UNITED STATES OF AMERICA

ATOMIC ENERGY COMMISSION

In the Matter of THE TOLEDO EDISON COMPANY and THE CLEVELAND ELECTRIC ILLUMINATING COMPANY (Davis-Besse Nuclear Power Station)	)	Docket No. 50-346

1-27-72

APPLICANTS' REQUEST FOR DETERMINATION THAT CERTIFICATION PURSUANT TO SECTION 21(b) OF THE FEDERAL WATER POLLUTION CONTROL ACT IS NOT REQUIRED

Applicants, The Toledo Edison Company and The Cleveland Electric Illuminating Company (hereafter "Applicants"), hereby request the Commission to determine that certification pursuant to Section 21(b) of the Federal Water Pollution Control Act (FWPCA), 33 U.S.C. §1171(b), as to the construction permit for the Davis-Besse Station (No. CPPR-80) is not required for the reasons set forth herein.

1. Section 21(b)(1) provides that any applicant for a Federal permit, such as an AEC construction permit, which may result in any discharge into navigable waters of the United States, shall provide the permitting agency with a certification "that there is reasonable assurance . . . that such activity will be conducted in a manner which will not violate applicable

8002060751

517

G

water quality standards." The Davis-Besse Station will discharge effluents into Lake Erie and the Toussaint River.

2. Because the construction permit for the Davis-Besse Station was issued on March 24, 1971, pursuant to an application filed on August 1, 1969, under Section 21(b)(8), any certification for the Davis-Besse Station is not required until March 24, 1972, subject to other provisions of Section 21(b) which, as will be pointed out, dispense with such certification.

3. Any certification required by Section 21(b) for the Davis-Besse Station would be issued by the Ohio Water Pollution Control Board (OWPCB). Under Section 21(b), certification shall come from either the state where the discharge originates (in this case Ohio); or an interstate water pollution control agency having jurisdiction; or the Environmental Protection Agency (EPA) if standards have been promulgated under Section 10(c) of FWPCA or if the state or interstate agency has no certification authority. None of the conditions which would require interstate agency or EPA certification are applicable here. In accord with EPA regulation 40 CFR §115.1(e), the Governor of Ohio has designated OWPCB as the certifying authority. See letter from Governor Rhodes to the Administrator, Federal Water Quality Administration, dated June 17, 1970, attached hereto as Appendix 1.

4. On January 5, 1971, Applicants requested a certification from OWPCB as to the Davis-Besse Station for purposes of Subsection 21(b). At that time OWPCB had no rule for the giving of notice of the application as required by the clause of 21(b)(1) which reads: "Such State . . . agency shall establish procedures for public notice in the case of all applications for certification." Because of this, Applicants gave publication and mail notices substantially as provided in the Rule subsequently adopted by OWPCB, but no action was taken on the application. OWPCB did adopt an appropriate rule which became effective April 6, 1971.

5. On April 9, 1971, Applicants again applied to OWPCB for certification as to the Davis-Besse Station. Notice of the application was given by the Board as provided in its Rule, and after it set the matter for public hearing on July 28 and 29, 1971, further notice of the hearing was given in the same manner as with respect to the filing of the application, plus additional notices. The application, as amended on July 19, 1971, is attached hereto as Appendix 2.

6. A public hearing on the application was conducted by the OWPCB on July 28 and 29, 1971, at the time and place specified in the notice of hearing, at which testimony of

representatives of Applicants, EPA and various opponents of the project was received. An EPA representative testified that EPA had no objection to certification as to assurance of compliance with water quality standards. Within 30 days subsequent to the hearing, pursuant to leave by the Board to all parties, additional material was submitted to the Board.

7. Up to the date of the filing of this Request the OWPCB has taken no action on the application for certification. On October 18, 1971, the OWPCB adopted a resolution reciting that Federal and State certification requirements necessitated a high degree of technical expertise on the part of the Board and supporting state departments, that such expertise can often be best provided by sources outside state government, that the cost should be borne in large measure by applicants and that William B. Nye as a member of the Board and as Director of Natural Resources should coordinate and effectuate such a program, and resolving as follows:

> "NOW THEREFORE, We the members of the Water Pollution Control Board of the State of Ohio, regularly assembled this 18th day of October, 1971, do hereby direct that William B. Nye as a member of this Board and as the Director of the Department of Natural Resources, under circumstances hereinbefore set forth in this resolution, be empowered to enter into contractual arrangements designed to provide the Board with technical expertise not then currently possessed by the state, and that the cost

> of such arrangement shall be borne in large measure by the applicant."

The full text of the resolution is attached hereto as Appendix 3.

On December 5, 1971, the Governor of Ohio, by written press release (Appendix 4 hereto), announced an assessment of the total impact of Davis-Besse and another projected nuclear power station in Ohio had been ordered through the Department of Natural Resources and was to be conducted by the Columbus Laboratories of Battelle Memorial Institute. It was also stated that the work would be completed in phases over a seven month period.

It is thus apparent that the Board will not have available to it prior to March 24, 1972, the information it deems necessary to pass upon the certification application here involved.

8. Therefore, there has been a waiver of the certification requirement with respect to the Federally-approved water quality standards for Lake Erie and the OWPCB criteria for the Toussaint River, for which no Federal approval is required since it is not an "interstate water". Paragraph (1) of Subsection 21(b) provides that "If the State . . . fails or refuses to act on a request for certification within a reasonable period of time (which shall not exceed one year) after

receipt of such request, the certification requirements of this subsection shall be waived with respect to such Federal approval." EPA in its regulations with respect to state certification, 40 CFR §115.16 (Fed. Reg. 11-25-71, p. 22488), provides that the reasonable period of time "shall generally be considered to be 6 months, but in any event shall not exceed 1 year."

9. Inasmuch as over 12 months have passed since the initial request for certification was filed with OWPCB and over 9 months have passed since the final application was filed (well in excess of the 6 months specified in EPA's regulations), Applicants submit that the failure of OWPCB to act should be determined by the Commission to be the failure of the State agency to act on such request for certification within a reasonable period of time after receipt of such request and that because of such failure no certification is required with respect thereto.

10. In addition to the provisions of Section 21(b)(1) as to waiver, Section 21(b)(9)(A) provides "In the case of any activity which will affect water quality but for which there are no applicable water quality standards, no certification shall be required under this subsection," except that the permitting agency (AEC) shall impose a condition that the permittee shall comply with the purposes of FWPCA. With respect

to thermal and dissolved oxygen criteria, there are no "applicable water quality standards" for Lake Erie. EPA's regulations, 40 CFR §120.10 (Fed. Reg. 11-25-71, p. 22490), state,

> "Water quality standards consisting of water quality criteria and plans of enforcement and implementation thereof which the Administrator has determined meet the criteria of section 10(c) of the Federal Act, except as otherwise noted, have been established by the States as follows:
>
> * * * *
>
> "Ohio
>
> Water quality standards established by Ohio in June 1967, for interstate waters subject to its jurisdiction, and which are contained in the following documents:
>
> * * * *
>
> "6. 'Report on Water Quality Standards For Interstate Waters of Lake Erie, May 1967, as amended; except for temperature and dissolved oxygen criteria for waters classified "Aquatic Life A"'."

In the absence of "applicable water quality standards" for temperature and dissolved oxygen in Lake Erie, Section 21(b)(9)(A) applies and certification is not required as to these matters. However, the Commission must impose as a license condition a requirement that the Applicants will comply with the purposes of FWPCA.

Applicants accordingly request that the Commission:

(a) Determine that the Ohio Water Pollution Control Board has failed to act on Applicants' request for certification within a reasonable period of time after its receipt, and that such failure constitutes a waiver of the requirements of Section 21(b) as to certification with respect to Applicants' construction permit.

(b) Give written notification to the Chicago Regional Administrator of the Environmental Protection Agency of the above determination, pursuant to 40 CFR §115.16(b), and supply him with a copy of this Request and its Appendices.

(c) Determine that there are no water quality standards applicable to Lake Erie relating to temperature and dissolved oxygen and that no certification pursuant to Section 21(b) is required as to such matters with respect to Applicants' construction permit.

(d) Impose, as a condition of Applicants' construction permit, a requirement that Applicants shall comply with the purposes of the Federal Water Pollution Control Act with respect to the matters referred to in the preceding paragraph (c).

Respectfully submitted,

Gerald Charnoff
SHAW, PITTMAN, POTTS & TROWBRIDGE

Leslie Henry
FULLER, HENRY, HODGE & SNYDER

Counsel for Applicants

Dated: January 27, 1972

June 17, 1970

Eud Ewa Hall

Mr. David D. Dominick, Commissioner
Federal Water Pollution Control Administration
U. S. Department of the Interior
Washington, D. C. 20242

Dear Mr. Dominick:

Your letter of June 5 inquired as to which agency in Ohio provides certification for the discharging of wastes into the waters of our state. This is a function performed by our Ohio Water Pollution Control Board. Dr. Emmett W. Arnold, Director of the State Department of Health, is Chairman of the Board. I have advised Dr. Arnold of your letter.

Sincerely,

JAMES A. RHODES
Governor

JAR-jn

cc: Dr. Emmett W. Arnold

Appendix 2

WATER POLLUTION CONTROL BOARD

DEPARTMENT OF HEALTH
STATE OF OHIO

APPLICATION OF

THE TOLEDO EDISON COMPANY
and
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

FOR CERTIFICATION OF

DAVIS-BESSE NUCLEAR POWER STATION

FOR PURPOSES OF SECTION 21(b)
FEDERAL WATER POLLUTION CONTROL ACT

REPORT AND PLAN FILED APRIL 9, 1971,
WITH AMENDMENT, JULY 23, 1971

WATER POLLUTION CONTROL BOARD

DEPARTMENT OF HEALTH
STATE OF OHIO

APPLICATION FOR CERTIFICATION FOR PURPOSES
OF SECTION 21 (b) FEDERAL WATER POLLUTION CONTROL ACT

The Toledo Edison Company on behalf of itself and The Cleveland Electric Illuminating Company hereby applies for certification for the purposes of Section 21(b) of the Federal Water Pollution Control Act (33 United States Code 1171(b)), that there is reasonable assurance that the construction and operation of the Davis-Besse Nuclear Power Station will be conducted in a manner which will not violate applicable water quality standards.

The Davis-Besse Nuclear Power Station is to be located on the shore of Lake Erie in Carroll Township, Ottawa County, Ohio and owned by The Toledo Edison Company and The Cleveland Electric Illuminating Company as tenants in common in the respective shares of 52.5% and 47.5%. Toledo Edison is responsible for the design, construction and operation of the Station.

A report and plan for said Station is submitted herewith and made a part hereof showing the general design of the Station and plans for its operation as now contemplated and detailed data as to expected liquid discharges from said Station into Lake Erie and the Toussaint River.

It is requested that public notice of this application be given in accordance with Rule HEwp-1-02 of this Board as promptly as possible.

It is respectfully requested that the Board issue the certification here applied for as promptly as possible in order that applicants may obtain Federal licenses and permits required for the construction and operation of the Station. The Station is scheduled for full operation in the latter part of 1974, at which time its output will be needed to assure an adequate and dependable supply of electric energy to large sections of the State of Ohio.

THE TOLEDO EDISON COMPANY

By Glenn J. Sampson
Vice President - Power
420 Madison Avenue
Toledo, Ohio 43601

GLENN J. SAMPSON, being first duly sworn, says that he is the officer duly authorized to execute the foregoing application and that the statements made therein are true as he verily believes.

Glenn J. Sampson

Sworn to and subscribed in my presence this 8th day of April, 1971 at Toledo, Lucas County and State of Ohio.

Geneva I. Leake

GENEVA . LEAKE
Notary Public, Lucas County, Ohio
My Commission Expires Sept. 2, 1974

EXPLANATION

The Amendments to the report and plan are submitted to present a revision of the plan by which the service water discharge will be used for cooling tower makeup water, thereby reducing substantially the amount of heat discharged to Lake Erie and the size of the plumes of heated water.

Changed portions of the pages are indicated by sidelining.

THE TOLEDO EDISON COMPANY

By Glenn J. Sampson
Vice President, Power
420 Madison Avenue
Toledo, Ohio 43652

GLENN J. SAMPSON, being first duly sworn, says that he is the officer duly authorized to execute the foregoing application and that the statements made in the application as amended are true as he verily believes.

Glenn J. Sampson

Sworn to and subscribed in my presence this 19th day of July, 1971 at Toledo, Lucas County and State of Ohio.

Geneva I. Leake
GENEVA I. LEAKE
Notary Public, Lucas County, Ohio
My Commission Expires Sept. 2, 1974

DAVIS-BESSE NUCLEAR POWER STATION
ARTIST'S RENDERING

Preface

This report and plan is submitted as part of and in support of the application of The Toledo Edison Company on behalf of itself and The Cleveland Electric Illuminating Company dated April 8, 1971 for certification for the purposes of Section 21(b) of the Federal Water Pollution Control Act (33 United States Code 1171(b)) with respect to the Davis-Besse Nuclear Power Station.

The purpose of this report is to describe the water systems which are proposed to be part of the Davis-Besse Station and the discharges of effluent into Lake Erie and the Toussaint River, for the purpose of demonstrating that there is reasonable assurance that the construction and operation of said Station will be conducted in a manner that will not violate applicable water quality standards, and that this Board may properly give certification thereof pursuant to Section 21(b).

This report covers generally the matters contained in a report submitted to this Board in connection with an application for certification pursuant to Section 21(b) on January 25, 1971, as to which no action was taken, and a report submitted to this Board on March 25, 1970 in connection with an application for a discharge permit pursuant to Section 6111.03 of the Ohio Revised Code, as to which no action has been taken. (The latter report was also filed with the Department of Health, State of Ohio on December 30, 1969 in connection with an application for approval pursuant to Sections 3701.18 and 3701.19 of the Ohio Revised Code.)

In the original report it was recommend that a once through condenser cooling water system be used with a discharge into Lake Erie at 18°F above ambient lake temperature at a rate of 685,000 GPM which would involve a thermal plume 5°F or higher above ambient under zero current conditions of about 88 acres and with a length of about 3900 feet. The 1°F plume would have covered 6680 acres under zero current conditions and have a length of about 34,000 feet. Larger plumes would have occurred under certain current conditions. Heat input to the Lake was calculated at 6,120,000,000 BTU per hour.

This report sets forth the changes and modifications made in the plans for the Station since the original report, including the installation of a closed cycle condenser cooling water system with a natural draft cooling tower, and also the use of service water discharge for cooling tower make-up. These changes will reduce the quantity of water discharged into the Lake, including blowdown from the cooling tower and all other water, to a maximum of about 13,800 GPM, at varying temperatures, which will result in a thermal plume 5°F or higher above ambient not in excess of .16 acre and a length of 180 feet under any current conditions. The 1°F plume under the same conditions would cover only about 3.5 acres and have a length of about 840 feet. Maximum heat input to the Lake and River is calculated at 138 Million BTU per hour. Also set forth are figures as to plume sizes at other temperatures.

Additionally, the open intake and discharge channels have been eliminated and submerged pipes substituted. As a resu't the shoreline of the Lake will be unchanged and there will be no effect on the drift of littoral sand. Also there will be no interference with boating along shore. Also it is now proposed to discharge effluent from the sewage treatment plant to Lake Erie instead of the Toussaint River, so that discharges into the River will consist principally of storm water runoff in quantities dependent on natural conditions.

TABLE OF CONTENTS

FIGURES

TABLES

1 INTRODUCTION

1.1 HISTORY OF WATER USE AND DISCHARGE PLANS TO DATE

1.1.1 General

All major steam electrical generating stations utilize steam turbines which discharge large quantities of low temperature unrecoverable heat that must be dissipated to the environment. This heat is contained in the steam that passes through the turbine and into the condenser at high vacuum. Cooling water is pumped through tubes in the condenser where this unrecoverable heat is transferred to the cooling water, raising the temperature of the cooling water. This temperature rise is normally in the order of 12°F to 28°F, depending upon the particular design. The cooling water in most stations comes from a river or lake and is returned to the same body of water from which it was withdrawn. This unrecoverable heat is ultimately rejected to the atmosphere through evaporative cooling, radiation and convection from the discharge cooling water after it is dispersed in the lake or river.

In addition, these stations require smaller quantities of water, commonly called service water, for cooling various station components.

1.1.2 The Original Recommendation

The original report and general plan for Lake Erie Water Use and Discharge from Davis-Besse Station was formally submitted to the Ohio Department of Health on December 30, 1969.

The recommended arrangement in this report was an open lake cooling system with an 18°F temperature rise across the condenser at a flow rate of 685,000 gpm. The lake area covered by the thermal plume at a temperature of 5°F and higher was estimated to be 88 acres under zero current conditions and it extended into the lake a distance of 3,900 feet from the point of outfall.

This report contained the results of limnology studies conducted by Dr. John C. Ayers of the Great Lakes Research Division at the University of Michigan. It also contained thermal plume studies conducted by Dr. Donald W. Pritchard of the Chesapeake Bay Institute at Johns-Hopkins University. Both studies indicated that there would be no damage to the lake.

1.1.3 The Change of Plan

On July 30, 1970, the final decision was made to provide a closed cycle condenser cooling system utilizing a natural draft cooling tower to reject substantially all of the heat in the condenser cooling water directly to the atmosphere.

The decision to use a closed cooling water system was based on a number of factors, including the following:

1. Numerous statements of representatives of the Federal Water Quality Administration and others connected with the Department of the Interior opposing large additions of heat to Lake Erie from power plants,

2. The publicly expressed concern of conservation and other organizations as to the effect of an open cycle system on the ecology of Lake Erie,

3. The overriding need of having the station in operation on schedule and thus avoiding the possibility of delays pending decisions as to applicable water quality standards, and

4. The avoidance of duplicate costs involved with system partially or wholly built and then required to be replaced by a different system.

The public interest involved in the last two factors was deemed so great that the more costly and less efficient system should be installed. The two public utilities are duty-bound to use their best efforts to supply the needs of their customers. Because of constantly increasing demands for power, it is very important that the unit be in operation without delay.

It is estimated that the net additional capital cost of the station with the closed cycle cooling system will be about $9 million and that the annual cost, giving effect to extra costs and reduced output, will be about $3 million.

1.2 REPORT AND PLAN

This report and plan has been prepared by The Toledo Edison Company for the Water Pollution Control Board, Department of Health, State of Ohio, to describe the presently proposed arrangement of facilities for the Davis-Besse Nuclear Power Station and to set forth conditions of water use from Lake Erie and discharge into the lake and the Toussaint River.

The Davis-Besse Station will be owned by The Toledo Edison Company and The Cleveland Electric Illuminating Company as tenants in common. Toledo Edison will own 52.5% of the station and Cleveland Electric will own 47.5%. Toledo Edison will be responsible for the design, construction, and operation of the station.

Toledo Edison and Cleveland Electric are a part of the CAPCO Group which also includes Ohio Edison Company and two electric utilities in Pennsylvania. These two companies are committed to this Group to install this generating facility which is needed to provide for anticipated load growth of Toledo Edison, Cleveland Electric, and also Ohio Edison. A part of the memorandum of understanding of CAPCO calls for pooled generating units and related high voltage transmission interconnections to realize economies of scale that would not be available to each company individually.

This station is planned for a December 1974 commercial operating date. The first fuel loading is planned for June 1974 followed by initial low power operation with a gradual increase in output until the AEC licensed power level is attained.

1.3 LOCATION

The site of the Davis-Besse Station is on the shore of Lake Erie in Carroll Township, in Ottawa County, approximately 6 miles northeast of Oak Harbor and 21 miles east of Toledo as shown on Figure 1 at the end of this section of the report under the tab FIGURES. This site area is sometimes referred to as Locust Point. The station site will encompass more than 950 acres of which about half will be marshland.

The principal portion of the site (Navarre Marsh) was acquired from the U.S. Bureau of Sport Fisheries and Wildlife in exchange for an established private game marsh area (Darby Marsh) which had been acquired by Toledo Edison. Under the acquisition agreement, certain unused marsh areas within the plant site boundaries will be available to the Bureau for management as a National Wildlife Refuge. This will amount to the addition of approximately 500 acres of water fowl refuge area that will be under management of the Bureau of Sport Fisheries and Wildlife.

