on corrosion inhibitors will be met.

423.12(b)(9) 423.13(j) The applicant plans to periodically chlorinate the closed condenser cooling water system (from which blowdown is removed) for up to four 30 minute periods per day.

Because of the time necessary to flush the closed condenser circulating water system by blowdown removal, chlorination of this system for the maximum time estimated may result in residual chlorine being discharged from the station for greater than two hours per day, which will not be in compliance with the provisions of this part.

Since the service water system is continuously chlorinated and this water reaches the receiving water after passing through the main condenser cooling circuit, the potential exists for residual chlorine to be discharged for a period greater than 2 hrs/day. The staff believes that the chlorine demand of the unchlorinated main condenser cooling water (1.4 mg/l ref: OL-ER Suppl. Table 3.3-1) will reduce the chlorine residual to an undetectable level.

423.13(k) The applicant will discharge blowdown from the cold side of the recirculation loop and thereby comply with this limitation.

No detectable effects on water quality or uses are expected due to effluent from the sewage treatment plant. The BOD^5 of the effluent will be below the State of Ohio limits and the effluent will be continuously chlorinated to control bacteria at an almost zero level.

5.3 COOLING TOWER EFFECTS

5.3.1 Choice of Cooling System

5.3.2 Possible Atmospheric Effects

5.3.3 Experience with Natural-Draft Cooling Towers

The information relied on for the discussion of the cooling tower, the atmospheric effects, and the experience with natural draft tower is still considered valid by the staff.

5.3.4 Predictions for the Station Cooling Tower

The only change in the predictions of the impacts of the station cooling tower operations is related to drift. This change is a result of the updated water quality information for the site. The staff examined the possible effects of cooling tower drift in the FES-CP (p 5-10). No measurable effects on terrestrial biota were expected due to drift, fogging, or icing. A revised estimate of drift emission has since been made available which indicated a slightly higher level of emission than previously estimated although the assumed operating parameters of the tower have not changed. Drift emission is currently estimated to be about 270 pounds per day instead of 247 pounds per day as previously estimated. The staff's evaluation of the increased drift is still that there will be no adverse effect of drift on terrestrial biota.

5.4 EFFECT ON TERRESTRIAL ENVIRONMENT

The following information updates the staff's evaluation of terrestrial impacts due to station operation.

5.4.1 Wildlife

Loss of habitat and bird collision with the cooling tower are the primary impacts of the plant on animals of the area. At the CP review, the staff did not find that the loss of habitat would be unacceptable to the biota since the site consists primarily of marsh areas, which are being protected, and farmland or disturbed woodlands. At the present stage of construction for Unit 1, the loss of habitat has been completed and no further alteration is expected.

The cooling tower is within major flyway of migratory song birds and waterfowl and some hazard of bird mortality due to impaction on the tower exists. The staff assessment of this possibility in the FES-CP stage concluded that birds were not likely to be killed in large numbers but that a few mortalities at varying intervals were likely. Since that assessment, the applicant has submitted data on impactions (Table 6.3). These results are consistent with the original assessment. A total of 157 birds mostly Warblers and Kinglets were killed on station structures during the migratory periods of 1972-1973. During the 9-week autumn migratory season in 1974, 342 dead birds were recovered.[19] Eighty-two percent were recovered from the cooling tower, 15.5% from Unit 1 structures and 2.8% from the meteorological tower. Warblers and Kinglets were again the most frequently affected. The increase in bird numbers may not be due to increased numbers of collisions since the applicant increased his frequency of collection in 1974. Studies based on small samples show that scavengers (raccoons, skunks, foxes, etc.) may take up to 88% of the fallen birds if they are not collected quickly after they fall. All counts to date are, therefore, probably underestimates of true collision frequency.

Two species which appear on the list of rare, declining or endangered birds (Table 2.10) have thus far collided; these are the Yellow Warber (6 impactions) and the Pine Warbler (7 impactions). These species do not appear on the U.S. Department of Interior list of endangered species. While it is generally undesirable to adversely affect these species, the staff notes that the number involved is small and reliable methods for prevention of impactions are not available. No waterfowl have collided with the tower. Mortalities in the number reported do not constitute a threat to the species involved, and continued monitoring will be required until the long term impacts have been established.

The waterfowl which utilize the site are an important wildlife resource. Navare Marsh, which is the principal waterfowl habitat on site, has been protected from construction effects and is, for the benefit of waterfowl, under the management by the Bureau of Sport Fisheries and Wildlife. This arrangement gives reasonable assurance that there will be no unacceptable adverse effects of the plant on waterfowl resulting from any further construction of Unit 1 and the subsequent operation of the station.

5.4.2 Noise

The staff has reviewed the predictive technique utilized by the applicant for estimating noise levels in the plant vicinity during operation (see ER Suppl. sec 6.2.6) as well as the baseline noise measurements (see ER Suppl. sec 2.9).

The staff agrees with the applicant that the predictive technique employed is conservative in that no sound attenuation was accounted for by intervening structures, meteorological conditions or topographical features in estimating population exposure levels. Thus the predicted increase in numbers of permanent and non-permanent area residents exposed to higher than "acceptable" (ref. 2, 3) levels could be expected to be lessened somewhat. The applicant's predictions (see

Figures 5.1 and 5.2) indicate that the current number of permanent area residents experiencing daytime background sound levels in excess of both the HUD "acceptable" noise level of 45dBA[2] and the EPA "identified level" for public health and welfare of 55dBA[3] will be increased by approximately 10% and 8%, (26 and 4) respectively. The corresponding nighttime exposure increases will be 29 residents (compared to 0 residents for preoperational conditions) for the HUD guidelines and no increase for the EPA "identified level".

Because response to subhearing loss or annoyance levels of noise is subjective in nature and because of variables not accounted for in the applicant's analysis such as the presence of attenuating conditions which may or may not mitigate the effects, the staff will require the applicant to confirm the predictions made concerning operational noise levels in the site vicinity. The requirement for this special study will be set forth in the Environmental Technical Specifications.

5.4.3 Transmission Rights of Way

Herbicides

The applicant plans no use of herbicides for transmission corridor maintenance. No adverse effects are therefore anticipated.

Ozone

The staff considered possible adverse effects of ozone along transmission line in the FES-CP stage (p. 12-27 comment 10C). It was concluded at that stage that no adverse effects due to ozone generation could be anticipated. The information relied on for that conclusion is still considered valid and the staff conclusion at this stage remains unchanged.

Effects of Induced Currents

The question of electrostatically induced currents in metal structures near EHV transmission line rights-of-way was not addressed at the CP stage except in reference to possible effects on railway signal and communication circuits. Recent information indicates that electrostatic effects in fences, metal buildings, and motor vehicles are also possible but do not present hazards of lethal electric shock to humans or animals. However, shock ranging from "barely perceptible" to "real jolt" has been received from metal structures and vehicles beneath EHV lines. A fire hazard may exist if vehicles are refueled beneath EHV lines.

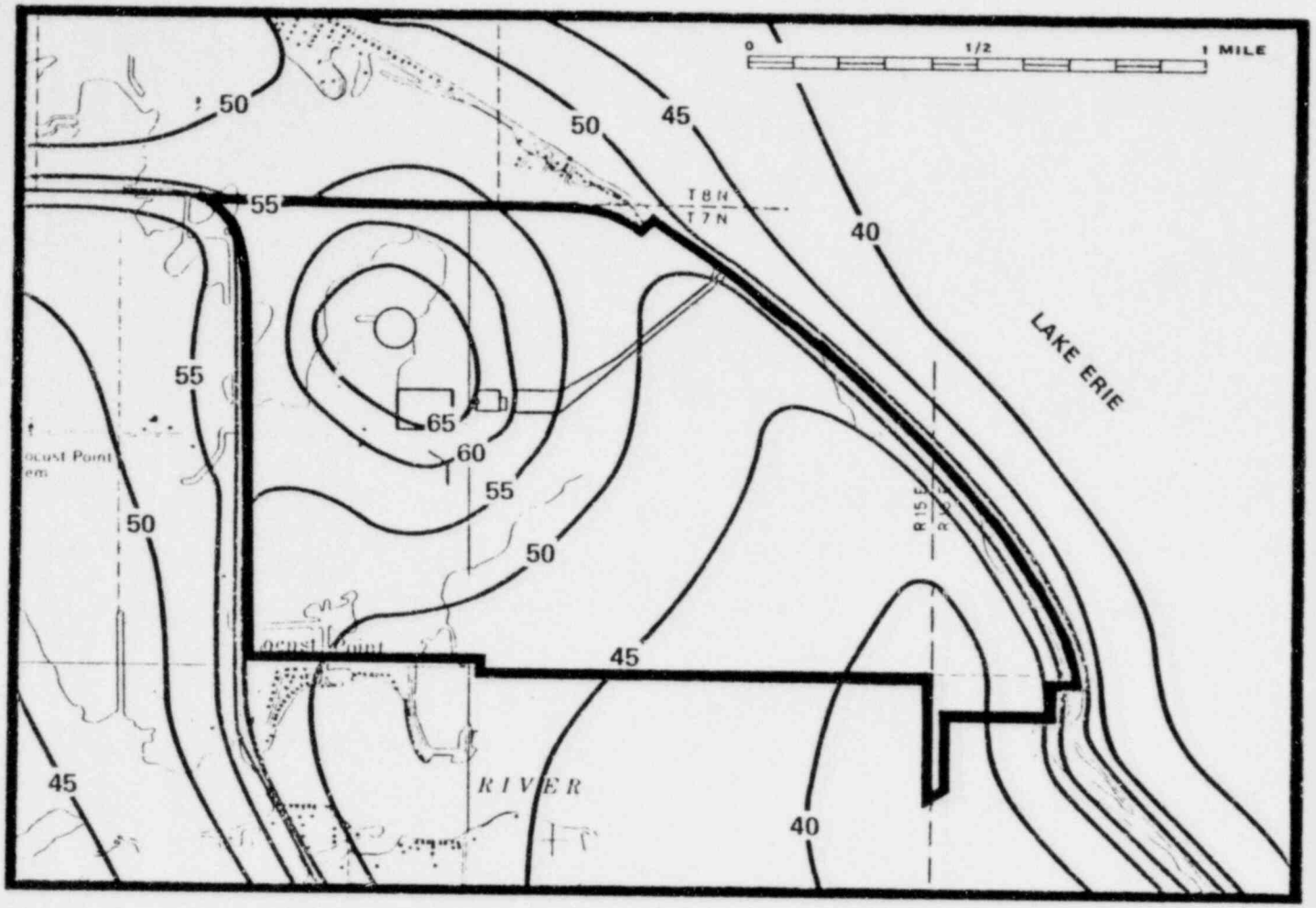
The staff concludes that electrostatic induction could cause inconvenience and varying degree of nuisance to residents who live near the corridors but there is no likelihood of mortality caused by electrocution of persons or animals from the applicant's lines.

5.5 EFFECTS ON AQUATIC ENVIRONMENT

5.5.1 Intake Effects

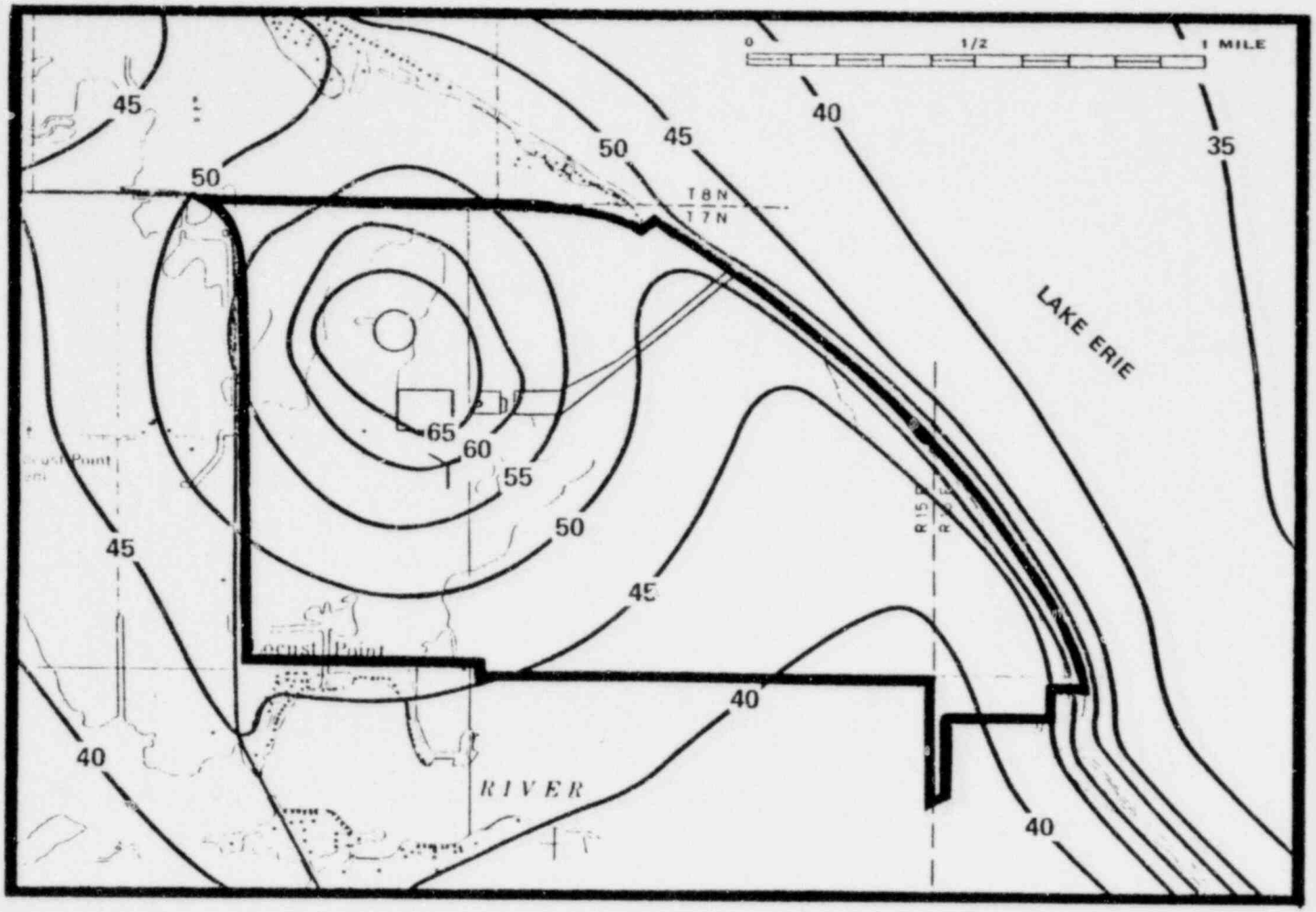
Inpingement of Fishes

The vertical downflow through the slots in the intake crib will be a maximum of 0.25 feet/second at the design intake flow of about 42,000 gpm.[4]. The actual velocity which will be experienced at the expected intake flow of approximately 16,700 gpm will be about 0.10 feet/second. These low intake velocities do not entirely eliminate the potential for impingement. It is questionable whether the bubble screen which has been installed at the intake crib will be effective in deflecting fishes. The applicant's preoperational aquatic monitoring program and experience gained at similar nuclear power plants indicate that emerald shiner, spottail shiner, gizzard shad and alewife will be impinged in greatest numbers. Survival of fishes washed from the traveling screens and sluiced through a trough to the holding basin is not expected to be high, based on low survival rates experienced at other nuclear power plants along the Great Lakes. The staff expects that impingement losses at the plant will not significantly affect the fisheries of Lake Erie. The staff will require and evaluate future monitoring of fishes in the lake and intake canal to ensure that unacceptable impingement losses are not incurred. The effect of the marsh control pumps on the abundance and distribution of fishes in the vicinity of the site will be investigated as appropriate.



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 DAYTIME OPERATION SOUND LEVEL CONTOURS (dBA)

FIGURE 5 - 1



DAVIS - BESSE NUCLEAR POWER STATION UNIT NO. 1 NIGHTTIME
OPERATIONAL SOUND LEVEL CONTOURS (dBA)

20

FIGURE 5 - 2

5.5.2 Station Passage Effects

Entrainment of Plankton and Fish Life-Stages

Phytoplankton, zooplankton, and fish eggs, larvae and young small enough to pass through the 1/4"-mesh openings of the traveling screens will either be retained by the 1/16"-mesh strainers following the cooling tower makeup and service water pumps or continue on through the condenser. On the average an organism will spend about 20 hours in the station, during which time it will go through periods of chlorination and several trips through the condenser and pumps. It is assumed that all organisms entrained within the Davis-Besse Unit 1 heat dissipation system will be killed by a combination of mechanical, thermal and biocidal effects.[4,5,6] The staff does not agree with the approach used by the applicant to assess potential impacts which may result from entrainment losses at the station. A comparison of the number of organisms entrained in the intake volume of the plant at design flow with an assumed homogenous distribution of the same organisms in the calculated flow through the western basin of Lake Erie and in the volume of the entire lake does not provide a valid assessment of regional impact. However, the staff expects that entrainment losses will not significantly alter local populations of plankton and fishes at the Davis-Besse Site. This conclusion is based on (1) the low fish egg and larval densities at the site which indicate that it is not a major spawning area, (2) the distribution of known spawning areas along the southwest shore of Lake Erie, (3) the offshore location of the intake crib, and (4) the relatively small volume of water withdrawn from the lake by the plant. The staff will require the applicant to monitor phytoplankton, zooplankton, and ichthyoplankton at the site to verify this evaluation. This monitoring program will be included in the Environmental Technical Specifications which becomes part of the operating license.

5.5.3 Discharge Effects

Scouring

Approximately one-half acre of lake bottom in the immediate vicinity of the discharge jet has been covered with riprap, permanently altering the benthic community. The riprap extends approximately 200 feet out from the discharge structure beyond the influence of an induced current of 0.5 fps, thus preventing scouring of sediments.[4] Benthic organisms which have recolonized the area associated with the discharge facility will experience induced currents when the plant becomes operative. The areas experiencing currents in excess of 1.0 and 0.5 fps will be 0.014 and 0.086 acres, respectively.[4] Epibenthic organisms presently inhabiting the area of induced discharge currents of 0.5 fps or greater may be swept clear and deposited on nearby areas. The discharge structure and its induced currents should have no discernible effect on the benthic ecology of the western basin of Lake Erie or the Lake as a whole. The staff considers the disruption of a small amount of benthic habitat to be acceptable when compared to the prevention of continuous scouring of sediments which would otherwise result at the discharge.

Thermal Discharge

Water from the station collection basin will be discharged into Lake Erie. This effluent generally will be warmer than Lake Erie, except for a few days in fall when it will likely be a few degrees cooler.[4] Under conditions of maximum heat discharge (138×10^6 BTU/hr) the plume of water warmer than 3°F above ambient will cover about 0.9 acres.[4] Approximately 73 acres will be contained within the 1°F isotherm.[6] Residence time within the 1°F isotherm usually will be less than 15 minutes, but may be as long as one hour. Thermal effects caused by entrainment of phytoplankton, zooplankton, and fish eggs and larvae in the discharge plume are not expected to measurably alter the aquatic populations in the western basin of Lake Erie or the Lake as a whole. The slight increase in temperature experienced for a short time by entrained organisms will not induce significant shifts in species composition or abundance in these areas.

Thermal Shock

Fishes will be attracted to the perimeter of the thermal plume during winter and early spring.[4,6] The high velocity of the discharge and natural avoidance reaction of most fishes to lethal temperatures will discourage them from residing in the immediate vicinity of the discharge jet. Most of the small plume area where fish could congregate will be only a few degrees above Lake ambient temperatures. It is unlikely that these fishes would be killed by cold shock if the station shutdown suddenly.

Chemical Discharge

The total dissolved solids concentration in the discharge water will be about twice that of Lake Erie water because of evaporation loss of water in the cooling tower.[6] The constituents of the dissolved solids will be essentially the same as those of lake water (Table 2.4). Their concentrations in the discharge water will be reduced rapidly by dilution with entrained lake water. Concentrations of dissolved solids greater than 15% above ambient will be confined to an area less than one acre at a discharge rate of 19,260 gpm.[4] Mortalities resulting from exposure of aquatic biota to dissolved solids concentrations approximately double lake ambient are not expected to have a discernible effect on the local aquatic biota. Total dissolved solid levels in Lake Erie varied by a factor greater than 4 in 1974[3]. Free chlorine in the discharge water will be kept to a minimum and total residual chlorine is predicted by the applicant to be at or below prediction and that a total residual chlorine concentration of 0.5 mg/l maximum in the discharge for short periods of time will not significantly alter aquatic populations at the Davis-Besse Site. The staff evaluated the effect on the aquatic environment from discharging chlorine at the 0.5 mg/l level in FES-CP. This level is allowed by the new EPA guidelines. In that evaluation the staff estimated that a toxic zone within 50 feet of the discharge could be produced during the intermittent discharges. Due to the high discharge velocity of the blowdown, the staff concluded that no adult fish would likely be subjected to toxic concentrations, but that there could be a sublethal effect on the reproductive capacity of scuds (amphypods), which is not considered to be an important food source at the site. The staff's previous evaluation that the impact on the aquatic ecology due to the intake of lake water and discharge of heated, sometimes chlorinated, water will be negligible is unchanged. In addition, the staff has evaluated the applicant's proposal to continuously chlorinate the service water system. This water reaches Lake Erie after passing through the main condenser cooling circuit. The staff believes that the chlorine demand of the unchlorinated main condenser cooling water will reduce the chlorine residual to an undetectable level and that the aquatic impact resulting will be negligible.

5.6 RADIOLOGICAL IMPACT ON BIOTA OTHER THAN MAN

5.6.1 Exposure Pathways

The pathways by which biota other than man may receive radiation doses in the vicinity of a nuclear power station are shown in Figure 5.3. Two comprehensive reports[7,8] have been concerned with radioactivity in the environment and these pathways. They can be read for a more detailed explanation of the subjects that will be discussed below. Depending on the pathway being considered, terrestrial and aquatic organisms will receive either approximately the same radiation doses as man or somewhat greater doses. Although no guidelines have been established for desirable limits for radiation exposure to species other than man, it is generally agreed that the limits established for humans are also conservative for these species.[9]

5.6.2 Radioactivity in the Environment

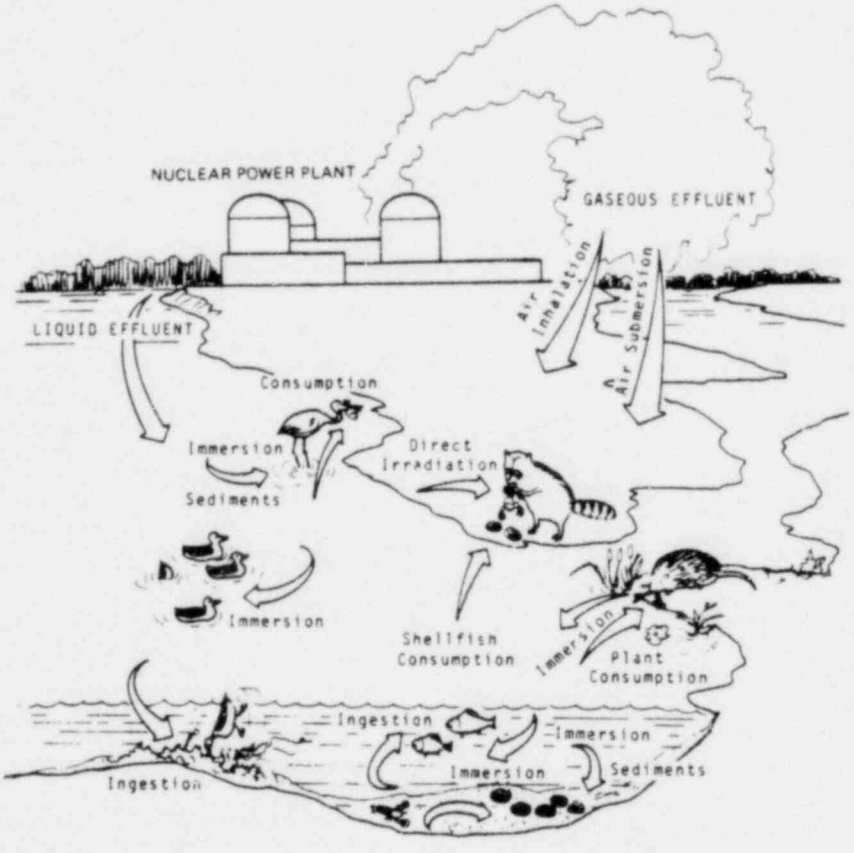
The quantities and species of radionuclides expected to be discharged annually by Davis-Besse Unit 1 in liquid and gaseous effluents have been estimated by the staff and are given in Tables 3.2 and 3.3b respectively. The basis for these values is discussed in Section 3.5. For the determination of doses to biota other than man, specific calculations are done primarily for the liquid effluents. The liquid effluent quantities, when diluted in Davis-Besse Unit 1 discharge, would produce an average gross activity concentration, excluding tritium, of 0.0065 picocuries per milliliter in the plant discharge areas. Under the same conditions, the tritium concentration would be 7.5 picocuries/ml.

Doses to terrestrial animals such as rabbits or deer due to the gaseous effluents are quite similar to those calculated for man (Section 5.3).

5.6.3 Dose Rate Estimates

The annual radiation doses to both aquatic and terrestrial biota including man were estimated on the assumption of constant concentrations of radionuclides at a given point in both the water and air. Referring to Figure 5.4, radiation dose has both internal and external components. External components originate from immersion on surfaces, in distant volumes of air and water, in equipment, etc. Internal exposures are a result of ingesting and breathing radioactivity.

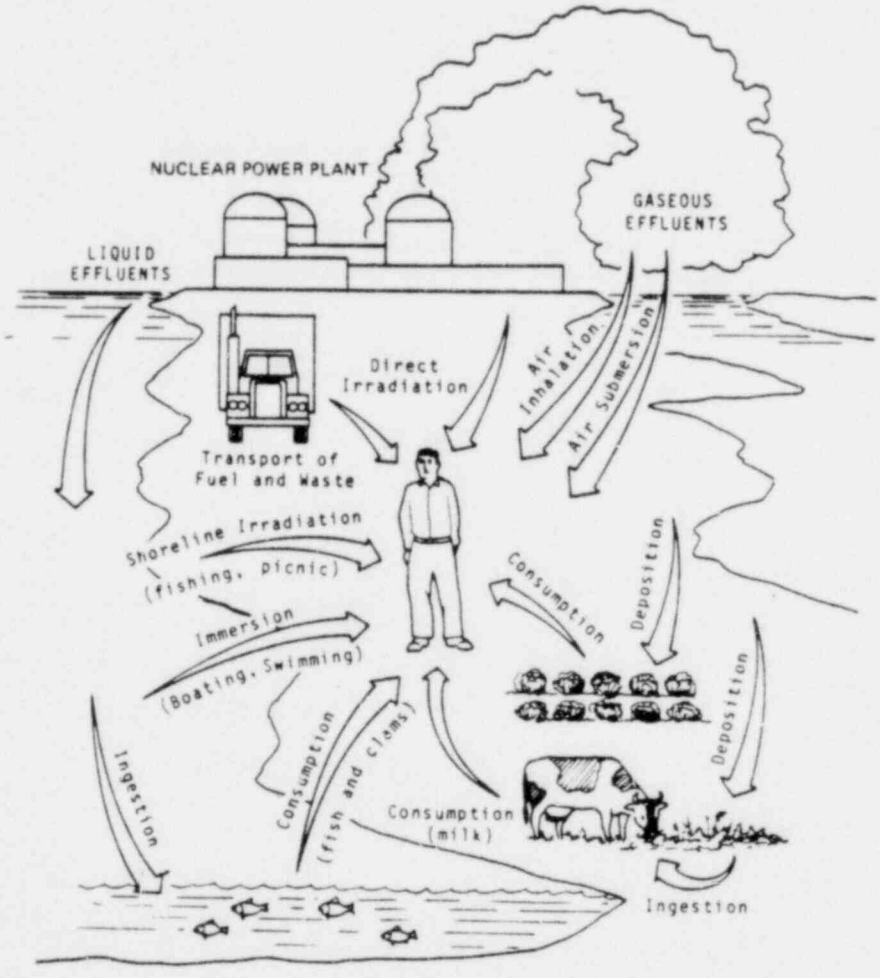
Doses will be delivered to aquatic organisms living in the water containing radionuclides discharged from the power station. This is principally a consequence of physiological mechanisms that concentrate a number of elements that can be present in the aqueous environment. The extent to which elements are concentrated in fish, invertebrates, and aquatic plants upon uptake or ingestion has been estimated. Values of relative biological accumulation factors (ratio of concentration of nuclide in organisms to that in the aqueous environment) of a number of waterborne elements for several organisms are provided in Table 5.1.



EXPOSURE PATHW .YS TO BIOTA OTHER THAN MAN

FIGURE 5 - 3

Doses to aquatic plants and fish living in the discharge region due to water uptake and ingestion (internal exposure) were calculated to be 37 and 7.6 mrads/year, respectively, for Davis-Besse 1 Nuclear Station operation. The discharge region concentrations were those given above and it was assumed that these organisms spent all of the year in water of maximum concentrations. All calculated doses are based on standard models.[10] The doses are quite conservative



EXPOSURE PATHWAYS TO MAN

FIGURE 5-4

TABLE 5.1

FRESHWATER BIOACCUMULATION FACTORS[12]

ELEMENT	FISH	INVERTEBRATES	PLANTS
C	4550	9100	4500
Na	100	200	500
P	100000	20000	500000
Sc	2	1000	10000
Cr	200	2000	4000
Mn	400	90000	10000
Fe	100	3200	1000
Co	50	200	200
Ni	100	100	50
Zn	2000	10000	20000
Rb	2000	1000	1000
Sr	30	100	500
Y	25	1000	5000
Zr	3	7	1000
Nb	30000	100	800
Mo	10	10	1000
To	15	5	40
Ru	10	300	2000
Rh	10	100	200
Ag	2	770	200
Sn	3000	1000	100
Sb	1	10	1500
Te	400	150	100
I	15	5	40
Cs	200	100	500
Ba	4	200	500
La	25	1000	5000
Ce	1	1000	4000
Pm	25	1000	5000
Nd	25	1000	5000
Pm	25	1000	5000
Sm	25	1000	5000
Bu	25	1000	5000
Gd	25	1000	5000
W	1200	10	1200
Np	10	400	300
Pu	4	100	350
Am	25	1000	5000
Cm	25	1000	5000

since it is highly unlikely that any of the mobile life forms will spend a significant portion of their life span in the maximum activity concentration of the discharge region. Both radioactive decay and additional dilution would reduce the dose at other points in the Lake.

