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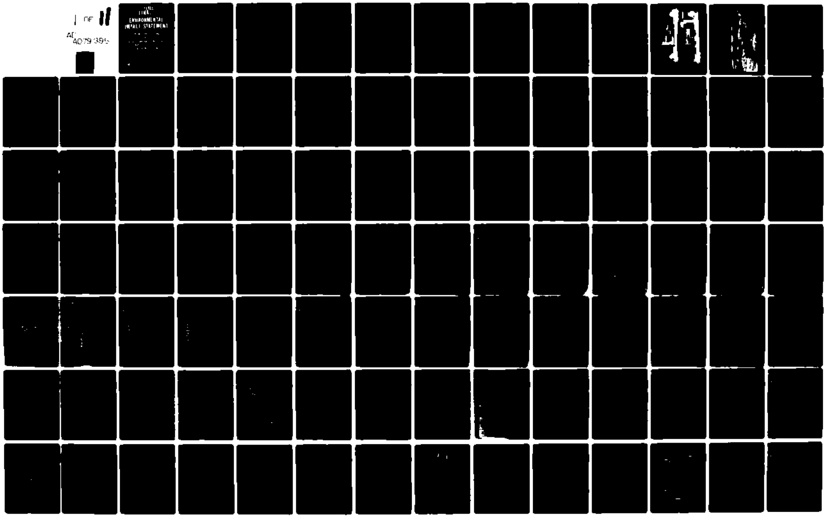

LEVEL II

FINAL ENVIRONMENTAL IMPACT STATEMENT

PERMIT APPLICATION BY NIAGARA MOHAWK POWER CORP. PROPOSED LAKE ERIE GENERATING STATION

POMFRET AND SHERIDAN, NEW YORK

(6) (12) (11) Dec 78

(10) Arthur K. Mar... (12) 981

PREPARED BY
U.S. ARMY ENGINEER DISTRICT, BUFFALO
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

410 090

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Buffalo 1776 Niagara Street, Buffalo, NY 14207		12. REPORT DATE December, 1978
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

air quality, ecological effects, energy demand, entrainment, environmental effects, fish and wildlife values, impingement, Lake Erie, pollution control, social and economic factors, steam electric power plants, water quality

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A detailed analysis of the environmental impacts associated with the construction and operation of a coal-fired steam electric generating station. Two locations along the southeastern shore of Lake Erie in Chautauqua County, New York have been proposed for this facility. The primary site occupies a 1,054 acre tract of land in the Town of Pomfret, New York, while the secondary site in Sheridan, New York has a total area of approximately 986 acres. Steam produced by this facility will be used to generate approximately (Continued)

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20. (Continued) 1,700 megawatts of electrical power. The water intake and effluent discharge system will be located in Lake Erie and coal will be delivered to this plant by means of an offshore unloading facility. Approximatley 6,000,000 tons of coal will be consumed annually by the Lake Erie Generating Station.

DISCLAIMER

The reviewer is cautioned that any reference to trade names, commercial products or processes in this Environmental Impact Statement does not constitute endorsement or recommendation for use by the U.S. Army Corps of Engineers.

SUMMARY

LAKE ERIE GENERATING STATION
POMFRET AND SHERIDAN, NEW YORK

( ) DRAFT (X) FINAL ENVIRONMENTAL IMPACT STATEMENT

RESPONSIBLE OFFICE: U. S. Army Engineer District, Buffalo,
1776 Niagara Street, Buffalo, NY 14207
Telephone No. (716) 876-5454.

1. NAME OF ACTION: (X) Administrative ( ) Legislative

2. DESCRIPTION OF ACTION: This Final Environmental Impact Statement was prepared by the U.S. Army Corps of Engineers, Buffalo District, as the lead Federal agency to fulfill the requirements of the National Environmental Policy Act of 1969 (NEPA).