1.4 SCOPE

This report and plan describes the facilities at the Davis-Besse Station for water supply, sewerage, purification and treatment facilities for water supply and sewage and the works for the treatment and disposal of industrial wastes. It also describes the nature of the discharges into Lake Erie and the Toussaint River.

It is submitted that the showing made demonstrates that the facilities will more than meet the requirements of the public health and that the discharges will comply with the water quality criteria and standards for Lake Erie and the Toussaint River adopted by the Water Pollution Control Board and approved by Federal authorities and will not affect the properties of the waters of Lake Erie or the Toussaint River in a manner which renders such waters harmful or inimical to the public health or to animal or aquatic life, or to the use of such waters for domestic water supply, or industrial or agricultural purposes, or for recreation.

A detailed description of the Davis-Besse Nuclear Power Station, with the principal design criteria and nuclear safety analysis, is contained in the Preliminary Safety Analysis Report (PSAR) which has been submitted to the U.S. Atomic Energy Commission as a supporting document to the Application for Utilization Facility Construction Permit and Operating License filed on August 1, 1969 (AEC Docket No. 50-346). Copies of the PSAR with all amendments to date have also been submitted to the Atomic Energy Coordinator for the State of Ohio, to the staff of the Water Pollution Control and the Ohio Department of Health for their information.

2. SITE ARRANGEMENT AND STATION DESIGN

2.1 SITE ARRANGEMENT

The station structures will be located approximately in the center of the site on the high ground immediately to the west of the marsh area as shown on Figure 2 at the end of this section of the report under the tab FIGURES. The intake water pumps for condenser cooling system make-up and station service water are located in a separate intake structure adjacent to, and east of, the main station structures.

The station electrical switchyard will be located to the west of the station structure and three 345 KV transmission lines will exit from the switchyard and station site.

2.2 STATION DESIGN

2.2.1 Nuclear Area

The nuclear portion of the station will consist of a pressurized water reactor nuclear steam supply system (NSSS) with its related auxiliaries and containment structures.

The reactor power level for which the license application to the U. S. Atomic Energy Commission (AEC) has been submitted, is 2,633 megawatts thermal (MWt). It is anticipated that after some period of operation, the licensed power level can be increased to 2,772 MWt. In addition to the nuclear reactor heat output, 17 megawatts of heat is added to the primary system by the pumping power input from the primary coolant pumps, which gives a rated output of 2,650 MWt and an expected maximum output of 2,789 MWt from the nuclear steam supply system.

To remove heat from the reactor primary system, feedwater from the turbine area is pumped through the steam generators where heat from this system is transferred to feedwater in the secondary system, boiling it to steam which is utilized to drive the turbine. Steam and feedwater in the secondary system are not radioactive. Both of these systems are closed systems and the water or steam in them does not come in contact with the closed condenser cooling water and cooling tower system.

A diagram of the nuclear steam supply system is shown on Figure 3 at the end of this section under the tab FIGURES. Principal design data for this system is given in Table 1 at the end of this section under the tab TABLES.

2.2.2 Turbine Area

The turbine area of the station will consist of a turbine-generator with related auxiliaries to utilize steam from the nuclear steam supply system.

The turbine will be a tandem compound, four-flow exhaust unit with exhaust steam entering the condenser from two low pressure elements, each element exhausting to a separate shell of the condenser. The turbine cycle will utilize six stages of feedwater heating using extraction steam from the turbine to heat the feedwater supplied to the steam generators. A diagram of the turbine steam and feedwater cycle is shown on Figure 4 at the end of this section under the tab FIGURES.

At the rated output of 2,650 MWt from the nuclear steam supply system (NSSS), the electrical output of the station is 872 MWe, and at the expected maximum NSSS output of 2,789 MWt, it is 906 MWe. The difference between the NSSS thermal output and the station electrical output, is the heat rejected to the condenser cooling water system and the station electrical use.

All quantities given in this report including flow rates, temperatures, BTU total heat values, thermal plume sizes, suspended solids, oxygen contents, etc., are based on the maximum expected NSSS output of 2,789 MWt corresponding to a net electrical output of 906 MW. There will be no increase in any of these values since there can be no increase in operating power level beyond the 906 MWe maximum.

2.3 WATERWAY ARRANGEMENT

As shown on Figure 2, Lake Erie water will be drawn into the station through submerged intake pipes that extend from the shoreline of the site in a northeasterly direction out into Lake Erie for a distance of approximately 3,000 feet to a depth near the contour line 11 feet below mean low water datum level. The on-site portion of the intake water system will consist of an open intake channel connecting to the submerged pipes at the shoreline and extending in a southwesterly direction to the intake structure near the station.

An intake crib will be provided at the inlet of the submerged pipe to prevent debris and ice pile-up from plugging the intake during winter and spring when ice conditions are prevalent on Lake Erie. The lake end of the intake pipes will be turned up and terminate with a flared intake cone such that lake water will enter vertically downward through a screen over the cone. With the screen and the low entrance velocity in this type arrangement no significant number of fish will enter the open intake canal. Conventional traveling screens will be installed immediately ahead of the pump well area at the station intake structure to prevent any fish which might be in the intake canal or small debris from entering the pump wells.

The submerged offshore intake pipes will pass under the shoreline and enter the inlet of the open intake channel, onshore, in a manner that will not alter the contours of the shoreline. The shoreline at this point will be essentially unchanged and the structures will have no influence on the drift of littoral sand.

The width and depth of the open channel section of the intake water system are amply sized for service water system flow which will also serve as make-up for the closed condenser cooling water system at a design make-up flow rate of 22,000 gpm plus dilution water flow up to a maximum rate of 20,000 gpm, including other miscellaneous uses for a total of 42,000 gpm. Water velocity in this open channel will be less than one foot per second at mean low water level of 568.6 feet. This elevation is based on the International Great Lakes Datum (1955).

The diameter of the submerged intake pipes for the offshore section of the intake system will be sized for a velocity of about two feet per second at the total water flow of 42,000 gpm.

The submerged discharge pipe, shown on Figure 2, will follow the routing of the intake canal from the station in a northeasterly direction to the shoreline of the lake, turn in the easterly direction away from the intake and continue out to a distance of about 1,300 feet. The outlet of the discharge pipe will be reduced in cross-sectional area to impart a velocity of 6.7 feet per second, at a flow of 20,000 gpm, to the discharge water at the point of entry into the unconfined lake water in a depth of approximately six feet.

Discharge at this velocity promotes rapid mixing with adjacent lake water and quickly reduces the temperature level of the discharge plume. The Tables on Pages 14 and 15 cover, in detail, the thermal profiles obtained with this discharge configuration.

Neither the submerged intake or discharge structures will in any way hinder navigation or normal use of the lake.

2.4 WATER SYSTEMS

2.4.1 Closed Condenser Cooling Water System

The largest volume of water is used for make-up to the closed condenser cooling tower system and as stated in 2.2.1, this system is isolated from the primary and secondary reactor coolant systems. The closed condenser cooling water system utilizes four large, high head, circulating water pumps to pump water through the Low Pressure shell of the two-shell multipressure condenser. The water, after leaving the L.P. shell, circulates through the High Pressure shell in a series circuit. From the H. P. shell, the water passes out of the plant in two underground pipes to the single natural draft cooling tower.

The condenser cooling water enters the cooling tower at a point approximately 50 feet above grade level and is distributed throughout fire resistant filler material arranged inside the base of the tower. As the water drops through the porous fill, it comes in contact with the air to reduce the temperature. The water then falls into a collecting basin under the tower from which it flows back to the four large pumps through a single open channel. This system is shown on figure 5 at the end of this section under the tab FIGURES.

2.4.2 Service Water System

Service water to the cooling water heat exchangers in the closed cooling water system, used to cool the various station components, will be pumped from the intake structure after it has passed from the lake through the intake piping and canal system described in 2.3. A chlorination system will be installed ahead of the intake structure to add small amounts of chlorine to the water to prevent fouling of heat exchange surfaces by algae. The amount of chlorine added gives a concentration in the discharge water that is less than that of drinking water from the average city water system.

There are several cooling water systems, utilizing service water, that are a part of the station. The service water system supplies lake water to heat exchangers for a closed component cooling system and heat exchangers for the containment cooling system.

A closed cycle, recirculating water system is used in the turbine area to remove heat from the turbine oil system, generator cooling system and miscellaneous equipment. The heat from this closed system is transferred to service water in the two turbine building heat exchangers which are also supplied from the service water system, described below.

Three pumps are located in the intake structure to supply lake water to the service water system for distribution to the containment coolers, the heat exchangers for the closed cycle nuclear component cooling system and turbine building heat exchangers. A flow diagram including the service water pumps and all of these cooling water systems is shown on Figure 6 at the end of this section under the tab FIGURES. After passing through the heat exchangers, water from the service water system is discharged into the closed condenser cooling water system to supply the make-up requirements for this system as shown on Figures 5, 6 and 8 at the end of this section under the tab FIGURES.

2.4.3 Potable Water System

Water for general station use, including potable water, will be processed lake water. This water will be taken from the intake canal, processed through a filter clarifier unit, and chlorinated to make it suitable for potable, sanitary, and general station use. This water will be further processed in make-up demineralizers to provide the high purity water required for use in the turbine and nuclear steam supply systems.

The backwash effluent from the filter clarifier will be discharged into a settling basin equipped with an overflow wier to retain all suspended solids in the settling basin and permit only clear water to flow into a sump adjacent to the settling basin. From the sump, it will be pumped to the collecting basin for combined discharge with the other effluents to Lake Erie. The settling basin is shown on Figures 7 and 9 at the end of this section under the tab FIGURES.

2.4.4 Demineralized High Purity Water System

The extremely pure water required for initial filling and make-up for the primary system and secondary system will be supplied by ion exchange demineralizer units that will process potable water. These ion exchange units require regeneration periodically and this is done by passing acid and caustic over the ion exchange material which has become saturated with ions from the potable water. The treatment and disposal of this regeneration effluent is discussed in Section 3.6.

2.4.5 Sewage Treating System

A sewage treatment plant will be provided to process all effluent from the station's sanitary sewer system. This treatment plant will provide primary and secondary treatment, which will meet requirements of the Department of Health, State of Ohio. The resulting effluent discharge is discussed in Section 3.8.

2.4.6 Storm Water Drainage System

The building and paved areas of the station will be provided with a storm drainage system that will drain directly into the existing ditch along the south boundary of the site. Storm water drainage after entering this ditch travels a distance of approximately 1½ miles before reaching the Toussaint River.

2.4.7 Miscellaneous Drains

Miscellaneous drains from equipment, plant floor drains, etc., will discharge into the storm drainage system. No chemical or oily wastes will be permitted to be discharged in this manner. All such drains will be lake water or system water which is of better quality than lake water.

2.4.8 Marsh Water

Under the agreement with the U.S. Bureau of Sport Fisheries and Wildlife, pumping stations for water level control of the marsh will be installed in the two main marsh sections. These pumping stations will be operated by the Bureau to maintain desired water levels in the marsh.

3 STATION WASTE TREATMENT AND LIQUID EFFLUENTS

3.1 GENERAL

Total water supply for all equipment, personnel, and make-up requirements for the station will be taken from Lake Erie. After use in the station, all of the remaining effluents will be released to Lake Erie and only storm water drainage will be discharged to the Toussaint River.

As this water passes through the plant there will be only a slight alteration in its mineral composition due to the addition of neutralizing chemicals.

The Ph will be reduced slightly bringing it closer to neutral. The total weight of solids discharged will be only slightly greater than the weight of those removed.

All effluents that will be eventually discharged to Lake Erie will be first piped to a common collection point, which is shown on Figures 7 and 8 at the end of this section under the tab FIGURES.

The common collection point, referred to as the collecting basin, is used to (1) permit the use of a single discharge point to Lake Erie, (2) to provide uniformity in chemical and thermal effluents from multiple sources, and (3) to facilitate monitoring of chemical concentration and temperature of the single composite effluent flow to the lake.

The combined discharge of the seven effluents listed in 3.3 will not adversely effect the water quality of Lake Erie or the Toussaint River. Effluent quality will be well above the most stringent existing criteria for public water supply, aquatic life A, and recreational use.

3.2 EXISTING LAKE WATER CHEMICAL COMPOSITION

Sampling and analysis of lake water at the station site has been conducted over a two-year period. This data was used for design of the station water treating equipment and for determination of effluent discharge quality. The average water analysis for this period is given in Table 2 at the end of this section under the tab TABLES.

3.3 EFFLUENTS TO COLLECTING BASIN

Station Systems that will be piped to the collecting basin and ultimately to Lake Erie are as follows:

1. Blowdown from closed condenser cooling water system.
2. Service water discharge (Normally closed).
3. Neutralized regenerant waste from make-up demineralizers.
4. Pumped effluent from the settling basin.
5. Sewage Treatment plant effluent.
6. Processed effluents from nuclear area.
7. Tempering water from Lake Erie.

Flow quantities, chemical compositions, and temperature rise above ambient lake temperature for each of the individual effluents and the combined effluent discharge to Lake Erie are given in Tables 3, 4, 5, and 6 at the end of this section under the tab TABLES. Dispersion and mixing with lake water is discussed in Part 3.11. All values given on these four tables are for normal operating conditions at the maximum net station capacity of 906 MWe. Under reduced load operation or shutdown conditions, all of these values will be reduced.

3.3.1 Monthly Average Operating Conditions

Tables 3 and 4 give detailed data for the minimum and maximum monthly averages included in summary Table 7. Table 3 applies to the month of September which is the minimum and Table 4 applies to the month of April which is the maximum.

3.3.2 Daily Extreme Operating Temperature Conditions

Tables 5 and 6 give detailed data corresponding to minimum and maximum daily temperature rise conditions. The minimum condition occurs on a September day when temperature of the cooling tower blowdown and other miscellaneous effluents is below lake temperature as shown in Table 5. The maximum temperature rise condition is given in Table 6. This occurs on an April day and 4,580 GPM of dilution water is required to reduce the composite effluent from about 30°F above lake temperature down to 20°F.

3.4 CLOSED CYCLE CONDENSER COOLING WATER SYSTEM

One natural draft cooling tower approximately 490' high and 415' in diameter will be used to dissipate 98% of the total heat from the condenser to the atmosphere through evaporative cooling. The remaining 2% of the total heat from this system is discharged to Lake Erie in the blowdown from the cooling tower system. Condenser cooling water in the closed system will be pumped through the cooling tower at the rate of 480,000 gpm using four circulating pumps each with a capacity of 120,000 gpm. Temperature rise of water passing through the condenser will be 26°F and the temperature will be reduced by this amount when the water circulates through the cooling tower.

A portion of the water in the closed cooling system will be discharged to Lake Erie to maintain chemical concentrations in the system at a level twice that of the make-up water. To maintain this level of concentration, the amount of blowdown from the tower will be equal to the evaporative losses from the tower. These losses will vary from 7,500 gpm to 10,400 gpm. The system will be designed to discharge a maximum of 11,000 gpm to the lake after passing through the collecting basin as shown on Figures 5 and 8 at the end of this section under the tab FIGURES.

The chemical concentration of the blowdown water from this system will be maintained at approximately 480 ppm total dissolved solids.

Due to the high alkalinity of the Lake Erie make-up water, some acid feed for neutralization is necessary to control scale formation on surfaces of the closed condenser cooling water system, and to maintain the ph of the discharged water within applicable water quality standards for Lake Erie. The acid feed will amount to 60 ppm based on a maximum make-up flow of 22,000 gpm and will result in the discharge of water at a ph of 7.3.

The closed cooling system will be periodically chlorinated to prevent slime and algae build-up in the condenser. Chlorination will be approximately four times per day at 30 minutes each time. Free residual chlorine will be 0.5 ppm. Chlorine will be added to one of the two supply pipes to the condenser. Blowdown will be taken from the opposite pipe to minimize discharge of chlorine to the collecting basin.

An inhibitor may be used in the closed condenser cooling water to help prevent corrosion and scaling in plant equipment if this proves to be a problem. If an inhibitor is used, it will not be a chromate or zinc type so these, or other toxic materials, will be avoided completely. The inhibitor added would probably be a very low level ortho phosphate to maintain about 2 ppm concentration in the system.

No chemical will be added to the water that would substantially reduce its oxygen content, and at the normal blowdown water temperature, the oxygen content will be essentially the same as that existing in ambient Lake Erie water at the same temperature.

Blowdown from the cooling tower circuit will be released from the cold water circuit leaving the tower to keep temperature of the discharge to a minimum. The temperature of this blowdown will average approximately 14.3°F above ambient lake water temperature and total heat discharged to the lake from this system will amount to about 66 million BTU's per hour on an annual basis.

The design of all systems will be based on the expected maximum NSSS output of 2,789 MWt corresponding to 906 MWe net.

The condenser cooling water flow will be constant over all ranges of station output and, as a result, the temperature rise will decrease as the station output decreases. The first year of operation will be limited to the maximum output of the initial AEC license level of 2,650 MWt and during this period, the maximum temperature rise will be 95% of that for which the system is designed.

3.5 SERVICE WATER FROM TURBINE ROOM, COMPONENT, AND CONTAINMENT COOLERS

Water for turbine room cooling, component cooling, and containment cooling heat exchangers will be taken directly from the intake channel fore-bay. Three high pressure service water pumps will be used to supply lake water to these heat exchangers.

The chemical content of this service water will be unchanged as it passes through the heat exchangers except for small amounts of chlorine that will be added to reduce slime and algae build-up on the heat exchange surfaces.

The temperature rise of the cooling water in this circuit will be 12° to 15°F above the lake and it will be pumped to the closed condenser cooling water system during hot weather periods so that it can be used as make-up for this system. During cold weather periods, the discharge from this system will be piped directly to the fore-bay area to retard ice formation in the water intake. The closed condenser cooling water system will be bypassed under this condition and make-up requirements for it will come directly from Lake Erie at lake temperature.

3.6 NEUTRALIZED REGENERANT WASTE FROM MAKE-UP DEMINERALIZERS

Strong acid and caustic will be used to regenerate the station make-up demineralizers shown on Figure 10 at the end of this section under FIGURES.

In order to avoid discharging these chemical wastes directly to the lake, they will be diverted to a hold-up tank where excess acid will be neutralized. Following neutralization to a ph of 7.0, the regenerant wastes are piped to the collecting basin where they mix with other station effluents.

Due to the nature of the wastes and the fact that they have been neutralized, they contain high dissolved solids. The amount of these wastes is quite low in relation to some of the other station effluents and thus have a small effect on the resultant solids discharged to the lake.

3.7 PUMPED EFFLUENT FROM THE SETTLING BASIN

Effluent from the settling basin will come from two sources as follows:

1. Filter clarifier solids effluent as shown on Figure 10.
2. Condensate demineralizer backwash effluent as shown on Figure 11.

These two system effluents are the only ones that contain suspended solids. The effluents from these systems are pumped through the four-cell settling basin. The design of this settling basin is expected to result in a suspended solids discharge equal to, if not better than, the lake water itself.

3.8 EFFLUENT FROM SEWAGE TREATMENT PLANT

Effluent from the sewage treatment plant will be piped to the collecting basin for mixing with other effluents prior to discharge to Lake Erie. This is shown on the effluent streams diagram of Figure 8. The sewage treatment plant will process all effluents from the station's sanitary water system. It will provide primary and secondary treatment, which will meet all standards of the Department of Health, State of Ohio. Effluent B.O.D. will be 14 ppm which is substantially below that required for secondary sewage treatment systems.

Effluent water will be chlorinated so that the fecal coliform content will meet criterion for waters used for recreational purposes.

The sewage treatment plant is designed for 360 personnel. Design effluent flow rate will be 30 gpm with intermittent operation. System capacity on a daily basis will be 9,000 gallons per day.

3.9 PROCESSED EFFLUENTS FROM NUCLEAR AREA

The United States Atomic Energy Commission has jurisdiction over standards for protection against radiation hazards including the release of radioactive material under the Atomic Energy Act of 1954. The regulations are contained in Title 10, Code of Federal Regulations (10 CFR) which is issued pursuant to this Act.