External doses to terrestrial animals other than man are determined on the basis of gaseous effluent concentrations and direct radiation contributions at the locations where such animals may actually be present. Terrestrial animals in the environs of the station will receive approximately the same external radition doses as those calculated for man.

An estimate can be made for the ingestion dose to a terrestrial animal such as a duck which is assumed to consume only aquatic vegetation growing in the water in the discharge region. The duck ingestion dose was calculated to be about 14 mrads/year, which represents an upper limit estimate since equilibrum was assumed to exist between the aquatic organisms and all radionuclides in water. A nonequilibrium condition for a radionuclide in an actual exposure situation would result in a smaller bioaccumulation and therefore in a smaller dose from internal exposure.

The literature relating to radiation effects on organisms is extensive, but very few studies have been conducted on the effects of continuous low-level exposure to radiation from ingested radionuclides on natural aquatic or terrestrial populations. While the existence of extremely radiosensitive biota is possible and while increased radiosensitivity in organisms may result from environmental interactions, no biota have yet been discovered that show a sensitivity to radiation exposures as low as those anticipated in the area surrounding Davis-Besse 1 Nuclear Station. In the "BEIR" report,[11] it is stated in summary that evidence to date indicates that no other living organisms are very much more radiosensitive than man, therefore, no detectable radiological impact is expected in the aquatic biota or terrestrial mammals as a result of the quantity of radionuclides to be released into Lake Erie and into the air by Davis-Besse Unit 1.

5.7 RADIOLOGICAL IMPACT ON MAN

5.7.1 Exposure Pathways

The NRC staff is presently reassessing assumptions and evaluating models for projected radioactive effluent releases and calculated doses in order to reflect the Commission's guidance in its option issued April 30, 1975, in the rulemaking proceeding RM-50-2.

The revised specific models for a detailed assessment of individual and population doses have not been completed. For the interim, it can be said that the individual doses associated with the radioactive releases of Davis-Besse Unit 1 will be in accord with the requirements stated in Appendix I. Thus, no final plant design will be approved which will result in individual doses in excess of Appendix I requirements.

The staff has developed a procedure to quantitatively evaluate the maximum integrated doses which could be delivered to the U.S. population by radioactive emissions from Davis-Besse Unit 1. A description of this procedure for gaseous effluents is contained in attached Appendix D. The intent of this estimate is to evaluate the radiological environmental impact of the facility by establishing an upper bound population dose associated with plant operation which is unlikely to be exceeded when the detailed review is performed.

5.7.2 Liquid Effluents

Expected radionuclide releases in the liquid effluent have been estimated for Davis-Besse Unit 1 and are listed in Table 3.2. Doses to the population from these releases were calculated using dose procedures consistent with the recommendations of ICRP-II.

The cumulative dose resulting from the consumption of fish harvested from Lake Erie was estimated. It was conservatively assumed that the population within 50 miles of the plant consumed the regional harvest of 2,200,000 Kgm per year of fish caught where the coolant water discharges were diluted by an additional factor of 1000.

The usage of Lake Erie and its shoreline for recreational purposes within 50 miles of the site was estimated to be 2.2×10^6, 4.5×10^6, and 8.9×10^6 man-hours/yr, for swimming, boating, and recreational use of the shoreline, respectively.

The tritium released to the receiving water is assumed to enter the biosphere in the same manner as tritium released to the atmosphere. Thus, the tritium discussion in Appendix D applies to all tritium sources from the plant.

Table 5.2 includes the doses to the population due to the release of radionuclides in the liquid effluents.

5.7.3 Gaseous Effluents

NRC staff estimates of the probable gaseous releases listed in Table 3.3 were used to evaluate potential doses to the U.S. population. As discussed in Appendix D these gaseous effluents were considered in five categories; viz. noble gases, radioiodines, particulates, carbon-14, and tritium. Krypton-85 was treated separately from the other noble gases because of its relatively long half-life (about 11 years).

The population can be exposed via the pathways discussed in Appendix D. External total body irradiation results from submersion in dispersed noble gases and from standing on surfaces containing deposited radioiodines and particulates. Internal total body and organ exposures result from inhalation of contaminated air or ingestion of contaminated foodstuffs. Three food pathways were evaluated which involved consumption: meat, milk, and food crops.

Doses to the population were calculated by assuming uniform dispersal of the radionuclides. Direct exposure pathways to the population (e.g., noble gas submersion) were based upon a uniform population density (160 people/mi^2). Indirect food pathways were based upon the assumption that meat, milk, and crop productivity of the land area east of the Mississippi River is capable of supporting the U.S. population.

Table 5.2 lists the population doses resulting from this analysis.

5.7.4 Evaluation of Radiological Impact

Using conservative assumptions, the staff has estimated an upper bound integrated exposure to the population of the U.S. due to operation of Davis-Besse Unit 1. Appendix I to 10 CFR 50 requires that individual doses be kept to a small fraction of the doses specified by 10 CFR 20.

TABLE 5.2

Annual Integrated Dose to U.S. Population

Radionuclide Group	Annual Dose (man-rem)	
	Total Body	Thyroid
Noble Gases	3.2	3.2
Radioiodine	.20	84.
Particulate	4.2	4.1
Tritium	1.0	1.0
Carbon-14	17.	17.
Total	26.	110.

The above statements can be placed in prespective by noting that individuals in the U.S. population each receive an average of about 100 mrem/year from natural background radiation. Thus, the annual population dose due to natural background to the U.S. population is about 20,000,000 man-rem.

Both the maximum individual doses and the upper bound population doses resulting from operation of Davis-Besse Unit 1 are fractions of the doses individuals and the population recieve from naturally occurring radiation.

5.7.5 Direct Radiation

5.7.5.1 Radiation from the Facility

The plant design includes specific shielding of the reactor, holdup tanks, filters, demineralizers and other areas where radioactive materials may flow or be stored, primarily for the protection of plant personnel. Direct radiation from these sources is therefore not expected to be significant at the site boundary. Confirming measurements will be made as part of the applicant's environmental monitoring program after plant start-up. Low level radioactivity storage containers outside the plant are estimated to contribute less than 0.01 millirems per year at the site boundary.

5.7.5.2 Occupational Radiation Exposure

Based on a review of the applicant's Preliminary Safety Analysis Report, the staff has determined that individual occupational doses can be maintained within the limits of 10 CFR 20. Radiation dose limits of 10 CFR 20 are based on a thorough consideration of the biological risk of exposure to ionizing radiation. Maintaining radiation doses of plant personnel within these limits ensures that the risk associated with radiation exposure is no greater than those risks normally accepted by workers in other present-day industries.[6] Using information compiled by the Commission[7] on past experience from operating nuclear reactor plants (with a range of exposures of 44-5134 man-rem per year) it is estimated that the average collective dose to all on-site personnel at large operating nuclear plants will be approximately 450 man-rems per year per unit. The total dose for this plant will be influenced by several factors for which definitive numerical values are not available. These factors are expected to lead to doses to onsite personnel lower than those estimated above. Improvements to the radioactive waste effluent treatment system to maintain off-site population doses as low as practicable may cause an increase in onsite personnel doses if all other factors remain unchanged. However, the applicant's implementation of Regulatory Guide 8.8 and other guidance provided through the staff radiation protection review process is expected to result in an overall reduction of total doses from those currently experienced. Because of the uncertainty in the factors modifying the above estimates, a value of 450 man-rems will be used for the occupational radiation exposure for this unit of the station.

5.7.6 Summary of Annual Radiation Doses

The annual population doses (man-rem) resulting from the plant operation are presented in Table 5.3. As shown in this table, the operation of Davis-Besse Unit 1 will contribute a small fraction of the population dose that persons living in the U.S. normally receive from natural background.

TABLE 5.3

Summary of Annual Doses to the U.S. Population

Category	Population dose (man-rem/year)
Natural environmental radioactivity	21,000,000
Nuclear plant operation	
Plant work force	450
General Public	
Gaseous and Liquid Effluents (total body and thyroid)	140
Transportation of nuclear fuel and radioactive wastes	3

5.8 EFFECTS ON THE COMMUNITY

The staff considered the environmental effects of station operation in the community in the FES-CP, Section 5.8. It was concluded that the size of the operating staff was sufficiently small as to have an insignificant effect on the local economy, that the taxes on the station will greatly benefit the local school district, and that since there are no zoning regulations in the area, the extent to which industrial development would occur was under the authority of the local authorities. The information relied on for that conclusion is still considered valid and the staff's conclusion at this stage remains unchanged.

5.9 TRANSPORTATION OF RADIOACTIVE MATERIAL

The transportation of cold fuel to a reactor, or irradiated fuel from the reactor to a fuel reprocessing plant, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the NRC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and From Nuclear Power Plants." The environmental effects of such transportation are summarized in Table 5.4.

5.10 EFFECTS OF THE URANIUM FUEL CYCLE

The environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low-level wastes and high-level wastes are within the scope of the NRC report entitled, "Environmental Survey of the Uranium Fuel Cycle."[18] The contribution of such environmental effects are summarized in Table 5.5.

Table 5-4 Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor[a]

Normal Conditions of Transport			
			Environmental Impact
Heat (per irradiated fuel cask in transit)			250,000 Btu/hr
Weight (governed by Federal or State restrictions)			73,000 lb per truck; 100 tons per cask per rail car.
Traffic density			
Truck			Less than 1 per day
Rail			Less than 3 per month
Exposed Population	Estimated Number of Persons Exposed	Range of Doses to Exposed Individuals[b] (per reactor year)	Cumulative Dose to Exposed Population (per reactor year)[c]
Transportation workers	200	0.01 to 300 millirem	4 man-rem
General public			
Onlookers	1,100	0.003 to 1.3 millirem	3 man-rem
Along route	600,000	0.0001 to 0.06 millirem	
Accidents in Transport			
			Environmental Risk
Radiological effects			Small[d]
Common (nonradiological) causes			1 fatal injury in 100 reactor years; 1 nonfatal injury in 10 reactor years; $475 property damage per reactor year.

[a]Data supporting this table are given in the Commission's "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants," WASH-1238, December 1972.

[b]The Federal Radiation Council has recommended that the radiation doses from all sources of radiation other than natural background and medical exposures should be limited to 5000 millirem per year for individuals as a result of occupational exposure and should be limited to 500 millirem per year for individuals in the general population. The dose to individuals due to average natural background radiation is about 130 millirem per year.

[c]Man-rem is an expression for the summation of whole-body doses to individuals in a group. Thus, if each member of a population group of 1000 people were to receive a dose of 0.001 rem (1 millirem), or if two people were to receive a dose of 0.5 rem (500 millirem) each, the total man-rem in each case would be 1 man-rem.

[d]Although the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified, the risk remains small regardless of whether it is being applied to a single reactor or a multireactor site.

From Federal Register, Volume 40, Number 3, pp. 1005-1009, Monday, Jan. 6, 1975.

Table 5-5. Summary of Environmental Considerations for Uranium Fuel Cycle (normalized to model LWR annual fuel requirement)

Natural resource use	Total	Maximum effect per annual fuel requirement of model 1,000 MWe LWR
Land (acres)		
Temporarily committed	63	
Undisturbed area	45	
Disturbed area	18	Equivalent to 90 MWe coal-fired power plant
Permanently committed	4.6	
Overburden moved (millions of megatons)	2.7	Equivalent to 90 MWe coal-fired power plant
Water (millions of gallons)		
Discharged to air	156	≈2% model 1000 MWe LWR with cooling tower
Discharged to water bodies	11,040	
Discharged to ground	123	
Total	11,319	<4% of model 1000 MWe LWR with once-through cooling
Fossil fuel		
Electrical energy (thousands of MW-hour)	317	<5% of model 1000 MWe LWR output
Equivalent coal (thousands of megatons)	115	Equivalent to the consumption of a 45 MWe coal fired power plant
Natural gas (millions of scf)	92	<0.2% of model 1000 MWe energy output
Effluents - chemical (megatons)		
Gases (including entrainment)[a]		
SO_2	4.400	
NO_2[b]	1.177	Equivalent to emissions from 45 MWe coal fired plant for a year
Hydrocarbons	12.5	
CO	28.7	
Particulates	1,156	
Other gases		
F	0.72	Principally from UF_6 production enrichment and reprocessing. Concentration within range of state standards - below level that has effects on human health
Liquids		
SO_4	10.3	From enrichment, fuel fabrication, and reprocessing steps. Components that constitute a potential for adverse environmental effect are present in dilute concentrations and receive additional dilution by receiving bodies of water to levels below permissible standards. The constitutents that require dilution and the flow of dilution water are:
NO_3	26.7	
Fluoride	12.9	
Ca^{++}	5.4	
Cl	8.6	
Na^+	16.9	NH_3 - 600 cfs
NH_3	11.5	NO_3 - 20 cfs
Fe	0.4	Fluoride - 70 cfs
Tailings solutions (thousands of megatons)	240	From mills only - no significant effluents to environment
Solids	91,000	Principally from mills - no significant effluents to environment
Effluents - radiological (curies)		
Gases (including entrainment)		
Rn-222	75	Principally from mills - maximum annual dose rate <4% of average natural background within 5 miles of mill. Results in 0.06 man-rem per annual fuel requirement
Ra-226	0.02	
Th-230	0.02	
Uranium	0.032	Principally from fuel reprocessing plants - whole body dose is 6 man-rem per annual fuel requirements for population within 50 mile radius. This is <0.007% of average natural background dose to this population. Release from Federal Waste Repository of 0.005 Ci/year has been included in fission products and transuranics total
Tritium (thousand)	16.7	
Kr-85 (thousands)	350	
I-129	0.0024	
I-131	0.024	
Fission products and transuranics	1.01	
Liquids		
Uranium and daughters	2.1	Principally from milling - included in tailings liquor and returned to ground - no effluents, therefore, no effect on environment
Ra-226	0.0034	From UF_6 production - concentration 5% of 10 CFR 20 for total processing of 27.5 model LWR annual fuel requirements
Th-230	0.0015	
Th-234	0.01	From fuel fabrication plants - concentration 10% of 10 CFR 20 for total processing 26 annual fuel requirements for model LWR
Ru-106	0.15[c]	From reprocessing plants - maximum concentration 4% of 10 CFR 20 for total reprocessing of 26 annual fuel requirements for model LWR
Tritium (thousands)	2.5	
Solids (buried)		
Other than high level	601	All except 1 Ci comes from mills - included in tailings returned to ground - no significant effluent to the environment. 1 Ci from conversion and fuel fabrication is buried
Effluents - thermal (billions of Btu)	3,360	<7% of model 1000 MWe LWR
Transportation (man-rem): exposure of workers and general public	0.334	

[a] Estimated effluents based upon combustion of equivalent coal for power generation.

[b] 1.2% from natural gas use and process.

[c] Cs-137 (0.075 Ci/AFR) and Sr-90 (0.004 Ci/AFR) are also emitted.

Source: *Federal Register*, Docket 74-9076, filed April 19, 1974, 8:45 am.

References

1. "Radioactivity in the Marine Environment", Panel on R.I.M.E. of the Committee on Oceanography, NAS-NRC, 1971.

2. Garner, R. J.; "Transfer of Radioactive Materials from the Terrestrial Environment to Animals and Man", CRC Critical Reviews in Environmental Control, 2, 337-385 (1971).

3. Auerbach, S. J.; "Ecological Considerations in Siting Nuclear Power Plants. The Long Term Biota Effects Problems", Nuclear Safety, 12, 25 (1971).

4. "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation", Report of the Advisory Committee on Biological Effects of Ionizing Radiations, NAS-NRC, 1972.

5. Thompson, S. E., C. A. Burton, D. J. Guinn, and Y. C. Ng, "Concentration Factors of Chemical Elements in Edible Aquatic Organisms", UCRL-50564 Rev. 1 (1972).

6. "Implications of Commission Recommendations that Doses be Kept As Low As Readily Achievable", ICRP Publication 22, (1973).

7. Murphy, T. D., "Occupational Radiation Exposure at Light Water Cooled Power Reactors: 1969-1974", U.S.N.R.C., NUREG-75/032 (June, 1975).

8. "Recommendations of the International Commission on Radiological Protection", ICRP Publication 2, Pergamon Press, New York (1959).

6 EFFLUENT AND ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS

Résumé

The continuation of Construction Permit No. CPPR-80 was conditioned, in part, on the following:

- A comprehensive, preoperational environmental monitoring program shall be established to provide an adequate baseline for measuring the operational impact of the station.

- A monitoring program shall be established to record any kills due to birds hitting the cooling tower and other station structures, placing emphasis on observations during adverse weather conditions and during the spring and fall migratory seasons.

The following sections have been revised to address those two requirements and to update the entire section in general.

6.1 METEOROLOGICAL PROGRAM

The current onsite meteorological program, operational since August 1974, includes the use of a 340 ft. tower and a 35 ft. satellite tower. These towers are about 2000 feet southwest of the nearest containment building. The 35 ft. tower is used only for wind speed and direction measurements at the 35 foot level. All other measurements are made on the 340 foot tower, with measurement levels at 35, 250 and 340 feet.

On the 340 foot tower, wind speed and direction are measured at the 250- and 340 foot levels. Ambient dry bulb temperatures are measured at 35 and 340 feet. Vertical temperature difference measurements are made between the 35 and 250 foot levels and between the 35 and 340 foot levels. Precipitation is measured at ground level. The instruments meet the recommendations and intent of Safety Guide 23, Onsite Meteorological Programs.

A meteorological program consisting of a 300 foot tower was initiated in October 1968. Wind speed and direction are measured at the 20, 100 and 300 ft. levels; vertical temperature gradient is measured between 145 ft. and 5 ft. and between 297 ft. and 145 ft., dewpoint temperature is measured at 5 ft. This tower was instrumented prior to the issuance of Safety Guide 23. The construction of Unit 1 structures and a change in grade elevation subsequent to November 1970 impacted the wind speed and direction data being measured at this tower. However, data collected during the period December 1969 through November 1970 were not effected by the Unit 1 structures and the change in grade elevation. To meet the requirement of Safety Guide 23, the applicant has constructed the new 340 foot tower in a location which minimizes the interference from the station structures. The applicant will make a correlation study of one year of temperature lapse rate data between the 300 ft. and 340 ft. towers to determine the effect that the two ponds which are between the reactor structure and the new tower may have on the temperature measurements at the new tower location.

One full year of onsite data from the new meteorological program will not be available until late 1975. The applicant submitted data from the 300 ft. tower for the period December 1969 through November 1970. These data were in the form of joint frequency distributions of wind speed and direction at the 20 ft. level by atmospheric stability (defined by the vertical temperature gradient between 145 ft. and 5 ft.). Data recovery for this period was 32%. These data are the only data available at this time. The lower level temperature sensor at 5 ft. increases the number of extremely unstable and extremely stable stability classes recorded. These increases would tend to compensate each other in the calculation of annual average relative concentration (X/Q) values. The staff has performed an interim evaluation of annual average relative concentration values using these data. A Gaussian diffusion model with adjustments for building wake effects, described in Regulatory Guide 1.42, was used to make estimates of relative concentration values at various distances and directions as specified in Section 5. The staff is presently waiting for additional information on the accuracy of the delta-T measurement during the period December 1969 through November 1970. The staff will use the one year of onsite data from the new program, and the correlation study of delta-T as measured on the 300

ft. and 340 ft. towers, to verify the relative concentration values presented herein. At this time, there is no reason to suspect that the relative concentration values presented in this document will increase sufficiently to change the conclusions on site and design suitability; however, the staff requires that the data from the upgraded meteorological program be submitted prior to final staff approval of the Environmental Technical Specifications to verify this. The staff estimates that this can be accomplished by November 1975.

6.2 AQUATIC MONITORING

6.2.1 Preoperational Monitoring

On June 11, 1973 the applicant submitted his preoperational environmental monitoring program designed to provide the baseline for measuring the operational impact of the station. This submittal fulfills condition 9a of the Summary and Conclusions of the FES-CP. Preoperational environmental monitoring at the station prior to this proposal has been described previously.[1,2,3,4] The current program at Davis-Besse began in spring of 1974 and consists of biological sampling at 25 stations: 18 along 4 transects in the open lake, 2 stations in the intake canal, 2 stations in the marshes, and 3 along the shoreline (Figure 6-1). The specific grouping of stations to evaluate potential operational impacts and the major biological groups sampled are as follows:

- Control west transect extends north from the shore-end of the intake pipeline and consists of sampling stations located at 500 ft. (Station 1), 1000 ft. (Station 2), 2000 ft. (Station 3) and 3000 ft. (Station 4) from the shoreline.

- Intake transect stations are located 500 ft. (Station 5), 1000 ft. (Station 6), 2000 ft. (Station 7), 3000 ft. (Station 8 proposed intake) and 4000 ft. (Station 9) from the shore.

- Discharge transect stations are at 500 ft. (Station 10), 1000 ft. (Station 11), 1500 ft. (Station 12, proposed discharge), 2000 ft. (Station 13) and 3000 ft. (Station 14) from shore. Additional stations are at 500 ft. north of Station 12 (Station 15) and 500 ft. south of Station 12 (Station 16).

- Control east transect runs parrallel to the intake, about 2500 ft. east of the intake, with stations at 500 ft. (Station 17) and 1000 ft. (Station 18) from the shore.

- Stations 19 and 20 are located in the intake canal, 1000 and 2500 ft. from the shoreline respectively. Stations 21 and 22 are located in the marshes while 23, 24 and 25 are on the shoreline at the intersection of the intake conduit and 1500 ft. on either side.

Plankton

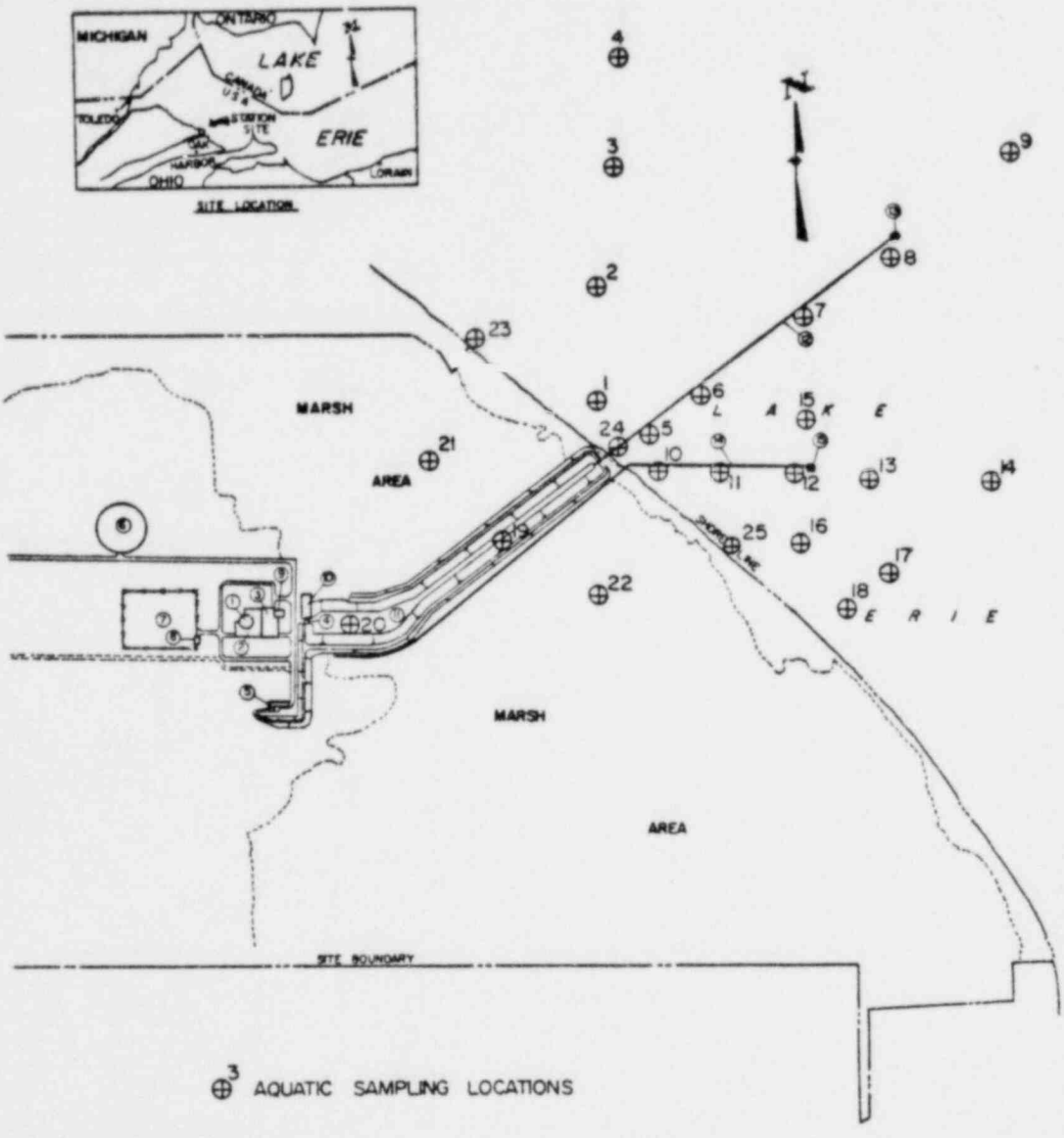
Plankton is sampled monthly during ice free periods (usually April through November) at 12 stations, 10 in the open lake (stations 1, 3, 6, 8, 10, 12, 13, 14 and 18) and 2 in the intake canal (stations 19 and 20). Duplicate vertical tows, bottom to surface, are taken at each of the stations with a Wisconsin plankton net. Phyto- and zoo-plankton numbers and generic composition are determined.

Benthos

Three replicate samples are taken monthly (usually April through November) at stations 1-20 with a Ponar grab sampler. Samples are sieved through a U. S. #30 sieve, preserved in formalin and returned to the laboratory for analyses. Individuals are identified usually to genus and to species when possible and reported as number of organisms per m^2.

Fish

Fish populations are sampled from April through November, weather permitting, by four methods: gill nets, shore seines, otter trawls and hoop nets. Two 125 ft. x 6 ft. (bar mesh range 1/2" - 2") gill nets are set parallel to and near the intake and discharge (stations 8 and 12) and fished for approximately 24 hours. Shore seining is conducted monthly at stations 23, 24 and 25 using a 100 ft. bag seine. Duplicate hauls are made at each station. Four 5-minute otter trawls are taken monthly between the intake crib and discharge structure. Two samples are taken monthly at Stations 21 and 22 using 25 ft. diameter, 1" bar mesh hoop nets. The nets are fished for approximately 24 hours. Twice a year, spring and fall, the intake canal is trawled for fish.



AQUATIC SAMPLING LOCATIONS

FIGURE 6-1

Fish collected by gill nets, seines, trawls and hoop nets are identified, weighed and measured. A representative number of structures are examined to establish food habits.

Ichthyoplankton eggs and larvae are collected monthly from April through November using a 0.75-meter oceanographic plankton net. Five-minute tows, surface and near bottom, in the vicinity of the intake and discharge are made. Ichthyoplankton are identified and enumerated as part of this program. Results of this program so far support the results of previous studies which indicate that the immediate site is not an important spawning area.

6.2.2 Operational Monitoring

The applicant plans to continue the preoperational monitoring studies as the operational program for measuring potential station impacts. The staff concurs with this approach but will require that the applicant provide additional program elements to evaluate the magnitude of entrainment and impingement losses at the station. The essential aspects of the preoperational monitoring program, any staff approved recommended changes in details of the program and these additional studies required above will be incorporated into the Environmental Technical Specifications which are presently under review by the staff for the Davis-Besse Station. Also see Section 12.2.2.

6.3 CHEMICAL RELEASE MONITORING

6.3.1 Preoperational Monitoring

The applicant has been conducting a baseline water quality monitoring program in the plant vicinity. Twenty water quality parameters (see Table 6.1) have been measured monthly during the ice-free time at three stations, numbers 1, 8 and 12 (see Figure 6.1). While these field measurements were being made, samples for 14 laboratory analyses were taken from surface and bottom locations. These analyses were made as shown for the parameters numbered 7 through 20 on Table 6.1. The results of these determinations are presented in Section 2 of this statement.

6.3.2 Operational Monitoring

The proposed operational chemical monitoring program is similar to the preoperational program and is identical to that proposed in the FES-CP, with the exception that color determination has now been deleted. The parameters, method of analysis, and frequency of analysis is given in Table 6.2. These parameters will be measured in the plant discharge pipe. The staff is in agreement with the approach proposed by the applicant; however, modifications to the sampling frequency for certain parameters to correspond to the intermittent operation of some plant systems will be made in the Environmental Technical Specifications for plant operation. In addition, the applicant will be required to comply with the Environmental Technical Specifications which will control the chemical discharges from the station.

In addition to plant chemical release monitoring, lake water quality will continue to be monitored by the applicant. This program is a continuation of the baseline water quality monitoring program with monthly analyses at stations 1, 8 and 13 (Rev. 1 ETS).