The proposed action, the construction and operation of a fossil fuel steam generating station at either Pomfret or Sheridan, New York, by the Niagara Mohawk Power Corporation, will be built in stages with completion of the first of the plant's two units scheduled for November 1987, and the second for November 1989. The proposed generating station will utilize two low-sulfur, western coal-fired units to produce steam for the generation of 1,700 megawatts of electrical power. The exhaust steam from the two turbine generators will be cooled and condensed by using Lake Erie water pumped to the plant via pipeline and circulated through a single natural draft cooling tower. Exhaust gases from coal combustion will be vented to the atmosphere via a 750-foot stack after passing through control devices capable of reducing the amount of air pollutants emitted. The electrical power produced under this proposal will be transmitted via high voltage electrical transmission lines to connections with existing and independently proposed transmission circuits in the Niagara Mohawk Power Corporation network. All coal will be delivered to the site by lake ship to a proposed offshore coal unloading facility connected to shore by a coal conveyor tunnel constructed beneath Lake Erie. The facility will require six million tons of coal per year.

3. (A) ENVIRONMENTAL IMPACTS: The proposed generating station would:

(1) Provide 1,700 megawatts (MW) of electrical power to the Niagara Mohawk Power Corporation's system to meet the projected power demands of its customers.

(2) Provide a reasonable reserve margin of electrical generating capacity to the Niagara Mohawk Power Corporation system, thereby improving system reliability for the company and the interconnected New York Power Pool and Northeast Power Coordinating Council.

(3) Provide approximately 3.07×10^{11} kwh of electricity over the projected 30-year life of the plant. At 1976 rates, this electricity is valued at nearly eight billion dollars.

(4) Increase the assessable property in either Pomfret or Sheridan, Chautauqua County, New York, and thereby increase local, county, State, and Federal tax revenues.

(5) Create about 100 permanent jobs (30-year duration) and about 1,947 temporary construction jobs during the peak year of construction.

(6) Produce about three million dollars per year in permanent job wages (by 1987) and about 570 million dollars over the entire construction period.

(7) Allow for future retirement of older, less efficient, and less environmentally acceptable generating units.

(8) Create further diversification in the types of fuel used in the applicant's system.

(B) ADVERSE ENVIRONMENTAL EFFECTS: The proposed generating station construction and operation would have the following adverse environmental effects:

(1) The construction of the plant would result in the conversion of 454 acres of Pomfret agricultural land or 447 acres of Sheridan agricultural land to industrial usage. Total land conversion at Pomfret will be 1,054 acres or 986 acres at Sheridan.

(2) The strip mining of large quantities of low-sulfur western coal needed by the plant will increase regional environmental and socio-economic impacts in the coal mining areas of Wyoming.

(3) The transportation and unloading of large quantities of coal at the offshore facility will increase the probability of coal contamination of Lake Erie waters.

(4) The increased road and rail traffic due to transportation of construction workers and materials will have impacts on normal traffic patterns in the plant area.

(5) Construction of the offshore coal unloading facility and intake-discharge system will temporarily degrade water quality and permanently eliminate benthic habitat.

(6) The construction and operation of the plant will result in the discharge to Lake Erie and onsite streams of some chemical wastes and silt. This discharge is not expected to have significant impacts on aquatic life. None of these discharges are expected to be in excess of applicable water quality standards.

(7) Small quantities of construction materials such as steel, concrete, nonrecyclable minerals and metals will be irretrievably committed in the station's construction.

(8) Several small ponds at Pomfret or Sheridan will be filled and several streams altered by power plant construction.

(9) Heated water will be discharged from the plant to Lake Erie via a submerged multiport diffuser. No significant effect on aquatic biota is anticipated. No thermal discharge exceeding that permitted by applicable water quality regulations is expected.

(10) Large quantities of aquatic organisms entrained in the circulating water system will be killed due to thermal, chemical, and mechanical stress. The entrainment and loss of planktonic organisms is expected to have only localized effects on the aquatic ecosystem. No significant effects on total populations or species diversity in the area are anticipated. The entrainment of fish larvae will not constitute a significant impact on the lake fishery.

(11) Although there is a potential for impingement of fish at the intake system traveling screen, serious losses are not expected to occur.