Approval of the processes and limits involved in the treatment and disposal of radioactive wastes will be a part of the necessary licenses issued by the U. S. Atomic Energy Commission. Application for a utilization facility construction permit and licenses was made on August 1, 196[illegible], (AEC Docket No. 50-346). A description of the liquid radioactive waste system and effluents is included in this report only to present a complete summary of information on all effluents as shown on Figures 12 and 13 under the tab FIGURES.

All radioactive liquid wastes, and all liquid wastes suspected of containing radioactivity, will be processed through liquid radioactive waste treatment systems. There will be two complete and separate systems with one to handle relatively pure water from the reactor primary system (Clean Radioactive Waste System), and the other to handle wastes from sources that could contain larger amounts of nonradioactive impurities (Miscellaneous Radioactive Waste System). In each system, the wastes are first collected in tanks where they can be monitored for radioactivity and other impurities.

The first waste system is designed to process water from the primary reactor coolant system that has been removed to provide for expansion or to reduce the boron content. This water is passed through a degassifier to remove dissolved gases, through a boron saturated demineralizer (ion exchanger) to remove dissolved impurities and finally through an evaporator system to remove the boron. The resulting water is extremely pure and is placed in storage for reuse or it is released to the collecting basin as indicated on Figure 12.

The second liquid radioactive waste system processes water from the fuel storage system drains, laboratory, and building drains that could be radioactive. Effluents from these areas, after monitoring, are released directly to the collecting basin, if satisfactory, or are processed through an evaporator and/or demineralizer if treatment is required. After processing and sampling, they are released to the collecting basin or are placed in storage for reuse (see Figure 13).

In all cases, the liquid effluent from these waste processing systems discharged to the lake via the collecting basin is extremely pure and contains only traces of dissolved solids. There can be extremely small amounts of radioactivity in these effluents, but any release of radioactivity will be well within the limits prescribed by Part 20 of Title 10 CFR and as low as practicable.

The concentrated radioactive wastes from the evaporator and demineralizer will be canned and shipped off site for disposal.

3.10 EFFLUENTS TO THE TOUSSAINT RIVER

3.10.1 Method of Entry

All effluents to the Toussaint River will discharge first into an existing ditch along the south boundary of the site. After entering this ditch, the effluent travels a distance of approximately 1½ miles before reaching the Toussaint River. This system is shown on the diagram given on Figure 14 at the end of this section under the tab FIGURES.

3.10.2 Effluents Discharged

3.10.2.1 Storm Water Drainage System

All effluents discharged to the Toussaint River will enter via the storm water drainage system. This system will provide drainage for the buildings and paved areas of the station and it will discharge into the existing ditch along the south boundary of the site. This system is shown on the diagram given on Figure 14 at the end of this section under the tab FIGURES.

3.10.2.2 Miscellaneous Drains

Miscellaneous drains from equipment, plant floor drains, etc., will discharge into the storm drainage system as shown on Figure 14. No chemical or oily wastes will be permitted to be discharged in this manner. All such drains will be lake water or system water which is of better quality than lake water.

4 THERMAL PREDICTIONS

The combined effluent from the collecting basin shown on Figure 8 at the end of this section under FIGURES will be piped to the Lake Erie shoreline in a relatively large buried pipeline to keep pressure drop to a low value. This pipe will follow the routing of the intake canal and continue submerged on out into the lake where it will turn easterly away from the intake and continue for about 1,300 feet. The diameter at the outlet of the pipe will be reduced to approximately three feet to provide the restriction necessary to increase the water velocity to about 6.7 feet per second at a flow of 20,000 gpm for jet entrainment.

The maximum monthly average heat input to Lake Erie from the Davis-Besse Station occurs during the month of April. Average flow to the lake amounts to 9,220 GPM, at an average temperature above the lake of 19°F for a total heat input rate of 88 millions of BTU's/Hr.

The maximum daily average heat input to the lake also occurs during the month of April. Maximum flow to the lake at this time is 13,800 GPM at a temperature of 20°F above lake temperature for a total heat input rate of 138 million BTU's/Hr.

Dr. Pritchard of Johns-Hopkins University has analyzed these discharges to determine the dispersion pattern of the warmed water after discharge to the lake and the data presented in tables following are based on his work. The distance traveled, and the area within the various isotherm lines of the thermal plumes corresponding to various temperature levels at the boundary are given on Pages 14 and 15.

The tabulation on Page 14 gives plume sizes that will exist when the discharge flow is 9,220 gpm and the temperature is 19.1°F above the ambient lake temperature at the point of outfall. On this basis, total heat input to Lake Erie will amount to 88 million BTU's per hour as shown on Table 7 for the month of April.

The areas shown on the tabulation will hold true for all wind and lake current conditions because the discharge is submerged and full jet entrainment is available since there is no restriction to lake water movement caused by wind or current flow. The plume could be bent somewhat by any lake currents, but its mean length and width would be unchanged.

COMBINED EFFLUENT TO LAKE ERIE FROM COLLECTING BASIN

OPERATING FLOW AND TEMPERATURE CONDITIONS
WITH MAXIMUM MONTHLY AVERAGE TEMPERATURE RISE-19.1°F

Areas and Dimensions of Warmed
Water Plumes for Various Isotherm Lines

Temperature Above Lake	Plume Dimensions-Ft. Length	Width	Area Acres
6°F	134	34	.09
5°F	169	42	.14
4°F	228	57	.26
3°F	321	80	.51
2°F	481	120	1.14
1°F	787	197	3.05

Temperature level above the lake for the major system, contributing heat input to the lake, namely cooling tower blowdown at flows ranging from 7,500 to 10,400 gpm, does not necessarily follow the temperature of the lake at a fixed increment of temperature above it. This is because the condenser cooling water system is a closed system and its temperature follows the wet bulb and dry bulb temperatures of the air rather than temperature of the lake. Air temperatures are less stable; they fluctuate more rapidly and through a wider range than corresponding lake temperatures do. In addition, the lake warms up much more slowly in the spring than the air does. Conversely, the lake temperature cools down much more slowly in the fall than the air does which brings about even wider variations between discharge water temperature from the closed cooling tower system and that of lake water.

The temperature difference between the lake and the cooling tower system will vary from -5°F in the fall month of September, when the drop in lake temperature lags the drop in the wet and dry bulb temperatures of the air, up to +30°F in the spring month of April when the rise in lake temperature is lagging the rise in wet and dry bulb temperatures of the air.

Temperature rise of composite effluent to Lake Erie will be limited to 20°F above lake temperature and mixing of dilution water, at lake temperature, with the blowdown water from the closed cooling tower circuit will be used whenever necessary to accomplish this. For example, in the month of April 9,200 gpm of cooling tower blowdown water at a temperature 30°F above lake temperature will be reduced to 20°F above lake temperature when it mixes with 4580 gpm of dilution water at lake temperature as shown on Table 6 under the tab TABLES. Combined effluent temperature has also been calculated for the minimum temperature rise condition of -5°F for the cooling tower blowdown water and this is given on Table 5 under the tab TABLES. The temperature rise of effluent to the lake for this minimum temperature condition is a negative 5°F as given on Table 5 for a day in September.

Plume sizes have been calculated for the maximum temperature difference of 20.0°F that is expected to occur at any time during the operation of the plant. This 20.0°F difference between the diluted effluent and lake temperatures corresponds to 30°F difference between the cooling tower blowdown and the lake temperature without the dilution water added.

These plume sizes are given in the following table:

COMBINED EFFLUENT TO LAKE ERIE FROM COLLECTING BASIN

MAXIMUM OPERATING FLOW AND TEMPERATURE CONDITIONS WITH MAXIMUM TEMPERATURE RISE-20.0°F

Areas and Dimensions of Warmed Water Plumes for Various Isotherm Lines

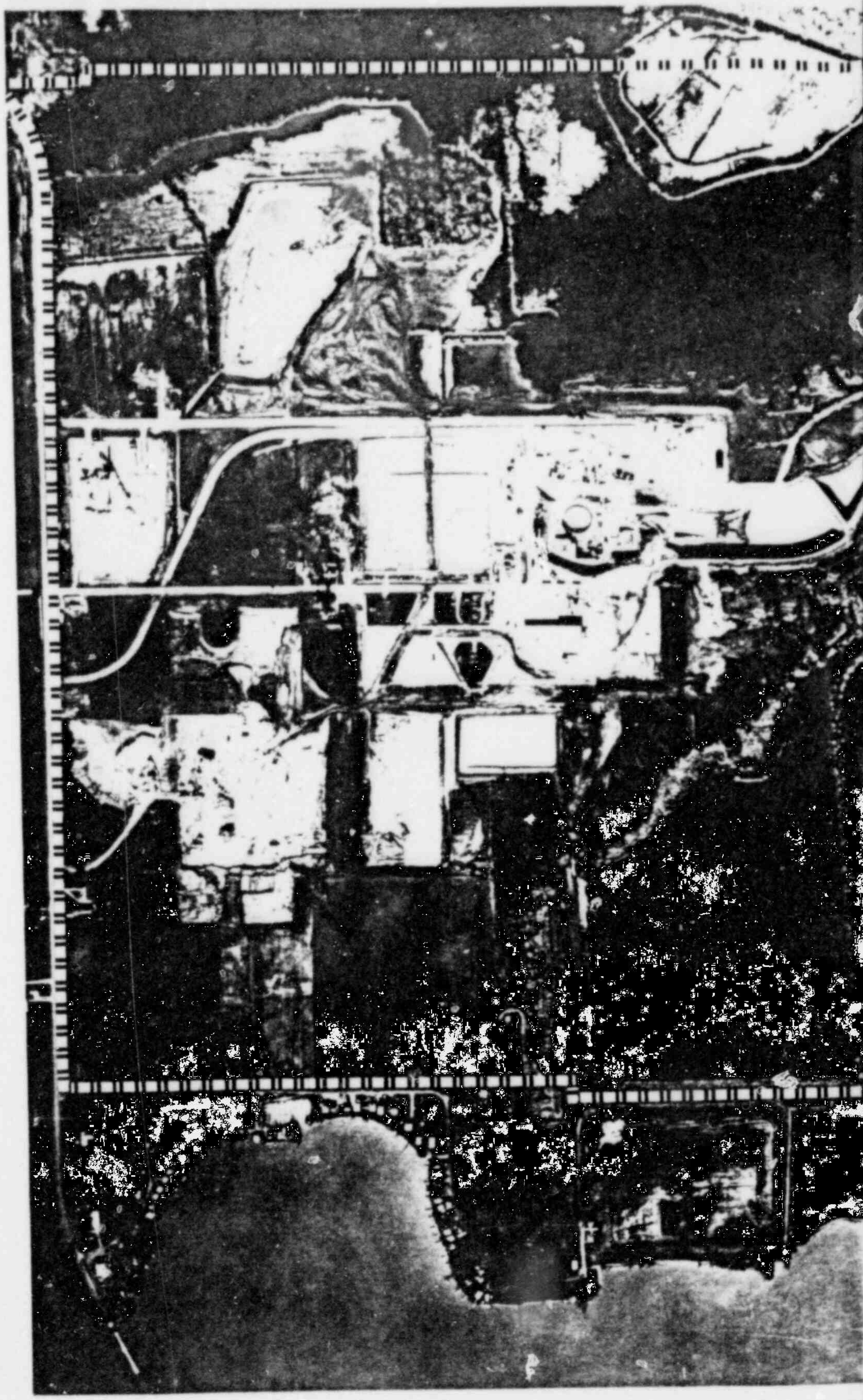
Temperature Above Lake	Plume Dimensions-Ft. Length	Width	Area Acres
6°F	142	36	.10
5°F	180	45	.16
4°F	243	61	.29
3°F	343	88	.62
2°F	510	128	1.28
1°F	840	210	3.48

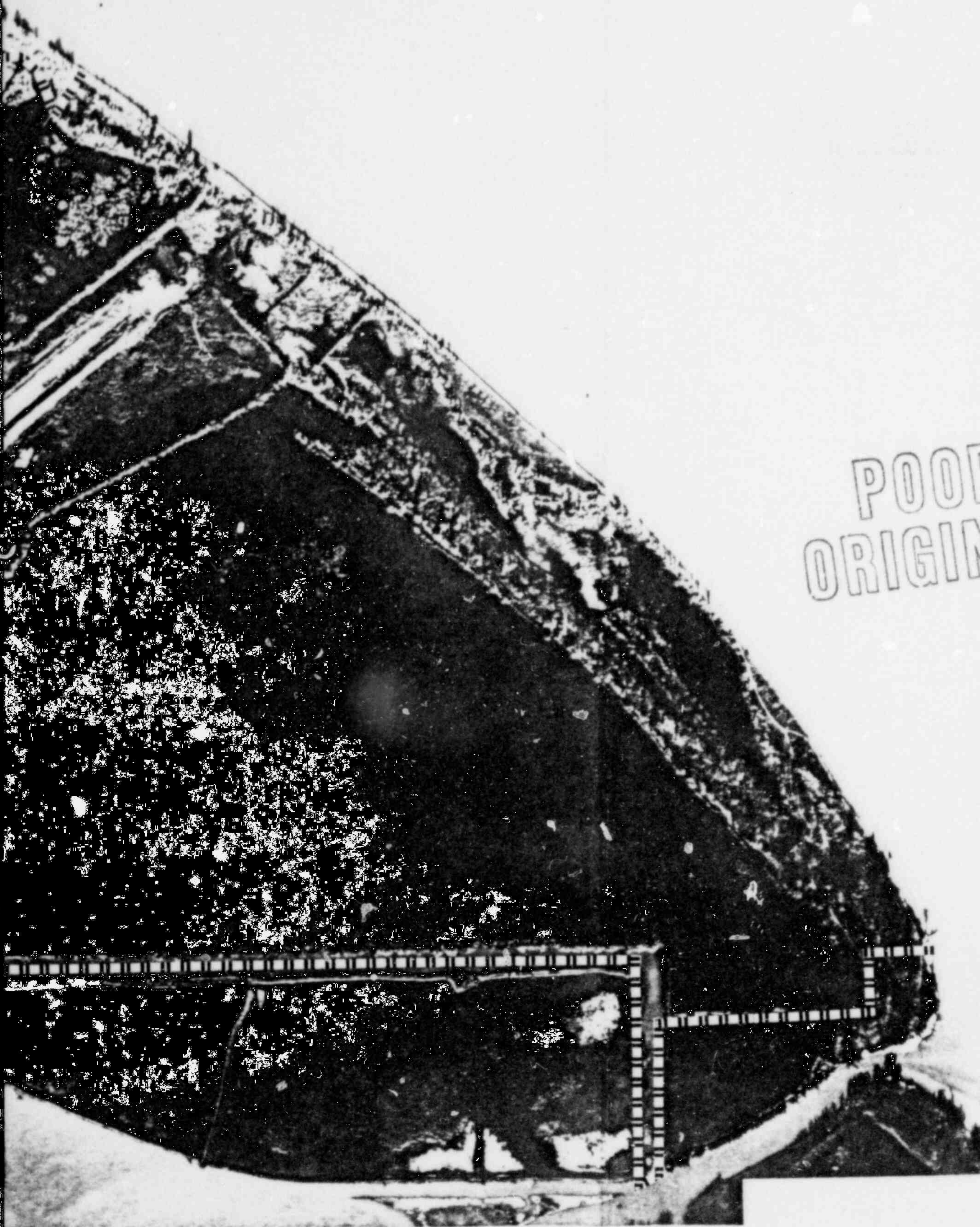
The above plume sizes apply to 13,800 gpm at the maximum effluent discharge temperature differential of 20.0°F. This maximum occurs in the month of April. Corresponding daily maximum differential discharge temperatures for the 11 remaining months of the year are given in the column on the extreme right of Table 8 under the tab TABLES.

With the addition of the cooling tower and the closed system, the maximum length of the 1°F plume that will exist in Lake Erie is 840 feet as shown at the bottom of the above table. The extent of this plume of 3.48 acres in area and 840 feet in length is shown on Figure 15 under the tab FIGURES.

This means that with the cooling tower and the closed system no water outside the boundary of the small $1^{\circ}F$ plume colored red will be at a temperature higher than $1^{\circ}F$ above Lake Erie ambient water temperature .

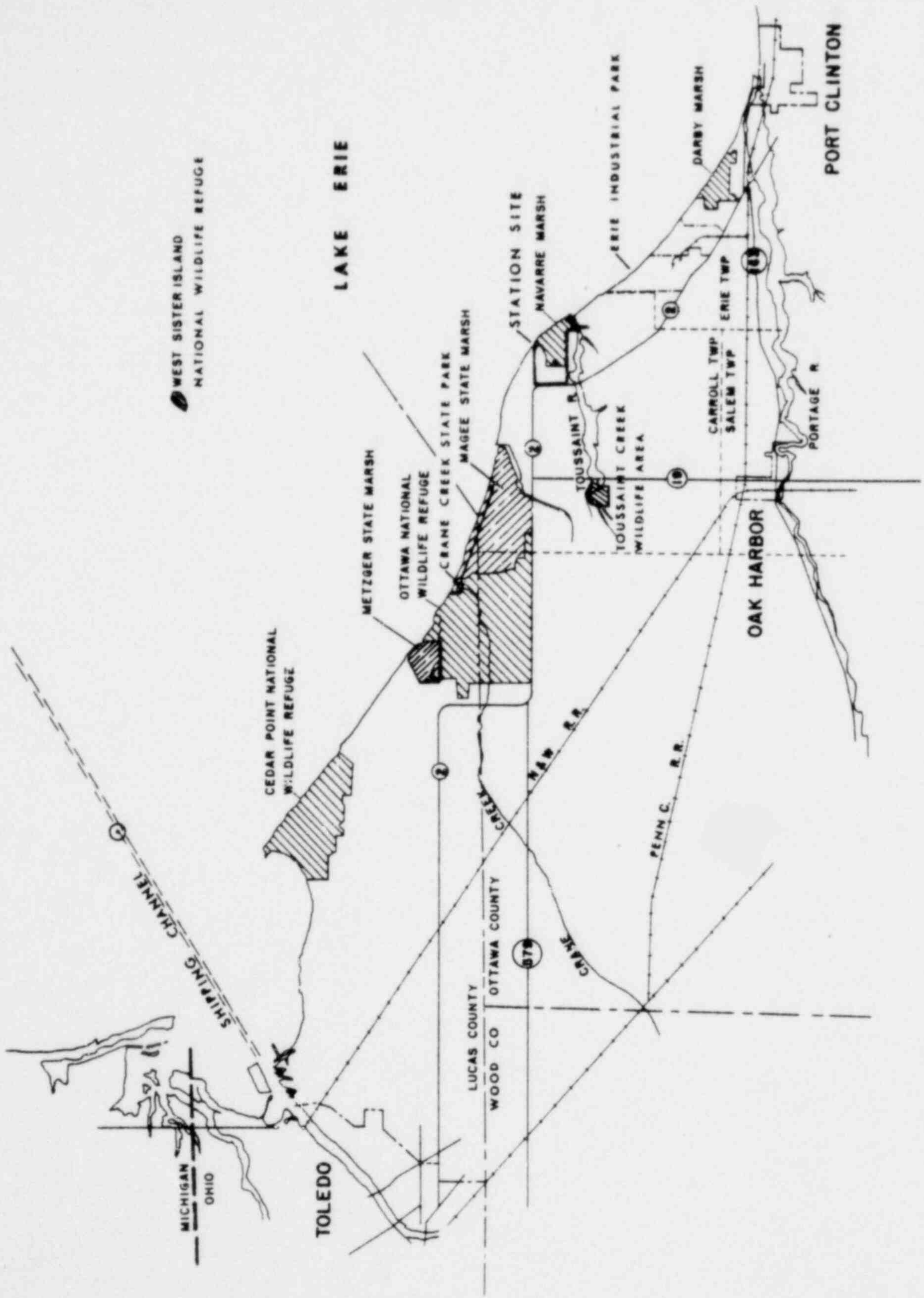
Corresponding plume information for the open channel type of cooling system without the cooling tower is shown on Figure 16 under the tab FIGURES. The $1^{\circ}F$ plume size for the open channel once through system shown on this figure would occupy 6,680 acres and would extend outward from the shoreline for a distance of 34,000 feet.