6.4 TERRESTRIAL ECOLOGICAL MONITORING

The preoperational bird monitoring program conducted at the site by the applicant fulfills condition 9c identified in the Summary and Conclusions of the FES-CP. The tabular results of this program are presented in Table 6.3. The staff's discussion has been presented previously in Section 2 and 5. The detailed results of this program are in the Davis-Besse 1 Semi-Annual Report July 1, 1974-December 31, 1974, Volume II.

A proposed ecological monitoring program of the terrestrial environment has been submitted (ER-Supplement). The objectives are to: a) monitor bird impactions on station structures, and b) monitor effects of cooling tower drift.

The bird monitoring program will consist of surveys around towers and other structures during the migratory seasons of the year. These will consist of monitoring during April and May in the spring and late August, September and October in the fall. The number and species of birds killed by impaction is proposed to be determined on a weekly basis. This program is conceptually adequate although changes in details may be recommended prior to the time environmental technical specifications are approved.

TABLE 6.1[6]

ANALYTICAL METHODS FOR WATER QUALITY DETERMINATIONS

	Parameter	Units	Analytical Method
1.	Temperature	°C	Std. Methods, 13th Ed., 162, (1971)
2.	Dissolved oxygen	mg/l	Std. Methods, 13th Ed., 218B (1971)
3.	Conductivity	umhos/cm (25°C)	ASTM D1135-64 (1973)
4.	Transparency	meters	Secchi disk (Welch, 1948)
5.	Solar radiation	u amps	G. M. Mfg. & Instr. Corp., submarine photometer
6.	Current	knots	HydroProducts, A-65 current meter
7.	Calcium (Ca)	mg/l	Std. Methods, 13th Ed., 110C (1971)
8.	Magnesium (Mg)	mg/l	Std. Methods, 13th Ed., 122B (1971)
9.	Sodium (Na)	mg/l	ASTM D1428-64 (1973)
10.	Chloride (Cl)	mg/l	Std. Methods, 13th Ed., 112B (1971)
11.	Nitrate (NO_3)	mg/l	ASTM D992-71 (1973)
12.	Sulfate (SO_4)	mg/l	ASTM D516-68C (1973)
13.	Phosphorous (Total as P)	mg/l	Std. Methods, 13th Ed., 223F (1971)
14.	Silicon (SiO_2)	mg/l	ASTM D 859-68B (1973)
15.	Alkalinity (total as $CaCo_3$)	mg/l	Std. Methods, 13th Ed., 102 (1971)
16.	Biochemical oxygen demand	mg/l	Std. Methods, 13th Ed., 219 (1971)
17.	Suspended solids	mg/l	Std. Methods, 13th Ed., 224C (1971)
18.	Dissolved solids	mg/l	USEPA, Chem. Analysis, Water (1971)
19.	Turbidity	F.T.U.	Std. Methods, 13th Ed., 163A (1971)
20.	Hydrogen-ion conc.	pH units	ASTM D1293-65 (1973)

TABLE 6.2 [7]

SAMPLING AND TESTING SCHEDULE FOR STATION DISCHARGE PIPE

Parameter	Sample Type	Analytical Method
Weekly Tests		
Chlorine Residual	Grab	Std. Methods, 13th Edition, 204A (1971)
Conductivity	Composite	ASTM D1123-64
Dissolved Solids	"	Methods of Chemical Analysis of Water and Wastes, U. S. Environmental Protection Agency, P. 275 (1971)
Oxygen	Grab	Std. Methods 13th Edition, 218B (1971)
pH	"	ASTM D1293-65
Phosphorous (as P)	Composite	Std. Methods, 13th Edition, 223F (1971)
Suspended Solids	"	Std. Methods, 13th Edition, 224C (1971)
Total Volatile Solids	"	Std. Methods, 13th Edition, 224B (1971)
Total Solids	"	Std. Methods, 13th Edition, 224 (1971)
Turbidity	"	Std. Methods, 13th Edition, 163A (1971)
Monthly Tests		
Alkalinity (as $CaCO_3$)	Composite	Std. Methods, 13th Edition, 102 (1971)
Ammonia (as N)	"	Std. Methods, 13th Edition, 132B (1971)
Arsenic	"	Std. Methods, 13th Edition, 104A (1971)
B.O.D.	"	Std. Methods, 13th Edition, 219 (1971)
Calcium	"	Std. Methods, 13th Edition, 110C (1971)
Chlorides	"	Std. Methods, 13th Edition, 112B (1971)
Chromium	"	Std. Methods, 13th Edition, 117A (1971)
C.O.D.	"	Std. Methods, 13th Edition, 220 (1971)
Total Coliform	"	Std. Methods, 13th Edition, 406 (1971)
Total Hardness	"	Std. Methods, 13th Edition, 122B (1971)
Iron	"	Std. Methods, 13th Edition, 124A (1971)
Kjeldahl Nitrogen	"	Std. Methods, 13th Edition, 216 (1971)
Magnesium	"	(Difference Between Total Hardness & Calcium Hardness)
Manganese	"	Std. Methods, 13th Edition, 128B (1971)
Mercury	"	ASTM D 3223-73
Nitrate (as N)	"	ASTM D992-71
Oil & Grease	"	ASTM D2778-70 Using Carbon Tetrachloride
Organic Nitrogen	"	Std. Methods, 13th Edition, 215 (1971)
Potassium	"	ASTM D1428-64
Sodium	"	ASTM D516-68, Method C
Sulfate	"	Std. Methods, 13th Edition, Method 165B (1971)
Zinc	"	

8

TABLE 6.3

SPECIES RECOVERED AT DAVIS - BESSE SITE DURING THREE CONSECUTIVE FALL SEASONS

	Fall 1972				Fall 1973				Fall 1974			
	CT	ST	MT	Total	CT	ST	MT	Total	CT	ST	MT	Total
Sora rail						1		1				
Virginia rail									1			1
Common gallinule										1		1
Ring-billed gull						1		1				
Yellowbellied flycatcher						1		1	5	2		7
Least flycatcher									2			2
Acadian flycatcher									1			1
Domestic pigeon									1		1	2
Red-breasted nuthatch									1			1
Brown creeper					1			1	1	1		2
Long-billed marsh wren		1		1		1		1				
House wren									1			1
Winter wren									2			2
Carolina wren									2			2
Gray catbird						1		1				
Hermit thrush									1			1
Veery									1			1
Golden-crowned kinglet					15	2		17	44	9		53
Ruby-crowned kinglet	1			1	16	7		23	36	2		38
Solitary vireo										1		1
White-eyed vireo										1		1
Red-eyed vireo									15	4		19
Philadelphia vireo		1		1					2	1		3
Warbling vireo						1		1				
Black & White warbler									3			3
Tennessee warbler						2		2	3			3
Nashville warbler						3		3	7	2		9
Parula warbler									1			1
Yellow warbler	1		1	2					1			1
Magnolia warbler					3	7		10	31	7	1	39
Cape May warbler									1			1
Myrtle warbler		1		1		1		1	2	1		3
Black-throated green warbler	1			1	1	1		2	16	3		19
Black-throated blue warbler									5	3		8
Blackburnian warbler						1		1	11	1		12
Chestnut-sided warbler					1			1	8			8
Bay-breasted warbler									10	1	1	12
Blackpol warbler						2		2	5	3	1	9
Pine warbler					1	3		4	3			3
Ovenbird					1	1		2	6	1	1	8
Kentucky warbler									2			2
Connecticut warbler					1			1	1	1		2
Yellowthroat	1	1		2	2	1		3	18	5		23
Wilson's warbler					1			1	5			5
Canada warbler									2			2
Redstart						4		4	5			5
Unidentified warbler	1			1	1			1				
House sparrow											2	2
Savannah sparrow									1		1	2
White-crowned sparrow					1			1	1			1
White-throated sparrow									1	2		3
Song sparrow									1			1
Unidentified bird					10	6		16	13*			13
TOTAL BIRDS	4	5	1	10	56	47	-	103	279	52	8	339
Big brown bat						1		1				
Red bat									2			2
Eastern pipistrel										1		1
TOTAL BIRDS & BATS	4	5	1	10	56	47	-	103	281	53	8	342

CT=Cooling tower

ST=Unit 1 structures (including shield, turbine, and auxilliary buildings)

MT=Meteorological tower

*12 remains were found at CT on Oct. 15 after a major kill on Oct 13; access to CT was denied on Oct 13-14, and an unknown number of specimens was lost to scavengers.

Monitoring of the effects of cooling tower drift will be by ground level methods and by infrared aerial photography of the site and environs. The infrared aerial photography will be done once annually for a period of five years after start up of commercial operation. Ground level measurements as proposed by the applicant include measurement of solar radiation, temperature, humidity, evaporation, precipitation and soil temperature for a period of two years after startup of commercial operation. These are generally adequate plans for monitoring the effects of cooling tower drift although details may change prior to approval of Environmental Technical Specifications.

6.5 RADIOLOGICAL MONITORING

6.5.1 Preoperational Program

The applicant began conducting an offsite preoperational radiological monitoring program to provide for measurement of background radiation levels and radioactivity in the plant environs in July 1972. The preoperational program which provides a necessary basis for the operational radiological monitoring program, will also permit the applicant to train personnel, evaluate procedures, equipment and techniques, as indicated in Regulatory Guide 4.1.

A description of the applicant's program is summarized in Table 6.4. Table 6.5 describe the sampling locations. The applicant has provided a commitment to monitor the pathways discussed in Section 5.3.4. More detailed information on the applicant's radiological monitoring program is presented in Section 6.1 of the applicant's Environmental Report. A summary of the first two years' preoperational radiological data is contained in Section 2.8 of the ER.

The staff concludes that the preoperational monitoring program being conducted by the applicant will provide adequate baseline data for environmental media (such as presented in Section 2.8 of the ER), which will assist in verifying radioactivity concentrations and related public exposures after plant operation.

6.5.2 Operational Program

An operational offsite radiological monitoring program is conducted to measure radiation levels and radioactivity in the plant environs. It assists and provides backup support to the detailed effluent monitoring (as recommended by Regulatory Guide 1.21) which is needed to evaluate individual and population exposures and verify projected or anticipated radioactivity concentrations.

The applicant plans essentially to continue the preoperational program during the operating period. However, refinements may be made in the program to reflect changes in land use or preoperational monitoring experience.

An evaluation of the applicant's proposed operational monitoring program is being performed as part of the Environmental Technical Specification review. Details of the required monitoring program are being incorporated in the Technical Specifications, all of which will become part of the plant's operating license.

Table 6.4. Environmental Monitoring Program

Type of Sample	Locations and Sampling Points	Sample Frequency	Analyses
AIRBORNE PARTICULATES	T-1 Site boundary near intake canal and Sand Beach NE direction	Weekly	Gross alpha Gross beta
	T-2 Site boundary beach E of station		Note: Gamma spectral analysis when beta activity >10pCi/m3
	T-3 Site boundary Toussaint River and storm drainage pt. outfall SE of station		on quarterly composite of all filters
	T-4 Site boundary, S of station near Locust Point and Toussaint River		Gamma spectral analysis
	T-7 Sand Beach, 0.9 mi. NNW of site		
	T-8 Earl Moore Farm		
	T-9 Oak Harbor		
	T-10 Erie Industrial Park		
	T-11 Port Clinton		
	T-12 Toledo		
	T-23 Put-in-Bay		
	T-27 Magee Marsh		
AIRBORNE IODINE	T-1 T-2 T-3 T-4 T-7 T-8 T-9 T-10 T-11 T-12 T-23 T-27	Weekly	Gamma spectral analysis on charcoal canister for ^{131}I
AMBIENT GAMMA RADIATION LEVELS	T-1 T-2 T-3 T-4 T-5 Main entrance to site T-6 NW corner of site boundary T-7 T-8 T-9 T-10 T-11 T-12 T-14 Township School T-15 Lacarne T-23 T-24 Sandusky T-26 Fostoria T-27 Magee Marsh	Monthly, Quarterly, and Annually	Gamma dose

Table 6.4 Continued

Type of Sample	Locations and Sampling Points	Sample Frequency	Analyses
UNTREATED SURFACE WATER	T-1 Water from station intake in lake opposite intake canal T-2 In lake east of station T-3 In river opposite (storm drainage outfall in river) T-10 Erie Industrial Park water intake T-11 Port Clinton intake water T-12 Toledo water intake	Weekly Grab* Composited Monthly	Gross alpha and gross beta in dissolved and suspended fractions Tritium Gamma spectral analysis Note: Radium determination when gross alpha >3pCi/l On quarterly composite ^{90}Sr, gamma spectral analysis
TREATED SURFACE WATER	T-10 Erie Industrial Park tapwater T-11 Port Clinton tapwater T-12 Toledo tapwater T-28 Unit 1 treated water supply	Weekly Grab Composited Monthly	Gross alpha and gross beta in dissolved and suspended fractions Tritium Gamma spectral analysis Note: Radium determination when gross alpha >3pCi/l On quarterly composite ^{90}Sr, gamma spectral analysis
GROUND WATER	T-7 Beach well-sand beach T-13 State roadside park T-18 Hess Sunoco Garage T-27 Magee Marsh	Quarterly*	Gross alpha and gross beta in dissolved and suspended fractions Tritium ^{90}Sr and gamma spectral analysis Note: Gamma spectral analysis when gross beta >10pCi/l Radium determination when gross alpha >3pCi/l
PRECIPITATION	T-1 T-23	Monthly* Composite	Gross beta Tritium Gamma spectral analysis
BOTTOM SEDIMENTS	T-1 T-29 T-30	Quarterly*	Gross beta Gross alpha ^{90}Sr Gamma spectral analysis
FISH (Three species of fish, min.)	Lake Erie in vicinity of site near T-1 Toussaint River near storm drainage outfall by T-3	Quarterly *	Flesh-Gross beta Gamma spectral analysis Bone- ^{90}Sr
CLAMS (Flesh only)	Lake Erie in vicinity of site near T-1	Quarterly*	Gross beta Gamma spectral analysis

Table 6.4. Continued

Type of Sample	Locations and Sampling Points	Sample Frequency	Analyses
FRUITS AND VEGETABLES	T-8 T-19 Miller Farm T-25 Winter Farm	Semi-Annually	Edible portion Gross beta Gross alpha Gamma spectral analysis ^{90}Sr
MILK	T-8 T-20 Daup Farm T-21 Haynes Farm T-12 Toledo (milk processing plant) T-24 Sandusky (milk processing plant)	Monthly	Gross beta ^{89}Sr ^{90}Sr Gamma spectral analysis Calcium ^{131}I
DOMESTIC MEAT	T-22 Peter Farm	Semi-Annually	Flesh-Gross beta Gamma spectral analysis
WILDLIFE (min of two species, including snapping turtle)	Onsite	Semi-Annually	Flesh-Gross beta Gamma spectral analysis Bone- ^{90}Sr
SOILS	T-1 Beach sand T-8 T-19 T-20 All air sample locations	Semi-Annually Triennially	Gross beta Gamma spectral analysis ^{90}Sr
WINE	T-16 Put-in-Bay Winery	Annually	Gross beta Gross alpha ^{90}Sr Gamma spectral analysis
ANIMAL FEED	T-8 T-21	Semi-Annually	Gross alpha Gross beta ^{90}Sr Gamma spectral analysis
WATERFOWL	Vicinity of Site	Annually	Flesh-Gross beta Gamma spectral analysis Bone- ^{90}Sr
SMARTWEED	Vicinity of Site	Annually	Gross alpha Gross beta Gamma spectral analysis ^{90}Sr

*Except when ice conditions prohibit sampling

From ER, Table 6.1-5.

Table 6.5. Radiological Monitoring Program Sampling Locations

Sampling Point	Location[a]
T-1	Site boundary, NE of station, near intake canal
T-2	Site boundary, E of station
T-3	Site boundary, Toussaint River and storm drainage point outfall SE of station
T-4	Site boundary, S of station, near Locust Point and Toussaint River
T-5	Main entrance to site
T-6	Site boundary, NW of station
T-7	Sand beach, 0.9 mi NNW of site
T-8	Earl Moore Farm, 3.2 mi WSW of site
T-9	Oak Harbor, 6.8 mi SW of site
T-10	Erie Industrial Park, 6.5 mi SE of site
T-11	Port Clinton, 11.5 mi SE of site
T-12	Toledo, 23.5 mi WNW of site
T-13	State roadside park, 3.0 mi WNW of site
T-14	Township school, 3.8 mi WSW of site
T-15	Lacarne, 6.6 mi SSE of site
T-16	Put-In-Bay Winery, 15.3 mi ENE of site
T-17	Irv Fick's onsite well, 0.7 mi SW of station
T-18	Hess Sunoco Garage, 1.3 mi S of site
T-19	Miller Farm, 3.7 mi S of site
T-20	Daup Farm, 5.4 mi SSE of site
T-21	Haynes Farm, 3.6 mi SSW of site
T-22	Peter Farm, 2.6 mi SW of site
T-23	Put-In-Bay Lighthouse, 14.3 mi ENE of site
T-24	Sandusky, 24.9 mi SE of site
T-25	Winter Farm, 1.3 mi S of site
T-26	Fostoria, 35.1 mi SW of site
T-27	McGee Marsh, 5.3 mi WNW of site
T-28	Unit 1 treated water supply, onsite
T-29	Lake Erie, Intake Area, 1.5 mi NE of site
T-30	Lake Erie, Discharge Area, 0.9 mi ENE of site

[a]Distance measured from center of shield building of Unit No. 1.

From ER, Table 6.1-4.

REFERENCES

1. Toledo Edison Company. Davis-Besse Nuclear Power Station Unit 1 Pre-operational Environmental Monitoring Programs, Semiannual Report, January 1, 1974, Volume I-A.

2. USAEC Directorate of Licensing. Final Environmental Statement related to the construction of Davis-Besse Nuclear Power Station. Docket No. 50-346. March 1973. Section 6.

3. Ohio Federal Aid Project F-41-R, "Environmental Evaluation of a Nuclear Power Plant." Job Progress Reports from 1970, 1971 and 1972; Job Completion Report - Research Completion Segment, 1972.

4. Letter from Charles E. Herdendorf, Ohio State University Center for Lake Erie Area Research, to P. Merry, ANL, July 3, 1972.

5. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit 1, Supplement to Applicant's Environmental Report, Operating License Stage, Docket No. 50-346, Issued December 20, 1974, p. 6.2-27.

6. Toledo Edison Company, Davis-Besse Nuclear Power Station Unit 1, Preoperational Environmental Monitoring Programs. Feb. 28, 1975, Aquatic p. 6.

7. Op. Cit., Ref. 5, p. 6.2-13.

8. Op. Cit., Ref. 6, Terrestrial, Bird Hazard p. 13.

7. ENVIRONMENTAL IMPACT OF POSTULATED PLANT ACCIDENTS

Résumé

The "Davis-Besse Nuclear Power Station, Unit-1 Supplement to Environmental Report - Operating License State" dated December 20, 1974 has been reviewed with respect to the environmental effects of plant accidents (Section 7.1). The results of this review are that the conclusions about environmental risks due to accidents remain as previously presented in the FES-CP stage. The transportation accident section has been updated to reflect the results of the Commission's "Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants", WASH-1238.

7.1 FACILITY ACCIDENTS

The NRC is currently performing a study to assess more quantitatively the environmental risks due to accidents. The initial results of these efforts were made available for comment in draft form on August 20, 1974.* This study is called the Reactor Safety Study and is an effort to develop realistic data on the probabilities and sequences of accidents in water-cooled power reactors, in order to improve the quantification of available knowledge related to nuclear reactor accident probabilities. The Commission organized a special group of about 50 specialists under the direction of Professor Norman Rasmussen of MIT to conduct the study. The scope of the study has been discussed with EPA and described in correspondence with EPA which has been placed in the NRC Public Document Room (letter, Doub to Dominick, dated June 5, 1973).

As with all new information developed which might have an effect on the health and safety of the public, the results of these studies will be made public and will be assessed on a timely basis within the NRC regulatory process on generic or specific bases as may be warranted.

7.2 TRANSPORTATION ACCIDENTS

The transportation of cold fuel to the plant, of irradiated fuel from the reactor to a fuel reprocessing plant, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the AEC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants, " December 1972. The environmental risks of accidents in transportation are summarized in Table 7.1.

TABLE 7.1[1]

ENVIRONMENTAL RISKS OF ACCIDENTS IN TRANSPORT
OF FUEL AND WASTE TO AND FROM A TYPICAL
LIGHT-WATER-COOLED NUCLEAR POWER REACTOR

	Environmental Risk
Radiological effects	Small[2]
Common (nonradiological) causes.	1 fatal injury in 100 years; 1 nonfatal injury in 10 years, $475 property damage per reactor year.

[1] Data supporting this table are given in the Commission's "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," WASH-1238, dated December 1972.

[2] Although the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified, the risk remains small regardless of whether it is being applied to a single reactor or a multireactor site.

* "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants, Draft," WASH-1400, August 1974.

8. EVALUATION OF THE PROPOSED ACTION

Resume'

In the FES-CP the staff evaluated the projected demand of the applicant's and CAPCo's system. CAPCo has updated its projected system load and generating capacity and the applicant has requested an operating license power level of 906 MWe, which is the design output of the plant. The power level previously analyzed for benefits was 872 MWe. The new need for power section reflects this new information and the revised plant capacity.

8.1 THE NEED FOR POWER

Since the issuance of the FES-CP, changes in the projected system load and generating capacity have occurred. These changes are similar to changes that have occurred in other utility systems under today's economic and energy situation. Both the Toledo Edison Company and the Cleveland Electric Illuminating Company are members of the Central Area Power Coordination Group (CAPCo) (see Introduction). They have joined with the other members of CAPCo (Ohio Edison Company and Duquesne Light Company) to benefit from the economy of large scale generating plants and increased reliability through pooling their generating and transmission capabilities. The capacity of the station now has been scheduled to be added to the CAPCo generating system in 1976, without designation of the percentage of capacity going to the member companies. The generation from Davis-Besse Unit 1 is ultimately expected to be shared between the Toledo Edison Company and the Cleveland Electric Illuminating Company in proportion to the respective ownership of 52.5% and 47.5%.

The staff considered the impact of conservation of energy during the environmental hearings held after issuance of the FES-CP. Conservation of energy methods considered included impact of advertising, rate structure changes, changes in uses of electricity, changes in public attitude, and energy efficient buildings and appliances. The staff has not found any additional conservation of energy information significant enough to change the previous evaluation.

The staff looked at the CAPCo system projected demands for its evaluation. Tables 8.1 and 8.2 indicate the most recent projections by CAPCo and the applicant. As shown in Table 8.1, without Davis-Besse Unit 1 and in the face of the CAPCo's projected increase in demand, CAPCo's peak load reserve margin would be in the range of between 18.5 and 8.2 percent in the 1976-1978 period. This reserve margin is below the 20 percent reserve margin recommended by the Federal Power Commission for system reliability. The demand identified in Table 8.2 for TEC and CEIC will be met by the CAPCO system generating capacity.

The Davis-Besse Nuclear Power Station Unit 1 will be a base load plant. The staff's estimate of the current baseload demand of the general service area of the CAPCo System is approximately 7,000 MWe which is approximately 8 times as large as the 906 MWe net capacity of Davis-Besse Unit 1. Comparing the projected operational and maintenance charges and the fuel charges projected for Davis-Besse Unit 1 and for other modern baseload plants in the applicants' system reveal that none of the exising baseload units are more economical for operating than Davis-Besse Unit 1. For example in 1977, the projected total operational and maintenance charges and fuel charges for Davis-Besse 1 are 4 mills/kwhr while the newest coal fired unit, Mansfield 2, has a projected cost of 16.7 mills/kwhr. The composite of the existing Bayshore units are projected to have a cost of 10.3 mills/kwhr in 1977.[1] The difference in costs between the coal fired units is that the Bayshore fuel cost were based on an existing coal contract and not the higher current contract levels. The air pollution intrinsic to the coal-fired plants make the Davis-Besse Station envionmentally preferred. (The CAPCo system is scheduled to include one additional nuclear unit of 885 MWe, Beaver Valley Unit 1, which will have a similar advantage as a baseload plant for CAPCo when Davis-Besse Unit 1 becomes available.)

The staff has considered the benefit to the public in substituting nuclear fuel for fossil fuel required to produce electrical energy for the CAPCO service area. The major fossil fuel used by the CAPCO companies is coal. As previously indicated, Davis-Besse Unit 1, which will be a baseload unit, is projected to be more economical and have less environmental impact than fossil fuel baseload units in the CAPCo generating system. This substitution will allow saving coal for future generations. Approximately 350 train loads of coal per year would be required to produce an equivalent amount of electrical energy.

Based on the above, it is the staff's evaluation that Davis-Besse Unit 1 is an optimal baseload plant for the CAPCo system and an operating license should be issued.

8.2 ADVERSE EFFECTS WHICH CANNOT BE AVOIDED

The staff has reassessed the physical, social, and economic impacts that can be attributed to the Davis-Besse Station. Until construction has been completed, some of the predicted adverse impacts of the construction phase will still be present. The applicant has planned a landscaping program at the plant site that will begin after commercial operation for those areas impacted by the construction of Unit 1. The staff has not identified any additional adverse effects other than those listed in the FES-CP, that will be caused by operation of the plant. As the result of the use of the upper bound approach, the calculated radiological impact has been determined for the entire U. S. population instead of the population residing within 50 miles of the Davis-Besse Station. The evaluation of the radiological effects remains unchanged since this is still a small percentage of natural background. The applicant plans to discharge total residual chlorine at a maximum level of 0.5 mg/l. This was the level evaluated by the staff in the FES-CP and the conclusion set forth in Section 8.2.2 of the FES-CP are still valid.

8.3 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The evaluation presented in the FES-CP is still valid.

8.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

There has been no change in the staff's assessment of this impact since the earlier review except that the continuing escalation of costs has increased the dollar values of the materials used for constructing and fueling the plant. (See Section 11.)

TABLE 8.1[2]

CAPCO FORECAST OF PEAK DEMANDS

Year	CAPCo Summer Peak Demand (MW)	CAPCo Summer Capability (MW)	Available Reserves (MW)	Available Reserves % of Peak Demand	Without Davis-Besse (%)
1975	10785	12007	1222	11.3%	-
1976	11442	14463	3021	26.4	18.5
1977	12368	15149	2781	22.5	15.2
1978	13186	15179	1993	15.1	8.2
1979	14002	15179	1177	8.4	0.2

TABLE 8.2[3]

CEIC AN TECO FORECAST OF PEAK DEMAND

Year	CEIC Annual Peak Demand	TECO
1975	3300	1328
1976	3460	1424
1977	3790	1600
1978	4050	1738
1979	4340	1829

REFERENCES

1. Letter from L. Roe, Vice President Toledo Edison Company to G. Knighton, U.S. Nuclear Regulatory Commission, April 21, 1975.

2. Toledo Edison Company, Davis-Besse Nuclear Power Station Units No. 2 and 3, Environmental Report, Construction Permit Stage, Volume 1, Docket Nos. 50-500 and 50-501, issued August 30, 1974, p. P-iv.

3. Ibid. p. 1.1-9.

9. ALTERNATIVE ENERGY SOURCES AND SITES

Resume

In the FES-CP, the staff evaluated the alternative energy sources and sites. Alternative energy sources considered were the purchase of power from other companies, hydroelectric potential in the CAPCO service area, and fossil fired generating plants, including oil, natural gas, and coal fired plants. The staff also evaluated the applicant's site selection. There have been no major changes in the information relied upon by the staff for the previous evaluations that would require consideration of alternative energy sources and alternative sites at the operating license review stage. The staff's evaluation that the recommendation is the completion and operation of the station remains unchanged.

10. PLANT DESIGN ALTERNATIVES

Resume

In the FES-CP, the staff evaluated alternatives to the proposed plant design and concluded that the construction of the proposed design was acceptable. Included in our evaluation was an alternative method of operating the closed cycle cooling system, which was a method to minimize the discharge of chlorine into the receiving waters. At the time that environmental review was conducted, no chlorine discharge limitations had been established by EPA under the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500). The staff selected a conservative value of 0.1 ppm total residual chlorine as adequate for the protection of the environment and conditioned the continuation of the construction permit with a requirement that the objective of the station design be such that by careful operation the total residual chlorine concentration in the effluent would be 0.1 ppm or less, not to exceed 2 hours/day. (See FES-CP pg. iv). The method of operation proposed was one alternative which the staff believed would have resulted in meeting that requirement.

Since that time, the EPA has established chlorine limits (see 39 FR 36201), in accordance with Public Law 92-500, as indicated below.

§423.15 Standard of Performance for New Sources

(i) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

Effluent Characteristic	Maximum Concentration	Average Concentration
Free available chlorine	0.5 mg/l.....	.....0.2 mg/l.

	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
Materials added for corrosion inhibition including but not limited to zinc, chromium, phosphorous.	No detectable amount.	No detectable amount.

(j) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination."

The staff previously evaluated the applicant's proposal to discharge total residual chlorine at the 0.5 mg/l level, and based on EPA recommendations, had imposed a limit of 0.1 mg/l. As a result of the establishment of this new limitation on chlorine, the previous staff requirement on chlorine is no longer applicable. Thus, the method of operating the cooling system identified in the FES-CP, Appendix B, will not be required.

The staff previous evaluation of the cooling system alternatives, the intake system alternatives, the discharge system alternatives, the sanitary waste system and the transmission system remain unchanged.

11. BENEFIT-COST SUMMARY

Résumé

There have been minor changes in the cost benefit summary since issuance of the FES-CP. The benefits have increased due to an increase in unit rating from 872 MWe to 906 MWe and a small increase in employment. The environmental cost of the proposed plant has changed slightly in that the projected population dose has decreased while the expected discharge of chlorine has increased. The capital costs of the Davis-Besse Station Unit 1 have increased. These changes are discussed in following sections.