(12) The operation of the natural draft cooling tower may increase the likelihood and intensity of ground fog and icing, as well as mineral salt deposition on the soil in the immediate area of the plant. Fog and ice are not expected to have any significant adverse effects beyond the site boundaries. Salt deposition is not expected to cause any serious vegetation losses. Operation of the cooling tower will probably result in slight increases in annual rainfall and snow in the local area.

(13) The annual combustion of six million tons of low-sulfur coal will produce increased regional levels of air pollution. However, no releases of air pollutants in excess of present air emission standards are postulated. Plant emissions are not expected to increase the frequency of any violations of short-term standards

and will not cause significant increases in the long-term air quality levels present as background in the area.

(14) The emission of sulfur dioxide from the plant's stack may contribute to long-term adverse effects on the area's grape crop. Although acute injury to grapes is not anticipated, the synergistic effects (greater than combined effect) of increased sulfur dioxide along with high ambient concentrations of ozone could affect productivity of the grapes.

(15) The presence of the power plant, transmission lines, and workmen will constitute an aesthetic intrusion into the present rural setting of the area. Landscaping, screening, and noise reduction methods will reduce but not eliminate adverse aesthetic impacts.

(16) Operation of the cooling water system will result in the annual consumption approximately 6.308×10^9 gallons or 8.43×10^8 cubic feet of water. Additionally, forced evaporation at the lake surface as a result of the thermal discharge will increase annual evaporation by 183,417 gallons or 24,521 cubic feet of water.

(17) Operation of the proposed facility over a 30-year period will require the consumption of 180 million tons of low sulfur western coal or 120 million tons of eastern coal. These consumable resources will be irretrievably committed by the proposed action.

4. ALTERNATIVES TO THE PROPOSED ACTION:

(A) No Action
(B) Alternatives Not Requiring the Creation of New Base Load Capacity
(C) Alternative Power Sources
(D) Alternative Sites
(E) Alternative Power Plant Designs
(F) Alternative Coals and Modes of Transportation
(G) Waste Heat Utilization
(H) Alternative Equipment Cleaning Methods
(I) Fish Return Systems
(J) Alternative Emission Control Systems

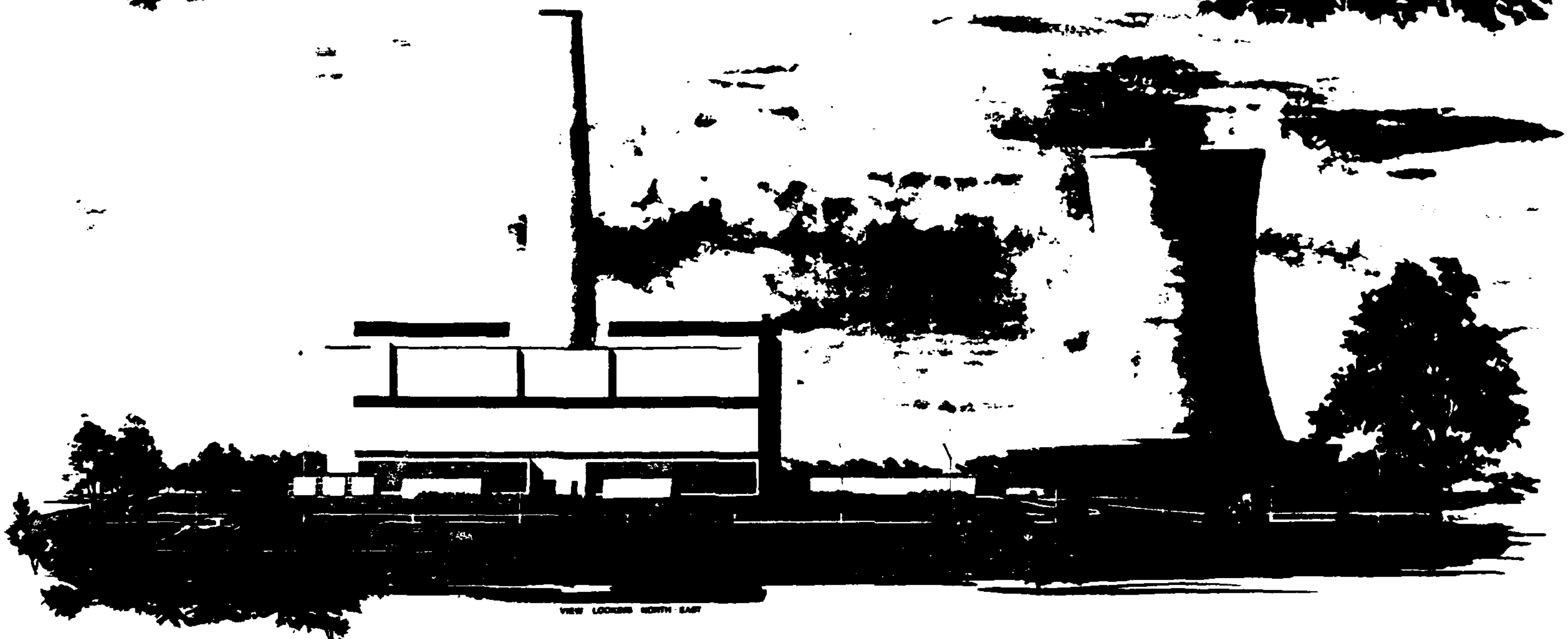
5. COMMENTS:

A. To insure full coordination, the draft environmental statement was sent to Federal, State, and local government agencies, private industries, citizen and environmental groups, and individuals for review and comment. A coordination list is presented below:

- U. S. Environmental Protection Agency

- U.S. Department of Agriculture
- U.S. Department of Interior
- U.S. Department of Housing and Urban Development
- U.S. Department of Commerce
- Water Resources Council
- Nuclear Regulatory Commission
- Federal Aviation Administration
- Federal Railroad Administration
- Advisory Council on Historic Preservation
- Federal Highway Administration
- U.S. Public Health Service
- Food and Drug Administration
- Great Lakes Commission
- Appalachian Regional Commission
- U.S. Coast Guard
- General Services Administration
- U.S. Department of Health, Education, and Welfare
- Interstate Commerce Commission
- National Endowment for the Arts
- St. Lawrence Seaway Development Corporation
- U.S. Fish and Wildlife Service
- Department of Energy
- New York State:
  - Public Service Commission
  - Department of Environmental Conservation
  - Office of General Services
  - Department of Health
  - Division of Budget
  - Office of Parks and Recreation
  - Sea Grant Program Office
  - Department of Commerce
  - Division of State
  - New York State Job Development Authority
  - New York State Agriculture Experiment Station
  - Office of State Archeologist
  - Department of Transportation
  - Department of Agriculture and Markets
  - Chautauqua County Board of Supervisors
  - Town of Portland Planning Board
  - Town of Sheridan Planning Board
  - Southern Tier Western Regional Planning-Development Board
  - Chautauqua County Planning and Development Agency
  - Dunkirk-Fredonia Inter-Municipality Planning Board
  - Town of Pomfret Planning Board
  - Silver Creek Village Planning Board
  - Mayor, City of Dunkirk
  - Supervisor, Town of Sheridan

VIEW LOOKING SOUTH EAST



VIEW LOOKING NORTH EAST

NIAGARA MOHAWK POWER CORPORATION LAKE ERIE GENERATING STATION POMFRET SITE

EBASCO SERVICES INCORPORATED

POMFRET SITE
PANORAMIC VIEW

- Supervisor, Town of Pomfret
- Administrator, Village of Fredonia
- Supervisor, Town of Dunkirk
- Supervisor, Town of Portland
- Natural Resources Defense Council
- Sierra Club
- Protest Against Pomfret
- Taylor Wine Company
- New York State Grape Production Research Fund, Inc.
- ORBA Corporation
- Niagara Mohawk Power Corporation
- New York State Power Pool Control Center

B. The following Federal, State, and local governmental agencies and interest groups commented on the Draft Environmental Impact Statement:

- U.S. Environmental Protection Agency
- Advisory Council on Historic Preservation
- U.S. Department of Agriculture - Soil Conservation Service
- U.S. Department of Commerce - National Oceanic and Atmospheric Administration
- U.S. Department of Energy
- U.S. Department of Health, Education, and Welfare - Public Health Service
- U.S. Department of Housing and Urban Development
- U.S. Department of the Interior
- U.S. Department of Transportation - Federal Aviation Administration
- U.S. Department of Transportation - U.S. Coast Guard
- U.S. Department of Transportation - Federal Highway Administration
- U.S. General Services Administration
- National Endowment for the Arts
- New York State Department of Environmental Conservation
- New York State Department of Public Services
- New York Grape Production Research Fund, Inc.
- Niagara Mohawk Power Corporation

(X) Draft EIS filed with USEPA - 17 March 1978

(X) Final EIS filed with USEPA - FEB 28 1979

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FOREWORD

On 1 November 1976 and 6 December 1976, the Niagara Mohawk Power Corporation filed applications for Department of the Army permits to perform certain work in the vicinity of Pomfret, NY, and Sheridan, NY, that is subject to regulation under Section 10 the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972. Specifically, authorization is requested to construct an offshore coal unloading facility, a coal conveyor tunnel and a cooling water intake and discharge system in Lake Erie and to perform the dredging needed to facilitate construction of these structures. The Niagara Mohawk Power Corporation noted in its applications that the work proposed is ancillary to the establishment of a new source 1,700 megawatt coal-fired steam electric generating station which is planned for either a 1,054-acre tract of land in Pomfret, NY, or a 986-acre site in Sheridan, NY.

The purpose of the facilities for which authorization is requested is to provide a reliable source of cooling water which is vital to the generation of electric power. The offshore coal unloading facility and conveyor tunnel will supply the coal to be used as fuel in the proposed power plant, and will also house elements of the cooling water system. Dredging will be used to prepare a foundation for the offshore unloading facility.

In compliance with the requirements set forth in the National Environmental Policy Act of 1969, a determination was made that the analysis of environmental impact must apply to the entire steam electric generating station and not just the work specifically regulated by the Department of the Army permit. Further, the determination found that the proposed activity would significantly affect the quality of the human environment and a decision was made that an Environmental Impact Statement (EIS) was essential for evaluation of these permit applications.

The U. S. Environmental Protection Agency (EPA) has delegated the authority to issue permits under the National Pollutant Discharge Elimination System Program (NPDES) to the State of New York. The EPA still retained its right to review such actions but no longer asserted regulatory control over such discharges as long as the State program remained consistent with established NPDES guidelines. As a result of this action, the Corps of Engineers remained as the only Federal agency exercising regulatory authority over the proposed project. Further analysis of the Federal regulatory requirements indicated that U. S. Coast Guard permits and EPA air quality permits were required but that these actions would not be initiated until well after the Corps of Engineers had completed action on their own permit application. Therefore, the Corps assumed the role of lead Federal agency during the processing of the Department of the Army permit application and the development of the Environmental Impact Statement. On 6 April 1977, the Corps of Engineers, Buffalo District, announced in its public notices Nos. 76-472-25 and 76-472-26, that it would take this lead agency responsibility.

To insure that the concerns of the regulatory agencies were fully identified and the many disciplines required to adequately assess the environmental impact of this facility were represented, an interagency technical review was established. The applicant's environmental report was evaluated and scrutinized by the U. S. Army Corps of Engineers, U. S. Environmental Protection Agency, U. S. Fish and Wildlife Service, U. S. Department of the Interior, U. S. Geological Survey, and the New York State Department of Environmental Conservation. Cultural resource reports were sent for review to the National Park Service and the New York State Office of Parks and Recreation. During this review period, agencies have identified standards which must be met by the facility to insure that the most environmentally acceptable design is achieved, and have evaluated the data collection effort by the applicant to insure that there is sufficient information to analyze the overall impact of the proposed facility on the environment. The overall net effect of the review is to assist the Corps in the development of a complete and comprehensive Environmental Impact Statement.