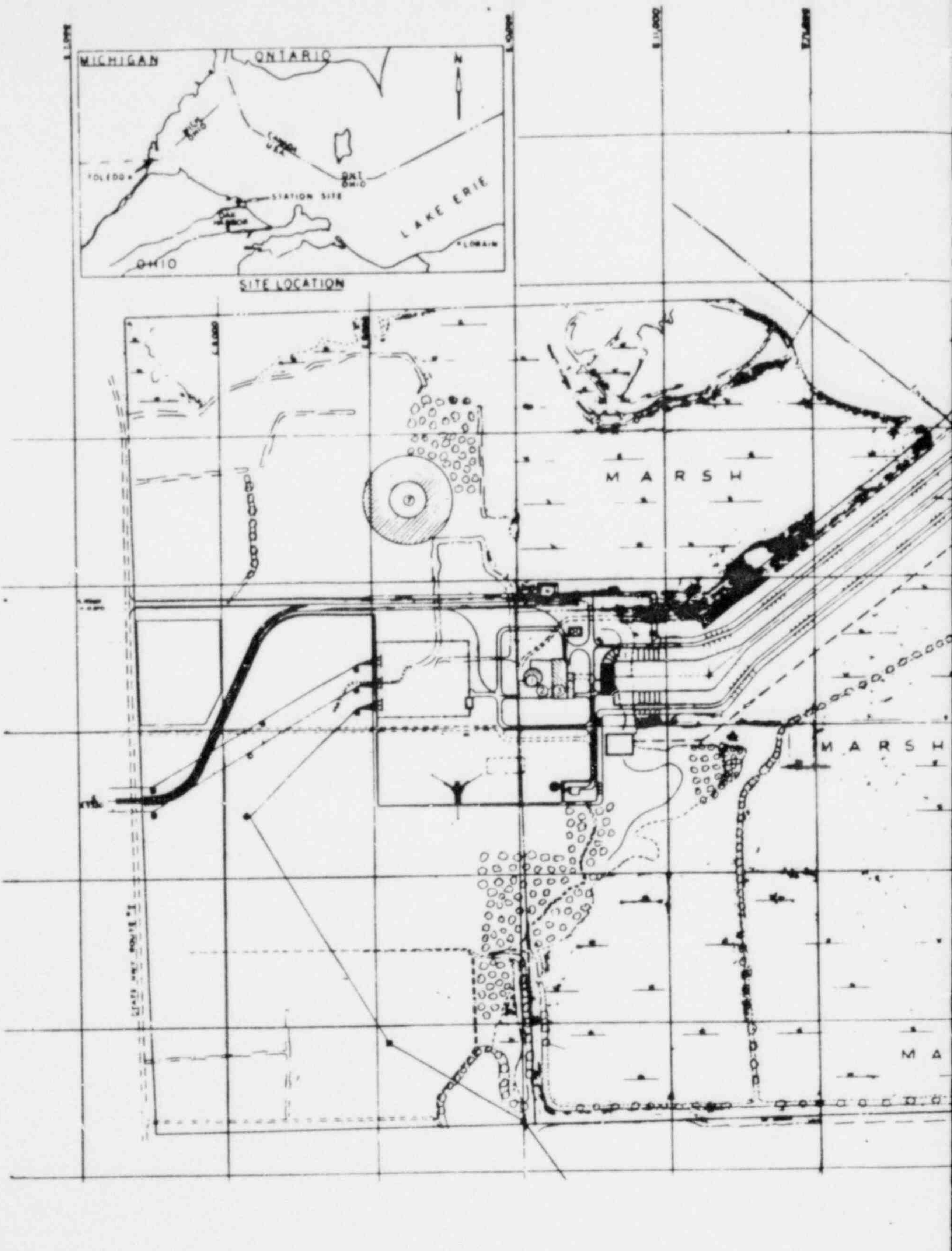


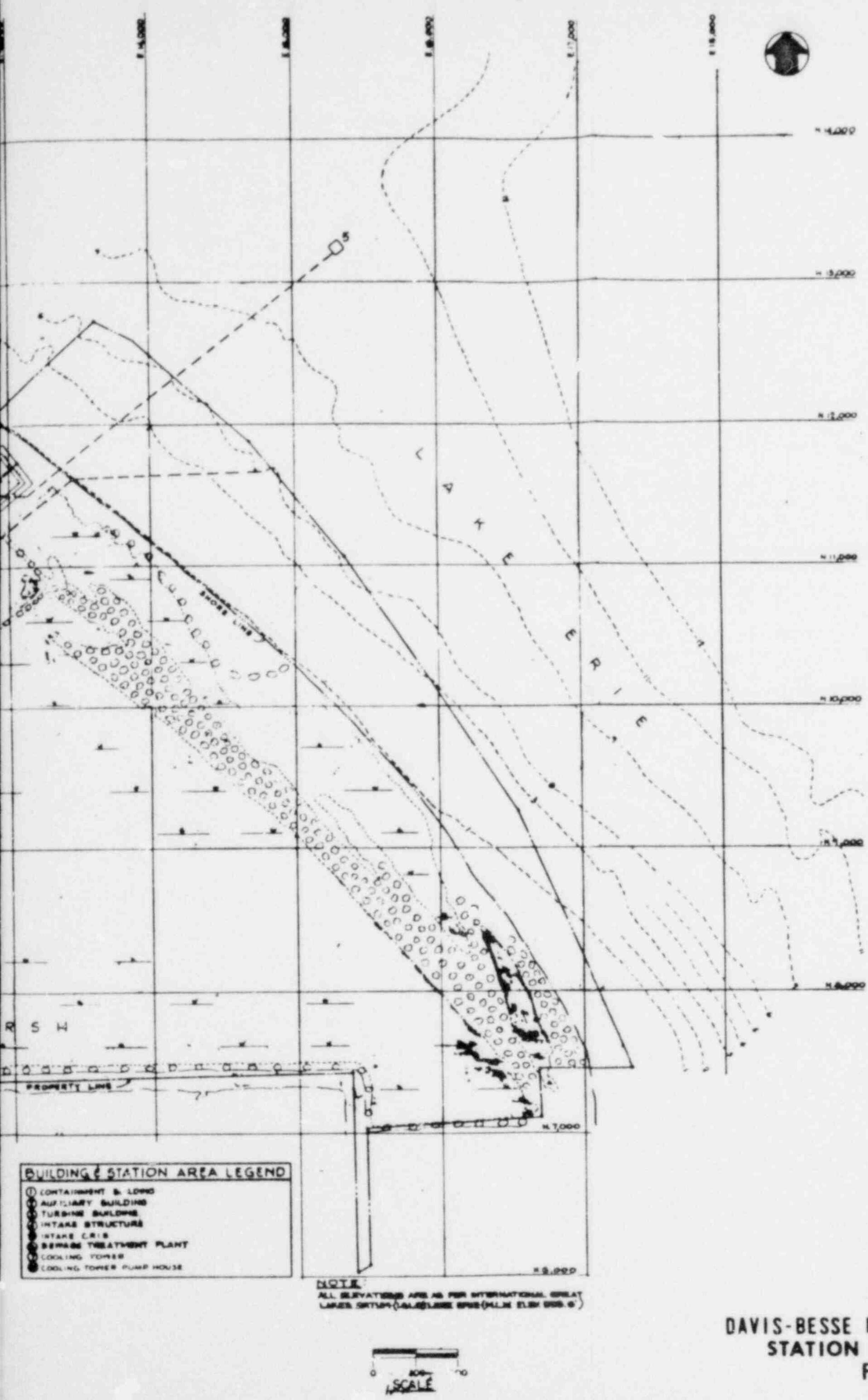
POOR ORIGINAL

DAVIS-BESSE NUCLEAR POWER STATION
CONSTRUCTION PROGRESS DEC-1970

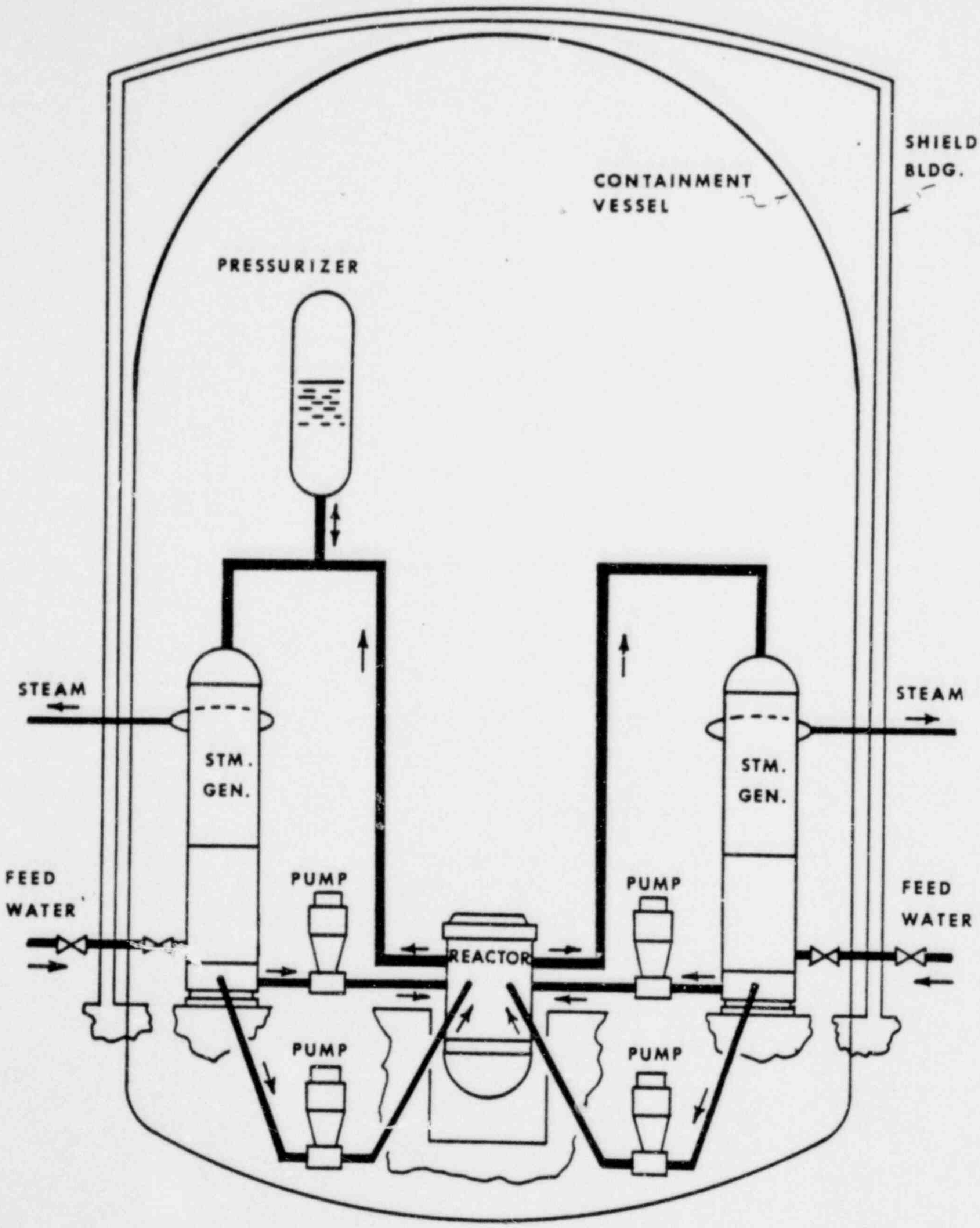


DAVIS-BESSE NUCLEAR POWER STATION
SITE LOCATION PLAN
FIGURE 1

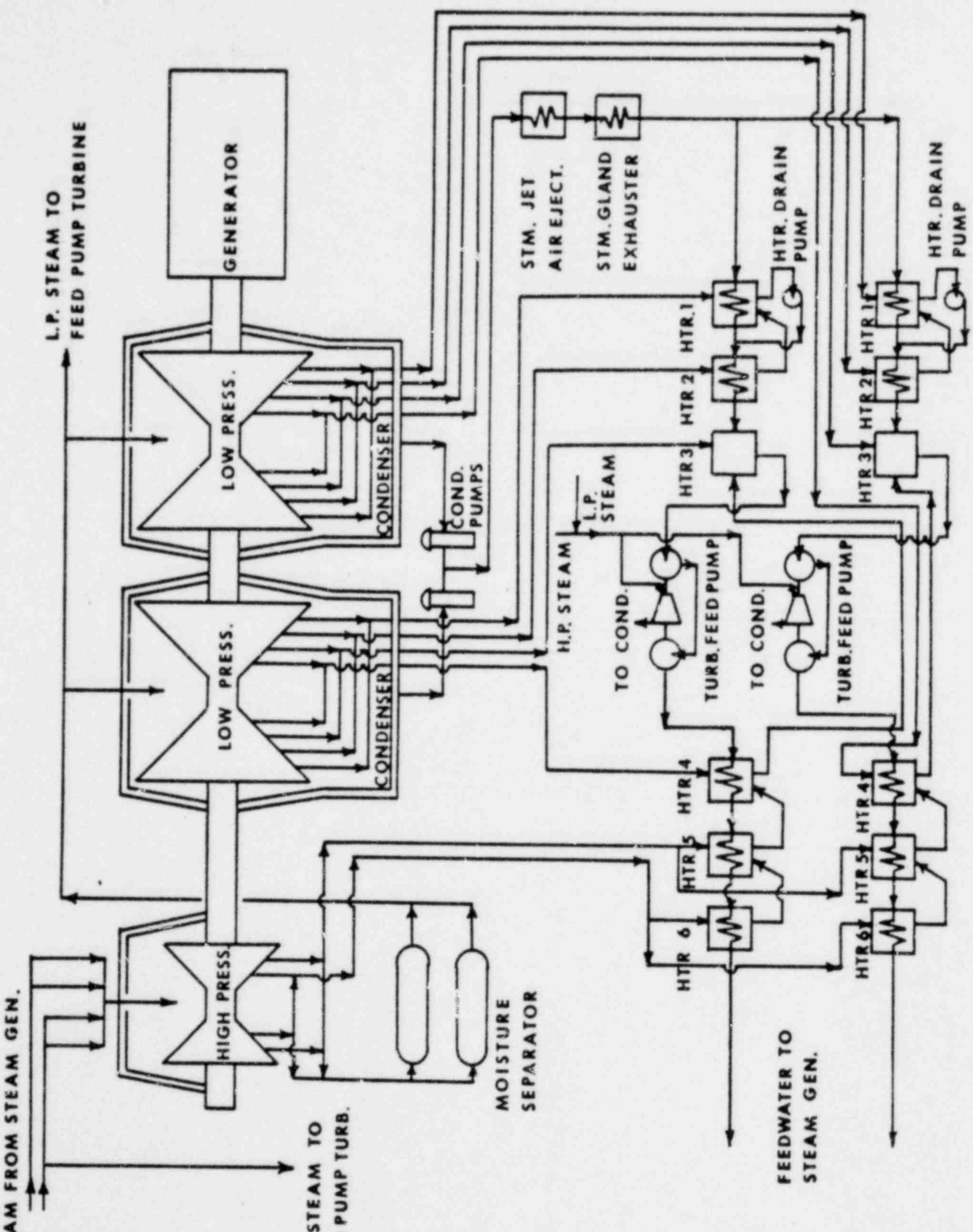

MICHIGAN
ONTARIO
N
TOLEDO
STATION SITE
LAKE ERIE
LORAIN
OHIO
SITE LOCATION
MARSH
MARSH
MA



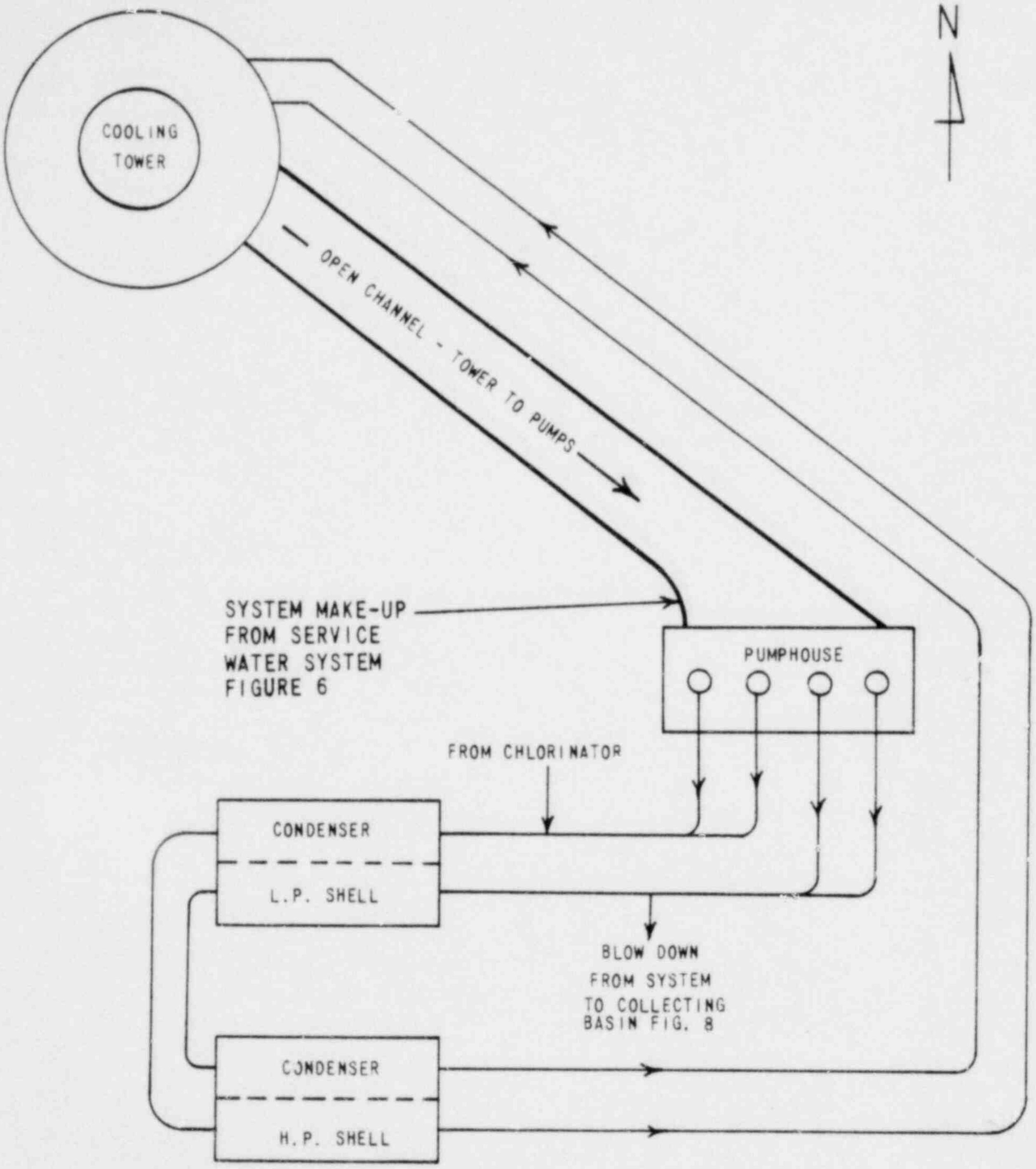
DAVIS-BESSE NUCLEAR POWER STATION
STATION ARRANGEMENT
FIGURE 2



DAVIS-BESSE NUCLEAR POWER STATION
NUCLEAR STEAM SYSTEM DIAGRAM
FIGURE 3



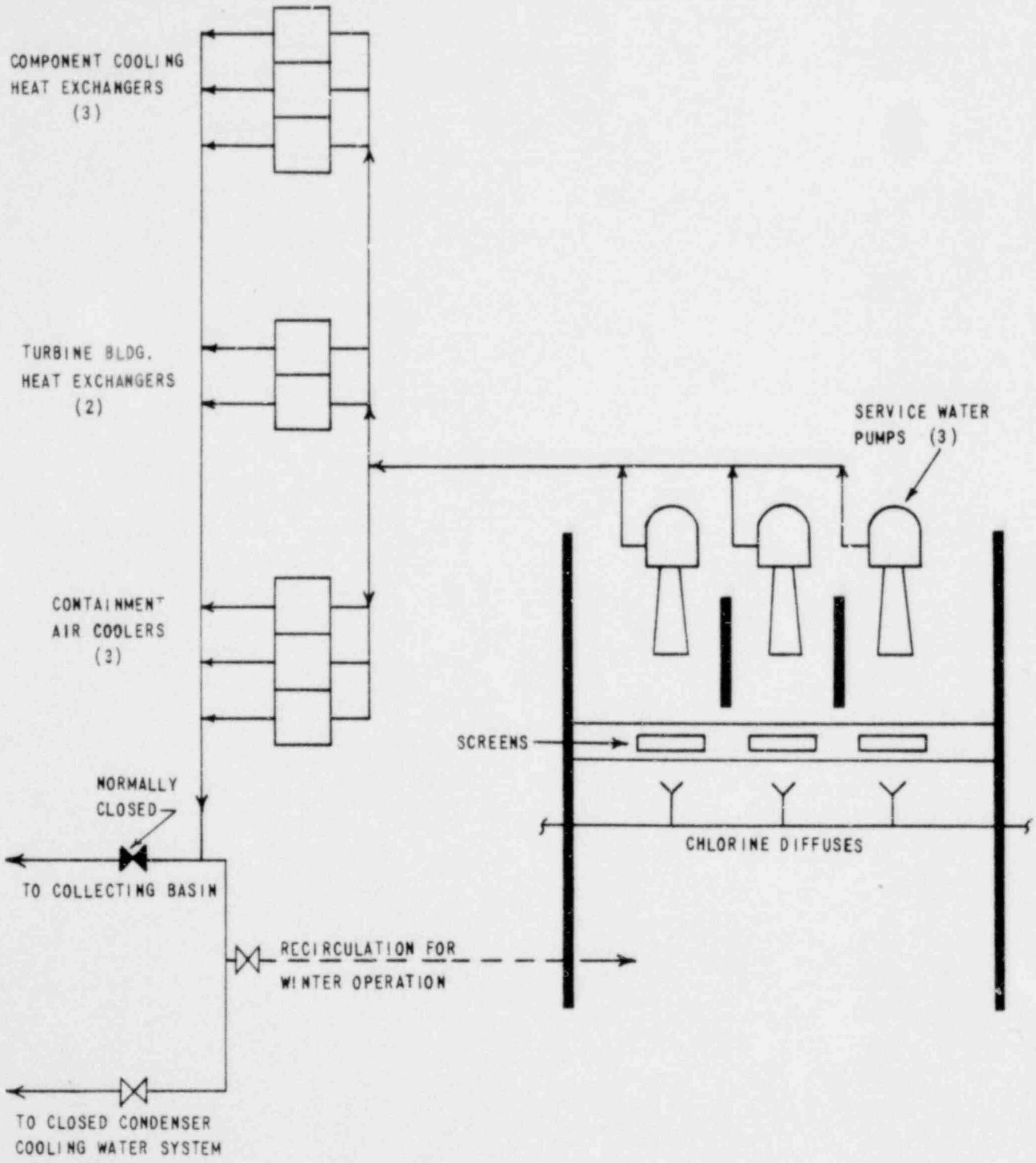
DAVIS BESSE NUCLEAR POWER STATION
STEAM AND FEEDWATER DIAGRAM
FIGURE 4



DAVIS-BESSE NUCLEAR POWER STATION

CLOSED CONDENSER COOLING WATER SYSTEM DIAGRAM