11.1 BENEFITS

Increasing the capacity of the station from 872 MWe to 906 MWe will result in an increase in the kilowatt-hours per year generated from approximately 6.1 billion to 6.3 billion and a proportinate increase in both income tax and sales tax revenue. The applicant now expects to have a permanent employment of 110 at the station. Thus, the benefits from the proposed action are slightly increased from those evaluated in the FES-CP.

11.2 ENVIRONMENTAL COSTS

The environmental cost of land use, water use, and biological effects previously evaluated remain basically unchanged. The calculated upper bound radiation dose is 140 man-rem per year. There will be a slight increase in the amount of chlorine discharged to the lake due to the applicant's change in chlorination scheduled for the service water system. The staff estimates that on the average, 15 pounds per day of chlorine amy be discharged to the lake instead of the 13 pounds previsouly listed in Table 11.1 of the FES-CP. Thus, the staff's previous evaluation of the environmental cost remains essentially the same.

11.3 ENVIRONMENTAL COSTS OF THE URANIUM FUEL CYCLE

The contribution of environmental effects associated with the uranium fuel cycle are sufficiently small so as not to affect significantly the conclusion of the Cost-Benefit Balance.

11.4 INTERNAL COSTS

The primary internal costs of the station are: the capital cost of the facility, including both plant and transmission; the fuel cost; and the operation and maintenance costs.

The total capital cost of the Davis-Besse Station is presently estimated at approximately $450 million.[1] Table 11.1 summarizes the major cost categories of the station. These cost estimates include provisions for escalation and contingencies incurred during the construction stage.

The power production cost, including both fuel and operation and maintenance costs, have been estimated by the applicant to be 4.66 mills per kWh for the year 1977. This estimate assumes a levelized plant factor of 75 percent over an estimated 40 year service life including expected escalation.

11.5 SUMMARY OF COST-BENEFIT

As the result of this second review of potential environmental impacts, the staff has been able to assess more accurately the problems that were associated with the construction phase and to review the previous evaluations of the effects of the plant's operations. No new information has been acquired that would alter the staff's previous position related to the overall balancing of the benefits of this plant versus the environmental costs (FES-CP, pg 11-2, 3). The staff's assessment of the changes in the plant operation identified in this Environmental Statement is that there will be an increase over the benefits found in the FES-CP resulting from the increased generating capacity, employment, and tax revenue, which more than offsets the potential increase in environmental cost due to increased chlorine discharged to Lake Erie. Consequently, it is the staff's conclusion that the benefit from this plant greatly outweighs the environmental impacts and that an operating license should be issued.

TABLE 11.1

CAPITAL COST OF THE DAVIS-BESSE NUCLEAR POWER STATION
(MILLIONS OF DOLLARS)

Land and Land Rights	3.5
Structures and Improvements	130.0
Reactor Plant Equipment	151.0
Turbogenerator Units	91.0
Accessory Electrical Equipment	49.0
Miscellaneous Power Plant Equipment	9.5
Sub-Total - Steam Production Plant	434.0
Transmission Plant	16.5
TOTAL	450.5

References

1. Letter from L. Roe, Vice President Toledo Edison Company to G. Knighton, U.S. Nuclear Regulatory Commission, April 21, 1975.

12. DISCUSSION OF COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL STATEMENT

12.1 INTRODUCTION

Pursuant to Paragraph A.6 of Appendix D to 10 CFR 50 the Draft Environmental Statement for Davis-Besse Unit 1 was transmitted, with a request for comments, to:

Advisory Council on Historic Preservation
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education, and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Transportation
Energy Research and Development Administration
Environmental Protection Agency
Federal Energy Administration
Federal Power Commission
Great Lakes River Basin Commission
Atomic Energy Control Board, Canada
Executive Office of the Governor of Michigan
Ohio Department of Health
Office of the Governor of Ohio
Toledo Metropolitan Area Council of Governments
Ohio Environmental Protection Agency
Ohio Public Utilities Commission
Mayor of the Village of Oak Harbor, Ohio
Mayor of Port Clinton, Ohio
Toledo Edison Company

In addition, the NRC requested comments on the Draft Environmental Statement from interested persons by a notice published in the Federal Register on April 30, 1975. In response to the requests referred to above, comments were received from:

Department of Commerce (COM)
Department of Health, Education, and Welfare (HEW)
Department of the Interior (INT)
Department of Transportation (DOT)
Energy Research and Development Administration (ERDA)
Environmental Protection Agency (EPA)
Ohio Environmental Protection Agency (OEP)
Toledo Edison Company (TEC)
Joanne L. Campbell (JC)
Daniel E. Doepker (DD)
Ted J. Ligibel (TL)

The comments are reproduced in this Statement as Appendix A, which is reserved solely for them. The staff's consideration of the comments received and its disposition of the issues involved are reflected in part by revised text in the pertinent sections of this Final Environmental Statement and in part by the following discussion. The comments are referenced by use of the abbreviations indicated above; also, the pages in Appendix A on which copies of the comments appear are indicated.

12.2 MONITORING

12.2.1 Radiological Environmental Monitoring Program (HEW, A-6, INT, A-14 TEC, A-26, OEP, A-18)

The applicant will be directed to include snapping turtles in the radiological environmental monitoring program under the category "wildlife" in Table 6.4.

Lake bed sediments will be included in the operational monitoring program, because as is indicated in Section 6.5.2 (p. 6-8), "The applicant plans essentially to continue the preoperational program during the operating period." Table 6.4 (p. 6-10) further indicates that bottom sediment samples will be included in the program. The sampling locations include indicator and control locations and should be sufficient, in our view, to indicate any significant buildup of radioactivity due to plant operation.

Table 6.4 has been revised to incorporate the staff's recommendations in Section 6.5.1 of the DES, and the recommendations have been deleted.

Fish and terrestrial wildlife will be included in the radiological environmental monitoring program, as indicated in Table 6.4 (pp. 6-10 and 6-11, respectively).

12.2.2 Aquatic Monitoring Program (COM, A-2, EPA, A-11, OEP, A-18, TEC, A-25, ERDA, A-5, EPA, A-8, INT, A-13)

It was suggested that during operation the applicant should monitor ichthyoplankton at the intake and discharge structures more frequently than previously (1973-1974) to accurately determine impacts of entrainment. During 1975 the applicant is sampling ichthyoplankton once every ten days from May through September. The Environmental Technical Specifications will require that identical sampling methods be used no less than once every ten days for the same period during at least two years of commercial operation. Monitoring at the intake structure will be used to estimate numbers and types of life-stages entrained, and to assess local and regional impacts in light of similar data being collected throughout the Western basin of Lake Erie.

The Environmental Technical Specifications will also require that fish impingement be monitored no less than three times each week to determine the number and size-distribution of each species impinged, and to assess local and regional impacts. Monitoring locations and procedures will be specified.

The Environmental Technical Specifications will require the applicant to submit a plan for estimating numbers of organisms impinged and entrained, and will require the applicant to submit a mitigation plan, for NRC staff approval, if unacceptable impingement or entrainment impacts are found to be occurring.

Mollusk populations at the site are not expected to be impacted significantly by operation of the plant. These populations have been studied previously and will continue to be investigated as part of the operational benthic monitoring program.

The Environmental Statement does not normally name organizations contracted by the applicant to perform environmental studies, since these studies are the responsibility of the applicant. The staff accordingly considers that any studies done under the direction of the applicant are being carried out by the applicant, whether the scientists and technicians involved are full-time employees of an applicant company, consultants to the applicant, employees of firms contracted to perform specific tasks for the applicant, or some combination of the above.

A comment was made that studies of fish should include studies of changes in lake bottom morphology. Information obtained from such studies can be helpful in interpreting spatial distributions of fish; however, the staff does not anticipate significant far-field impacts on fish. Information regarding substrate composition at the site will be obtained from benthic studies required by the Environmental Technical Specifications.

It was suggested that it was unnecessary to conduct a special study to determine the extent to which the intake canal supports a fish population and thus contributes to impingement losses. The staff believes that such a study is essential to developing an accurate estimate of adult and juvenile fishes that are withdrawn from the lake through the intake crib. The traveling screens at the intake structure will be monitored so as to provide annual estimates of impingement. Without determining the extent to which the intake canal supports a fish population, there will be no means of making a distinction between adult and juvenile fish entrained at the intake crib and then impinged and fish that grew to impingeable sizes in the intake canal after being spawned in the canal or entering as eggs and larvae entrained at the intake crib.

The staff believes that the intake design used by the applicant represents a practical balance between technological and ecological considerations and will have a minimal environmental impact. The Environmental Technical Specifications will require a frequent schedule for monitoring fish impingement to establish reliable estimates of the numbers and sizes of each species impinged and to enable periodic evaluation of impacts on local and regional fisheries.

Reference was made to a study by EPA, the Fish and Wildlife Service, the states of Michigan and Ohio, and several industries and universities to enumerate the number of fish larvae in Western Lake Erie to determine the impact of fish larval entrainment. The applicant is currently indirectly participating in this study through the Ohio State University Center for Lake Erie Area Research which is implementing the Ohio portion of the study and the aquatic environmental monitoring program at the Davis-Besse Station. The ichthyoplankton sampling locations at the Davis-Besse site are being incorporated into the EPA study while the data obtained at the EPA sampling stations in the reef areas of the western basin will be compared with the data obtained from the Davis-Besse stations.

It was suggested that it was unnecessary and impractical to conduct a special study to determine the effectiveness of the bubble screen in reducing impingement. The staff recognizes that some fish which enter the intake canal could reside in the canal for long periods of time before being impinged on the traveling screens where they would be monitored. This lag would make it difficult to correlate the operation of the bubble screen at the intake crib with impingement data. The applicant will be required to investigate entrainment of adult and juvenile fishes at the intake crib and operation of the bubble screen by a monitoring means other than use of the traveling screens. This could be done by concentrating on the extreme lakeward end of the intake canal where entrained fish first enter the canal. Such monitoring is essential not only to evaluating the effectiveness of the bubble screen, but also to identifying the extent to which the intake canal supports a resident fish population and contributes to impingement losses.

A comment was made that phytoplankton and zooplankton populations respond rapidly to changes in available light and nutrients and are capable of rapid changes in composition and size, and that results of monthly sampling are inadequate to completely describe the plankton dynamics at the site. The staff recognizes the extreme temporal and spatial variability of plankton populations and factors which affect population sizes, composition, and distribution. Tables 2.5 and 2.6 were not intended to provide a complete description of the micro-structure of plankton populations. Their purpose is to provide an understanding of the relative numbers of important species which might be expected to be found at the site during various seasons of the year. Additional data and discussion are available in the ER-CP (App. C) for Unit No. 1, FSAR (App. 2B) for Unit No. 1, and the ER-CP for Unit Nos. 2 and 3.

12.2.3 Chemical Release Monitoring, (TEC, A-26)

It was pointed out that the chemical monitoring, sample, and testing schedule shown in Table 6.2 might be modified upon the issuance of an NPDES permit. The staff is in agreement with this comment and will make every effort in establishing the requirements of the Environmental Technical Specifications to avoid unnecessary duplication of effort and reporting between the ETS and the requirements of the NPDES permit.

12.2.4 Groundwater Sampling (HEW, A-6)

The discharge from the sewage treatment facility, which is designed to provide secondary treatment and which will not involve the use of a septic tank, will be routed to the plant discharge line into Lake Erie. Because the effluent will be captive and not discharged to a land disposal system, the staff cannot justify the monitoring of on or off site wells for influence from sanitary wastes. Even if a land disposal system were used, off site wells would not likely be in danger of contamination because the groundwater gradient is toward the lake.

12.2.5 Terrestrial Ecological Monitoring (INT, A-14)

The applicant has stated that the frequency of bird collection around cooling towers will be increased during migration periods when inclement weather is expected since impaction frequency is expected to be greatest under these conditions. When the impaction frequency is low a weekly collection interval will be followed during migration seasons. This plan is acceptable to the staff since it is most important to detect and record catastrophic events (hundreds or thousands of impactions in one night for example). The staff recognizes that when impactions are infrequent, weekly collections could be inaccurate because of scavenger activity but concludes that this is acceptable because infrequent impactions have no appreciable effect on bird populations. Scavenger activity is not likely to affect the accuracy of data if larger numbers of birds are impacted.

12.3 NON-RADIOLOGICAL IMPACTS

12.3.1 Importance of Site as Spawning and Nursery Area for Fish (COM, A-1, A-2, INT, A-13, EPA, A-11, ERDA, A-5)

Comments were made that the previous (1973-1974) schedule for sampling ichthyoplankton was too infrequent to adequately determine the importance of the immediate plant site as a spawning and nursery area. Comparison of monthly samples taken by the same procedure at the site and Sandusky Bay in 1974 indicated that ichthyoplankton concentrations in the vicinity of the intake and discharge were about one-third as large as those found in Sandusky Bay. Habitats and conditions in Sandusky Bay are more favorable for spawning and nursery. Forage fishes, especially emerald shiner and gizzard shad dominated samples taken at the site. Few eggs and larvae of game fish were taken at the site.

During 1975 the applicant is sampling ichthyoplankton once every ten days at the intake and discharge structures from May through September. U.S. EPA, U.S. Fish and Wildlife Service, the States of Michigan and Ohio, and several universities are undertaking a study to enumerate the number and types of fish eggs and larvae in western Lake Erie. EPA is collecting samples once every ten days, using sampling procedures identical to the applicant's, at known spawning areas in western Lake Erie. These data will be compared to verify that the Davis-Besse site is not an important spawning and nursery area for game and commercial species. The Environmental Technical Specifications will require the applicant to continue to sample ichthyoplankton on the same schedule using the same methods for at least two years of commercial operation. The abundance and distribution of fish eggs and larvae at the site will be investigated further to refine the prediction of entrainment losses. Unless otherwise demonstrated, the staff will assume that all fish eggs and larvae entrained at the intake crib will be killed by passage through the plant.

12.3.2 Fish Catch Data (ERDA, A-6)

A comment was made that Table 2.9 (p. 2-13) is a very crude way of showing fish distributions at the site over a six-month period. The table is not intended to indicate spatial or temporal distributions; it is simply a summary of experimental catches by gear. The table shows relative abundances using three indices (trawl, gill-net, and seine) of abundance. As is clearly stated on page 2-12, detailed discussions and data pertaining to fish populations at the site are already available elsewhere in the public docket.

12.3.3 Commercial Fisheries (COM, A-1)

It was suggested that the FES include a discussion of the commercial fisheries in the immediate vicinity of the site. Section 2.7.1.5 has been expanded to consider these fisheries.

12.3.4 Scuds as a Source of Food for Fish (COM, A-2)

It was suggested that it would be appropriate to include data to support the conclusion that scuds are not an important food source for fish at the site. Supportive data and discussion for this conclusion appear in the ER-CP for Unit No. 1, ER-CP for Unit Nos. 2 and 3, FSAR (App. 2B) for Unit No. 1, and the Semi-Annual Reports for 1974, all of which are in the public docket.

12.3.5 Vertical Intake Flow (COM, A-1, EPA, A-11)

A comment was made that even though the plant intake velocity is very low, only limited information is available on the effects of vertical intake currents on fish, and that the staff's conclusion that fish impingement will be minimal requires further discussion.

A major factor in the design and location of the intake crib for the Davis-Besse Nuclear Station was the gentle slope of the lake bottom in the western basin of Lake Erie. Offshore intake structures at other nuclear power plants on the Great Lakes are commonly located in 20 to 50 feet of water. The intake crib at the station is located approximately 3000 feet offshore in relatively shallow water, 11 feet below low water datum (568.6 feet I. G. L. D.). The intake design has to be such that the crib would not be exposed by low water and the intake ports had to be far enough off the lake bottom that sediments would not be drawn into the crib and reduce the capacity of the intake system. The applicant investigated locating the crib in deeper water and found that not to be a viable alternative. In the vicinity of the site water depths of 20 feet are not reached until about four to five miles from shore. The design finally chosen utilized a downward flow of water into the crib so that the intake ports could be located as far off the lake bottom as possible and still be under water during low lake level conditions. During design of Units 2 and 3 the applicant considered using a velocity cap to change the direction of the intake flow to horizontal. This was determined to be impractical, since under low lake level conditions the upper portion of the cap would have been above water and subject to winter ice damage.

Over ten years of operating experience at the intake cribs of two fossil-fuel units at Oregon and Port Clinton, Ohio, indicates that minimal problems with fish entrainment and subsequent impingement due to vertical intake flows can be expected.

12.3.6 Endangered Species of Fish (INT, A-13)

It was suggested that the FES include a statement that longjaw cisco and blue pike, both on the U.S. Department of Interior's List of Endangered Fauna, are present in Lake Erie but are seldom found in its western basin. Section 2.7.1.5 has been expanded to include this information.

12.3.7 Water Quality Parameters (ERDA, A-5)

The variability in Lake Erie water constituents for 1972 through 1974 is given in Figures 2.1-1 through 2.1-3 of the DES. The extreme values over this same time period for the constituents listed in Table 2.4 of the DES was published in the DES CP stage for Davis Besse Units 2 and 3 (Docket Nos. 50-500 and 50-501). These figures were taken from the same data as those in Table 2.4 of the Unit 1 DES. The table has been modified to include these values.

Short range (seasonal) trends in various Lake Erie water quality constituents have been noted in the applicant's Pre-Operational Environmental Monitoring Program Semi-Annual Reports for 1973 and 1974 (see references 6 and 7 of the DES). These trends are attributed to seasonal changes in the aquatic biological community near the site and changes in the water's physical (e.g., temperature) characteristics.

As stated in Section 2.5.1 no long range trends have been noted in Lake Erie water quality in the vicinity of Locust Point during the sampling program of 1972-1974.

12.3.8 International Joint Agreement on the Great Lakes (INT, A-13)

The various environmental effects of station operation considered in Section 5.2 of the DES have been reexamined in light of the International Joint Agreement on the Great Lakes created on April 15, 1972. The staff has concluded that the provisions of this agreement are complied with in the proposed action.

12.3.9 Recreational Water Use (INT, A-13)

Recreational activities, largely associated with the lakeshore and associated wetlands, have been described in Section 2.2.4 of the FES-CP for Davis-Besse Unit 1 and updated in Section 2.2.3 of the DES-OL for Davis-Besse Unit 1.

The analysis of the possible environmental effects of station operation on the uses of Lake Erie presented in the DES-OL stage reveals no significant change to the impacts predicted at the FES-CP stage and that the overall analysis presented in Section 5.2.7 of the FES-CP (i.e., that the plant effluent will have no detectable effect on human uses of the lake) remains valid. Statements to this effect are present in Sections 5.2.2, 5.2.3 and 5.2.5.

12.3.10 Auxiliary Boiler Blowdown and Cleaning Solutions (TEC, A-25)

Table 3.7 of this statement has been revised to incorporate the new values. Additionally, the applicable portion of Section 5.2.5 has been changed to reflect analysis of the newly received data.

12.3.11 Chlorine Discharge (INT, A-14)

The total residual chlorine discharge limits recommended by Brungs (WPCF Vol. 45 No. 10, 1973, pp. 2180-2193) have been recognized by the Ohio EPA as bio-assay data satisfying the state's water quality standard's toxicity criterion for this constituent. This fact is reflected in the agreement between the state and the applicant to study means to reduce chlorine discharges to this level. See response on Plant Chlorination Procedures. The staff agrees with this approach.

12.3.12 Plant Chlorination Procedures (EPA, A-12)

Under normal unit operation, the incoming service water will be continuously chlorinated to protect the service water system from algae growth and to provide a chlorine demand-free make up to the closed condenser cooling water system. This will result in the minimum amount of chlorine required for protection of the closed condenser cooling water system from algae growth. It does, however, have the potential for some very low levels of chlorine to be present in the system at all times. It is, however, expected that the chlorine level in the system from this source will be undetectable.

To properly protect the condenser, and other parts of the closed condenser-cooling water system from biological fouling, it is anticipated there will be a need based on experience at existing installations to inject chlorine into the circulating water system for four, one half hour periods each day. The amount of chlorine to be added will be that required to maintain a free chlorine residual at the condenser outlet of 0.5 mg/l. Since the transit time of water through the circulating and cooling towers system is approximatley 25 minutes, there will be a buildup of residual chlorine in the total systems.

Passage through the cooling tower of the chlorinated circulating water will reduce the chlorine content by the time it reaches the blowdown point, which is at the outlet of the circulating water pump taking suction from the open canal leading from the cooling tower basin to the circulating water pumphouse. The total chlorine residual in the circulating water system, at this point, will reach and maintain an equilibrium condition until completion of the one half hour chlorination period after which the chlorine level will decay to a very low, and essentially undetectable,level. Due to this buildup of chlorine residual in the system, and the time required to decay after termination of chlorine injection, there will be a chlorine content in the blowdown discharge for more than the chlorine injection time.

The chlorine content in the cooling tower system blowdown water will be essentially all in a combined form, with essentially no detectable levels of free available chlorine. It is expected that during any single chlorination period, combined chlorine will appear in the cooling tower system blowdown water approximately twenty-five minutes after commencement of chlorination, and rise to the peak level of 0.35 mg/l thirty minutes after start of chlorination, followed by a rapid decay which tails off to zero 120 minutes after start of chlorination. There is additional decay time available to further reduce the combined chlorine content in the approimately two-hour transit time from the collection box through the discharge pipe to the orifice discharge in the lake. In addition, any dilution water required to maintain the discharge temperature at a value of 20°F, would provide both dilution and consumptive reduction of this chlorine level. The rapid entrainment mixing with the ambient lake water as the blowdown discharge leaves the slot-type orifice, will provide both mixing dilution and chemical reduction in a very short time, such that, at any place where fish are likely to be found in the discharge, the chlorine level is expected to be at an extremely low level.

During periods when the closed condenser-cooling water system is not operating, Unit service water will be discharged directly to the collection box after passage through the house service water systems rather than being used as cooling tower system makeup. During such periods of operations, the station service water will be chlorinated during four one-half hour periods a day instead of on a continuous basis when the discharge is being used as a cooling tower system makeup. During these periods, the transit time of some two hours from the discharge into the collection box to the discharge structure in the lake, will permit decay time for the free chlorine residual to be reduced to a concentration well within the maximum concentration of 0.5 mg/l with an average concentration by dilution with ambient lake water mixing, and even much quicker reduction of the free chlorine content by reaction with the chlorine demand of the ambient lake water.

The use of chlorine as a biocide at the Davis-Besse Unit 1 facility in the service water and main circulating water systems is summarily discussed in the DES Section 3.5.1 and referenced to the applicable portions of the ER. No further clarification is necessary.

It is the applicant's position that the discharge of total residual chlorine, under the present chlorination schedule, for a period greater than two hours per day is unavoidable at Davis-Besse Unit 1 due to plant design. Furthermore, the applicant plans to demonstate this to the State of Ohio in accordance with CFR 423.12(b)(9) and CFR 423.13(j). The staff agrees that, under the presently envisioned two hours per day chlorination of the circulating water system and the continuous chlorination of the service water system, this demonstration to the State of Ohio is necessary.

The applicant believes that the discharge of free residual chlorine will be almost undetectable at the point of discharge from the facility and that the total residual chlorine level at the nearest point to the discharge where fish and other quatic biota could maintain themselves for substantial period of time would be 0.5 mg/l or less. The applicant has subsequently agreed to conduct a study to determine the feasibility of reducing the total residual chlorine concentration at this same point to 0.2 mg/l for a period of 2 hours per day or less. This level of exposure is in conformance with the State of Ohio water quality standards' provision forbidding the creation of toxic conditions in the receiving water body.

The staff will require the applicant to conduct a study to confirm that such toxic conditions do not exist in the mixing zone where fish and other aquatic biota can maintain themselves. This confirmatory program will encompass the provisions regarding chlorine releases cited in the NPDES permit when issued and will be made a part of the ETS for the facility.

12.3.13 Chemical Mixing Zone (OEP, A-18)

The text of Section 5.2.5 has been changed to indicate a mixing zone of 2112 feet.

12.3.14 Asbestos in Cooling Tower Blowdown (DD, A-21)

Asbestos sheet will be used for the cooling tower fill for the Davis-Besse Nuclear Power Station Unit No. 1. The cooling tower supplier Research-Cottrell and their licensor, Hamon Sobelco, S.A. of Belgium, have been responsible for the design of hundreds of towers using asbestos-cement fill material. The oldest of these towers have been in operation for more than 30 years. Observations and physical measurement during the life of these towers indicated that asbestos leaching was either non-existent or negligible.

Studies by Toschi, a German asbestos-cement sheet manufacturer, on 20 year old 3/16 inch thick asbestos sheets showed they were within original tolerances. This study also showed that these sheets were covered by an organic film, similar to fat, which caused the water to run over the film and not come directly in contact with the asbestos sheet.

Research-Cottrell has measured asbestos levels in the circulating and makeup water at the John E. Amos Plant of the Appalachian Power Company, and the Bowen Plant of the Georgia Power Company, and found the asbestos concentration to be lower in the circulating water than in the makeup water. These measurements are presented below:

John E. Amos Plant
Makeup water 2.67×10^{-8}
Circulating water 1.32×10^{-8}

Bowen Plant
Makeup water 8×10^{-10}
Circulating water 6×10^{-10}

The above indicates that some asbestos is actually settling out in the cooling tower basin.

Based on site measurements made both in the United States, and at older tower sites in Europe, Research-Cottrell states that these tests yielded two important results:

1. After the first few months of operation, a Research-Cottrell/Hamon Cooling Tower, adds no detectable amount of asbestos fiber to the circulating water.

2. During the first few months of operation, when a tower does add to the asbestos content of the circulating water, the increment is much smaller than the normal "background" variation in American waterways.

In reviewing the medical literature, it was found that the question of asbestos fibers in water has been recently studied extensively by the United States Public Health Service, the World Health Organization, Johns-Manville, and the American Waterworks Research Foundation. All studies resolved to a single important point: There is no indication whatsoever of a line between the ingestion of asbestos fibers and gastro-intestinal cancer. It was found that subjecting test animals to massive doses of asbestos fiber results in the irritation of the gastro-intestinal tract, but not even massive doses prompted an elevation in the incidence of cancer.

12.3.15 Bald Eagles and Kirtlands Warbler (INT, A-13)

Neither the Southern Bald Eagle nor Kirtlands Warbler appears on the list of birds sighted in the Ottawa National Wildlife Refuge during the period 1969 through 1972 (ER Units 2-3 Appendix 2E). Neither bird appears in a recent listing of rare and endangered vertebrates of Ohio (H.G. Smith, et al., The Ohio Journal of Science (73:257-271, Sept. 1973). The staff concludes that these species do not normally inhabit the area of the Davis-Besse site and that they should not be included in the FES list of endangered species.

12.3.16 Land Use (INT, A-13)

The applicant has indicated a commitment for the preservation of the marshes on site. The possibility of providing a public recreation area has not been discussed and the staff concludes that public recreation is not part of the marsh preservation plan.

12.3.17 Prevention of Bird Collisions (INT, A-14, TL, A-24)

The applicant has indicated an intent to begin a program to explore the effectiveness of strobe lights for reduction of bird collisions with cooling towers. (Preoperational Environmental Monitoring Programs, Semi-Annual Report, July 1, 1974 - December 31, 1974. Davis-Besse Nuclear Power Station Unit No. 1 Bird Hazard Monitoring Contract, p. 10.) The staff will monitor results of the program as they are submitted in subsequent Annual Reports.

12.3.18 Air Quality (EPA, A-12)

Estimates of the auxiliary boiler air pollutant emissions to the ambient air are present in Table 3.7-1 of the Davis-Besse Nuclear Power Station Unit No. 1 Supplement to the Environmental Report-Operating License Stage.

12.4 RADIOLOGICAL IMPACTS

12.4.1 Fission Products (ERDA, A-6)

The comment was made that Table 3.2 should have included I^{129} as a fission product at the 100 uCi/yr level. We have calculated the release of I-129 to be less than 10^{-5} Ci/yr from Davis-Besse Unit 1. Therefore, we have included I-129 in the category "All Others."

12.4.2 Method of Estimating Releases (OEP, A-16)

Our parameter for defective fuel of 0.25 percent used in the DES was based on the available operating data for the reactors listed in Table B-2 of Draft Regulatory Guide 1.BB. This parameter has been revised to a value of 0.12 percent based on additional operating data. This revised value is used in the calculation of the source terms in the FES.

The main condenser/air ejector iodine partition factor of 0.00005 used in the calculation of releases from Davis-Besse 1 included the effect of a charcoal adsorber on the air ejector. Since this adsorber has been removed from the Davis-Besse 1 design, the value of the partition factor has been changed to 0.0005 in the FES.

We have considered the effect of the new 17 x 17 fuel array in the Davis-Besse 1 design. It is expected that there will be lower linear heat rates and fuel temperatures in the new fuel assemblies. Therefore it is expected that the fuel failure rate will probably be slightly lower than that assumed in our calcualtions.

Regarding the noble gas and tritium releases from the operating plants, it should be noted that of the plants listed in your letter, Yankee Rowe, Indian Pt. 1, Connecticut Yankee and San Onofre use stainless steel cladding for their fuel. Data in Table B-6 in the Draft Regulatory Guide 1.BB, shows that releases of tritium from plants which have stainless steel clad fuels is significantly higher than those with zircaloy clad fuels. Since Davis-Besse will use a zircaloy clad fuel we have compared it with the operating data found for similar plants in Table B-6.

For the noble gases released from the plant, it should be noted that the power level is only one parameter affecting the release. Other parameters which would have to be investigated in comparing releases from different plants are the gas stripping rate from the shim bleed, the letdown rate, and most importantly the holdup time in the gaseous radwaste systems. In particular, the San Onofre plant had only a 7-day holdup time for radioactive gases in 1970-1972 whereas Davis-Besse can provide 60 days of holdup. Furthermore, the releases which have been given in the DES for Davis-Besse represent estimates of releases averaged over the life of the plant. Therefore, it is the staff's conclusion that based on the actual Davis-Besse 1 plant parameters the estimates presented in Table 3.4 are realistically expected to occur on an average annual basis over the life of the plant.

Our parameter for plant factor 0.8 used in the DES was based on available operating data for the reactors listed in Table B-1 of Draft Regulatory Guide 1.BB. Although the 80% factor is higher than the average experience factors, it is expected that maintenance and refueling problems which contributed to the low capacity factors will be overcome. We are evaluating additional operating data as it comes available, and the plant factor will be considered for revision based on this evaluation.

12.4.3 Radwaste System Parameters (EPA, A-9)

The parameters and calculational models which we have used in the Davis-Besse 1 DES-OL stage reflect more recent information concerning plant operation than those parameters and models used in the Davis-Besse 1 FES, construction permit stage. The inconsistencies noted have been clarified in the FES-OL stage.

12.4.4 Concentration Factors (ERDA, A-6)

The values of Thompson, et.al., are concentration factors (not a dose assessment model) and were used in the radiation dose assessment in the DES. It is our position that the Thompson reference contains data which are reasonable values to use in lieu of site-specific data.

12.4.5 Radionuclide Concentrations in Environment (OEP, A-18)

The quantitative distribution of radionuclides in the environment has been considered by the Staff and is implicit in all of the radiological impact estimates in Section 5.7. This distribution is accomplished through the use of hydrologic and atmospheric dilution factors.

Estimates of radionuclide concentrations on vegetation are implicit in the estimates in Section 5.7. Such concentrations are due entirely to radioiodine deposition since, based on the source term in Table 3.3, radioiodine is the only species which will deposit on vegetation to any extent and will in turn be consumed by animals and humans. Doses from concentrations on land areas of the radionuclides in Table 3.3 have been found on a generic basis to be too small to warrent further consideration, and hence, have not been considered in the Davis-Besse DES.

The buildup of radionuclides in the enviornment has been considered in the dose estimates in Section 5.7 in that all radionuclides were assumed to be at equilibrium levels in the environment. The dose from radionuclides in sediment was specifically evaluated (recreational use of shoreline - DES Table 5.2) and was based on the anticipated buildup after 40 years of plant operation.

12.4.6 Occupational Exposure (JC, A-20)

The NRC Staff (and its predecessor, the AEC) has significantly increased its review effort relative to occupational exposures since the design of Indian Point-1. This effort was brought into focus with the publication of Regulatory Guide 8.8, "Information Relevant to Maintaining Occupational Radiation Exposure As Low As Practicable (Nuclear Reactors)." The Staff's review effort has resulted in increased attention by the nuclear industry to occupational radiation exposure in both the design and operation of nuclear plants.

12.5 Other Topics

12.5.1 Referencing Sources of Data (COM, A-1, INT, A-13)

The Environmental Statement references sources of data, rather than presenting all data available, because of the tremendous amount of unnecessary duplication that would be involved. The applicant has provided on the order of a thousand pages of data and descriptive material on environmental considerations for Davis-Besse Unit 1. It is much more practical to use needed data in the form originally provided by the applicant than to extract the data out, insert it into the text of the Environmental Statement, and then take the data out of the Environmental Statement.

12.5.2 Radioactive Contamination (HEW, A-6)

Facilities will be available for treating radioactive contaminated persons or radiation injuries at Magruder Memorial Hospital in Port Clinton, Ohio. The Applicant and the hospital staff are currently reviewing equipment requirements for providing this treatment. The equipment required will be purchased by the Applicant to ensure its being available when needed.

12.5.3 Employment Increase (OEP, A-16)

As stated in Section 2.2.2 the estimated employment at Erie Industrial Park has increased 50 people (5.9%) from 850 to 900. This increase was observed between 1972 and 1974, and appears to reflect the normal fluctuations associated with industries moving in and out and the economy. The Applicant believes that as a result of the current economic recession the present employment at Erie Industrial Park could be below the 850 figure cited in the FES-Construction Permit Stage. The Applicant is aware of one firm which had approximately 360 employees in 1973 and now only employs approximately 200 people. It is reasonable to believe that other industries in the park have also experienced a similar drop in employment. There is no known relationship between the increased employment at the Erie Industrial Park and the construction of Davis-Besse Unit No. 1.

12.5.4 Thermal Plume (OEP, A-18)

Regulatory Guide 4.2 applies specifically to the preparation of the applicant's environment report. Section 5.1.2 requires the applicant to describe the effect that any heated effluent will have on the temperature of the receiving body of water with respect to space and time. As was indicated in Section 5.5.3 of the DES, the applicant has met this requirement. Also see Section 12.5.1 of this Statement.

12.5.5 Environmental Dose Commitment (EPA, A-10)

The environmental effects of the uranium fuel cycle were the subject of recent rulemaking (39 FR 14888). The Environmental Protection Agency participated in the rulemaking hearings and made its views part of the hearing record. EPA's comments and views were considered in the formulation of the rules. Subsection 20e of 10 CFR Part 51 (formerly Appendix D to 10 CFR Part 50) reads in part:

> "In the Environmental Report required in paragraph (a) for light-water-cooled nuclear power reactors, the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental costs of licensing the nuclear power reactor shall be as set forth in the following Table S-3 of the Commission's "Environmental Survey of the Uranium Fuel Cycle." No futher discussion of such environmental effects shall be required."

At the present time the Commission's assessment of environmental impacts associated with the uranium fuel cycle remains as described in Report WASH-1248.[19] The staff concludes that the discussion of the subject in Subsection 5.7 (including Table 5.13) suffices until additional information becomes available from several studies that are now in progress related to the various aspects of the fuel cycle.

12.5.6 Indemnification (JC, A-20, TL, A-23)

Under the Price-Anderson Act of 1957, there is a system of private insurance and governmental indemnity totalling $560 million to pay public liability claims for personal injury and property damage resulting from a nuclear accident. Under this law, owners of commercial nuclear power plants having a rated capacity of 100 electrical megawatts or more must provide proof to the NRC that they have private nuclear liability insurance, or another form of financial protection (usually insurance) available from private sources. The maximum amount of private insurance currently available is $125 million. Above that amount, a licensee is required to execute an "indemnity agreement" with the NRC. This indemnity agreement, by law, provides up to but not exceeding $500 million in government indemnity to satisfy public liability claims in excess of the amount of insurance or other financial protection required of the licensee. Since the law provides that in no event shall the sum of the financial protection and the government indemnity exceed the amount of $560 million for a single nuclear accident and because the maximum private insurance is currently $125 million, the government's current indemnity is for $435 million.

In the 16 years since the inception of the Price-Anderson program, no claim requiring payment of government funds under a licensee "indemnity agreement" has ever been received. The only claim paid out under an insurance policy used by licensees to provide the financial protection required by the law involved the shipment of a spent fuel cask. Due to leakage from the cask, it was necessary to decontaminate two trucks used in the movement and a claim of $3,500 was paid by the insurance company.

The indemnity provisions of the Price-Anderson Act expire on August 1, 1977. Congress is expected to consider, this year, the need for additional legislative proposals.

12.5.7 Glossary (OEP, A-18)

The inclusion of a glossary in environmental statements has been the subject of numerous discussions among members of the staff. The conclusion was that, because of the multi-disciplinary nature of environmental statements, a comprehensive glossary would be much more voluminous than the environmental statement itself, and the preparation of such a glossary would be a major project. Because of priority considerations, such a project has not been launched.

12.5.8 Plant Capacity Factor (OEP, A-18, JC, A-19)

Cost comparisons using plant capacity factor were done at the pre-CP stage. No new information has been received to prompt a new evaluation.

12.5.9 Emergency Core Cooling System (ECCS) (DD, A-21, JC, A-19, TL, A-22)

Each nuclear power plant which is licensed by the U.S. Nuclear Regulatory Commission contains a number of engineered safeguards, one of which is an Emergency Core Cooling System. Prior to the issuance of a Construction Permit by the NRC to an applicant for a proposed nuclear power plant, the applicant (an electric power utility company) must first file an application which will undergo a thorough review. In this review, the emergency core cooling system proposed by the applicant

will be studied to ascertain that it conforms to the Acceptance Criteria published January 4, 1974 by the NRC for Emergency Core Cooling Systems.

Prior to any loading of the nuclear fuel and subsequent operation of the power plant, additional information is also thoroughly reviewed to determine that the ECCS, as designed and built, conforms to our Acceptance Criteria. During this review, the Technical Specifications for the completed power plant will be carefully reviewed to determine that the pre-operational and periodic testing that will be performed on the individual subsystems of the ECCS meet our requirements. After the owners of nuclear power plants receive their Operating Licenses, the status of the ECCS will be monitored via the periodic testing procedures detailed in the Technical Specifications. It should be noted that though no licensed power reactors have had an accident situation requiring actuation and full scale operation of the ECCS, unplanned actuations resulting from abnormal conditions have occurred in a number of plants, and in these instances, the ECCS have worked as designed.

The ECCS consists of many redundant subsystems, each capable of cooling the reactor core under emergency conditions. Thus, though some individual subsystems have occasionally malfunctioned either during the periodic testing or during inadvertent actuation, the redundant backup subsystems have functioned properly, thereby performing the required function of the ECCS. This planned redundancy is part of the engineered safeguard design philosophy of licensed power reactors which requires that no single failure will be allowed to impede the functioning of systems which are essential to safety.

In addition to the periodic testing of the major subsystems of the ECCS installed in all power reactors, a series of experiments have been performed to confirm the design features of the individual components and subsystems over a range of conditions which exceed those expected to occur during any postulated loss of coolant accident. These experiement were also conducted to confirm the analytical techniques used in the design and analysis of the various emergency core cooling systems. The question of steam generator tube ruptures will be addressed in the Safety Evaluation Report, which is expected to be published in December 1975.

12.5.10 Transportation of Radioactive Waste (TL, A-23, A-24; JC, A-19)

The transportation of radioactive waste is regulated by the Department of Transportation and the Nuclear Regulatory Commission. The regulations provide protection of the public and transport workers from radiation. This protection is achieved by a combination of standards and requirements applicable to packaging, limitations on the contents of packages and radiation coming from packages.

Primary reliance for safety in the transport of radioactive material is placed on the packaging. The packaging must meet regulatory standards which are specified in the Commission's regulations (10 CFR Part 71; 49 CFR Parts 173 and 178) and which are established according to the type and form of material for containment, shielding, nuclear criticality, and heat dissipation. The standards provide that the packaging shall prevent the loss or dispersal of the radioactive contents, retain shielding efficiency, assure nuclear criticality safety, and provide adequate heat dissipation under normal conditions of transport and under specified accident damage test conditions, including train derailments. The contents of packages not designed to withstand accidents are limited, thereby limiting the risk of hazards arising from an accident. The contents of the package also must be limited so that the standards for external radiation levels, temperature, pressure, and containment are met.

Procedures applicable to the shipment of packages of radioactive material require that the package be labeled with a unique radioactive materials label. In transport, the carrier is required to exercise control over radioactive material packages including loading and storage in areas separated from persons and to limit the aggregation of packages to limit the exposure of persons. The procedures the carrier must follow in case of accident include segregation of damaged and leaking packages and the notification of the shipper and the Department of Transportation. Radiological assistance teams are available through an inter-governmental program to provide equipment and trained personnel, if necessary, in such emergencies.

Within the limitations of the regulatory standards, radioactive materials are required to be safely transported in routine commerce using conventional transportation equipment. No special restrictions on the speed of vehicle, routing, or ambient transport conditions are needed to assure safety. According to the Department of Transportation, the record of safety in the transportation of radioactive materials exceeds that for any other type of hazardous commodity. The Department of Transportation estimates that approximately 800,000 packages of radioactive materials are currently being shipped in the United States each year. To date, there have been no known serious injuries to the public or to the transport workers due to radiation from a radioactive material shipment. WASH-1238 titled "Environmental Survey of Transporation of Radioactive Materials To and From Nuclear Power Plants" provides additional information on this topic.

12.5.11 Emergency Plans (JC, A-20)

An application for a construction permit is required to contain sufficient information to assure the compatibility of proposed emergency plans with nuclear power plant design features, site layout and site location with respect to such considerations as access routes, surrounding population distributions and land use. At the operating license stage of the safety review, an applicant is required to submit for Commission approval procedures for notifying, and agreements reached with local, State and Federal officials and agencies for the early warning of the public and for public evacuation or other protective measures should such warning, evacuation, or other protective measures become necessary or desirable. Requests for specific evacuation plans should be addressed to the appropriate state officials.

12.5.12 Safeguards (DD, A-21)

Studies[1,2] performed for the Commission have shown that acts of industrial sabotage directed toward operating electrical generating stations are relatively rare occurrences. These studies show that transmission and distribution systems are far more accessible and vulnerable targets for attacks against a public utility. Although there exists a potential for release of some of the substantial quantities of radioactive materials present in a nuclear power plant, these studies conclude that generic characteristics such as defense in depth design and engineered safety features reduce the likelihood of sabotage which could endanger public health and safety and that the expected consequences of successful acts of sabotage are likely to be a small fraction of the type of maximum consequences (due to accidents) predicted by the Reactor Safety Study.[3]

To reduce these risks further, the Commission requires security systems and physical protection measures, pursuant to 10 CFR Part 73, which are designed to prevent, inhibit, deter, detect, and, if necessary, respond with force to threats and attempts at acts of sabotage. These measures include on-site armed guards, continuously manned alarm stations, independent communications links with law enforcement authorities, specifications for intrusion alarms, equipment testing, and protection of vital equipment through design features including physical barriers and automatic indications of inoperability. Although details of the Davis-Besse Plant security program will be withheld from public disclosure pursuant to NRC regulations in 10 CFR 2.790(d), the staff's Safety Evaluation Report (SER) will include an assessment of it.

12.5.13 Spent Fuel Storage (TL A-23, A-24, JC, A-19, A-20)

The subject of spent fuel storage will be considered in a generic environmental impact statement by the Commission. For a discussion of the problem of fuel storage and reprocessing, see pp. 42801-48202 in Federal Register, Vol. 40, No. 180 - Tuesday, September 16, 1975.

12.5.14 Uranium Enriching (JC, A-19)

The basis of the ERDA charge for enrichment services is to recover the Government's costs. When these costs increase, the charges increase. Private industry is taking a number of initatives to enter the field of commercial uranium enrichment. It is not clear whether the charges by commercial enrichment plants will be signficantly different from present charges by the Government.

12.5.15 Accident Analysis (INT, A-14)

A comment was made that Class 9 accidents were not evaluated. The current staff position on Class 9 accidents is stated in Section 7.1 of this environmental statement. When the Reactor Safety Study is finalized, the results "will be made public and will be assessed on a timely basis within the NRC regulatory process on generic or specific bases as may be warranted."

12.5.16 Reactor Safety (TL, A-22)

A comment was made that a British government study of American-type reactors had concluded that they were not safe enough to install in Britain. In the white paper released by the British Secretary of State for Energy, Eric Varley, on July 10, 1974, Secretary Varley specifically states that the Government was asking the "...Nuclear Installations Inspectorate to carry through to conclusions their examination of the generic safety issues." related to light water reactors. He further stated that the "...choice of SGHWR for our next nuclear power station orders does not imply any judgment about the validity of the technical doubts expressed by some on safety of LWR's."

12.6 LOCATION OF PRINCIPAL CHANGES IN THE STATEMENT IN RESPONSE TO COMMENTS

Topic	Page
Radiological Environmental Monitoring Program (HEW, A-6, INT, A-14, TEC, A-26, OEP, A-18)	6-8, 6-10, 6-11
Commercial Fisheries (COM, A-1)	2-12
Endangered Species of Fish (INT, A-13)	2-12
Water Quality Parameters (ERDA, A-5)	2-3
Auxiliary Boiler Blowdown and Cleaning Solutions (TEC, A-25)	3-15, 5-3
Chemical Mixing Zone (OEP, A-18)	5-2

REFERENCES

1. "An Apporaisal of the Potential Hazard of Industrial Sabotage in Nuclear Power Plants", C.R. McCullough, S.E. Turner, and R.C. Lyerly, SNE-37/UC-80, July 1968.

2. "Safety and Security of Nuclear Power Reactors to Acts of Sabotage", Unclassified Summary of Sandia Laboratories Report SAND-0069, March 1975.

3. "An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants", WASH-1400 (DRAFT), August 1974.

APPENDIX A

COMMENTS ON THE DRAFT ENVIRONMENTAL STATEMENT

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

June 17, 1975

Mr. George W. Knighton
Chief
Environmental Projects Branch No. 1
Division of Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Knighton:

The draft environmental impact statement for "Davis-Besse Nuclear Power Station, Unit 1," which accompanied your letter of April 30, 1975, 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.

Page 2-7, Section 2.7 - Ecology

This section fails to provide data in sufficient detail to allow comprehensive evaluation of project impacts on the Locust Point area of Lake Erie or the western basin in general. The major reason for this deficiency is the practice of referencing sources of data rather than actually presenting the data in the text.

Page 2-7, Section 2.7.1.3 - Ichthyoplankton

We agree that Sandusky Bay is a known and valuable spawning area. However, we conclude that comparison of Sandusky Bay with the project site is invalid since the types of habitats and conditions are different and cannot be equated. Using the data supplied in Table 2.7 (page 2-10), it appears that the total number of larval fish collected on July 10, 1974, is significant. We do not believe that present sampling is frequent enough to be statistically valid or to supply the data necessary to make

decisions on the value of the area for spawning and nursery. A thorough sampling program of the intake site should be conducted on a weekly basis beginning in April. For the reasons cited above, we do not agree with the NRC staff's assessment of the low value of the immediate site as a spawning area.

Page 2-12, Section 2.7.1.5 - Fishes

This section should discuss the commercial fishery of the project area and indicate its approximate value. We have enclosed for use in the final statement, commercial catch data for 1971-1974 for Ohio District 1 (see enclosed map), and Grids 903 and 904 for 1973-1974 under the new reporting system. In reviewing these figures, we note that the area depicted by these two grids, in 1973 and 1974 produced 37.5% and 45.7% of the total District 1 catch, respectively. These catch data indicate this area to be an important fishing zone which deserves additional consideration. The statement also notes that young-of-the-year of various species, including white bass (Morone chrysops), were taken in increasing numbers throughout the summer. As indicated by the commercial statistics, white bass are becoming increasingly important in the Ohio Lake Erie catch. In addition, as the result of new methods and techniques being developed for processing and marketing low value species, we expect a significant increase in future commercial production from this area of Lake Erie. Finally, according to figures prepared by the Ohio Department of Natural Resources (Lake Erie Research Unit F-35-5), 83% of the state's Lake Erie commercial catch is taken with seines (56%) and trapnets (27%). This indicates that the major fishery is inshore and, therefore, within the zone of plant operational influence.

Page 5-5, Section 5.5.1 - Intake Effects - Impingement of Fishes

We disagree with the staff's conclusion regarding the problem of fish impingement. Even though the plant intake velocity is very low, only limited information is available on the effects of vertical currents on fish. Secondly, the staff's conclusion appears to be based on the plant's impact on the fishery of the entire lake and not the immediate project area. If this approach is taken then every source of fish impingement in the basin should be considered in the evaluation. It is

estimated at Detroit Edison's Monroe Plant, located on the River Raisin, that from 300 million to a high of one billion fish are impinged or entrained annually (personal communication, Dr. Richard Cole, Michigan State University). Finally, it should be noted that the species most affected comprise the forage base upon which the restoration of high value predator species depend. The National Marine Fisheries Service agrees with the staff's conclusion that close monitoring of fishes in the lake and intake canal should be conducted to detect impingement losses.

Page 5-8, Section 5.5.2 - Station Passage Effects - Entrainment of Plankton and Fish Life-Stages

We believe that the staff has underestimated the potential entrainment effects at the plant. Table 2.7 (page 2-10) indicates that the largest number of ichthyoplankton were collected at the sampling station located nearest the intake. Therefore, the staff's conclusion that the area is not a major spawning area may be incorrect.

Page 5-9, Section 5.53 - Discharge Effects - Chemical Discharge

It would be helpful if data were presented to support the applicant's conclusion that scuds are not an important food source at the site.

Page 6-4, Section 6.2.2 - Operational Monitoring

While continuation of the preoperational program as the operational monitoring program will allow continuity, we conclude that the program, as it exists, has a limited sampling frequency, which will not allow valid conclusions to be drawn. In addition to the weekly sampling scheme in the intake and discharge zones, daily monitoring should be conducted in the intake canal and at the screen house to allow an accurate determination of the numbers, life stages, and species composition of fish entrained and/or impinged. The entrainment and impingement effects of the plant on the early life stages of fish (eggs, larvae, and young-of-the-year) need to be studied completely prior to cessation of ecological monitoring programs.

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

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure

SPECIES PRODUCTION IN DISTRICT ON 1*

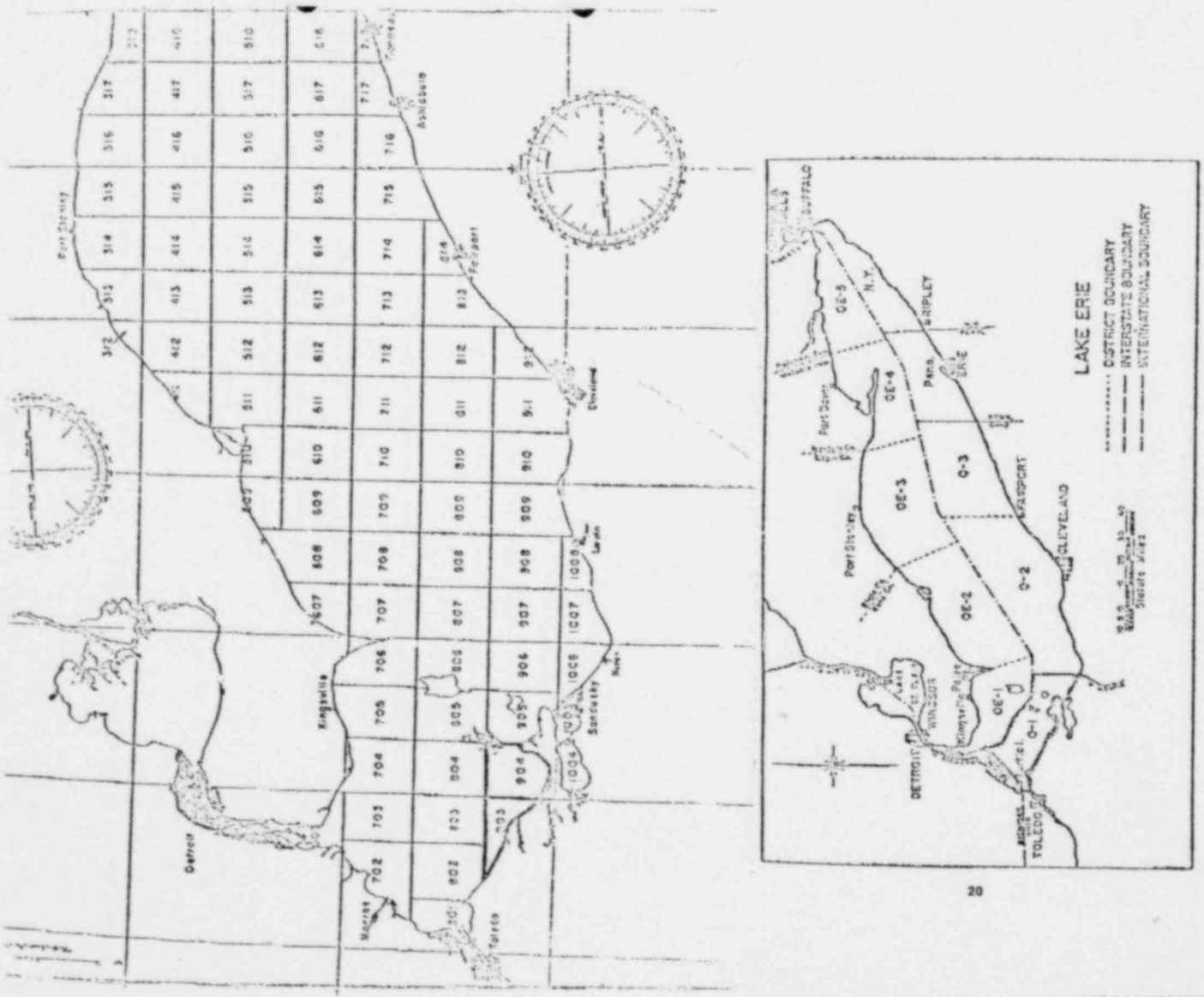
	19 1	1972	1973	1974
Buffalofish	6,628	12,408	7,480	11,000
Bullheads	14,750	17,806	10,406	12,000
Carp	2,235,738	2,070,837	1,377,763	1,600,000
Catfish	423,762	478,321	156,050	208,000
Goldfish	2,754	8,295	6,220	22,000
Quillback	27,644	42,635	42,877	41,000
Sheepshead	245,278	385,491	396,160	250,000
Smelt(Human food)	495	None	None	None
Suckers	67,400	61,980	39,940	54,000
White Bass	676,285	526,167	1,266,461	1,700,000
Yellow Perch	691,766	401,611	225,412	200,000
Walleye	None	None	815	None
TOTAL	4,392,500	4,005,551	3,529,584	4,060,000

Source - National Marine Fisheries Service, Statistics and Market News Division

SPECIES PRODUCTION BY GRID OHIO LAKE ERIE*

	903 - 1973 - 904		903 - 1974 - 904	
Buffalofish	1,645	875	3,714	1,186
Bullhead	3,549	354	3,821	1,071
Carp	184,800	105,881	435,427	302,215
Catfish	41,856	29,352	57,193	78,635
Drum	36,065	53,712	26,688	88,667
Goldfish	3,800	4,220	24,680	1,191
Quillback	13,522	3,700	11,681	16,564
Suckers	7,399	9,335	9,535	12,479
White Bass	548,059	201,836	477,797	236,726
Perch	43,276	24,451	50,636	13,771
TOTAL	883,991	438,716	1,101,172	754,479

Source - Fish and Wildlife Service, Ann Arbor, Michigan



20

Ohio to the ...
boundary to the ...
igan (Mich. Com...
boundary is, ther...

Ohio-Pennsylvan...

The Ohio-Pe...
extension of the ...
tional boundary (...

Pennsylvania-Ne...

The Pennsyl...
ward extension of ...
national boundary ...

STATISTICAL DIS...

Michigan

The Lake Er...
district.

New York

The Lake E...
district.

Ohio

District O-1 ...
dary, on ...
east by a ...
to an inte...
District O-2 ...
by the in...
mouth fro...
with the ...
District O-3 ...
by the in...
Pennsylv...

Ontario

District O...
tional bo...
tip of Pe...

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

JUN 30 1975

RECEIVED
JUL 2 1975

George W. Knighton, Chief
Environmental Projects Branch No. 1
Division of Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Knighton:

This is in response to your transmittal dated April 30, 1975, inviting the U.S. Energy Research and Development Administration to review and comment on the Commission's Draft Environmental Statement related to the proposed operation of the Davis - Besse Nuclear Power Station, Unit 1.

We have reviewed the Statement and staff comments are enclosed. In addition to these comments, we would like to point out that there is a noticeable lack of design information for various pre-and post-monitoring programs. An example of this lack of design information is noted in the discussion relating to the monitoring of the effects of cooling tower drift.

Thank you for the opportunity to provide these comments and we hope they will be helpful in the preparation of the Final Statement.

Sincerely,

W. H. Pennington
Assessments and Coordination Officer
Division of Biomedical and Environmental Research

Enlosures:
Staff Comments

cc: w/encl.
CEQ (5)

DOCKETED USNRC
JUL 3 1975

7055

ERDA STAFF COMMENTS
ON THE NUCLEAR REGULATORY COMMISSION
DRAFT ENVIRONMENTAL STATEMENT
DAVIS - BESSE NUCLEAR STATION, UNIT 1.

Page 2-3. Water quality standards

Table 2.4 shows values of many water quality parameters taken over a three year period. These values undoubtedly vary considerably and the ranges would be important to indicate short and long term trends in these parameters. Without these trends it is impossible to assess the impact of the plant operation on the water quality

Page 2-4. Figure 2-1.

Gross trends in seasonal temperatures also are illustrative of the above point that error presentments should be placed on each monthly and quarterly datum point as natural diurnal and weekly storms greatly perturb this simple trend. These short term fluctuations must be understood before any assessment of the plants impact on this aquatic system can be made.

Pages 2-8 and 2-9.

Tables of data on monthly phyto and zooplankton give one very little as a baseline with which the plant's operation can be compared. For instance, the phytoplankton grow in response to available light and nutrients and reach exponential stafe in less than a week. Thus, four seperate blooms could have taken place between each monthly sampling trip. This means that each month's sampling could be taken at differenc stages in these exponential blooms and it is, therefore, dangerour to conclude, as was done on page 2-7, the 'summer' had the lowest phytoplankton populations.

Page 2-10.

The ichyoplankton data in Table 2.7 should be contrasted to that data available [illegible] WMFS (NOAA) laboratories around the lake for this same time period. What the are the reasons why the surface intake values are six fold h gher that the surface discharge (patchiness ?); also, why are the bottom discharge values six fold higher than the bottom intake/

Page 2-13.

Table 2.9 is a very crude way to show fish distributions at a site over a six month period. Perhaps too much emphasis was on relating the sample collection gear and not on the real time variability of these fish.

Page 3-8.

Table 3.2 should have included I^{129} as a fission produce at the 100 μ Ci/yr. level.

Page 5-14.