FIGURE 5

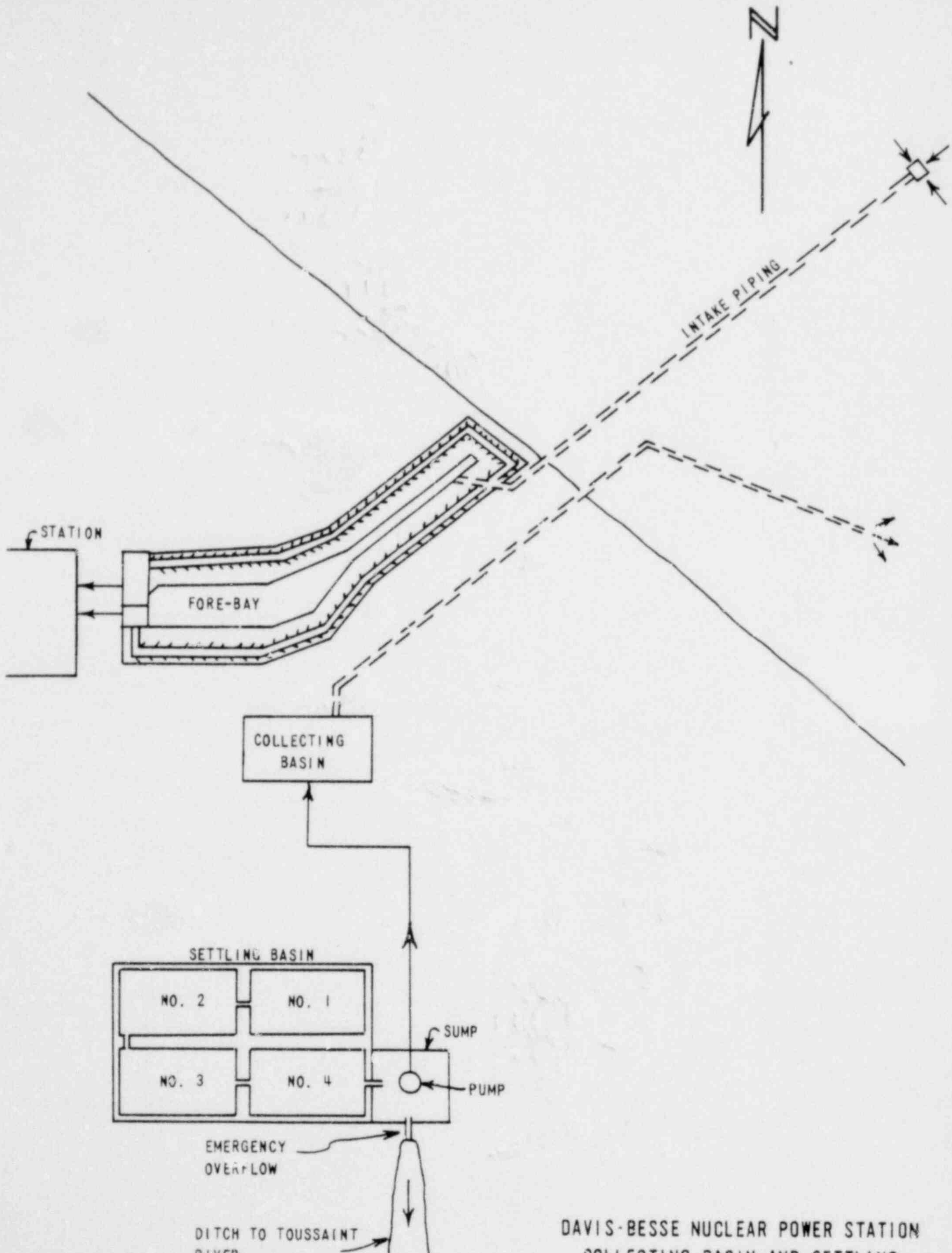
REV. 7/7/71



DAVIS-BESSE NUCLEAR POWER STATION
SERVICE WATER SYSTEM DIAGRAM

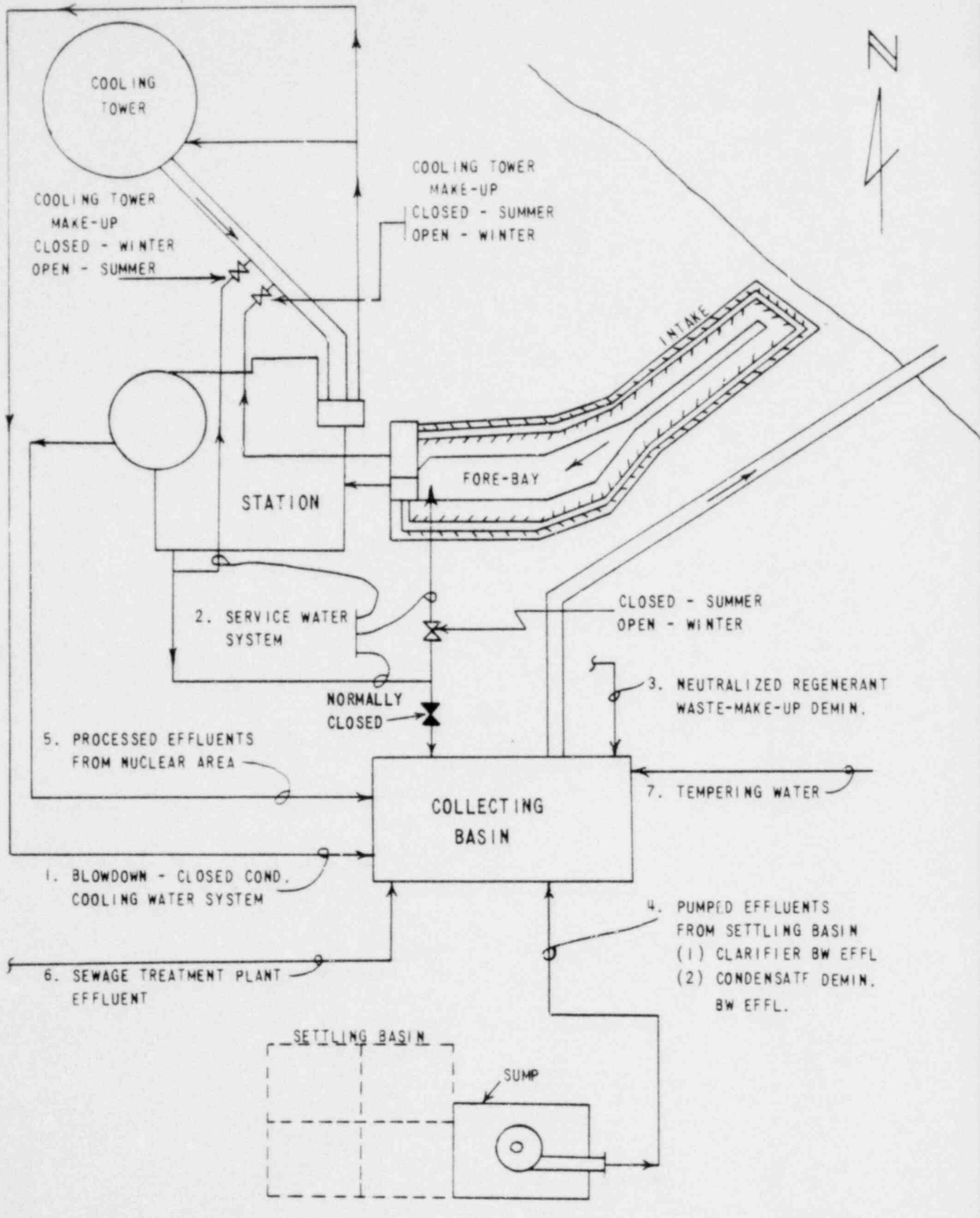
FIGURE 6

REV. 7/7/71



DAVIS-BESSE NUCLEAR POWER STATION
COLLECTING BASIN AND SETTLING
BASIN ARRANGEMENT
FIGURE 7

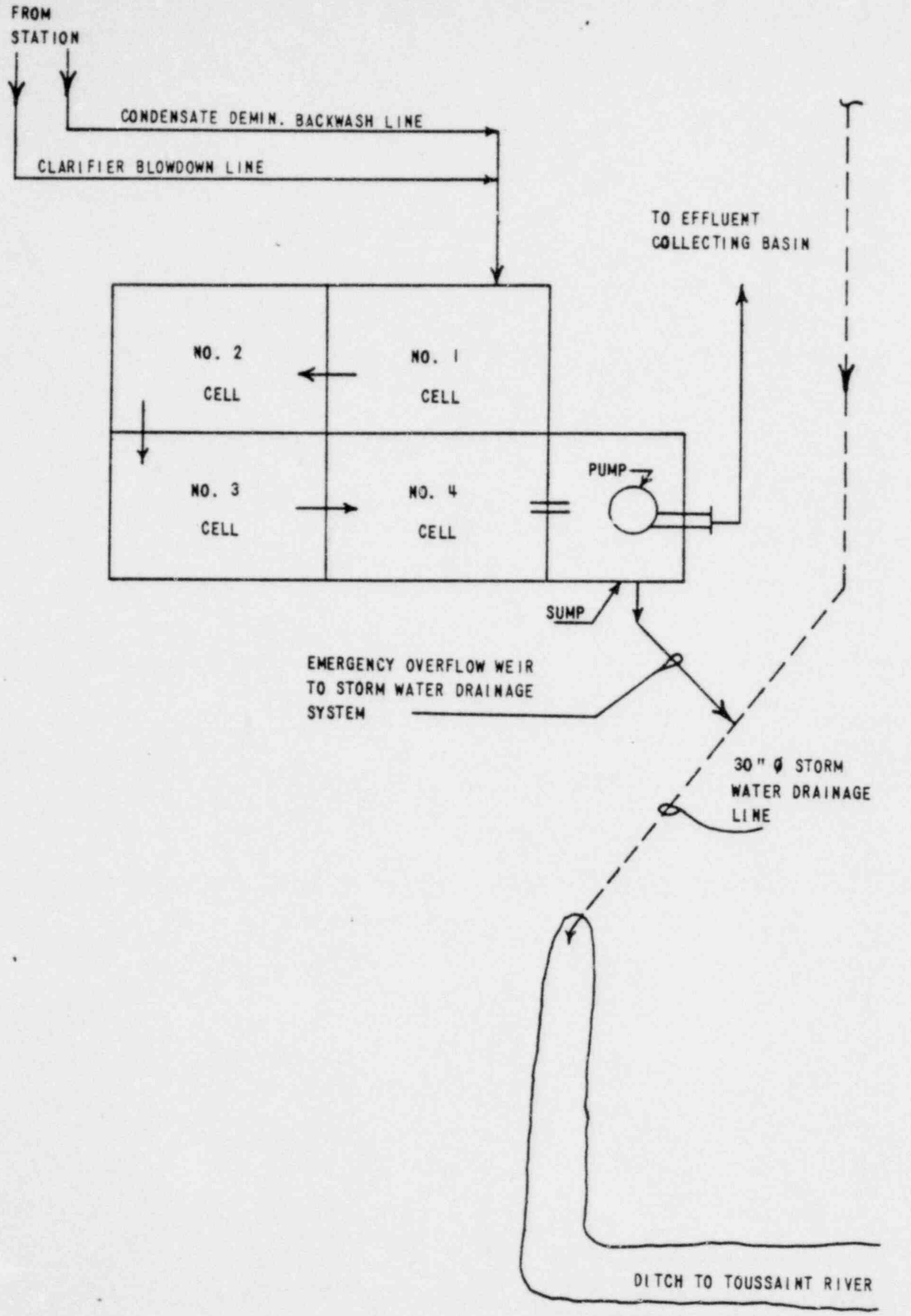
REV. 7/7/71



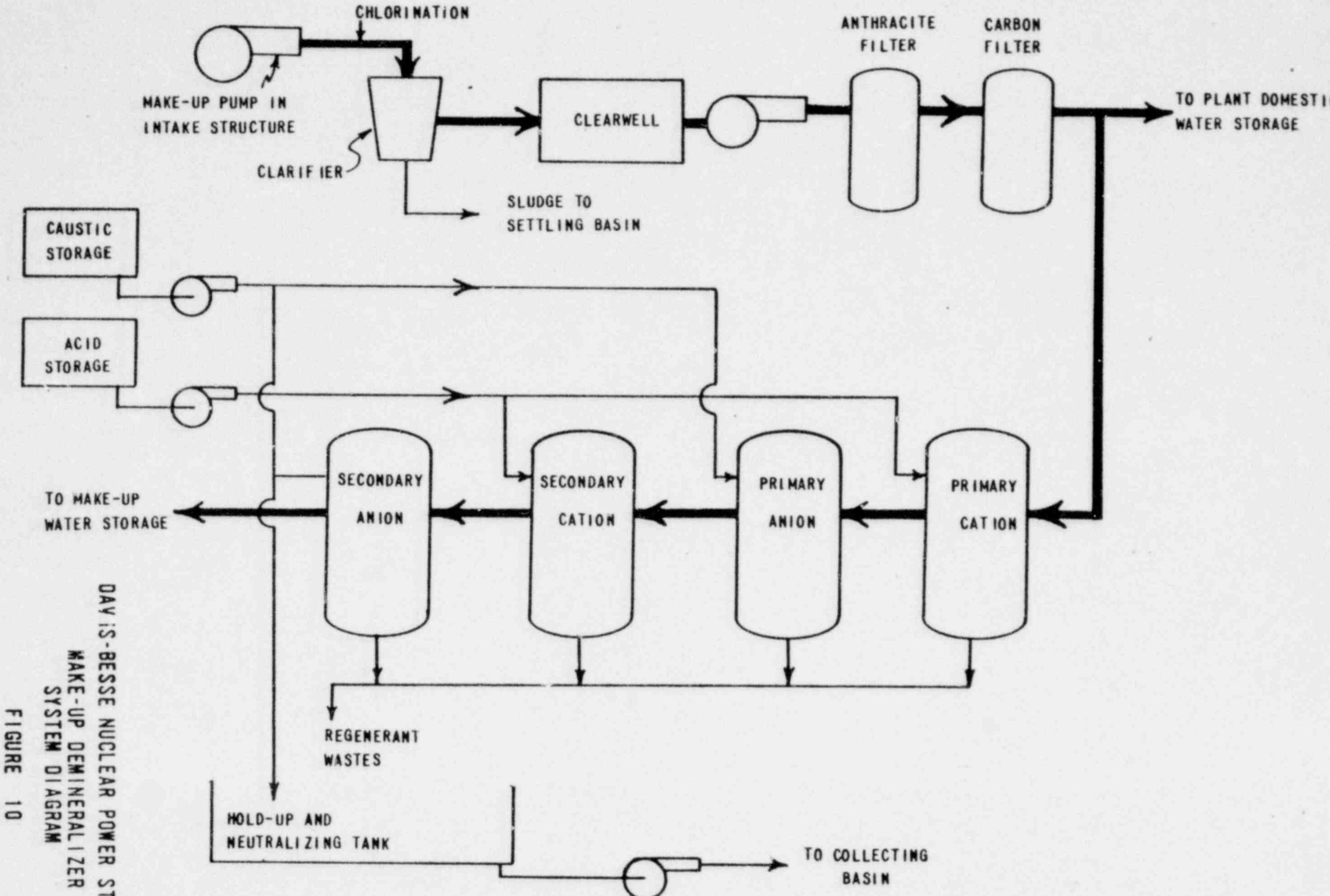
DAVIS-BESSE NUCLEAR POWER STATION
COLLECTING BASIN
EFFLUENT STREAMS DIAGRAM

FIGURE 8

REV. 7/7/71

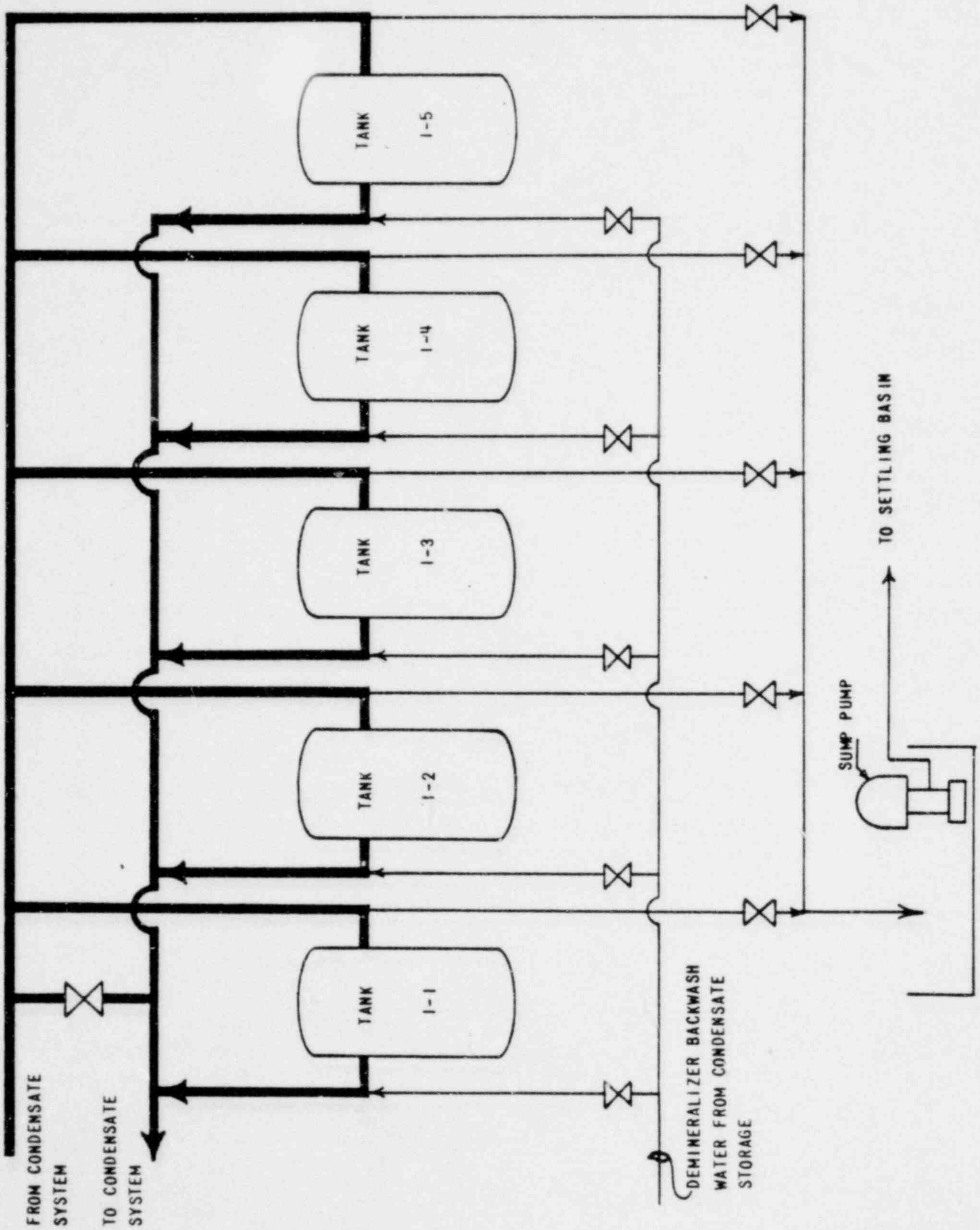


DAVIS-BESSE NUCLEAR POWER STATION
FOUR CELL SETTLING BASIN
EFFLUENT STREAMS
FIGURE 9

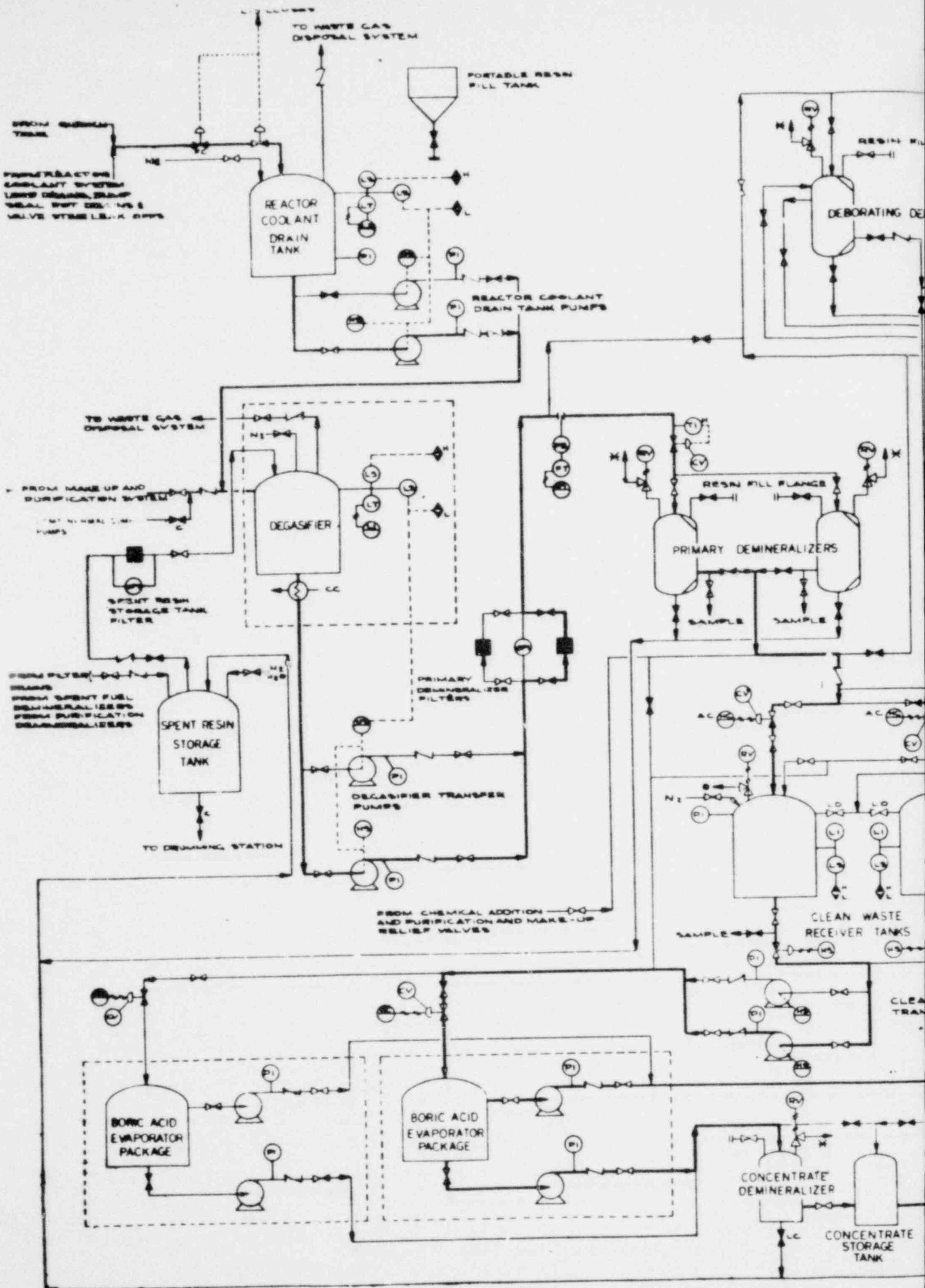


DAVIS-BESSE NUCLEAR POWER STATION
MAKE-UP DEMINERALIZER
SYSTEM DIAGRAM

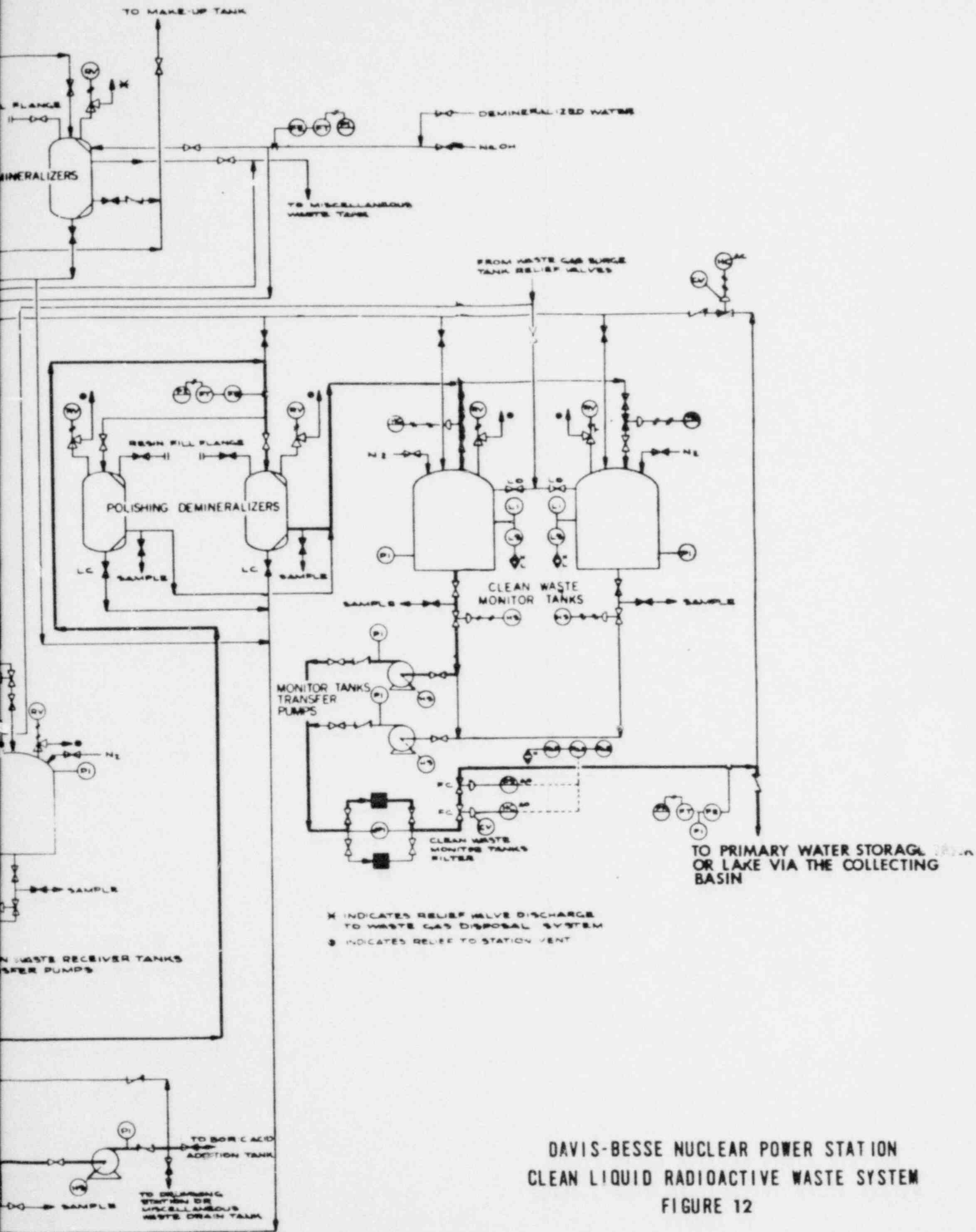
FIGURE 10