The dose-assessment model by Thompson, et. al. (Reference 12) may be sufficient to cover all the pathways to man from the radionuclide releases from the plant, but were all of the radionuclides and the proper concentration factors used.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

JUN 19 1975

RECEIVED
JUN 24 1975

Mr. George W. Knighton
Chief, Environmental Projects Branch No. 1
Division of Reactor Licensing
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Knighton:

We have reviewed the draft Environmental Impact Statement for the Davis-Besse Nuclear Power Station, Unit 1 (50-346). On the basis of our review, we offer the following comments:

1- Environmental Radiation Monitoring Program:

We recommend that the sampling of reptiles, i.e., the snapping turtle, be added to the environmental monitoring program.

2- Groundwater Sampling Program:

We recommend that the groundwater sampling program include both sanitary chemical and bacteriological analyses to determine the possibility of effect on the quality of groundwater due to the percolation of septic tank effluent into the groundwater table. This would include all of the wells which are proposed for sampling as well as the on-site wells.

3- Radioactive Contamination:

The statement fails to give qualitative information on the current or planned availability of facilities appropriate for radioactive contaminated persons or radiation injuries at any nearby medical facility. This should be addressed in the final statement.

Thank your for the opportunity to review this document.

JUN 24 1975

Sincerely,

Charles Custard
Director
Office of Environmental Affairs

6766

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

AUG 18 1975

OFFICE OF THE ADMINISTRATOR

Mr. Daniel R. Muller
Assistant Director for Environmental
Projects
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Muller:

The Environmental Protection Agency has reviewed the draft environmental statement issued April 30, 1975, by the Nuclear Regulatory Commission is conjunction with the application of Toledo Edison Company and the Cleveland Electric Illuminating Company for a license to begin operation of Davis-Besse Nuclear Power Station, Unit 1. Our detailed comments are enclosed.

EPA's independent analysis of the information in the draft statement and the Applicant's environmental report indicates that the proposed gaseous and liquid waste management systems are capable of limiting radioactive releases to within the "as low as practicable" quidance of the recently issued Appendix I to 10 CFR Part 50. Therefore, we conclude that the anticipated radiological impact of normal plant operations will be acceptable.

The closed-cycle cooling tower system at Davis-Besse, Unit 1, is in conformance with the general design requirements of EPA's quidelines promulgated under the Federal Water Pollution Control Act Amendments of 1972. However, projected levels of chlorine release and possible entrainment and impingement impacts of the makeup water intake structure are cause for concern. In EPA's opinion, the importance of the western basin of Lake Erie to fish production argues for close monitoring of the intake structure and the chlorine released in the unit's discharge. The final statement should indicate what steps the utility will take should unacceptable intake impacts occur and present the rationale for utilizing the levels of chlorination currently being proposed.

In light of our review and in accordance with EPA procedure, we have classified the project as ER (Environmental Reservations) and rated the draft Statement Category 2 (Insufficient Information). If you or your staff have any questions concerning our comments or classification, we will be happy to discuss them with you.

Sincerely yours,

Sheldon Meyers

Sheldon Meyers
Director
Office of Federal Activities

Enclosure

EPA# D-NRC-A06155-OH

ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

AUGUST 1975

ENVIRONMENTAL IMPACT STATEMENT COMMENTS

Davis-Besse Nuclear Power Station

Unit 1

TABLE OF CONTENTS

INTRODUCTION AND CONCLUSIONS

The Environmental Protection Agency has reviewed the draft environmental statement issued in conjunction with the application of Toledo Edison Company and Cleveland Electric Illuminating Company for a license to begin operation of the Davis-Besse Nuclear Power Station, Unit 1. This facility is situated on a site adjacent to Lake Erie in Ottawa County, Ohio. The following are our major conclusions.

1. EPA's independent analysis of the information in the draft statement and the Applicant's environmental report indicates that the proposed gaseous and liquid waste management systems appear capable of limiting radioactivity releases and the resulting doses to within the "as low as practicable" guidance of the recently issued Appendix I to 10 CFR Part 50. Therefore, we conclude that the anticipated radiological impact of normal plant operations will be acceptable.

2. The closed-cycle cooling tower system constructed at Davis-Besse, Unit 1, is conformance with the general design requirements of EPA's "Steam Electric Power Generating Point Source Category Effluent Guidelines and Standards," promulgated under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) and published in the Federal Register of October 8, 1974.

3. The importance of the western basin of Lake Erie to fish production argues for close monitoring of the cooling water intake at Davis-Besse. While EPA concurs with the NRC staff's monitoring requirements, the final statement should provide details of the overall monitoring program and indicate the expected frequency (and numbers) of eggs, larvae and adult fish of various types to be found at the intake site. In addition, the final statement should indicate what steps the utility will take should unacceptable entrainment and inpingement impacts occur.

4. It appears that, due to the design of the service and recirculating cooling water systems, chlorine releases may exceed the maximum two hour release limit of EPA's effluent guidelines and standards. The final statement, therefore, should present the utility's rationale for utilizing the levels of chlorination currently being proposed. Although it appears that chlorine release through the Unit's discharge diffuser may be in compliance with State water quality standards for toxic substances, chlorine levels where fish reside must be closely monitored to determine that non-toxic conditions can be consistently achieved.

RADIOLOGICAL ASPECTS

Radioactive Waste Management Systems

Based on our evaluation of the draft statement and the environmental report, the proposed gaseous and liquid waste management systems appear capable of limiting radioactivity releases and the resulting doses to within the "as low as practicable" guidance of Appendix I to 10 CFR 50. As a consequence, we conclude that the radiological impact of routine plant operation is expected to be acceptable.

It should be noted that our conclusion of radiological acceptability is not based on exactly the same parameters as given in the draft statement as many of these are inconsistent with respect to those given in the final environmental statement issued for the construction permit (FES-CP) and Regulatory Guide 1. 88. For example, the FES-CP indicates the waste evaporator as a source of radioiodine while this draft statement (DES-OL) does not. Powdex filter-demineralizers are indicated for condensate cleanup in the FES-CP while the DES-OL uses decontamination factors for condensate cleanup appropriate to deep-bed demineralizers. Regulatory Guide 1.88 shows a main condenser air ejector radioiodine partition factor of 0.0005 while the DES-OL uses a partition factor that is smaller by an order of magnitude. It is suggested that these inconsistencies be clarified in the final statement and corrected source terms be presented.

Dose Assessment

The estimated dose equivalent rates and absorbed dose rates due to the calculated radioactivity releases from the facility indicate that satisfactory in-plant control measures have been incorporated into the design of the Davis-Besse Nuclear Power Station, Unit 1 to permit operation at or below the "as low as practicable" levels defined by Appendix I to 10 CFR 50. Therefore, we conclude that the anticipated radiation doses from the normal releases of radioactivity at Davis-Besse Unit 1 are acceptable.

EPA expects that the results from current EPA/NRC and industry cooperative field studies in the evirons of operating nuclear power facilities will greatly increase knowledge of the processes and mechanisms involved in the exposure of man to radiation produced through the use of nuclear power. We believe that, overall, the cumulative assumptions utilized to estimate various human doses are conservative. As more information is developed, the models used to estimate human exposure will be modified to reflect the best data and most realistic situations possible.

EPA agrees with the NRC staff's recommendations for needed additions to the Applicant's radiological monitoring program as stated on p.6-8 of the DES-OL:

1. High resolution gamma spectral analyses should be performed on all composited samples on a routine basis independent of gross beta activity.
2. Iodine-131 analyses should be performed with a sensitivity of 0.5 pCi/L on all monthly milk samples collected during the grazing season which immediately precedes the projected fuel-loading date of Davis-Besse Unit 1.
3. Soil samples should be collected at a frequency of once per 3 years at the location of all air samplers and analyzed as indicated in the environmental report.

Reactor Accidents

EPA has examined the NRC analyses of accidents and their potential risks which the NRC has developed in the course of its engineering evaluation of reactor safety in the design of nuclear plants. Since these issues are common to all nuclear plants of a given type, EPA concurs with the NRC approach to evaluate the environmental risk for each accident class on a generic basis. The AEC has in the past and NRC continues to devote extensive efforts to ensure safety through plant design and accident analyses in the licensing process on a case-by-case basis.

For the past two years, AEC sponsored an effort to examine reactor safety and the resultant environmental consequences and risks on a more quantitative basis. We have strongly encouraged this effort and continue to do so. On August 20, 1974, the AEC issued for public comment the draft Reactor Safety Study (WASH 1400), which is the culmination of the extensive effort to quantify the risks associated with light-water-cooled nuclear power plants. EPA is conducting a review of this document, including in-house and contractual efforts through June 1975, after which we will issue a final set of comments. Initial comments, issued November 27, 1974 indicate the AEC's efforts represent an innovative step forward in concept and methodology in the evaluation of risks associated with nuclear power plants. The study appears to provide an initial meaningful basis for obtaining useful assessments of accident risks.

If future NRC efforts in this area indicate unwarranted risks are being taken at the Davis-Besse Nuclear Power Station, Unit 1 we are confident the NRC will ensure appropriate corrective action. Similarly, if EPA efforts identify any environmentally unacceptable conditions related to reactor safety, we will make our views known. Until our review of the Reactor Safety Study is completed, we believe there is sufficient assurance that no undue risks will occur as a result of the continued planning for and operation of the Davis-Besse Nuclear Power Station, Unit 1.

Transportation

EPA, in its earlier reviews of the environmental impacts of transportation of radioactive material, agreed with the AEC that many aspects of this program could best be treated on a generic basis. The NRC has codified this generic approach (40 F.R. 1005) by adding a table to their regulations (10 CFR Part 51) which summarizes the environmental impacts resulting from the transportation of radioactive materials to and from light-water reactors. This regulation permits the use of the impact values listed in the table in lieu of assessing the transportation impact for individual reactor licensing actions if certain conditions are met. Since this nuclear power plant appears to meet these conditions and EPA has agreed that the transportation impact values in the table are reasonable, this approach appears adequate for this action.

While the impact resulting from the routine transportation of radioactive materials was chosen at that level within which the impact of 90% of the reactors currently operating or under construction fell, the basis for the impact, or risk, of transportation accidents is not as clearly defined. There are current efforts by both EPA and ERDA (the Energy Research and Development Administration) (and/or NRC) to more fully assess the radiological impact of transportation accidents. As the quantitative results of these analyses become available, EPA intends to conduct reviews to ascertain the acceptability of the potential transportation risks. If EPA efforts identify any environmentally unacceptable conditions related to transportation, we will make our views known. Until our reviews of the transportation accident analyses are completed, we believe there is sufficient assurance that no undue risks will occur as a result of transportation accidents for this nuclear power plant.

Fuel Cycle

NRC's predecessor, the AEC, issued a document (WASH-1248) entitled, "Environmental Survey of the Uranium Fuel Cycle" in conjunction with a regulation (10 CFR 50, Appendix D) for application in completing the cost-benefit analyses for individual light-water reactor environmental reviews (39 FR 14188). The information therein is employed in NRC draft statements to assess the incremental environmental impacts that can be attributed to fuel cycle components which support nuclear power plants. In our opinion, this approach appears adequate for plants currently under consideration, and such estimates of the incremental impacts for the Davis-Besse Nuclear Power Station, Unit 1 are reasonable. However, as suggested in our comments on the proposed rulemaking (January 19, 1973), if this is to continue for future plants, it is important for the NRC to periodically review and update the information and assessment techniques used. EPA intends to monitor developments in the fuel cycle area closely and will bring to the NRC's attention any factor or concerns we believe relevant to continue improvement in assessing environmental impacts.

The concept of environmental dose commitment is one which we believe should be included in the assessment of the environmental impacts of the fuel cycle. The information presented in the draft statement indicates the "Maximum Effect" in terms of annual person-rems (man-rems) within a 50-mile radius. As many of the radionuclides involved presist in the environment over extremely long periods, their impact is not adequately represented by an annual dose. Instead, we recommend that the maximum effect for fuel cycle releases be indicated by an environmental dose commitment, that is, by the projected person-rems which will be accumulated over several half-lives of the radioisotopes released annually from these facilities. (This would involve decades for very long-lived isotopes.) Also, such evaluations should be done for the total U.S. population exposure. Radionuclides of importance in this approach include Kr-85, I-129, tritium, radium, C-14, and the actinides.

High-Level Waste Management

Environmental impacts will arise as a consequence of the techniques and procedures utilized to manage high-level radioactive wastes. These impacts have some relevance to the environmental considerations regarding each nuclear power plant in that the reprocessing of spent fuel from each reactor will make some contribution to the total waste. EPA concurs, however, with the NRC's approach of handling waste management impacts on a generic basis rather than by including a specific, in-depth analysis in each nuclear power plant's environmental statement. As part of this effort, the AEC on September 10, 1974, issued for comment a draft statement entitled "The Management of Commercial High-Level and Transuranium Contaminated Radioactive Waste" (WASH-1539).

Though a comprehensive long-range plan for managing radioactive wastes has not yet been fully demonstrated, acceptance of the continued development of commercial nuclear power is based on the belief that the technology to safely manage such wastes can be devised. EPA is available to assist the NRC and ERDA in their efforts to ensure that an environmentally acceptable waste management program is developed to meet this critical need. In this regard, EPA provided extensive comments on WASH-1539 on November 21, 1974. Our major point of criticism was that the draft statement lacked a program for arriving at a satisfactory method of "ultimate"high-level waste disposal. We believe this is a problem which should be resolved in a timely manner, since the country is committing an increasingly significant portion of its resources to nuclear power and wastes from operating plants are already accumulating. ERDA now intends to prepare a new draft statement which will more broadly discuss waste management and emphasize ultimate disposal. EPA concurs with this decision. We will review the new draft statement when it is issued and will provide public comments.

NON-RADIOLOGICAL ASPECTS

General

The Davis-Besse Nuclear Power Station, Unit 1, will utilize a pressurized water reactor rated at 2772 megawatts thermal (MWt). Waste heat from this unit will be rejected to the atmosphere via a single hyperbolic natural-draft cooling tower with makeup water being drawn from, and blowdown discharged to, Lake Erie.

The State of Ohio is responsible for the issuance of a discharge permit for this unit under the National Pollutant Discharge Elimination System (NPDES) -- Section 402 of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Issuance of the permit will be based upon review and analysis of all relevant information supplied by the Applicant. Consideration will be given to requirements of Section 301, of 316(b), and all other provisions of the FWPCA and the final permit will be conditioned accordingly. We understand that issuance of this permit by the State is imminent.

Cooling System Design and FWPCA Requirements

Section 301 of the FWPCA stipulates that effluent limits for various point sources discharging to navigable waters shall require the application of "Best Practicable Control Technology Currently Available" no later than July 1, 1977, and "Best Available Technology Economically Achievable" no later than July 1, 1983. The levels of technology corresponding to these terms were defined in EPA's "Steam Electric Power Generating Point Source Category Effluent Guidelines and Standards," as published in the Federal Register of October 8, 1974. These guidelines, in addition to other requirements, call for closed-cycle cooling and set limits for the discharge of various chemicals. Although the cooling system design for Unit 1 is in general conformance with these requirements, projected levels of chlorine release and possible impacts of the makeup water intake structure are cause for concern.

Intake Structure and Chemical Effluent Impacts

In our comments of May 22, 1975, on the draft environmental statement for Davis-Besse, Units 2 and 3, we compared the intake structure at the Davis-Besse facility directly to that of a fossil fuel plant at Monroe, Michigan. At the

Monroe plant, the capture of adult fish has been recognized as a problem and a fish pump has been installed. Estimates are for a capture rate of over 100,000 pounds of yellow perch per year on the rotating screens. In addition, the significance of fish larvae entrainment is being evaluated. The estimated entrainment is approximately 300,000,000 larvae per year. Although the average intake rates and the intake structure designs of the two plants are substantially different, we believe the importance of the western basin of Lake Erie to fish production argues for close monitoring of the intake at Davis-Besse.

While we concur in general with the NRC staff's monitoring requirements, it is essential that the utility submit a detailed plan for estimating the number of fish larvae and fry entrained on an annual basis. To the extent possible, the final statement should describe this plan, give details of the overall monitoring program, and indicate the expected frequency (and numbers) of eggs, larvae, and adult fish of various types to be found at the intake. Presently, EPA, the Fish and Wildlife Service, the States of Michigan and Ohio, and several industries and universities are undertaking a study to enumerate the number of fish larvae in Western Lake Erie to determine the impact of fish larval entrainment. To the extent possible, the efforts of the utility (in determing the effects of Davis-Besse entrainment) should be coordinated with this study.

An air bubbler system will be utilized around the intake crib at Davis-Besse. Although bubblers have met with some success on Lake Michigan in reducing the number of adult fish drawn into cooling water intakes, this has not been the case at the Monroe plant on Lake Erie. Thus, we believe that the utility should study this intake system feature further, and once Unit 1 is in operation, monitor its performance closely. Since monitoring could show unacceptable inpingement losses, alternatives to the air bubbler system should be evaluated.

The final statement should indicate the steps the utility will take should projections or actual monitoring reveal that unacceptable entrainment and inpingement impacts will occur at Davis-Besse. The State of Ohio has authority under the FWPCA to require changes in plant operation or design to assure continued compliance with Section 316(b) intake structure requirements. In addition, EPA has overview responsibilities in this regard under the Act.

It is difficult to determine from the draft statement the levels of chlorine that can be expected in the discharge from Davis-Besse, Unit 1. In part, this is due to the rather complicated and adjustable interties between the service water system and the closed condenser circulating water system--both of which will be chlorinated, but following different procedures. To the degree possible, the operational characteristics of these systems and the specific procedures relative to chlorination should be better detailed and clarified in the final statement.

EPA's effluent limitations guidelines require that free available chlorine in discharges be limited to a maximum concentration of 0.5 mg/l and an average concentration of 0.2 mg/l. In addition, neither free available chlorine nor total residual chlorine "... may be discharged from any unit for more than two hours in any one day ... unless the utility can demonstrate to the regional administrator or state ... that the units cannot operate at or below this level of chlorination. Although the present system may be able to operate in compliance with the maximum and average limits for free available chlorine, we tend to agree with the NRC staff that "... chlorination of [the closed condenser circulating water system] for the maximum time estimated may result in residual chlorine being discharged from the station for greater than two hours per day, which will not be in compliance with the provisions of [the guidelines]." In our opinion, therefore, the final statement should present the utility's rationale for utilizing the levels of chlorination currently being proposed.

Ohio Water Quality Standards require that levels of toxic pollutants within a mixing zone not exceed the 96-hour Toxic Lethal Median (TLM) for aquatic life. Because of the known toxicity of chlorine to aquatic species, total residual chlorine must be limited such that levels where fish may reside (i.e. areas where velocities are acceptable to important species) do not exceed the total residual chlorine concentrations of 0.2 mg/l for warm water fish and 0.04 mg/l for trout and salmon. In addition, the exposure to chlorine at these levels must not exceed two hours per day. Since the applicant is using a diffuser, it is our opinion that the facility may be able to comply with these standards. However, to assure such compliance, chlorine levels where fish reside must be closely monitored until it is determined that acceptable levels can be consistently achieved. If the plant cannot achieve the

levels indicated above, the utility may choose to run bioassays to determine whether some other level to total residual chlorine is acceptable for the water quality, exposure time, and fish species found at this site. If after running bioassays, it is determined that total residual chlorine concentrations are toxic, then the utility will be required to take steps necessary to reduce the concentration to non-toxic levels.

Air Quality

The draft statement does not provide information related to auxiliary steam generating facilities that may be needed for start-up steam pressure and nuclear plant space heating requirements. Estimates of auxiliary boiler air pollutant emissions to the ambient air should be provided including all technical data [such as size of capacity of boilers, fuel type, fuel analysis (including percent sulfur), annual and hourly fuel use rate, and frequency of operation]. Also, the calculations and assumptions that will be used for these estimates should be presented in the final statement.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
PEP ER-75/439

JUL 28 1975

7-31-75

Dear Mr. Knighton:

Thank you for your letter of April 30, 1975, requesting the Department's comments on the Nuclear Regulatory Commission's draft environmental statement on the Davis-Besse Nuclear Power Station, Unit 1, (Operating Stage), Ottowa County, Ohio.

Our comments are presented according to the format of the draft statement or by subject.

General

The statement is generally condensed and abbreviated in all sections as it refers much of the discussion of plant operating effects to previous documents such as the Construction Permit Stage Environmental Statement and various environmental reports. It is therefore laborious for reviewers to continually refer to the reference material which is quite voluminous. The final statement should include more information and make fewer references to other documents. This will enable the document to be more understandable by itself.

The final statement should consider and reference the International Joint Agreement on the Great Lakes for Lake Erie and the water quality objectives outlined therein. The International Treaty was signed by the United States and Canada on April 15, 1972.

Aquatic Ecology

In the discussion of ichthyoplankton on page 2-7, the draft statement states that the immediate site is not an important spawning area based on the results of two ichthyoplankton samples in 1973 and monthly samples in 1974. The rather infrequent fry sampling completed to date at the Davis-Besse site does not provide sufficient data to make credible predictions of the

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

8041

relative value of the immediate site and adjacent areas for spawning and nursery purposes. Therefore, the final statement should be corrected to state that the immediate site is a spawning and nursery area for yellow perch, walleye, gizzard shad, smelt, drum, white bass, emerald and spottail shiners and many of the other common fish found in the western basin of Lake Erie.

Terrestrial Ecology

The list of endangered species which could occur at the site should be expanded in the final statement to include the immature southern bald eagle (Haliaeetus leucocephalus leucocephalus and Kirtland's Warbler (Dendroica Kirtlandii). Both the blue pike (Stizostedion vitreum glaucum) and the longjaw cisco (Coregonus alpenae) would not likely be found in the western basin of Lake Erie except possibly during the winter months. This should be noted in the final statement.

Effect on Land Use

In the final statement concerning the construction phase of the project, on page 5-1, it is stated that 600 acres of marsh land at the site will be preserved as a National Wildlife Refuge. However, it is not clear in the construction phase final statement or in the draft statement concerning the operation of the plant, how extensively the refuge will be used by the public. If the refuge is to be open to the public, then we suggest that a discussion of recreation use of the 600 acres of marsh land be included in the operation phase final statement. This discussion should include an analysis of the possible impacts of station operation upon recreational use of the refuge.

Effect on Water Use

The final statement should include a discussion of the recreational use of Lake Erie in the vicinity of the project site and an analysis of any impacts from station operation.

Entrainment Effects

The discussion of entrainment on page 5-8 indicated that local fish populations will not be significantly altered. It is further noted that to verify this evaluation, the staff will require the applicant to monitor the ichthyoplankton at the site.

Since the program to gather baseline data is based on a relatively infrequent sampling interval of one month, it is questionable whether the proposed monitoring program could accurately determine the entrainment effects of station operation. We recommend that daily monitoring be required at the plant to accurately determine the numbers, life-stages, and species composition of the fish entrained or impinged from the intake canal. Bi-weekly monitoring should be conducted in Lake Erie in the vicinity of the intake and discharge structures to provide sufficient data to enable a valid assessment of the effects of these structures and to provide a comparison with the data being collected daily at the plant. The entrainment effects of the plant on the early life stages of fish (eggs, larvae, and young-of-the-year) should be thoroughly studied prior to the cessation of the ecological monitoring studies. This should be noted in the final statement.

Discharge Effects

The draft statement's evaluation of the chlorine discharge at a level of 0.5mg/l from the service water system and the main condenser cooling system is that it will have a neligible effect on the aquatic ecology. This is in sharp contrast to the recent published report on the effects of residual chlorine on aquatic life by Brungs (Journal WPCF Vol. 45, No. 10, October 1973, p. 2180-2193), which recommends for areas receiving intermittently chlorinated wastes that total residual chlorine should not exceed 0.2mg/l for a period of 2 hours per day for more resistant species of fish or exceed 0.04mg/l for a period of 2 hours per day for trout and salmon. The report also recommends that if free chlorine persists, total residual chlorine should not exceed 0.01mg/l for a period of 30 minutes per day for areas with population of trout and salmon. Coho salmon are found near the station site (FES construction phase 2-42), and although no trout are presently found in the area due to eutrophic and polluted conditions, the International Joint Agreement on Great Lakes Water Quality provides for a significant enhancement of water quality that may, in the future, support trout populations. In drafting the final statement, reconsideration of chlorine limitations in the light of Dr. Brung's report should be made.

Terrestrial Ecological Monitoring

The proposed bird monitoring program will determine the number and species of birds killed by station structures on a weekly basis for the spring and fall migration seasons. If accurate accounts are to be obtained by the monitoring program of the birds killed at the station, the frequency of collection visits should be increased

from the proposed weekly basis to a daily or more frequent basis. This is necessary to determine an accurate accounting of the numbers of birds killed and to identify those which are a declining, threatened or endangered species.

In addition to the basic monitoring program proposed, we suggest that the staff require the applicant to undertake extensive studies seeking ways of reducing or eliminating the bird collision problem. This requirement should be indicated in the final statement.

Operational Radiological Monitoring

Lake bed sediments were to be monitored for radioactivity before operations at three locations near shore (FES construction phase, p. 6-7) but operational monitoring of lake sediments is not specifically mentioned in the statement under review. In drafting the final statement, a reevaluation of the sampling locations for bed sediments based on prevailing plume and current directions should be made and consideration should be given to increasing the number of sampling locations.

Facility Accidents

The most serious (Class 9) postulated accident has not been evaluated in this statement or in the prior construction statement. Instead, reference is made to the Reactor Safety Study (p. 7-1, par. 2), which evalutes environmental impacts of Class 9 accidents on the basis of average conditions at 100 reactor sites. However, any site posing special problems or risks in the event of a core melt-through accident should be evaluated specifically. In the case of Davis-Besse Nuclear Power Station, the founding of Unit 1 on dolomite beneath the water table adjacent to Lake Erie creates concerns in relation to such an accident. The applicant's Environmental Report describes the rocks as argillaceous dolomite containing varying amounts of gypsum and anhydrite. The hazard of overpressurization of the containment shell as a result of gases generated by contact of a core melt with the underlying materials should be evaluated in the final statement. If the consequences of such an accident would be significantly more severe at this site than at the average site considered in the

Reactor Safety Study, it would be advisable to provide an evaluation of these consequences and risks in the final statement for the Operating Stage.

We hope that these comments will be helpful to you in the preparation of a final statement.

Sincerely yours,

Stanley R. Foremus

Deputy Assistant Secretary of the Interior

Mr. George W. Knighton
Chief
Environmental Projects Branch
No. 1
Division of Reactor Licensing
Nuclear Regulatory Commission
Washington, D. C. 20555

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: 426-2262

16 JUN 1975

Mr. George W. Knighton, Chief
Environmental Projects Branch No. 1
Division of Reactor Licensing
Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Knighton:

This is in response to your letter of 30 April 1975 addressed to Mr. Benjamin O. Davis concerning a draft environmental statement for the Davis-Besse Nuclear Power Plant Operation, S. W. Shore Lake Erie, Ottawa County, Ohio.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

R. I. PRICE
Rear Admiral, U. S. Coast Guard
Chief, Office of Marine Environment and Systems

B

9

6621

State of Ohio Environmental Protection Agency, Box 1049, 361 East Broad Street, Columbus, Ohio 43216 (614) 466-8565

June 24, 1975

Regulatory Docket File 50-346

Re: Draft Environmental Statement for Operation of Davis-Besse Nuclear Power Station, Unit I, Carroll Township, Ottawa County, Ohio

James A. Rhodes
Governor
Ned E. Williams, P.E.
Director

Mr. George W. Knighton, Chief
Environmental Projects Branch No. 1
Division of Reactor Licensing
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

OhioEPA

Dear Mr. Knighton:

The Ohio Environmental Protection Agency has been charged by the Governor with lead agency and review coordination responsibilities for the State of Ohio on Federal Environmental Impact Statements. The above mentioned Draft Environmental Statement has been reviewed by sections of this Agency and by the Ohio Department of Natural Resources, the Ohio Power Siting Commission, and the Ohio Department of Economic and Community Development. The following comments constitute those of the above agencies and have been coordinated under the auspices of the State Clearinghouse.

GENERAL

The discussion of alternatives available at this time for the subject project is adequate and indicates that granting of an operating permit for Unit I is necessary if the project is to achieve its intended objectives. Our primary concern is that proper precautions are taken in the operation of Unit I to ensure the protection of this environmentally sensitive area.

Review of this report was conducted with reference to Regulatory Guide 4.2, Revision 1, "Preparation of Environmental Reports for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, January 1975.

SPECIFIC

In the interest of producing a better report that may help to speed approval of the project, the following revisions and additions are suggested.

6851

As noted in Section 2.2.2, the estimated employment at Erie Industrial Park has increased by over 6 percent. Over what length of time did this change occur? What caused it? Is it significant, and is it related to Davis-Besse Unit I in any way?

One difficulty with the DES concerns radioactive releases discussed in Chapter 3. Essentially there are two methods of estimating radioactive releases from reactors not yet operating. One is to evaluate a "source term" which means to go through the exercises in Section 3.4 of the DES and calculate the resultant releases. The second is to compare the reactor with similar operating PWR's. These two methods do not give consistent results and the NRC staff should resolve or explain the problem.

Of fundamental importance to the first method is the % failed fuel in the source term. The NRC staff uses a failed fuel rate of 0.25%, this number being extracted from Table B-3 of WASH 1258. No further justification of this number appears; it is routinely used for all zircalloy clad fuel elements in PWR's. Indeed the applicant uses a failed fuel rate of 0.1%. In a letter (April 1, 1975), the applicant cited data from thirty operating PWR's in support of their failed fuel estimate of 0.1%, whereas the NRC estimate is based on operating data for only five plants. Furthermore, two of these plants, Ginna and Beznau I, had hydriding and densification problems which are no longer applicable to modern plants. Hence, even though much of this operating experience has been obtained on smaller reactors undergoing foreign operating experience, the 0.1% failed fuel rate seems a more realistic number than 0.25%. This would have the effect not only of lowering the release rates by a factor of 2.5, but also lowering the frequency of changeout of filter cartridges, ion exchangers, etc., thus decreasing operating costs and amounts of medium and low level waste shipped. (Parenthetically, the NRC Staff recalculation of release rates did not take into account changes in the amount of waste shipped.)

On the other hand, the releases from Davis-Besse Units II and III are postulated to be the same as those for Davis-Besse Unit I. Indeed, Table 3.2 from the Unit I statement is identical with Table 3.3 from the Unit II & III statement and similarly Table 3.3 for Unit I equals Table 3.4 for Unit II except for the containment vessel radiodine. This may be due to the use of an incorrect main condenser/air ejector partition factor. Based on WASH 1258, 0.0005 (the inverse of the decontamination factor, 2000) should be used. Unit I, however, is using a 15 x 15 fuel array whereas Units II & III use a 17 x 17 fuel array. This means longer thinner fuel rods with a greater surface to volume ratio in II and III compared to I. Given the same cladding temperature, every indication is that releases from II and III will be higher than those from Unit I. The NRC staff should evaluate these differences.

Both the applicant and the NRC staff seem to have underestimated release of tritium and of noble gases if one uses simply operating data from existing U.S. reactors. Based on the report "Summary of Radioactivity Released in Effluents from Nuclear Plants During 1973, PB-239 191," if one examines the data from the 11 PWR's listed (Maine Yankee, Palisades, Yankee Rowe, Indian Point I & II, Ginna, Connecticut Yankee, H.B. Robinson II, San Onofre and Point Beach I & II) and adjusts them by linear extrapolation of power level and capacity factor to a 910 MWe reactor operating at 80% capacity, the average releases for noble gases are about 12,500 curies/year and for tritium about 4600 curies/year.

It might be argued, for tritium at any rate, that in the newer plants (Robinson, Ginna, Point Beach) the releases are uniformly below those estimated by the NRC and applicant, and that this is due to improvements in design. But this is not true for noble gases, for Connecticut Yankee and Yankee Rowe, both old plants, have lower noble gas releases than Ginna.

A table of calculated releases of noble gases and tritium is included on the following page. It is also pertinent to note that in this table of 31 reactor years operation, there were 20 reactor years of less than 4000 curies noble gas release and 10 reactor years of greater than 4000 (extrapolated). For tritium releases, the numbers are 7 years less than approximately 350 and 21 more than approximately 350. Hence, a probabilistic argument supports the staff estimate for noble gases, but not for tritium.

Another difficulty with the DES concerns the plant factor mentioned in Table 3.1 and Section 11.4. The plant factor routinely used by the NRC staff is 80%. This number is not justified by the operating experience of U.S. PWR's. We have calculated plant factors using the LORDS reports through April 1975. The key number used was the cumulative unit capacity. The procedure was to sum all the available data for PWR's and BWR's operating in the United States. For each reactor, the total potential available megawatt months was first calculated. The total actual megawatt months was calculated, this being simply potential megawatt months times capacity factor. These were tabulated, summed, and divided. In mathematical language:

$$\% = \frac{\Sigma (MW \times T \times C)}{\Sigma MW \times T} \times 100$$

where: MW = Megawatts capacity
T = Time in months
C = Capacity factor

For PWR's, the total cumulative output was 258,495 megawatt months out of a possible 424,852 for a cumulative capacity factor of 60.84%. If we discard one reactor (Palisades) as atypical, since it had a capacity factor of only 25.4%, the capacity factor increases to 62.8%. The highest performance was recorded by Three Mile Island (91.4%), but this comprises only six months of operating experience. High performance figures were also recorded by Connecticut Yankee (79.58%), Yankee Rowe (71.86%), and Turkey Point IV (74.50%)

Table 1

Releases of Noble Gases and of Tritium from PWR's

Reactor	Year	Noble Gases (curies)	Tritium (curies)
Maine Yankee	72	3	-----
	73	302	288
Palisades	72	1360	-----
	73	1206	491
Yankee Rowe	70	101	9018
	71	78.6	10073
	72	108.6	4828
	73	215	4212
Indian Point I	70	106141	2560
	71	2247	4527
	72	3391	3584
	73	not operated in 1973	
Indian Point 2	73	281	501
Ginna	70	37142	255
	71	74383	358
	72	25536	276
	73	1080	536
Conn. Yankee	70	1231	13012
	71	5714	10252
	72	1134	10358
	73	84	10256
H.B. Robinson II	71	32	213
	72	465	730
	73	5203	725
San Onofre	70	1053	10422
	71	18878	10825
	72	45242	8242
	73	30500	11285
Point Beach	71	921	296
	72	3030	561
	73	6444	623
Totals	31	373506	129307
Arithmetic Average	-----	12450	4618

Since the plant factor is directly proportional to the benefits from the plant, we recommend that a plant factor of 60% be used by the NRC staff for all PWR's.

In Section 5.2.5 (Chemical Effluents), the distances mentioned in the fourth and fifth sentences of the second paragraph should be corrected. Our study of the topographic map found a distance of 4.0 statute miles or 21120 feet, which gives a mixing zone length of 2112 feet.

In accordance with Section 5.1.2 of the above referenced guide, Section 5.5.3 (Discharge Effects) of the DES should include a graphic portrayal of the thermal plume, showing isotherms in three dimensions for a range of conditions which form the basis for the estimation of ecological impact.

In accordance with Section 5.2.2 of the above referenced guide, Section 5.6 of the DES should consider how radioactive effluents are quantitatively distributed in the environment. This section should include estimates of the radionuclide concentrations on land areas and on vegetation (on a per unit area basis) due to operation of Unit I. This section should also discuss the possibility of cumulative buildup of radionuclides in the environment, such as in lake sediments.

The following comments apply to Chapter 6 of the DES:

1) In Section 6.2 (Aquatic Monitoring), there should be some indication that pre-and post-operational studies of the area's biology and ecology will include studies of mollusk populations.

2) It should be stated that chemical and radiological monitoring will include animals (fish and terrestrial wildlife).

3) There should be some indication of the agencies or organizations that are carrying out the ecological studies.

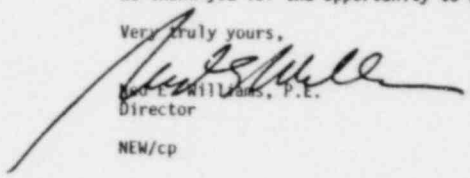
4) Studies of fish should include studies of changes in lake bottom morphology.

5) It is our opinion that more than one survey station will probably be needed to determine the loss of fish due to the intake structures.

Because of the technical nature of the report, we would strongly urge that a glossary of technical terms and abbreviations be included in an appendix to the final statement.

We thank you for the opportunity to review this Draft Environmental Statement.

Very truly yours,



W. L. Williams, P.E.
Director

NEW/cp

Comments by a deeply concerned citizen:

Question: Are TEC and CEIC aware that nine stations have reported thinning pipe walls in some of Westinghouse's PWRs (i.e. San Onofre 1, Surry 1 and 2, etc.,)? There is debate as to the cause but it is believed that all PWR steam generators are of poor quality, and the problem is generic. Also, large PWRs have a number of steam generators, each generator contains hundreds of steam generator tubes, and rupture of a "handful" of these tubes could render a PWR ECCS ineffective. Since the ECCS was designed by computer and, therefore, lacks any empirical verification of its safety effectiveness other than the theoretical, abstract calculations of the computer, and in a series of small-scale tests it failed six out of six times, how does CAPCO plan to deal with the above question?

Comment: Based upon 5.9 Transportation of Radioactive Wastes: It states here that the transportation of irradiated fuel from the reactor to a fuel reprocessing plant, and of solid radioactive wates from the reactor to burial grounds is within the scope of the NRC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants." How is this in the scope of the NRC? Where are these burial grounds? As of now no reprocessing facilities will be operating in the U.S. for at least two years (for spent fuel). The New York Times has said that as many as ten power reactors could be forced to close down indefinitely due to a shortage of storage space for spent fuel. Will this, then, not set back the fueling date for Unit 1, projected for 1976? And would this not also affect cost-benefit? However, if Unit 1 should begin operating without this problem solved, this would be at odds with such a NEPA statement as: "Fulfill the responsibilities of ~~each~~ generation as trustee of the environment for succeeding generations."

6/16/72

Comments on Cost-Benefit: Unit 1 is projected to be more economical and have less "environmental" impact than units which use fossil fuel. Nuclear plants are supposedly cheaper because of increased costs of coal. In the draft statement it is pointed out that the substitution of nuclear fuel for fossil fuel "will allow saving coal for future generations." Total cost of Unit 1 is estimated at $466 million. The draft statement estimates $450 million. The original cost was estimated at $105 million and was to be completed in 1974. TEC has been seeking "an increase of about 20% in the rate charged non-heating customers." John Williamson, Edison president, said "the firm will have to spend $1.5 billion to construct power facilities to meet the expected need by 1985." Area residents have objected to this rate increase and noted "that their bills have increased considerably despite efforts to insulate their homes and use as little power as possible." Thus I find it difficult to understand such Edison advertisements which end: "Electricity is still a bargain...and we're working to keep it that way." Yet, Mr. Williamson said Edison's construction program will be in jeopardy unless increases in earnings are achieved by the fall.

Now Unit 1 may be competitive with coal fired units providing it operates at projected capacity and has few outages. Nuclear plants reach their peak capacity factors at the age of about 6 yrs. of commercial operation and decline to 39%. The draft statement "assumes a levelized plant factor of 75% over an estimated 40 yr. service life..." Most nuclear plants in the U.S. have not operated at projected capacities--80%. It takes 8 yrs in construction and fuel loading during which time construction is affected by increased capital costs. As generating capacity decreases per kilowatt generating cost increases for the consumer. During 1974, nuclear construction costs approached $700 per kilowatt of installed capacity. Nuclear power had been promised at less than $200/kw. Technology Review reports that high capital costs could render nuclear power uncompetitive with coal. Would utilities find nuclear fuel cost-competitive if it were not for Federal uranium enrichment facility at Oak Ridge, Tennessee, which uses

20% of the Tennessee Valley Authority's total electric output (which is produced by strip-mined Appalachia coal)?

It may be debated whether nuclear plants are cheaper than coal-fired considering not only capacity factors or capital construction costs but repair costs as well. Because of the radioactivity of reactor and primary coolant systems in LWRs, repairs on these reactors take time and more workers than similar repairs on coal-fired plants. Workers in nuclear plants must not exceed their maximum permissible radiation exposure so more workers are needed to work sequentially. For example, at Indian Point 1, Con Ed's 277 megawatt PWR, it took 2,000 repairmen to perform a job in six months that would have taken slightly over a week in a fossil fuel plant. Crud was found in valves and pipes. Crud is created by corrosion of reactor innards and subsequent neutron bombardment. Ordinary steels can be turned into such nuclides as Tungsten 187, and Zirconium 95. Thus 2,000 men were exposed to a high level of radioactivity.

Certainly coal is not cheap, but it does not risk workers to high levels of radioactivity nor risk city or rural populations to either routine emissions of radiation or the dangers of a serious plant accident. I find such a statement as "the substition of nuclear fuel for fossil fuel will allow saving coal for future generations" not only illogical but morally corrupt. What do we leave our future generations, but our radioactive wastes. Dr. Hannes Alfven has said: "In a full-scale economy program, the radioactive waste will soon become so enormous that a total poisoning of our planet is possible."

Directive: As a Federal regulatory agency start giving people all the facts--benefits and risks--of nuclear power. Don't do as the old AEC did and act as the PR for the industry. Let the public decide if they want the risks and don't scare or blackmail them into believing that nuclear energy is the only way out of our energy problems. For once put public welfare ahead of business interests.

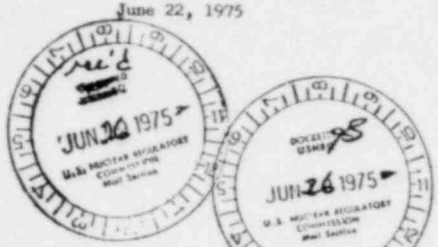
Even uranium is limited and a large amount of raw uranium ore must be mined to produce the few tons of nuclear fuel needed to operate a large reactor for one year. The President today 6-9-75 has stated that he is deemphasizing "a need for rapid development of the breeder" which would produce more fuel than it consumes.

Comment: Since TEC is responsible for the design, construction, and operation of the station, it could be a real leader in standing by reactor safety by urging Congress to rectify the Price-Anderson Act. By urging Congress to allow the nuclear industry and the utilities to assume a larger share in insurance liability and by removing the lion's share form the taxpayers, the utilities would, in effect, be standing by reactor safety and also provide for a total picture of cost-benefit. This would be a noble response to the NEPA statement: "Attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.

Request: If I am not mistaken, evacuation plans must be available to resident's living within a reactor site. The NRC should make Davis-Besse Unit 1's plans available to the public via local newspapers before projected fueling in 1976.

Mr. Jane Campbell
563 Windsor
Toledo, Ohio 43609

June 22, 1975



Division of Reactor Licensing
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington D.C.

Dear Sirs:

I must object to the licensing of the nuclear reactor, Davis-Bessie in response to the environmental impact statement. Far too little research has been done on the safety of fission reactors in general and on Davis-Bessie in particular. The public has not been assured beyond a reasonable doubt that no catastrophic incident will occur at nuclear plants and much of the research that has been done seems to show that such an accident may be inevitable. For example, the ECCS which is the last line of defense against a catastrophic meltdown of the reactor core has never been adequately tested. In those tests which have been conducted, it has failed miserably.

Adequate precautions against terrorist attacks on the Davis-Bessie site have not been taken either. Such an attack, if reasonably well organized, could place the people in the area at the mercy of any of the radical groups which are so prevalent in today's society.

One other area of concern which has recently come to light is the use of asbestos in the water cooling towers. No in depth studies have been undertaken to determine to what degree this asbestos finds its way into the waste water which in turn ends up back in the lake (Erie) and into our drinking water. Asbestos is well known as a powerful carcinogen and careful steps must be taken to make absolutely sure that none of it gets into our water supply.

For these reasons and many others which I will be glad to supply at your request I must ask that the license for Davis-Bessie I not be granted at least until very

6803

thorough studies have been conducted as to the environmental impact of the reactor operations on surrounding communities, including Toledo, and until the general public has been made aware of all the facts and possible consequences involved in operating this reactor in this area.

Sincerely,

Daniel E. Doepker

Daniel E. Doepker

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 200

6/22/75

RECEIVED
JUN 26 1975

Dear Sirs—

12. RESPONSES TO COMMENTS

(Reserved for responses)

In response to the proposed action for issuance of an operating license to Toledo Edison Company and Cleveland Electric Illuminating Company for operation of Davis-Besse Nuclear Power station Unit I, (Docket #50-346), I have the following responses:

1) Generally, I am opposed to the issuance of an operating license for Davis-Besse I. after having heard testimony, and read about the Nuclear Power Industry, and what it has planned, I am appalled.

One of the biggest factors involved is safety. There are a great number of scientists, including many who have worked within the old AEC, or in the Nuclear Power Industry, who are gravely concerned about the lacks of safety. There have been great questions about just the ECCS (Emergency Core Cooling System), and it is only one system of a Nuclear Reactor. 121 6874

There was an incident at the "Brown's Ferry Reactor" which, statistically, had one chance in a trillion of occurring, yet it happened. Currently, we have only 55 Nuclear Plants in operation, and some near and small scale disasters have already occured (ENRICO FERMI, 1966).

We can't afford to learn this lesson the hard way at Davis-Besse. As a citizen of Toledo, I realize now I am living in an "endangered city" where populace could be devastated by a nuclear accident. I am not willing to live under such a threat, and I don't feel future generations should be saddled with our mistakes and wastes.

The British Government has studied the <u>american Type Reactors</u>, and has decided that they are not safe enough to install in Britian. If an independent government made this decision, to me that casts serious doubts on the safety and rationale behind our reactors, and at Davis-Besse in particular, as it is in my area.

2) A second problem is storage of radioactive wastes, which are dangerous for thousands of years. Currently, there is already about 92 million gallons of such waste from nuclear weaponry being stored at government facilities, and space is rapidly running out.

APPENDIX A. COMMENTS
(Reserved for comments)

Where will Davis-Besse go with their wastes? It is predicted that within a year at least 14 Reactors may have to close down because they have no storage facilities left for their wastes. The purpose of the plant is then defeated, and power outages can possibly occur as a result. Davis - Besse will be no different from the others - so when it shuts down in a few years where are we to receive our power and energy? We can see we must not rely on nuclear Reactors as the energy of the future, as they now exist in theory.

3) The next problem is transportation. The general public is not aware that wastes, and/or new fissionable uranium or plutonium, will be transported on their streets, railroads, super-highways, etc.

OVER

to and from the Reactor. The chances of a spill during transportation are very real (check National statistics on 1973 and 1974 train derailments). We have train derailments in our area about twice a month (at the least), and therefore we can expect future derailments and possible radioactive spills. This is an unnecessary danger to ours, or any community.

4) The public also seems unaware that insurance coverage on homes and cars is nonexistant, and that these insurance companies have 'total exclusion clauses' against damage from nuclear accidents. In addition, total compensation for a nuclear accident, paid for by the Government with our tax dollars, will only cover a small percentage ($560 million) of what are predicted to be damages in the billions of dollars. Here again the consumer is stuck.

Also there is little discussion given to the protection of radioactive materials from terrorist or desperate acts while in route

No insurance is available on blackmail or terrorism damages. again, Davis-Besse has not directed itself to this problem.

5) It is stated on Page 5-19, Table 5.7 of the Draft Environmental Statement that the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified". This statement can be construed to mean that the unknown factor may include the possibility of a great number of transportation accidents. How can the second part of the statement which reads "the risk remains small regardless of whether it is being applied to a single reactor or a multireactor site", be assumed, when a great number of small risk accidents may occur, and suddenly a large problem is the result.

6) On Page 7-1, Item 7.2, of the Draft Environmental Statement, the reprocessing of nuclear fuel is mentioned, are you aware that at the present time there are no reprocessing plants in operation, and that by the years end, there may be only one such plant in operation?

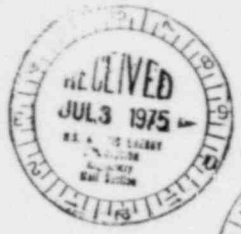
Where will Davis-Besse go with their fuel to be reprocessed? Surely one plant cannot handle all the reprocessing, and fuel to be reprocessed will certainly create storage problems. Past experiences have shown that plant safety is only as responsible as those who are operating the plant, and we now know that there have been intentional releases of radioactive materials into the environment (Dayton, Ohio Plant). What assurances do we have this will not happen when storage problems become acute at Davis-Besse. We don't have this assurance, and never will.

In summary, taking into account the human and wildlife aspects - as a member of the audubon society I am gravely concerned about wildlife, and the great number of deaths among the migrating bird populations - I feel Davis-Besse is not safe due to these and other unanswered questions, and therefore I must oppose the issuance of a license to Davis-Besse Unit I.

Sincerely -

Ted J Ligibel

TED J LIGIBEL
[redacted]
Ted J Ligibel
2512 PORTSMOUTH
TOLEDO OHIO 43611



TOLEDO EDISON

LOWELL E. ROE
Vice President
Facilities Development
(419) 259-5242

Docket No. 50-346

June 30, 1975

Mr. George W. Knighton, Chief
Environmental Projects Branch No. 1
Division of Reactor Licensing
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Knighton:

The Applicants have reviewed the Nuclear Regulatory Commission's Draft Environmental Statement related to the proposed operation of the Davis-Besse Nuclear Power Station, Unit No. 1 and are generally in agreement with the information and conclusions contained within. However, the Applicants do have several comments which are as follows:

SUMMARY AND CONCLUSIONS

6(B) Significant Technical Specification Requirements

(1) The Applicants generally agree with the environmental monitoring programs outlined in Chapter 6. The Applicants proposed environmental monitoring programs have been submitted to the NRC in Revision No. 1 to their proposed Environmental Technical Specifications for the Davis-Besse Nuclear Power Station, Unit No. 1, submitted June 13, 1975. Specific comments pertaining to the proposed monitoring programs will be contained in our comments on Chapter 6.

(2) The Applicants do not believe that a study to determine the extent to which the intake canal supports a fish population and thus contributes to impingement losses is necessary. As a part of the preoperational aquatic monitoring program the Applicants have conducted periodic trawls in the intake canal and have found them not to be good indicators of fish populations. The traveling water screens at the intake structure will be monitored for impingement, which is expected to be insignificant. It is questionable whether the fish population in the intake canal can be monitored accurately enough to be meaningfully correlated with fish impingement.

(3) The Applicants have committed to the continued monitoring of bird impacts in Revision No. 1 to the proposed Environmental Technical Specifications for the Davis-Besse Nuclear Power Station Unit No. 1 submitted to NRC June 13, 1975.

(4) The Applicants have committed to performing an operational noise survey in the Davis-Besse Nuclear Power Station Unit No. 1, Supplement to the Environmental Report - Operating Licenses Stage submitted to the AEC on December 20, 1975.

The Applicants do not believe a special study to determine the effectiveness of the bubble screen in reducing impingement is either necessary or possible to conduct. Any fish which enter the intake canal could reside in the canal for long periods of time before there is any chance of being impinged on the traveling water screens where they would be monitored. This makes it impossible to correlate with any degree of accuracy fish monitoring with operation of the bubble screen.

Section 1.2 - Status of Review and Approvals

On May 15, 1975, the Ohio Environmental Protection Agency (OEPA) withdrew the proposed NPDES permit after receipt of comments from the U.S. Environmental Protection Agency, Region V (USEPA). Since then the Applicants have met several times with representatives of OEPA and USEPA to arrive at acceptable permit conditions. It is anticipated that the proposed NPDES permit will be reissued in July. Upon receipt of this permit a copy will be forwarded to the NRC.

Section 3.5.1 - Plant Chemical Usage

The maximum level of total residual chlorine in the discharge will be determined by the NPDES permit for Unit No. 1.

Section 3.6 - Sanitary and Other Waste Systems

The Applicants have recalculated the expected concentrations of the constituents in the auxiliary blowdown based on periodic testing of the boiler feedwater during the past year while the boiler was used to provide heat for construction. Based on these tests we now expect the boiler blowdown concentration to be lower than previously estimated. The new expected blowdown concentrations are:

Fe, Max.	1.0 mg/l
Cu, Max.	0.5 mg/l
SiO_2, Max.	0.2 mg/l
Total Dissolved and Suspended Solids, Max.	0.007 mg/l 100 mg/l

Section 5.2.5 - Chemical Effluents

Paragraphs 423.12(b)(5) and 423.13(f)

Initial plant cleaning solutions and wastes will either be trucked off site for disposal or treated onsite by appropriate methods and discharged. Any wastes treated and discharged will meet the effluent limitations of this part. This change in treatment will be reflected in the next revision to the Environmental Report.

Paragraphs 423.12(b)(6) and 423.13(g)

The revised auxiliary boiler blowdown concentration presented in our comments on Section 3.6 will meet the limitations of this part.

Section 6.2 - Operational Monitoring

The chemical monitoring, sample and testing schedule shown in Table 6.2, could be modified upon the final issuance of an NPDES permit.

Section 6.5 - Preoperational Program

Items No. 1 and 2 that the Staff recommended be added to the preoperational radiological monitoring program were implemented in January, 1975. Plans are presently being developed to implement Item No. 3.

The Applicants appreciate the opportunity to comment on this statement which we feel is a complete review of the environmental factors associated with the Davis-Besse Unit No. 1 project.

Yours very truly,

Powell Hoe

dh a/1-3

vsm

OEPA Permit No. B 211 *AD

Application No. OH 0003786

OHIO ENVIRONMENTAL PROTECTION AGENCY

AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et. seq; the "Act"), and the Ohio Water Pollution Control Act (Ohio Revised Code Chapter 6111),

Toledo Edison Company
Davis-Besse Nuclear Power Station

is authorized to discharge from a facility located at

State Route 2
Oak Harbor, Ohio

to receiving waters named Toussaint River, Lake Erie and Navarre Marsh

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, and III hereof.

This permit shall become effective on November 23, 1975.

This permit and the authorization to discharge shall expire at midnight, November 22, 1980. Permittee shall not discharge after the above date of expiration. In order to receive authorization to discharge beyond the above date of expiration, the permittee shall submit such information and forms as are required by the Ohio EPA no later than 180 days prior to the above date of expiration.

Ned E. Williams

Ned E. Williams, P.E.
Director

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until November 22, 1980 the permittee is authorized to discharge from outfall(s) serial number(s) 001 (Discharge from Collecting Box)

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)		Measurement Frequency	Sample Type
INITIAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max		
Flow-M^3/day (MGD)	-	-	-	-	Daily	Continuous
Max. Temp. Rise (°F)	-	-	-	-	Daily	Continuous
Cl_2, Total Residual	-	-	-	-	Daily	grab*
Gross Beta Activity	-	-	-	400 picocuries/liter	daily**	Grab
Strontium 90	-	-	-	10 picocuries/liter	1/month**	Grab
Alpha Emitter Activity	-	-	-	3 picocuries/liter	1/month**	Grab

Gross Beta Activity shall not exceed a concentration of 100 picocuries/liter at the perimeter of the mixing zone as defined by EP-1-03-B-1-b.

2. The pH shall not be less than N/A nor greater than N/A and shall be monitored N/A.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations (s): at outfall 001; temperature shall also be continuously monitored at the inlet (station 801); inlet and outlet temperatures corresponding to the maximum temperature rise sustained for one hour shall be reported; in addition, in order to demonstrate compliance with water quality standards, Gross Beta Activity shall be monitored on a monthly grab sample basis at a representative point along the perimeter of the mixing zone (station 901).

5. Refer to Part III for additional reporting requirements.

* Maximum value during chlorination, using amperometric titration.
** During days discharged.

OEPA-NPDES-
8-10-74

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980 , the permittee is authorized to discharge from outfall(s) serial number(s) 003 (screenwash catch basin discharge).

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	Daily	24-hr. total(Est.
Total Suspended Solids	-	-	-	-	Monthly	Grab
Total Residual Chlorine	-	-	-	-	Monthly	Grab

2. The pH shall not be less than N/A nor greater than N/A and shall be monitored N/A

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at overflow from the screens wash catch basin.

5. Refer to Part III for additional reporting requirements.

Page 4 of 19
OEPA Permit No. B 211 *AD

8-2

OEPA-NPDES-

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980. the permittee is authorized to discharge from outfall(s) serial number(s) 002 (area runoff).

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	Daily	24-hr. total (Est.)
Total Suspended Solids	-	-	-	50 mg/l	Weekly	Grab

2. The pH shall not be less than 6.0 S.U. nor greater than 9.0 S.U. and shall be monitored weekly by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at the discharge point to the Toussaint River.

5. Refer to Part III for additional reporting requirements.

Page 3 of 19
OEPA Permit No.B 211 *AD

OEPA-NPDES-

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980
the permittee is authorized to discharge from outfall(s) serial number(s) 602 (low volume wastes)

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	weekly	24-hr. total (est.
Total Suspended Solids	-	-	30 mg/l	100 mg/l	weekly	grab
Oil/Grease	-	-	15 mg/l	20 mg/l	weekly	grab

2. The pH shall not be less than 6.0 S.U. nor greater than 10.0 S.U.
and shall be monitored weekly by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at overflow from settling basin.

5. Refer to Part III for additional reporting requirements.

Page 6 of 19
OEPA Permit No. B 211 *AD

*A

B-3

OEPA-NPDES-

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980
the permittee is authorized to discharge from outfall(s) serial number(s) 501 (Sanitary)

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	daily	24-hr. total (est.
BOD_5*	-	-	30 mg/l	45 mg/l	monthly	grab
Total Suspended Solids*	-	-	30 mg/l	45 mg/l	monthly	grab
Fecal Coliform**	-	-	200/100 ml	400/100 ml	Monthly	grab
Color, severity	-	-	-	-	daily	grab
Turbidity, Severity	-	-	-	-	daily	grab
Odor, Severity	-	-	-	-	daily	grab
Chlorine, Total Residual	-	-	-	-	daily	grab

2. The pH shall not be less than 6.0 S.U. nor greater than 9.0 S.U.
and shall be monitored daily by grab sample.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at discharge point of sewage treatment facility.

5. Refer to Part III for additional reporting requirements.

Page 5 of 19
OEPA Permit No. B 211 *AD

*For this component in this outfall, the "Daily Average" means the arithmetic mean of analyses of samples collected in a period of 30 consecutive days. "Daily Maximum" means the arithmetic mean of analyses of samples collected in a period of seven consecutive days.

**For this component in this outfall, the "daily average" means the geometric mean of analyses of samples collected in a period of 30 consecutive days. "Daily Maximum" means the geometric mean of analyses of samples collected on seven consecutive days.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980
the permittee is authorized to discharge from outfall(s) serial number(s) 604 (Floor Drains)

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	Daily	24-hr. total (Est.)
Oil/grease	-	-	15 mg/l	20 mg/l	Weekly	Grab

2. The pH shall not be less than 6.0 S.U. nor greater than 9.0 S.U.
and shall be monitored weekly by grab sample

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at a point representative of the flow drain discharge to the drainage ditch.

5. Refer to Part III for additional reporting requirements.

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning Nov. 23, 1975 and lasting until Nov. 22, 1980
the permittee is authorized to discharge from outfall(s) serial number(s) 603 (Neutralized Regenerate Waste)

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTIC	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
	kg/day (lbs/day)		Other Units (Specify)			
FINAL LIMITATIONS	Daily Avg	Daily Max	Daily Avg	Daily Max	Measurement Frequency	Sample Type
Flow-M^3/day (MGD)	-	-	-	-	Each discharge	24-hr.total(es
Total Suspended Solids	-	-	30 mg/l	100 mg/l	weekly	grab
Oil/Grease	-	-	15 mg/l	20 mg/l	monthly	grab

2. The pH shall not be less than 6.0 S.U. nor greater than 9.0 S.U.
and shall be monitored each discharge by a grab sample prior to discharge.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts.