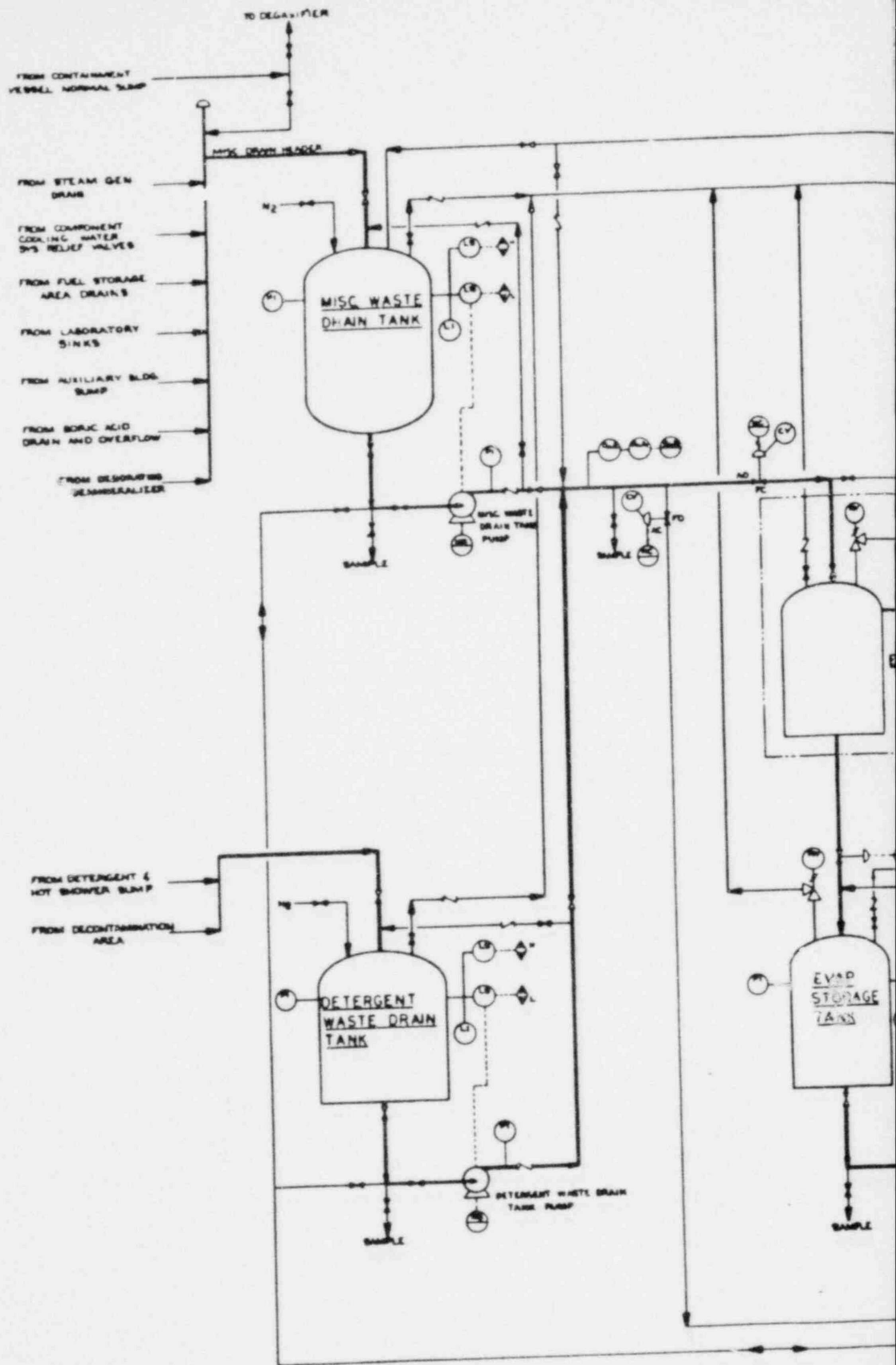
DAVIS-BESSE NUCLEAR POWER STATION
CONDENSATE DEMINERALIZER SYSTEM
FIGURE 11

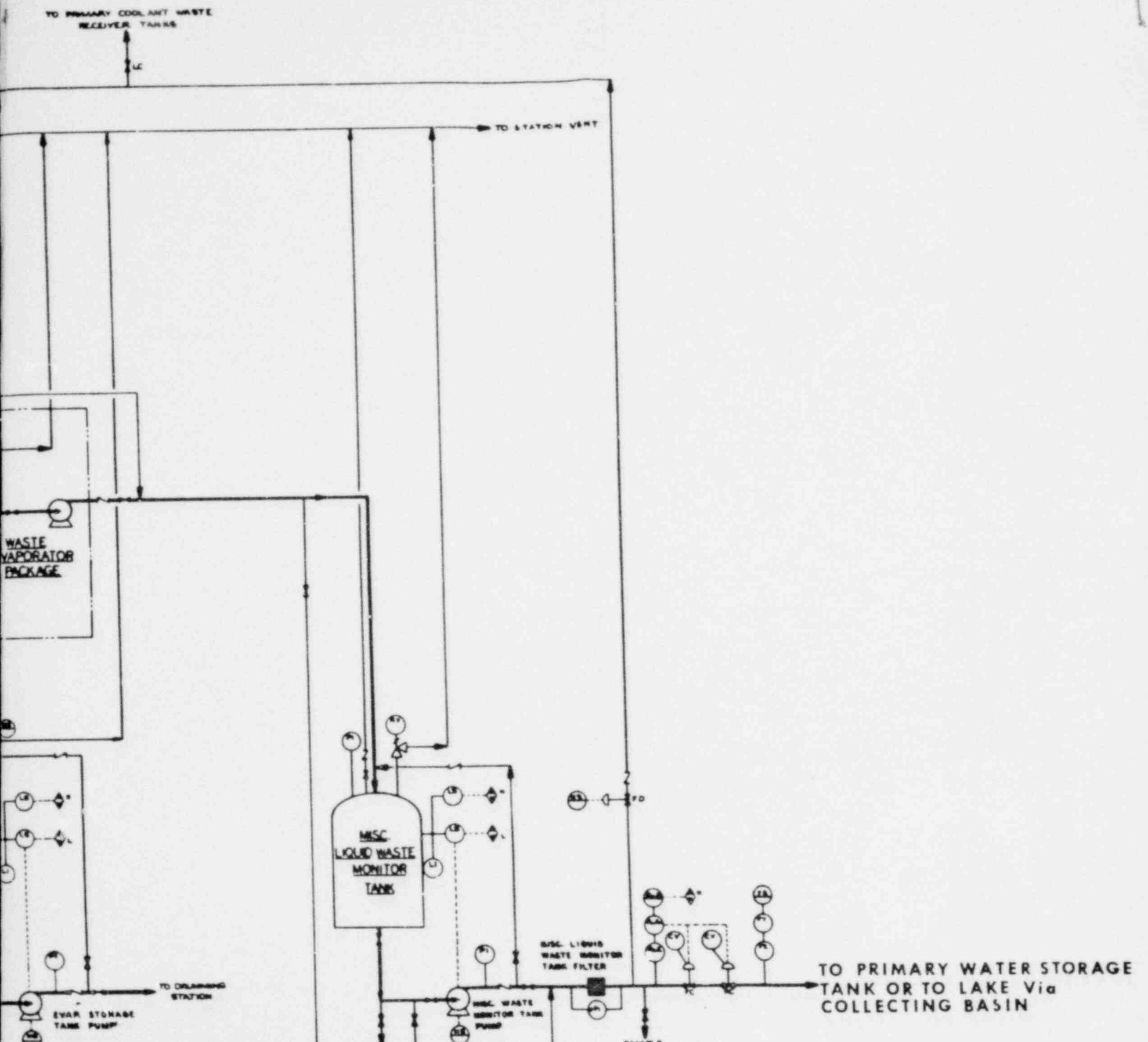


TO WASTE GAS DISPOSAL SYSTEM
PORTABLE RESIN FILL TANK
REACTOR COOLANT DRAIN TANK
REACTOR COOLANT DRAIN TANK PUMPS
DEBORATING DE
RESIN FILL
TO WASTE GAS DISPOSAL SYSTEM
FROM MAKE UP AND PURIFICATION SYSTEM
DEGASIFIER
SPENT RESIN STORAGE TANK FILTER
RESIN FILL FLANGE
PRIMARY DEMINERALIZERS
SAMPLE
SAMPLE
PRIMARY DEMINERALIZER FILTERS
SPENT RESIN STORAGE TANK
DEGASIFIER TRANSFER PUMPS
TO DRUMMING STATION
FROM CHEMICAL ADDITION AND PURIFICATION AND MAKE-UP RELIEF VALVES
CLEAN WASTE RECEIVER TANKS
SAMPLE
BORIC ACID EVAPORATOR PACKAGE
BORIC ACID EVAPORATOR PACKAGE
CONCENTRATE DEMINERALIZER
CONCENTRATE STORAGE TANK

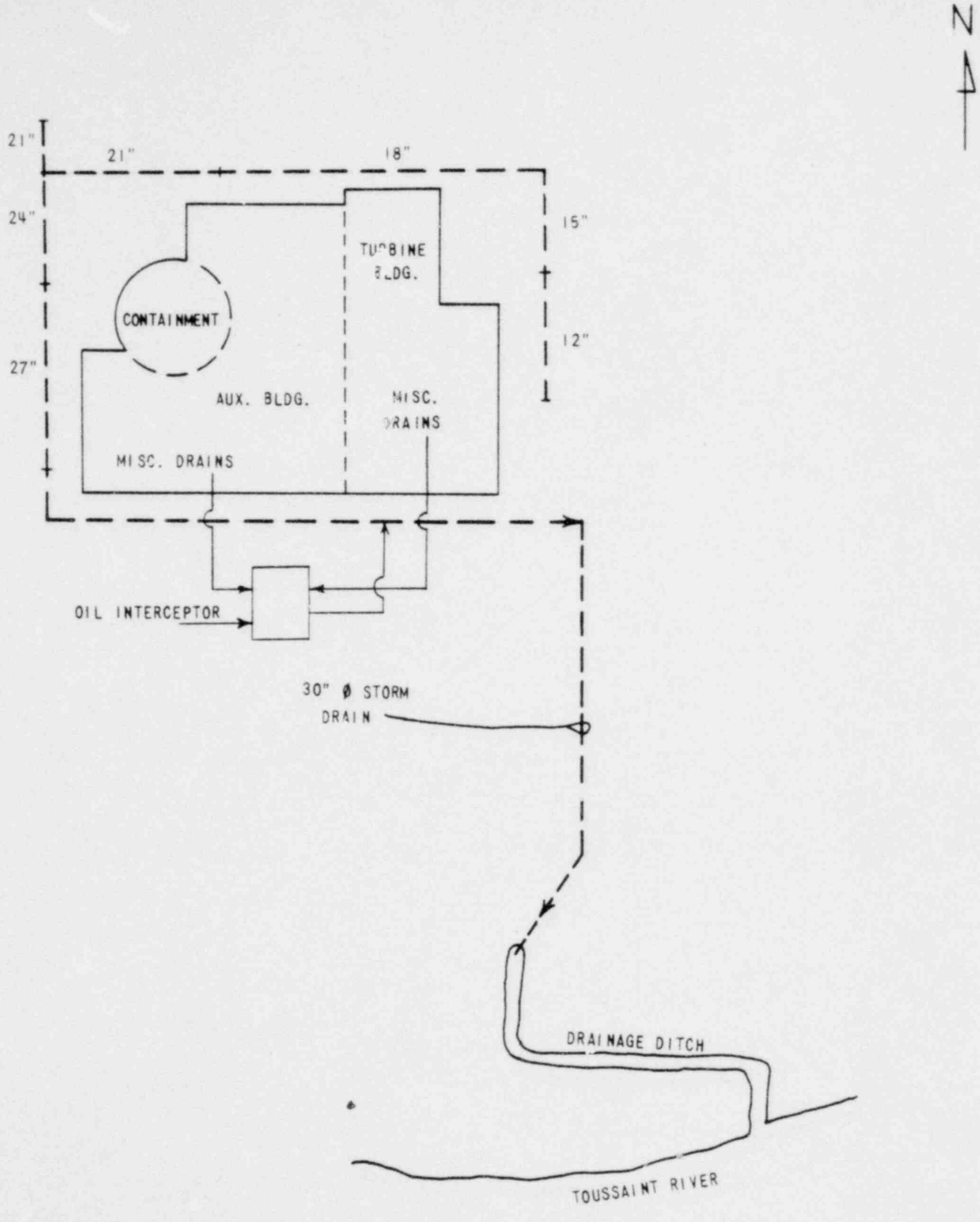


DAVIS-BESSE NUCLEAR POWER STATION
CLEAN LIQUID RADIOACTIVE WASTE SYSTEM
FIGURE 12


TO DEGASIFIER
FROM CONTAINMENT VESSEL NORMAL SUMP
MISC DRAIN HEADER
FROM STEAM GEN DRAIN
FROM COMPONENT COOLING WATER SYS RELIEF VALVES
FROM FUEL STORAGE AREA DRAINS
FROM LABORATORY SINKS
FROM AUXILIARY BLDG SUMP
FROM BORIC ACID DRAIN AND OVERFLOW
FROM DESORATING DEMINERALIZER
N_2
MISC WASTE DRAIN TANK
SAMPLE
FROM DETERGENT & HOT SHOWER SUMP
FROM DECONTAMINATION AREA
DETERGENT WASTE DRAIN TANK
DETERGENT WASTE DRAIN TANK PUMP
SAMPLE
EVAP STORAGE TANK
SAMPLE



DAVIS-BESSE NUCLEAR POWER STATION
MISCELLANEOUS LIQUID
RADIOACTIVE WASTE SYSTEM
FIGURE 13

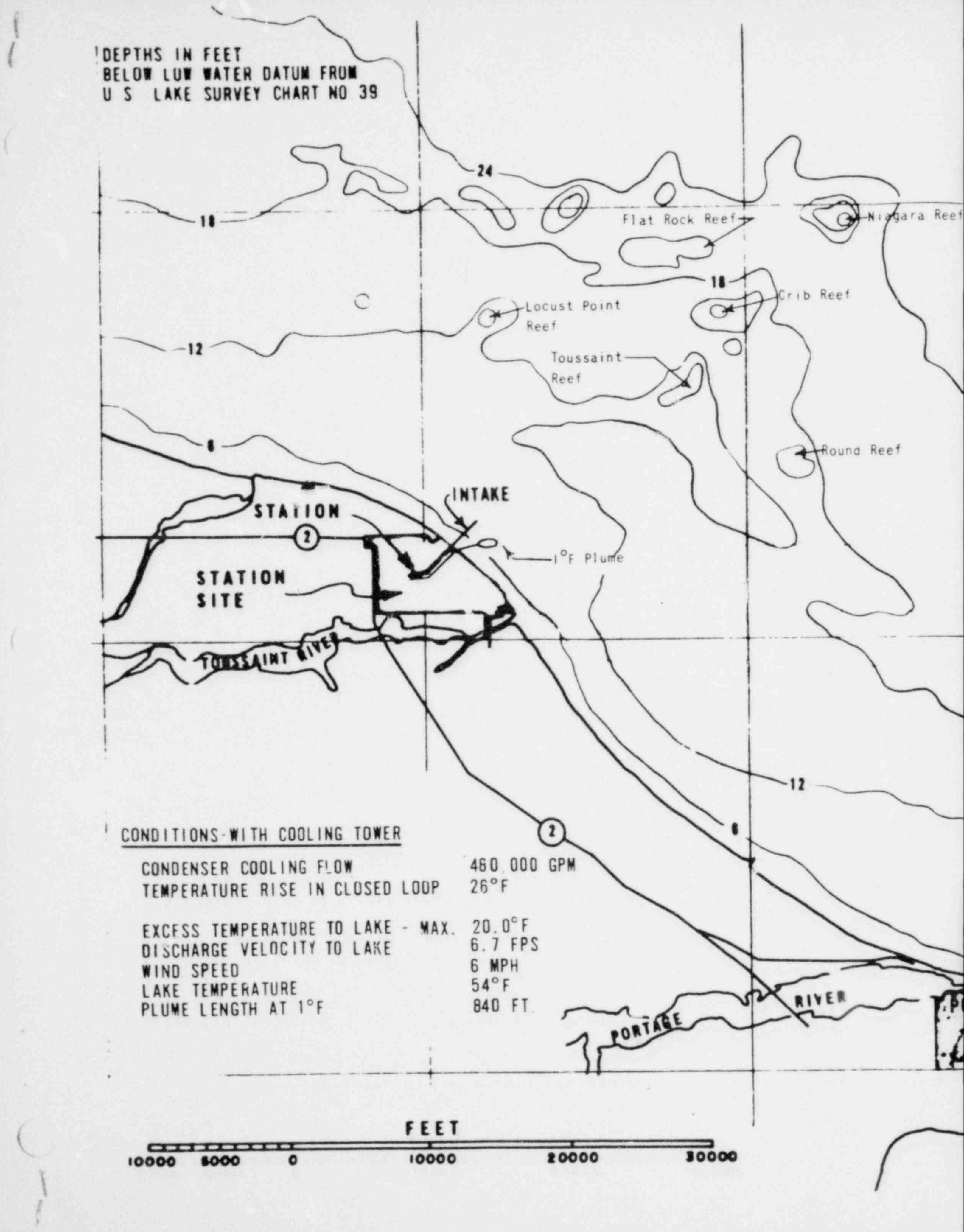


DAVIS-BESSE NUCLEAR POWER STATION

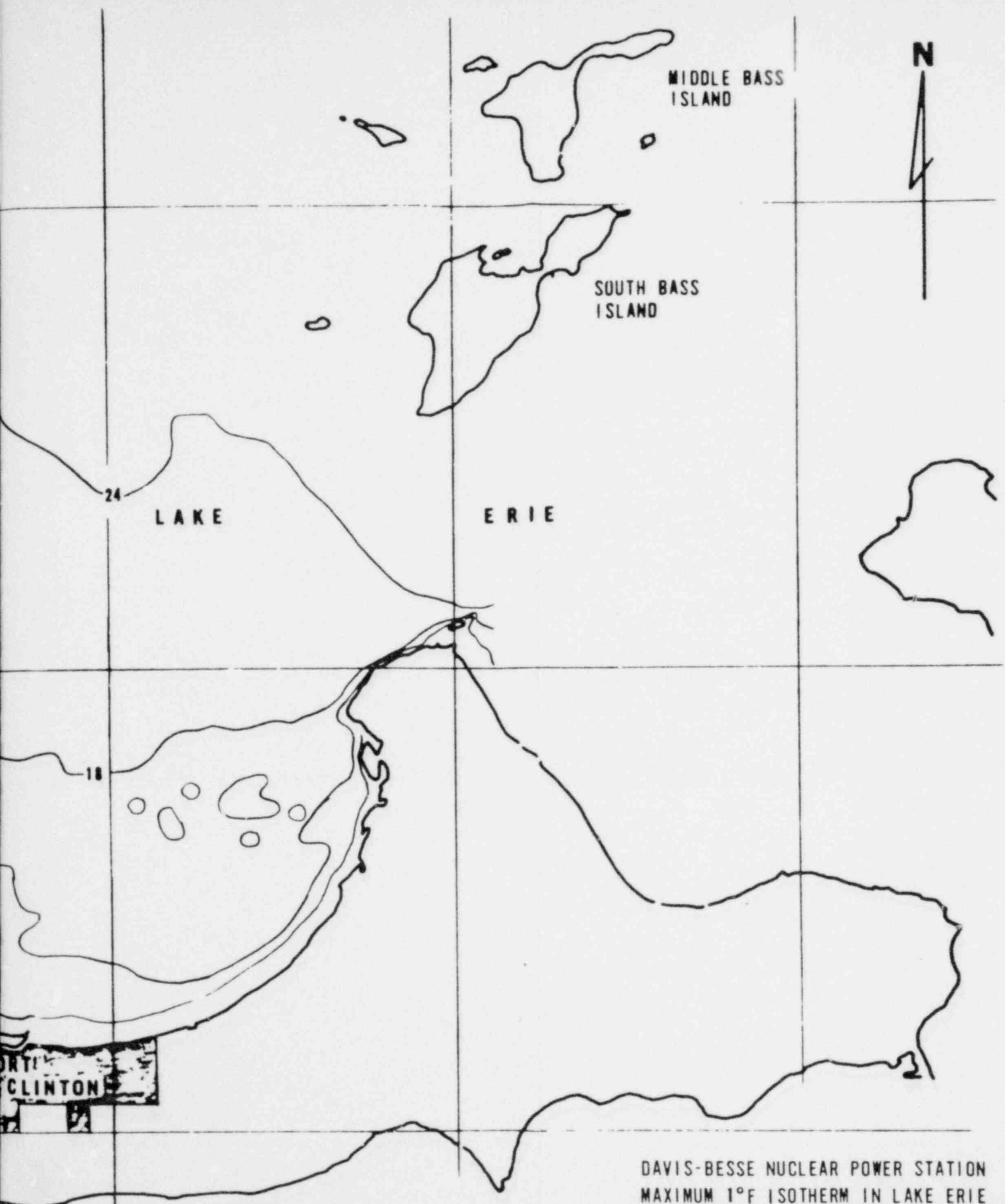
STORM WATER DRAINAGE
SYSTEM DIAGRAM

FIGURE 14

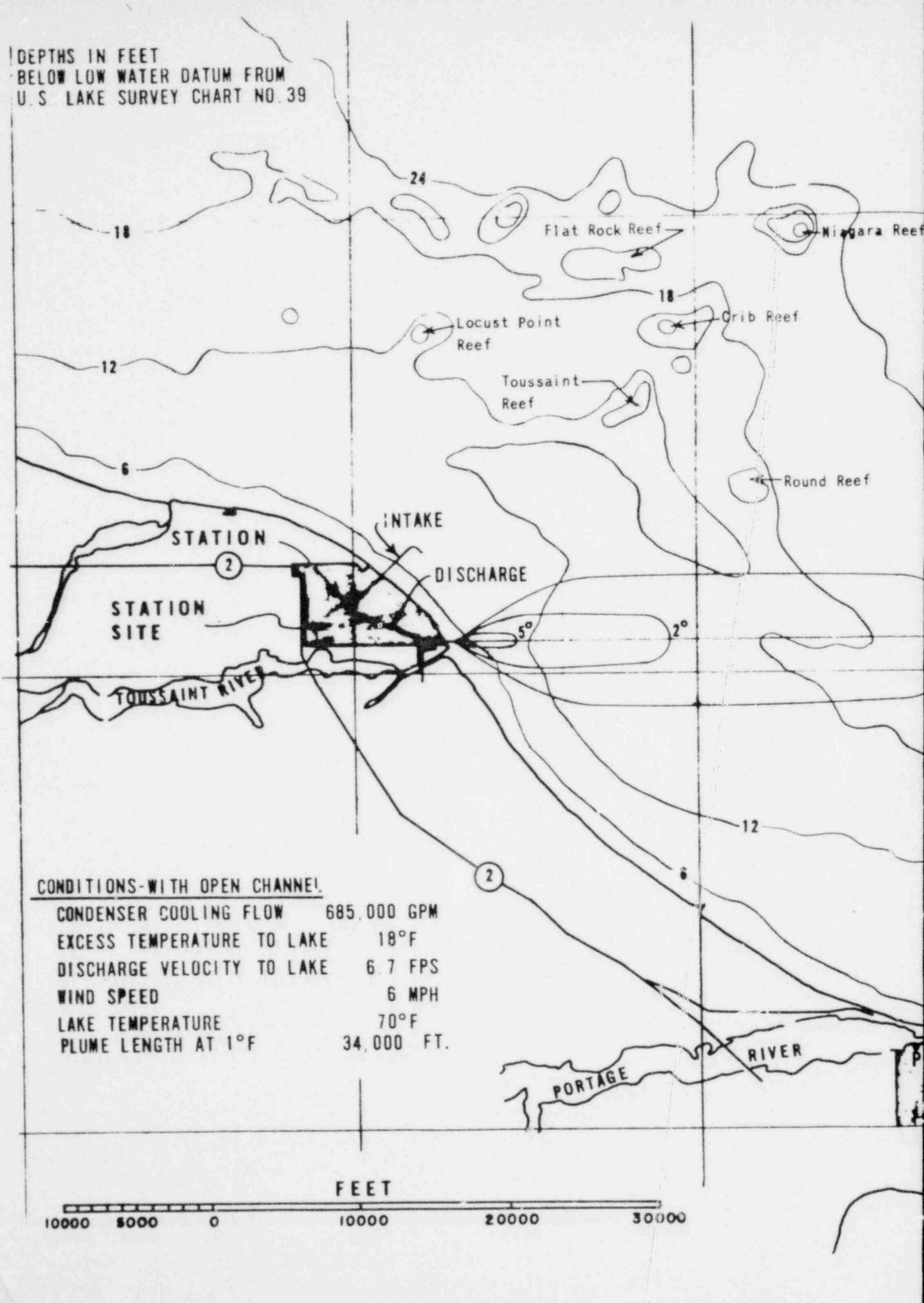
REV. 7 19 71

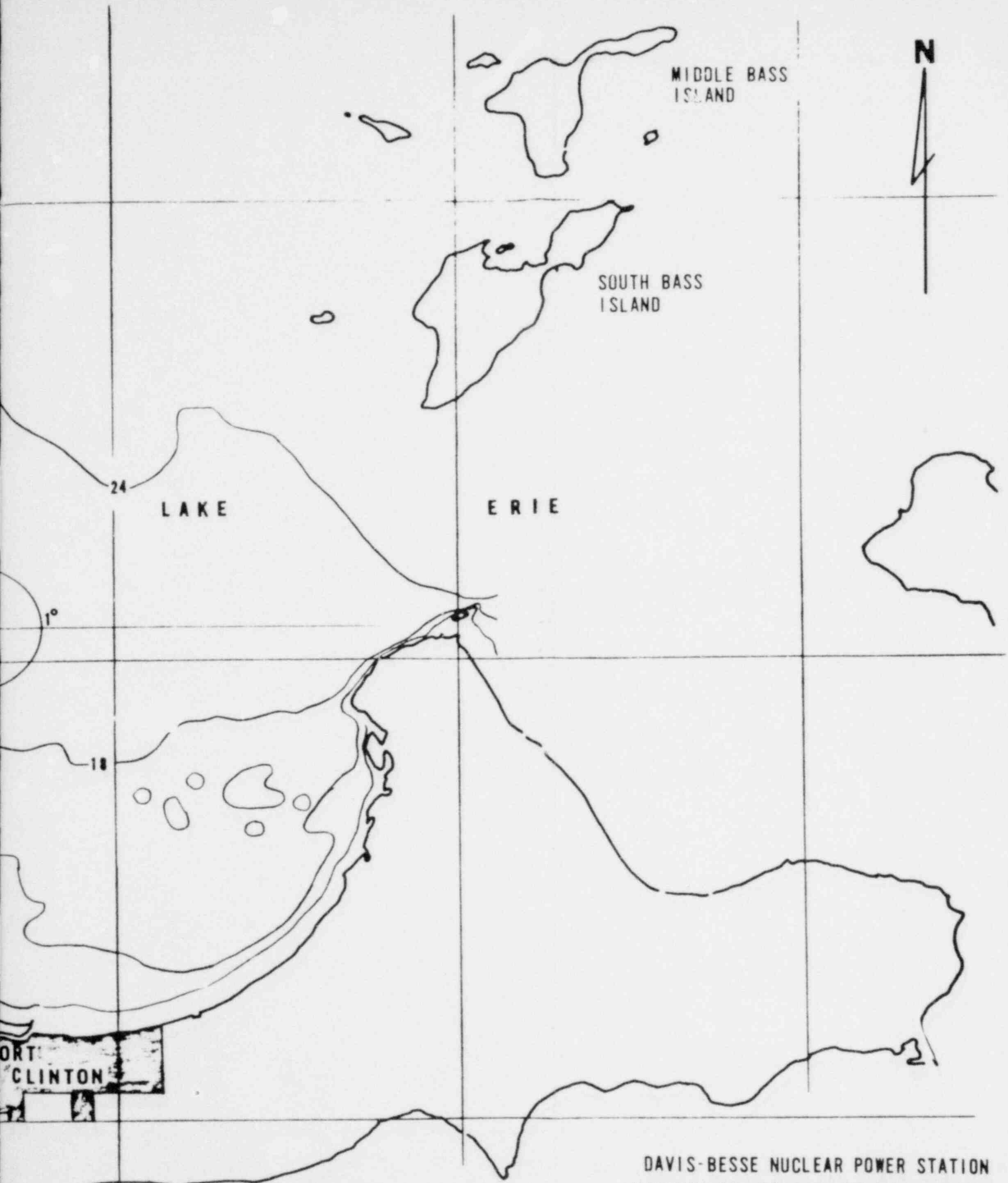


DEPTHS IN FEET
BELOW LOW WATER DATUM FROM
U S LAKE SURVEY CHART NO 39
24
18
Flat Rock Reef
Niagara Reef
18
Crib Reef
Locust Point Reef
12
Toussaint Reef
Round Reef
6
INTAKE
STATION
2
1°F Plume
STATION SITE
TOUSSAINT RIVER
12
6
2
CONDITIONS-WITH COOLING TOWER
CONDENSER COOLING FLOW 460,000 GPM
TEMPERATURE RISE IN CLOSED LOOP 26°F
EXCESS TEMPERATURE TO LAKE - MAX. 20.0°F
DISCHARGE VELOCITY TO LAKE 6.7 FPS
WIND SPEED 6 MPH
LAKE TEMPERATURE 54°F
PLUME LENGTH AT 1°F 840 FT
PORTAGE RIVER
FEET
10000 5000 0 10000 20000 30000