4. Samples taken in compliance with the monitoring requirements specified above shall be taken at the following locations(s): at discharge point of hold-up tank.

5. Refer to Part III for additional reporting requirements.

B. MONITORING AND REPORTING

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

2. Reporting

Monitoring data required by this permit shall be reported on the Ohio EPA report form (EPA- Surv- 1) on the monthly basis. Individual reports for each month are to be submitted no later than the 15th of the next month. Copies of the discharge monitoring report form must be signed and mailed to the District Office, Ohio EPA indicated below.

OHIO ENVIRONMENTAL PROTECTION AGENCY
Northwest District Office
1035 Devlac Grove Drive
Bowling Green, Ohio 43402

Monitoring results obtained during the previous three months shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. The first quarterly report shall be submitted for the period ending March 31, 1976.

U. S. Environmental Protection Agency
Region V, Permit Branch
230 South Dearborn, 13th Floor
Chicago, Illinois 60604
312/353-1475

3. Definitions

a. "daily average" discharge

i. Weight Basis - the "daily average" discharge means the total discharge by weight, during a calendar month divided by the number of days in the month that the production or comercial facility was operating. Where less than daily sampling is required by this permit, the "daily average" discharge shall be determined by the summation of the measured daily discharges by weight divided by the number of days during the calendar month on which the measurements were made.

ii. Concentration Basis - the "daily average" concentration means the arithmetic average (weighted by flow value) of all the daily determinations of concentrations made during the calendar month. Daily determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the daily determination of concentration shall be the arithmetic average (weighted by flow value) of all the samples collected during the calendar month.

b. "daily maximum" discharge

i. Weight Basis - the "daily maximum" discharge means the highest discharge by weight during any calendar day.

ii. Concentration Basis - the "daily maximum" concentration means the highest daily concentration in any calendar month.

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304(g) of the Act, under which such procedures may be required.

5. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date, and time of sampling;

b. The dates the analyses were performed;

c. The person(s) who performed the analyses;

d. The analytical techniques or methods used; and

e. The results of all required analyses.

6. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report Form (EPA No. 3320-1). Such increased frequency shall also be indicated.

7. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three(3) years. These periods will be extended during the course of any unresolved litigation, or when so requested by the Regional Administrator or the Ohio EPA.

C. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

a.	Progress report by	February 1, 1976
b.	Progress report by	November 1, 1976
c.	Progress report by	July 1, 1977
d.	Progress report by	March 1, 1978
e.	Attainment of final limitations by	July 1, 1978

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit a written report as to compliance (except for those dates requiring a written submittal such as reports, plans, etc.), or noncompliance. The report on noncompliance shall include the reason, an estimated date of compliance and the probability of meeting the next scheduled requirement. Reports should be submitted ot the Ohio EPA, District Office, ORE Representative.

Northwest District Office
1035 Delvac Grove Drive
Bowling Green, Ohio 43402

(END OF PART I)

PART II

A. MANAGEMENT REQUIREMENTS

1. Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different, or increased discharges of pollutants must be reported by submission of a new NPDES application or, if such changes will not violate the effluent limitations specified in this permit, by notice to the permit issuing authority of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

2. Noncompliance Notification

If, for any reason, the permittee does not comply with or will be unable to comply with any daily maximum effluent limitation specified in this permit, the permittee shall provide the Ohio EPA with the following information, in writing, within five (5) days of becoming aware of such condition:

a. A description of the discharge and cause of noncompliance; and

b. The period of noncompliance, including exact dates and times, or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

3. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit.

4. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to navigable waters resulting from noncompliance with any effluent limitations specified in this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

5. Bypassing

Any diversion from or bypass of facilities necessary to maintain compliance with the terms and conditions of this permit is prohibited, except (i) to prevent loss of life or severe property damage, or (ii) where excessive storm drainage or runoff would damage any facilities necessary for compliance with the effluent limitations and prohibitions of this permit. The permittee shall promptly notify the Ohio EPA in writing of each such diversion or bypass.

6. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed from or resulting from treatment or control of wastewaters shall be disposed of in a manner such as to prevent any pollutant from such materials from entering navigable waters.

7. Power Failures

In order to maintain compliance with the effluent limitations and prohibitions of this permit, the permittee shall either:

a. In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or, if no date for implementation appears in Part I,

b. Halt, reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of one or more of the primary sources of power to the wastewater control facilities.

B. RESPONSIBILITIES

1. Right of Entry

The permittee shall allow authorized representatives of the Ohio EPA and USEPA upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or in which any records are required to be kept under the terms and conditions of this permit, and

b. At reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit, to inspect any monitoring equipment or monitoring method required in this permit, and to sample any discharge of pollutants.

2. Transfer of Ownership or Control

This permit cannot be transferred or assigned, nor shall a new owner or successor be authorized to discharge from this facility until the following requirements are met:

i. The permittee shall notify the succeeding owner or successor of the existence of this permit by a letter, a copy of which shall be forwarded to the Ohio EPA.

ii. The new owner or successor shall submit a letter to the Ohio EPA stating that he will comply with the requirements of the permit on this facility and receive confirmation and approval of the transfer from the Ohio EPA.

3. Availability of Reports

Except for data determined by the Ohio EPA to be entitled confidential status, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the district offices of the Ohio EPA. Effluent data and data on quality of receiving water shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Ohio Revised Code Section 6111.99.

4. Permit Modification, Suspension, or Revocation

a. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term for cause including, but not limited to, the following:

i. Violation of any terms or conditions of this permit;

ii. Obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

iii. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

b. The permittee may at any time apply to the Ohio EPA for modification of any part of this permit, provided that application for modification is received by the Ohio EPA at least sixty days before the date on which it is desired that the modification shall become effective.

5. Toxic Pollutants

Notwithstanding Part II, B-4 above, if a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit shall be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

6. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" (Part II, A-5) and "Power Failures" (Part II, A-7), nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal State or local laws or regulations.

10. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

11 Reporting of Unauthorized Discharges

The permit holder shall within one (1) hour of discovery report to the Ohio EPA by calling 614-299-6336 and the proper Federal Authority any unauthorized discharge of untreated or partially treated sewage, industrial wastes or other wastes into the waters of the state or into publicly-owned treatment works, when such discharges result from pipeline breaks, equipment malfunctions or failures, operator errors, accidents, process interruptions, or power failures. The report shall include the remedial steps being taken, the names and telephone numbers of persons who have knowledge of the circumstances surrounding such discharge and the names and telephone numbers of persons who are responsible for the remedial steps being taken. Such report shall be confirmed in writing within one week after the date of such discharge. Within thirty (30) days after such discharge, the permit holder shall report to what extent permanent measures can be taken to prevent recurrence of such discharge, any such measures proposed to be taken shall be submitted to the Ohio EPA for approval within sixty (60) days of such discharge.

1. The permittee shall, by January 1, 1976, submit to OEPA for approval, general plans setting forth programs:

   A. To monitor the impact of the cooling water intake system to demonstrate compliance with Section 316(b) of the FWPCA, as amended. The plan should include a one year monitoring program to assess fish impingement on intake screens and fish egg and larval entrainment.

   B. To comply with the 96-hour Median Tolerance Limit (TLM) for total chlorine residual in the mixing zone as required in EP-1. The plan may include a program for minimizing the use of chlorine as well as bioassays using representative fish species expected to be found in the area of the discharge.

2. Uncontaminate Runoff

   No other discharges are permitted, other than those stated above and uncontaminated roof and area drains.

3. Copies of reports submitted to N.R.C. on Radwaste treatment discharge shall be submitted to Ohio EPA. Also to be included are Gross beta activity, strontium 90, alpha emitter activity in picocuries/liter on radwaste treatment discharge.

4. Sewage treatment discharge shall be tributary to the collection box at such time as the unit is on line. Subsequent discharge to Toussaint River shall be prohibited.

5. The discharge from the radwaste treatment system shall be bled into the collecting box at the lowest practical rate subject to plant operating conditions.

6. The mixing zone perimeter shall extend 0.4 miles from the point of discharge.

APPENDIX C

§ 423.11 Specialized definitions.

For the purpose of this subpart:

(a) Except as provided below, the general definitions, abbreviations and methods of analysis set forth in 40 CFR Part 401 shall apply to this subpart.

(b) The term "generating unit" shall mean any generating unit subject to the provisions of this part, except those units defined below as small, or old.

(c) The term "small unit" shall mean any generating unit subject to the provisions of this part, except a unit defined below as old, of less than 25 megawatts rated net generating capacity or any unit which is part of an electric utilities system with a total net generating capacity of less than 150 megawatts.

(d) The term "old unit" shall mean any generating unit, subject to the provisions of this part, of 500 megawatts or greater rated net generating capacity which was first placed in service on or before January 1, 1970 and any generating unit of less than 500 megawatts rated net generating capacity which was first placed in service on or before January 1, 1974.

(e) The term "blowdown" shall mean the minimum discharge of recirculating water for the purpose of discharging materials contained in the water, the further buildup of which would cause concentrations in amounts exceeding limits established by best engineering practice.

(f) The term "free available chlorine" shall mean the value obtained using the amperometric titration method for free available chlorine described in "Standard Methods for the Examination of Water and Wastewater", page 112 (13th edition).

(g) The term "sufficient land" shall mean 100 sq m (1180 sq ft) or more per megawatt of nameplate generating capacity.

(h) The term "low volume waste sources" shall mean, taken collectively as if from one source, wastewater from all sources except those for which specific limitations are otherwise established in this subpart. Low volume wastes sources would include but are not limited to: waste waters from: wet scrubber air pollution control systems, ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, floor drainage, cooling tower basin cleaning wastes and blowdown from recirculating house service water systems.

(i) The term "ash transport water" shall mean water used in the hydraulic transport of either fly ash or bottom ash.

(j) The term "metal cleaning wastes" shall mean any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and air preheater cleaning.

(k) The term "once through cooling water" shall mean water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat from the generating unit.

(l) The term "recirculated cooling water" shall mean water which is passed through the main condensers for the purpose of removing waste heat from the generating unit, passed through a cooling device, other than a cooling pond or a cooling lake, for the purpose of removing such heat from the water and then passed again, except for blowdown, through the main condenser.

(m) The term "cooling pond" shall mean any manmade water impoundment which does not impede the flow of a navigable stream and which is used to remove waste heat from heated condenser water prior to returning the recirculated cooling water to the main condenser.

(n) The term "cooling lake" shall mean any manmade water impoundment which impedes the flow of a navigable stream and which is used to remove waste heat from heated condenser water prior to recirculating the water to the main condenser.

§ 423.12 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

(a) In establishing the limitations set forth in this section, EPA took into account all information it was able to collect, develop and solicit with respect to factors (such as age and size of plant, utilization of facilities, raw materials, manufacturing processes, non-water quality environmental impacts, control and treatment technology available, energy requirements and costs) which can affect the industry subcategorization and effluent levels established. It is, however, possible that data which would affect these limitations have not been available and, as a result, these limitations should be adjusted for certain plants in this industry. An individual discharger or other interested person may submit evidence to the Regional Administrator (or to the State, if the State has the authority to issue NPDES permits) that factors relating to the equipment or facilities involved, the process applied, or other such factors related to such discharger are fundamentally different from the factors considered in the establishment of the guidelines. On the basis of such evidence or other available information, the Regional Administrator (or the State) will make a written finding that such factors are or are not fundamentally different for that facility compared to those specified in the Development Document. If such fundamentally different factors are found to exist, the Regional Administrator or the State shall establish for the discharger effluent limitations in the NPDES permit either more or less stringent than the limitations established herein, to the extent dictated by such fundamentally different factors. Such limitations must be approved by the Administrator of the Environmental Protection Agency. The Administrator may approve or disapprove such limitations, specify other limitations, or initiate proceedings to revise these regulations.

(b) The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best practicable control technology currently available:

(1) The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

(2) There shall be no discharge of polychlorinated biphenol compounds such as those commonly used for transformer fluid.

(3) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l

(4) The quality of pollutants discharged in ash transport water shall not exceed the quantity determined by multiplying the flow of ash transport water times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l

(5) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

(6) The quantity of pollutants discharged in boiler blowdown shall not exceed the quantity determined by multiplying the flow of boiler blowdown times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

(7) The quantity of pollutants discharged in once through cooling water shall not exceed the quantity determined by multiplying the flow of once through cooling water sources times the concentration listed in the following table:

Effluent Characteristic	Maximum Concentration	Average Concentration
Free available chlorine	0.5 mg/l	0.2 mg/l

(8) The quantity of pollutants discharged in cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown sources times the concentration listed in the following table:

Effluent Characteristic	Maximum Concentration	Average Concentration
Free available chlorine	0.5 mg/l	0.2 mg/l

(9) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or State, if the State has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

(10) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a)(1) through (10) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

§ 423.13 Effluent limitations guidelines representing the degree of effluent reduction attainable by the application of the best available technology economically achievable.

The following limitations establish the quantity or quality of pollutants or pollutant properties, controlled by this section, which may be discharged by a point source subject to the provisions of this subpart after application of the best available technology economically achievable:

(a) The pH of all discharges, except once through cooling water, shall be within the range of 6.0–9.0.

(b) There shall be no discharge of polychlorinated biphenol compounds such as those commonly used for transformer fluid.

(c) The quantity of pollutants discharged from low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l

(d) The quantity of pollutants discharged in bottom ash transport water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration listed in the following table and dividing the product by 12.5:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l

(e) The quantity of pollutants discharged in fly ash sluicing shall not exceed the quantity determined by multiplying the flow of fly ash transport water times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l

(f) The quantity of pollutants discharged in metal cleaning wastes shall not exceed the quantity determined by multiplying the flow of metal cleaning wastes times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

(g) The quantity of pollutants discharged in boiler blowdown shall not exceed the quantity determined by multiplying the flow of boiler blowdown times the concentration listed in the following table:

Effluent characteristic	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
TSS	100 mg/l	30 mg/l
Oil and Grease	20 mg/l	15 mg/l
Copper, Total	1.0 mg/l	1.0 mg/l
Iron, Total	1.0 mg/l	1.0 mg/l

(h) The quantity of pollutants discharged in once through condenser water shall not exceed the quantity determined by multiplying the flow of once through condenser water sources times the concentration listed in the following table:

Effluent Characteristic	Maximum Concentration	Average Concentration
Free available chlorine	0.5 mg/l	0.2 mg/l

(i) The quantity of pollutants discharged from cooling tower blowdown shall not exceed the quantity determined by multiplying the flow of cooling tower blowdown times the concentration listed in the following table:

Effluent Characteristic	Maximum Concentration	Average Concentration
Free available chlorine	0.5 mg/l	0.2 mg/l

	Maximum for any one day	Average of daily values for thirty consecutive days shall not exceed
Zinc	1.0 mg/l	1.0 mg/l
Chromium	0.2 mg/l	0.2 mg/l
Phosphorous	8.0 mg/l	5.0 mg/l
Other corrosion inhibiting materials	Limit to be established on a case by case basis.	

(j) Neither free available chlorine nor total residual chlorine may be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available or total residual chlorine at any one time unless the utility can demonstrate to the regional administrator or state, if the state has NPDES permit issuing authority, that the units in a particular location cannot operate at or below this level of chlorination.

(k) In the event that waste streams from various sources are combined for treatment or discharge, the quantity of each pollutant or pollutant property controlled in paragraphs (a) through (j) of this section attributable to each controlled waste source shall not exceed the specified limitation for that waste source.

(l) There shall be no discharge of heat from the main condensers except:

(1) Heat may be discharged in blowdown from recirculated cooling water systems provided the temperature at which the blowdown is discharged does not exceed at any time the lowest temperature of recirculating cooling water prior to the addition of the make-up water.

(2) Heat may be discharged in blowdown from recirculated cooling water systems which have been designed to discharge blowdown water at a temperature above the lowest temperature of recirculated cooling water prior to the addition of make-up water providing such recirculating cooling systems have been placed in operation or are under construction prior to the effective date of this regulation.

(3) Heat may be discharged where the owner or operator of a unit otherwise subject to this limitation can demonstrate that a cooling pond or cooling lake is used or is under construction as of the effective date of this regulation to cool

APPENDIX D

This Appendix describes the models and assumptions used to make upper bound estimates of population dose for interim assessment of the potential radiological impact from normal operation of nuclear power stations in the United States.

Dose Definitions

Individual doses from specific radionuclides were estimated using standard internal dosimetric techniques in accordance with the recommendations of ICRP.[1,2,3] All internal dose conversion calculations have been made using the maximum permissible concentrations listed in ICRP publications II and VI. Data on breathing rates, organ masses, and other physiological parameters are those implied by the standard man of ICRP II.

The isotopic concentration levels in the environment used in the dose calculations were conservatively assumed to be those which would exist during the final year of plant life. A 30-year plant operational lifetime was assumed for calculating buildup of long-lived activity in the environment. Calculated doses represent a 50-year dose commitment which would be received by the population during one year of exposure to radioactive releases from the facility at the levels described; that is, the calculated doses reflect the dose that a person would receive over fifty years from radioactive materials to which that person was exposed for one year. For isotopes with a short effective half life, the exposure essentially all occurs in the year of the intake. For isotopes with a longer effective half life, the dose resulting from intake in any one year may be spread over a long period. The 50-year dose commitment method computes the dose associated with any given year's intake, even if that dose is due to a long-lived isotope and is spread out over the lifetime of the person exposed.

Receiving Water

The liquid effluent population doses previously used by the staff were conservative. For example, fish were assumed to have come to equilibrium with the radioactivity content of the water in which they were caught. Thus, the man-rem developed previously has been accepted for this evaluation and incorporated into the sum. In any case, the liquid effluents contribute only small fractions of the total impact of the station.

Atmospheric Effluents

For a uniform population density the population dose may be written as Population dose = $K \overline{\Psi} P$ where $\overline{\Psi}$ is the spatially averaged concentration time integral appropriate for a population of P individuals.

Atmospheric Effluents Which Deposit (Radioiodine and Particulates)

At any point, the concentration time integral, will be related to the ground concentration w, and the deposition velocity, V_g, by

$$V_g = w/\Psi$$

Thus, the population dose can be expressed as

$$\text{Population dose} = K \overline{W} P/V_g$$

where $\overline{W}$ is the average ground concentration appropriate for the population P. In the above equation only the average ground concentration, $\overline{W}$, is needed. Noting that whatever is released will eventually settle, we can define the average $\overline{W}$ over a large arbitrary area as

$$\overline{W} = Q/A$$

where Q is the total source released. This gives

$$\text{Population dose} = K Q P/A V_g$$

where P/A is the average population density (people per square meter), Q is the total source released (curies), V_g is the deposition velocity (meters per second) and K is the dose conversion factor (rem per Ci-sec/m^3). The above equation was used to determine upper bound population doses for the generic case.

The doses resulting from ground plane irradiation of the population were primarily based on the Oak Ridge EXREM III Code.[4] Data on certain other isotopes were based on Battelle studies.[5] Basically, the method used consists of determining the gamma energy at 100 cm above an assumed infinite ground plane. Buildup of long-lived activity on the ground from 30 years of continuous deposition includes ingrowth of daughter products. No beta doses from ground plane irradiation were treated, as vegetation on the ground, clothing, and the travel distance in air all combine to make this dose contribution very small. In any case, the contribution to the total U.S. population dose from ground plane radiation is negligible.

Food Uptake

For exposure from airborne radioisotopes resulting from food uptake, the population exposure is determined not by the density of people in the area of the food crop, but by the number of persons that can be fed by the affected crop. We have considered the exposure associated with three principal pathways: direct ingestion of affected vegetation; consumption of meat from animals fed on affected vegetation; consumption of milk from animals fed on affected vegetation.

For our interim estimates, ground deposition was computed as described above. Vegetation density used was 2,300 grams vegetation per square meter and 440 grams grass per square meter of pasture[6] which is typical of average agricultural and pasture land.

Concentrations of isotopes on the soil assumed buildup of the isotope from continuous deposition over the facility lifetime (30 years). Also included was ingrowth of radioactive daughter products. Isotopes were assumed to be deposited directly on vegetation as well as deposited on soil and taken up by plant roots. No loss of radioisotopes from soil by weathering or other removal mechanisms is included so that the calculated results tend to be conservative.

Concentrations of isotopes directly deposited on vegetation assumed an effective 13-day weathering removal half-life from plant leaves in addition to the radiological half-life. Since both soil deposition and vegetation deposition are treated assuming the full original airborne concentration (i.e., deposition of isotopes on the soil was not depleted to account for the isotopes deposited on vegetation before they reach the soil), material weathered from the plants to the soil has already been accounted for. Thus the doses do not need to be separately treated. Of the amount directly deposited on vegetation, 30 percent was assumed to be absorbed by the plant.

This results in a computed concentration of radioisotopes in agricultural vegetation in the affected area. For that portion of the vegetation which is assumed to go directly to human consumption, a decay time of 7 days was assumed in the transfer of foodstuffs from the field to ultimate consumption.

In addition to the portion going directly to human consumption, vegetation containing radioisotopes as computed above is assumed to be fed to meat and milk animals. Cattle were assumed to have ingested at a rate equivalent to 200 kg "grass"/day[7]. Assuming a grass dry matter content of 25%, the above rate corresponds to 50 kg dry "grass"/day. This ingestion rate is not to be considered as the daily mass intake of feed, but the "grass equivalent" intake. The development of this estimate is outlined below.

To maintain a high productivity, animals are generally offered feeds, such as grains and harvested forages, to supplement or to totally replace the pasture intake.[7,8,9] The U.S. Dept. of Agriculture[9] has estimated that one-fifth of the diet of milk cattle is obtained from pasturing. This percentage is based on the "energy requirements" of milking animals.

In evaluating the transport of radioiodine (I-131) in the milk pathway, it is generally accepted that a pasture intake of 10 kg dry grass/day is applicable.[4-6] Assuming the energy content of various feeds are equivalent to grass, the above statement implies a total daily intake rate of 50 kg dry "grass"/day or 200 kg wet "grass"/day. Beef animals were assumed to be subject to the same feeding practices as milk cattle.

For the animal feed coming from stored feeds a two-month delay was assumed, which results in decay of short-lived isotopes. For the portion coming directly from pastureland uptake, no decay was assumed between deposition and animal uptake.

Transfer factors from animal uptake to milk and meat were taken from UCRL-50163, C.Ng et al.[13] For population dose estimates, a one-day milk supply delay factor was used, and a seven-day meat supply delay factor was used between consumption of vegetation by the animal and ultimate consumption of meat or milk from that animal by persons in the population. This gives a concentration of radioisotopes in meat and milk from agricultural lands in the affected area.

To convert from concentration of activity in foodstuffs to population dose, we have assumed that the affected land has an average agricultural productivity equivalent to assuming that the entire U.S. population was fed from that portion of the land area of the U.S. east of the Mississippi. With an average diet for an adult of:

Vegetation - 400 g/day
Meat - 250 g/day
Milk - 350 g/day

This results in an average land productivity of:

Vegetation - 100 kg/day - $mile^2$
Meat - 65 kg/day - $mile^2$
Milk - 90 kg/day - $mile^2$

This compares fairly conservatively with the agricultural land productivity for the U.S. of about 50 kg/day - $mile^2$ for milk[14] and 10 kg/day - $mile^2$ for meat.[15]

Atmospheric Releases Which Do Not Deposit (Noble Gases, Carbon-14 and Tritium)

Short-lived noble gases were assumed to disperse to the atmosphere without deposition, but radioactive decay which limits spread of the gas was explicitly treated. The population dose, assuming an infinite integration along the plume pathlength, is given by

$$\text{Population dose} = K\ Q\ P/\lambda L\ A$$

which is the same form as used for particulate deposition, except that the deposition velocity is replaced by λL, where λ is the radioactive decay constant (sec^{-1}) and L is the height of the assumed vertical air mixing. An L value of 1,000 meters was used in the calculations.

The long-lived gaseous radioisotopes, krypton-85 and carbon-14, were assumed to be distributed by dilution in the earth's atmosphere. Both were considered to build up over 30 years of plant life. Carbon-14 was assumed to be released in oxide form which maximizes its availability to the population via food chains. Other chemical forms such as methane would not be as readily available.

The carbon-14 was considered to be completely mixed in the troposphere with no removal mechanisms operating; i.e., the absorpiton of carbon by the ocean and long-lived biota not strongly coupled to man were neglected. In actuality, the atmospheric residence time of carbon is about 4-6 years[16,17] with the ocean being the major sink. The neglect of carbon sinks yields an overestimate of the steady-state or end of plant life (30 year plant life) atmospheric concentration by a factor of about six.

Unlike radioactivity ejected into the stratophere and then appearing in the high latitude troposphere as in weapon testing, the emission of concern here is directly introduced into the mid-latitudes of the troposphere. Transfer of tropospheric air between the two hemispheres, although inhibited by wind patterns in the equatorial region, is considered to yield a hemisphere average tropospheric residence time of about two years with respect to hemispheric mixing.[4] This time constant is quite short with respect to the expected plant life-time and mixing in both hemispheres can be assumed for end of plant life evaluations.

Doses were calculated assuming all carbon in the body reaches the same equilibrium ratio of carbon-14 to natural carbon as exists in the air.

Tritium

Tritium was assumed to mix uniformly in the world's hydrosphere. The hydrosphere was assumed to include all the atmospheric water and the upper 70 meters of the oceans. Having determined this equilibrium concentration of tritium in the world, doses to man were calculated by assuming all the hydrogen in the body reaches the same equilibrium ratio of tritium to hydrogen as exists in the air and water of the environment.

Population Density and Changes - Local Impact

The doses calculated for shine dose from radioactive materials deposited on the ground and for short-lived noble gases were based on a population density of 160 persons/sq. mile, characteristic of the U.S. population east of the Mississippi River. These components of dose would be increased if the close-in populations, the populations principally exposed exceeded this value substantially. However, as noted, these components do not significantly affect the total and would be reviewed on an individual case basis for the Appendix I cost-benefit analysis.

Local food uptake exposures are not based on population density, but, rather, on agricultural productivity, and, consequently, are not directly affected by population growth but more by changes in land use. Similarly, the principal future impact on estimates from liquid effluents would result if water use patterns in the nearby areas are changed, e.g., if a drinking water intake for a large city is constructed near the plant discharge. Such future changes are difficult to predict.

To assure adequate control of releases, allowing for future changes in water or land use, the operating license technical specifications will provide for periodic reassessment of changes in the land and water use patterns. This will provide a periodic reassessment of the adequacy of facility performance in order to maintain exposures of the public health within the Appendix I guides.

Conclusions

The main contributions to the population dose to the U.S. is from C-14 and I-131. The generic estimates are about man-rem/year for C-14 and about 300 man-rem/year for I-131 per curie realeased per year of the plant operation for 30 years. All other releases and pathways contribute relatively insignificant portions of the total population dose.

References

1. Recommendations of the International Commission on Radiological Protection, ICRP, Publication 2, Pergamon Press, Oxford (1959).

2. Recommendations of the International Commission on Radiological Protection, ICRP, Publication 6, Pergamon Press, Oxford (1962).

3. Recommendations of the International Commission on Radiological Protection, ICRP, Publication 10, Report of Committee IV, Pergamon Press, Oxford (1968).

4. Trubey, D. K. and S. U. Kaye, "The EXREM III Computer Code for Estimating External Radiation Doses to Populations from Environmental Releases," ORNL-TM-4322.

5. FES-ALAP-LWR Effluents, USAEC-WASH-1258 (July 1973).

6. Statistical Abstract of the United States, 93rd Edition, U.S. Dept. of Commerce, Bureau of Census (1972).

7. Reid, J. T., "Forages for Dairy Cattle," Forages, M. F. Heath, D. S. Metcalfe, and R. F. Barnes, Eds., 3rd Edition (1973).

8. Kennedy, W. K., J. T. Reid, and M. J. Anderson, "Evaluation of Animal Production Under Different Systems of Grazing," J. Dairy Sci. 42, 679 (1959).

9. Allen, G. C., E. F. Hodges and M. Devers, National and State Liverstock-Feed Relationships, ERS, USDA Stat. Bull. 446, Suppl. (1972).

10. Koranda, J. J., "Agricultural Factors Effecting the Daily Intake of Fresh Fallout by Dairy Cows," UCRL-12479 (1965).

11. Bryant, P. M., "Derivation of Working Limits of Continuous Release Ratios of Iodine-131 to the Atmosphere in a Milk Producing Area," Health Physics 10 (1964).

12. Comar, C. L., "Radioactivity in Animals - Entry and Matabolism," Radioactivity and Human Diet, R. Scott Russell, Ed., Pergamon Press (1966).

13. Ng, C., et al., "Prediction of the Maximum Dosage to Man from the Fallout of Nuclear Devices," IV. Handbook for Estimating the Maximum Internal Dose from Radionuclides Released to the Biosphere, UCRL-50163, Part IV.

14. California Dairy Industry Statistics, 1973-Prepared by California Crop and Liverstock Reporting Service, Sacramento, Calif. 95806.

15. California Livestock Statistics, 1974-Prepared by California Crop and Livestock Reporting Service, Sacramento, California 95806.

16. Machta, L., Carbon in the Biosphere, G. W. Woodwell and G. V. Pecan, Eds., Technical Information Center, USAEC (1973).

17. Houtermans, J. C., H. G. Seuss, and H. Oescher, J. Geophys. Res. 78, 1897 (1973).

18. Junge, C. E., J. Geophys. Res. 68, 3849 (1963).