DAVIS-BESSE NUCLEAR POWER STATION
MAXIMUM 1°F ISOTHERM IN LAKE ERIE
WITH COOLING TOWER CLOSED SYSTEM
FIGURE 15
REV 7 19 71


DEPTHS IN FEET
BELOW LOW WATER DATUM FROM
U.S. LAKE SURVEY CHART NO. 39
24
18
12
6
Flat Rock Reef
Niagara Reef
Locust Point Reef
Crib Reef
Toussaint Reef
Round Reef
INTAKE
STATION
DISCHARGE
STATION SITE
5°
2°
TOUSSAINT RIVER
PORTAGE RIVER
CONDITIONS-WITH OPEN CHANNEL
CONDENSER COOLING FLOW 685,000 GPM
EXCESS TEMPERATURE TO LAKE 18°F
DISCHARGE VELOCITY TO LAKE 6.7 FPS
WIND SPEED 6 MPH
LAKE TEMPERATURE 70°F
PLUME LENGTH AT 1°F 34,000 FT.
FEET
10000 5000 0 10000 20000 30000



DAVIS-BESSE NUCLEAR POWER STATION
MAXIMUM 1°, 2° AND 5°F ISOTHERMS IN LAKE ERIE WITHOUT COOLING TOWER
OPEN LAKE COOLING SYSTEM
FIGURE 16

Table 1

NSSS PRINCIPAL DESIGN DATA

1. Reactor Coolant System

(a)	System heat output, Mwt and Btu/hr.	2650; 9.04×10^9
(b)	Operating pressure, psig	2185
(c)	Reactor inlet temperature, °F	557
(d)	Reactor outlet temperature, °F	608
(e)	Number of loops	2
(f)	Coolant volume (including pressurizer), ft^3	11,440
(g)	Total reactor flow, gpm	352,000

2. Reactor Coolant Pumps

(a)	Number of units	4
(b)	Design capacity, gpm	88,000
(c)	Design total developed head, ft.	355
(d)	Motor rating, Hp	9000

3. Reactor Vessel

(a)	Design pressure, psig	2500
(b)	Design temperature, °F	650
(c)	Inside diameter of shell, in.	171
(d)	Outside diameter across nozzles, in.	249
(e)	Overall height of vessel and closure head, ft.	39

4. Steam Generators

(a)	Number of units	2
(b)	Tube side design pressure, psig	2500
(c)	Tube side design temperature, °F	650
(d)	Tube side flow, lb/hr per unit	65.66×10^6
(e)	Shell side design pressure, psig	1050
(f)	Shell side design temperature, °F	600
(g)	Operating pressure, tube side psig	2185
(h)	Operating pressure, shell side psig	910
(i)	Steam flow lb/hr per unit	5.68×10^6
(j)	Feedwater temperature, °F	455
(k)	Heat transferred, Btu/hr per unit	4.52×10^9

TABLE 2

AVERAGE COMPOSITION OF EXISTING LAKE ERIE WATER

AT THE DAVIS-BESSE STATION

Calcium (Ca)	45	ppm
Magnesium (Mg)	11	"
Sodium (Na)	12	"
Chloride (Cl)	22	"
[illegible] (NO_3)	12	"
Sulfate (SO_4)	37	"
Phosphate (PO_4)	1.5	"
Silica (SiO_2)	2	"
P Alkalinity as $CaCO_3$	6	"
M.O. Alkalinity as $CaCO_3$	101	"
Total Hardness as $CaCO_3$	154	"
pH	8.1	
Suspended Solids	131	ppm
Dissolved Solids	225	"
Dissolved Oxygen	10	"

Based on a mathematical average of Samples from November, 1968 to October, 1970 and Analyzed by The Toledo Edison Company. Samples were taken 50 to 100 feet from shore.

Rev. 7/7/71

TABLE 3

STATION SYSTEM EFFLUENTS AND COMBINED EFFLUENT TO LAKE ERIE FROM COLLECTING BASIN

Minimum Monthly Average Operating Flow and Temperature Rise Conditions-Month of September

Effluent Stream	Type of Flow	Avg. Flow (gpm)	Ph	Diss. Solids (ppm)	Diss. O_2 (ppm)	Avg. °F Above Lake	Heat Input/Hr. BTU x 10^6
1. Blowdown from Closed Condenser Cooling Water System	Cont.	10,000	7.3	478(1)	9.1(2)	5	25
2. Dilution Water System Flow	As Req'd.	0(3)	-	-	-	-	0
3. Neutralized Regenerant Waste from Make-up Demineralizers	Avg./Mo. Once/Wk.	9 (200)	7.0 "	6,655 "	3 "	0 "	0 "
4. Pumped Effluents from Settling Basin (1) Filter Clarifiers Backwash Effluent	Cont.	5	10.0	225	7	0	0
(2) Condensate Demin. Backwash Effluent	Avg./Mo. Once/Mo.	2 (125)	7.0 "	NIL "	NIL "	0 "	0 "
5. Processed Effluents from Nuclear Area	Avg./Mo. Once/Wk.	2 (140)	7.0 "	50 "	NIL "	0 "	0 "
6. Sewage Treatment Plant Effluent	Avg./Mo. Inter.	2 (30)	7.6 "	180 "	NIL "	0 "	0 "
Average Combined Effluent from Collecting Basin to the Lake		10,020	7.3	478	8.9	5.0	25
One Hour Peak Combined Effluent Flow from Collecting Basin to the Lake		(10,500)	(7.3)	(591)	(8.8)	(4.8)	(25)

(1) Based on average lake water composition give in Table 2.

(2) Base on 100% oxygen saturation at cooling tower operating temperature.

(3) Dilution water flow is based on the quantity required to limit the combined effluent discharge temperature, to Lake Erie, to 20°F. The blowdown temperature rise never reaches 20°F in September and this is the reason why dilution water flow is indicated as zero.

Rev. 7/7/71

TABLE 4

STATION SYSTEM EFFLUENTS AND COMBINED EFFLUENT TO LAKE ERIE FROM COLLE.TING BASIN

Maximum Monthly Average Operating Flow and Temperature Rise Conditions-Month of April

Effluent Stream	Type of Flow	Avg. Flow (gpm)	Ph	Diss. Solids (ppm)	Diss. O_2 (ppm)	Avg. °F Above Lake	Heat Input/Hr. BTU x 10^6
1. Blowdown from Closed Condenser Coolinr Water System	Cont.	9,200	7.3	478 (1)	7.9 (2)	19	88
2. Dilution Water System Flow	As Req'd.	0 (3)	-	-	-	-	0
3. Neutralized Regenerant Waste from Make-up Demineralizers	Avg./Mo. Once/Wk.	9 (200)	7.0 "	6,655 "	3 "	0 "	0 "
4. Pumped Effluents from Settling Basin (1) Filter Clarifiers Backwash Effluent	Cont.	5	10.0	225	7	0	0
(2) Condensate Demin. Backwash Effluent	Avg./Mo. Once/Mo.	2 (125)	7.0 "	NIL "	NIL "	0 "	0 "
5. Processed Effluents from Nuclear Area	Avg./Mo. Once/Wk.	2 (140)	7.0 "	50 "	NIL "	0 "	0 "
6. Sewage Treatment Plant Effluent	Avg./Mo. Inter.	2 (30)	7.6 "	180 "	NIL "	0 "	0 "
Average Combined Effluent from Collecting Basin to the Lake		9,220	7.3	478	7.8	19.1	88
Our Hour Peak Combined Effluent Flow from Collectirg Basin to the Lake		(9,700)	(7.3)	(597)	(7.6)	(18.1)	(88)

(1) Based on average lake water composition give in Table 2.

(2) Based on 100% oxygen saturation at cooling tower operating temper.ture.

(3) See Note (1) on Table 7.

Rev. 7/7/71

TABLE 5

STATION SYSTEM EFFLUENTS AND COMBINED EFFLUENT TO LAKE ERIE FROM COLLECTING BASIN

Minimum Operating Flow and Temperature Rise Conditions-A September Day

Effluent Stream	Type of Flow	Avg. Flow (gpm)	Ph	Diss. Solids (ppm)	Diss. O_2 (ppm)	Avg. °F Above Lake	Heat Input/Hr. BTU x 10^6
1. Blowdown from Closed Condenser Cooling Water System	Cont.	10,000	7.3	478(1)	9.1(2)	-5	-25
2. Dilution Water System Flow	As Req'd.	0(3)	-	-	-	-	0
3. Neutralized Regenerant Waste from Make-up Demineralizers	Avg./Mo. Once/Wk.	9 (200)	7.0 "	6,655 "	3 "	0 "	0 "
4. Pumped Effluents from Settling Basin (1) Filter Clarifiers Backwash Effluent	Cont.	5	10.0	225	7	0	0
(2) Condensate Demin. Backwash Effluent	Avg./Mo. Once/Mo.	2 (125)	7.0 "	NIL "	NIL "	0 "	0 "
5. Processed Effluents from Nuclear Area	Avg./Mo. Once/Wk.	2 (140)	7.0 "	50 "	NIL "	0 "	0 "
6. Sewage Treatment Plant Effluent	Avg./Mo. Inter.	2 (30)	7.6 "	180 "	NIL "	0 "	0 "
Average Combined Effluent from Collecting Basin to the Lake		10,020	7.3	478	8.9	-5.0	-25
One Hour Peak Combined Effluent Flow from Collecting Basin to the Lake		(10,500)	(7.3)	(591)	(8.8)	-(4.8)	-(25)

(1) Based on average lake water composition give in Table 2.

(2) Based on 100% oxygen saturation at cooling tower operating temperature.

(3) Dilution water flow is based on the quantity required to limit the combined effluent discnarge temperature, to Lake Erie, to 20°F. The blowdown temperature rise never reaches 20°F in September and this is the reason why dilution water flow is indicated as zero.

Rev. 7/7/71

TABLE 6

STATION SYSTEM EFFLUENTS AND COMBINED EFFLUENT TO LAKE ERIE FROM COLLECTING BASIN

Maximum Operating Flow and Temperature Rise Conditions-An April Day

Effluent Stream	Type of Flow	Avg. Flow (gpm)	Ph	Diss. Solids (ppm)	Diss. O_2 (ppm)	Avg. °F Above Lake	Heat Input/Hr. BTU x 10^6
1. Blowdown from Closed Condenser Cooling Water System	Cont.	9,200	7.3	478 (1)	7.9 (2)	30	138
2. Dilution Water System Flow	As Req'd.	4580 (3)	8.1 (1)	225 (1)	10.7	0 (3)	0
3. Neutralized Regenerant Waste from Make-up Demineralizers	Avg./Mo. Once/Wk.	9 (200)	7.0 "	6,655 "	3 "	0 "	0 "
4. Pumped Effluents from Settling Basin (1) Filter Clarifiers Backwash Effluent	Cont.	5	10.0	225	7	0	0
(2) Condensate Demin. Backwash Effluent	Avg./Mo Once/Mo.	2 (125)	7.0 "	NIL "	NIL "	0 "	0 "
5. Processed Effluents from Nuclear Area	Avg./Mo. Once/Wk.	2 (140)	7.0 "	50 "	NIL "	0 "	0 "
6. Sewage Treatment Plant Effluent	Avg./Mo. Inter.	2 (30)	7.6 "	180 "	NIL "	0 "	0 "
Average Combined Effluent from Collecting Basin to the Lake		13,800	7.6	395	8.7	20.0	138
Our Hour Peak Combined Effluent Flow from Collecting Basin to the Lake		(14,280)	(7.6)	(478)	(8.6)	(20.0)	(138)

(1) Based on average lake water composition give in Table 2.

(2) Based on 100% oxygen saturation at cooling tower operating temperature.

(3) See Note (1) on Table 7.

Rev. 7/7/71

COOL

C

Average Temperat

	Cooling Tower Blowdown Average Conditions	
	Temp. Rise Above Lake-^{o}F	Flow GPM
January	11	7500
February	17	8200
March	16	8500
April	19	9200
May	15	10000
June	14	10000
July	12	10400
August	10	10400
September	5	10000
October	17	9500
November	17	9000
December	18	8000

(1) Dilution water flow is based on the quant
to 20^{o}F in all cases where it would be ab
is never above 20^{o}F and this is the reaso

In actuality dilution water is required,
September, to maintain discharge water te

The integrated quantity of dilution water

TABLE 7

ᴾAVIS-BESSE NUCLEAR POWER STATION

ING TOWER BLOWDOWN AND OTHER EFFLUENT DATA

ombined Discharge to Lake Erie by Months

ure Rise above Lake and Average Heat Input to Lake Erie

Other Effluent Flows To Lake Erie-GPM		Combined Discharge to Lake Erie Monthly Average Conditions		
Process & Miscel.	Dilution (1) Water	Flow GPM	Heat Input BTUx10^6	Temperature Rise Above Lake-°F
20	0	7,520	42	11.2
20	0	8,220	70	17.0
20	0	8,520	68	16.0
20	0	9,220	88	19.1
20	0	10,020	75	15.0
20	0	10,020	70	14.0
20	0	10,420	63	12.1
20	0	10,420	52	10.0
20	0	10,020	25	5.0
20	0	9,520	81	17.0
20	0	9,020	77	17.1
20	0	8,020	73	18.2

ity required to limit the maximum combined effluent discharge temperature, to Lake Erie, ove 20°F without this added flow. On an average monthly basis the blowdown temperature why dilution water flow is indicated as zero for all months.

during adverse weather conditions on some days of all months, except July, August and mperature to the lake below 20°F with maximum dilution flows as given in Table 8.

for each month would require extensive work to calculate and this analysis has not been made.

COOL

C

Maximum Tempera

	Cooling Tower Blowdown Maximum Conditions	
	Temp. Rise Above Lake-^{o}F	Flow GPM
January	29	7500
February	25	8200
March	23	8500
April	30	9200
May	23	10000
June	22	10000
July	20	10400
August	14	10400
September	14	10000
October	23	9500
November	30	9000
December	30	8000

(1) Dilution water flow is based on the quant
to 20^{o} in all cases where it would be abo
August and September because maximum disc

TABLE 8

DAVIS-BESSE NUCLEAR POWER STATION

ING TOWER BLOWDOWN AND OTHER EFFLUENT DATA

ombined Discharge to Lake Erie by Months

ture Rise above Lake and Total Heat Input to Lake Erie

Other Effluent Flows To Lake Erie-GPM		Combined Discharge to Lake Erie Maximum Temperature Rise Conditions		
Process & Miscel.	Dilution (1) Water	Flow GPM	Heat Input BTUx10[6]	Temperature Rise Above Lake-°F
20	4080	11,600	116	20.0
20	2780	11,000	110	20.0
20	1980	10,500	105	20.0
20	4580	13,800	138	20.0
20	1480	11,500	115	20.0
20	980	11,000	110	20.0
20	0	10,420	104	20.0
20	0	10,420	73	14.0
20	0	10,020	70	14.0
20	2080	11,600	116	20.0
20	4480	13,500	135	20.0
20	4680	12,700	127	20.0

ty required to limit the maximum combined effluent discharge temperature to Lake Erie, e 20° without this added flow. Dilution water flow is zero during the months of July, arge temperature to the lake is less than 20°F without it.

R E S O L U T I O N

WHEREAS, The Ohio Water Pollution Control Board is empowered by law to develop programs for the prevention, control, and abatement of new or existing pollution of the waters of the state; and

WHEREAS, The Board is empowered by law to encourage, participate in, or conduct studies, investigations, research, and demonstrations relating to water pollution, and the causes, prevention, control, and abatement thereof; and

WHEREAS, Current federal and state certification requirements, when coupled with rapid technological advances and implementation, necessitate a high degree of technical expertise on the part of the Board and supporting state departments; and

WHEREAS, It is the opinion of the Board that such technical expertise can often be most efficiently, economically, and expeditiously provided by sources outside of state government; and

WHEREAS, It is the opinion of the Board that the increased financial burden upon the state necessitated by the aforementioned circumstances should properly be borne in large measure by the applicant; and

WHEREAS, It is the opinion of the Board that William B. Nye, as a member of this Board and as Director of the Department of Natural Resources should coordinate and effectuate a program whereby the applicant, in instances requiring technical expertise not then currently possessed by the state, bear in large measure the financial burden upon the state in acquiring such technical expertise;

NOW THEREFORE, We the members of the Water Pollution Control Board of the State of Ohio, regularly assembled this 18th day of October, 1971, do hereby direct that William B. Nye as a member of this Board and as the Director of the Department of Natural Resources, under circumstances hereinbefore set forth in this resolution, be empowered to enter into contractual arrangements designed to provide the Board with technical expertise not then currently possessed by the state, and that the cost of such arrangement shall be borne in large measure by the applicant.

By Order of the Board.

[illegible]

[illegible] E. [illegible]

[illegible]

[illegible]

Barton A. Hal

Robert B. Holt

Motion seconded by Mr. Holt. After lengthy discussion the motion was agreed to unanimously.

APPENDIX 4

JOHN J. GILLIGAN
GOVERNOR

WILLIAM B. NYE
DIRECTOR

STATE OF OHIO

DEPARTMENT OF NATURAL RESOURCES

OHIO DEPARTMENTS BUILDING
COLUMBUS 43215

FOR RELEASE: Sunday, December 5, 1971

Governor John J. Gilligan announced today that an assessment of the total impact of Ohio's first two proposed nuclear power plants has been ordered by the Department of Natural Resources.

The analysis will be performed by the Columbus Laboratories of Battelle Memorial Institute under contract to the Natural Resources Department, Governor Gilligan said.

Cost of the work, to be completed in phases over a seven-month period, is $53,000.

"The electric utility companies that want to build these two plants have contributed $50,000 to assist the Natural Resources Department in paying for it," Governor Gilligan said. "In this respect, I think they are perhaps showing a significant concern for the environment.

"They certainly are showing greater environmental concern than our State Legislature, which has done nothing on an Administration bill which would make mandatory action such as the utilities and the Natural Resources Department are taking voluntarily in this instance."

The bill would require that utilities proposing to build a nuclear power plant pay a $25,000 fee to the state, with the money going for a study of the plant's environmental impact and the suitability of the proposed site. It has not even been assigned to committee, Governor Gilligan said.

-more-

APPENDIX 4

Natural Resources Director William B. Nye said $25,000 of the contribution referred to by Governor Gilligan is being provided by Toledo Edison Company and Cleveland Electric Illuminating Company, which jointly are building and plan to operate the 872,000-kilowatt Davis-Besse Nuclear Power Station on Lake Erie about eight miles west of Port Clinton. The initial phase of the construction was authorized by the federal Atomic Energy Commission before federal law required any state approval.

Another $25,000 is being provided by the three utilities proposing to construct and operate the 810,000-kilowatt William H. Zimmer Nuclear Power Station on the Ohio River in Clermont County, Nye said. They are Cincinnati Gas & Electric Company, Columbus & Southern Ohio Electric Company and Dayton Power & Light Company.

"The Battelle-Columbus assessment will cover not only the environmental impacts of thermal and other discharges from the Davis-Besse and Zimmer plants," Governor Gilligan said, "but also the plants' social impacts.

"These include their effects on aesthetic values, on nearby recreational activities and on the human interest aspects of the environment which in turn affect our enjoyment of life."

Nye said where the study shows that the present design of a plant system or procedure would cause an environmental or social problem, the study also will review the potential effects of alternatives at that site.

"As alternatives to once-through cooling of a power plant's condensers, which might cause thermal pollution, for example, the analysis would look at recycle cooling, involving the use of ponds or natural or forced-draft cooling towers," Nye explained.

-more-