This Environmental Impact Statement identifies the primary and secondary impacts associated with the authorization of the Federal permits necessary to construct the proposed Lake Erie Generating Station at either Pomfret or Sheridan, NY. The decision to address both sites in a single Environmental Impact Statement was made because of the administrative proceeding for power plant siting in the State of New York. This proceeding, known as Article VIII of the New York State Public Service Law, requires that at least two viable power plant sites be identified and evaluated on a concurrent basis prior to approval of a single site by the New York State Board on Electric Generation Siting and the Environment. The Corps of Engineers is not involved in this process and, therefore, must either wait until the Board on Electric Generation Siting and the Environment approves a particular site or continue processing the Department of the Army application in anticipation of site selection. If the Corps were to wait for the Siting Board to make its decision, the time required for preparation of the EIS and completion of the public interest review would significantly delay construction and prevent the utility from meeting energy demands. Conversely, evaluation of both sites by the Corps during the same time frame utilized by the Siting Board will eliminate all such delays. Therefore, the latter course of action was selected since it represents the most practical solution to the problem. To accomplish this review, both sites will be evaluated in this Environmental Impact Statement. Each site is reviewed on the basis of its own merits and no attempt has been made to endorse one site over another.

The Environmental Impact Statement is organized so that each chapter describes the Pomfret site first and then the Sheridan site. It has been prepared by the U. S. Army Engineer District, Buffalo, in accordance with the requirements of the National Environmental Policy Act of 1969, Department of the Army regulation ER 1105-2-507 (15 April 1974) and 33 CFR 320-329 (19 July 1977), and the guidelines developed by the Council on Environmental Quality (1 August 1973).

The Environmental Impact Statement is prepared first as a draft. This document is circulated through the various Federal, State, and local agencies as well as the general public for review and comment. A final EIS is then prepared in which comments are addressed and resultant project modifications identified. The completed final EIS is then filed with the U. S. Environmental Protection Agency, Washington, DC, at which time it is again distributed to the public for review for 30 days.

The Environmental Impact Statement is not in itself a decision-making document. It will be used to assist the District Engineer in the public interest review prior to determining whether or not the Department of the Army permit, as requested, can be granted.

To insure availability during the designated review periods, copies of the EIS have been placed in the reference sections of the public libraries within the primary and secondary impact areas. Single copies of this statement may be obtained by writing the District Engineer, U. S. Army Engineer District, Buffalo, 1776 Niagara Street, Buffalo, New York 14207, ATTN: Regulatory Functions Branch, or by calling A/C 716-876-5454.

CHAPTER ONE: PROJECT DESCRIPTION

INTRODUCTION

1.001
This Environmental Impact Statement (EIS) is prepared by the U.S. Army Engineer District, Buffalo, and considers the construction, operation, and maintenance of the proposed 1,700 megawatt Lake Erie Generating Station by the Niagara Mohawk Power Corporation (applicant) at a site in Pomfret or Sheridan, New York, pursuant to the granting of necessary Federal permits.

THE APPLICANT

1.002
The Niagara Mohawk Power Corporation is a gas and electric utility organized under the laws of the State of New York. Its principal office is located at 300 Erie Boulevard West, Syracuse, New York 13202.

1.003
The applicant is a member of the New York Power Pool (NYPP) along with other major New York utilities. The members of the NYPP are engaged in coordinating the planning and operation of generation and transmission systems to achieve a balance of reliability and economy of service. The members of the New York Power Pool also jointly participate in the Northeast Power Coordinating Council which includes Ontario, New Brunswick, and New England.

THE APPLICANT'S PRODUCT, CUSTOMERS, AND SERVICE AREA

1.004
The principal business of the applicant is the generation, purchase, sale, transmission, and distribution of electricity and gas.

1.005
Niagara Mohawk, in 1974, provided services to approximately 1,278,000 customers in upstate New York covering a broad range of urban, suburban, and rural areas. During 1974, the applicant had 28,383 farm customers, 1,117,455 residential customers, 127,363 commercial customers, 3,052 industrial customers, and 1,762 other customers. In 1975, total customers grew to 1,288,000.

1.006
The applicant's service area is about 24,000 square miles and has a total population of 3,700,000 persons. The service area which is located in upstate New York is divided into a Western Division,

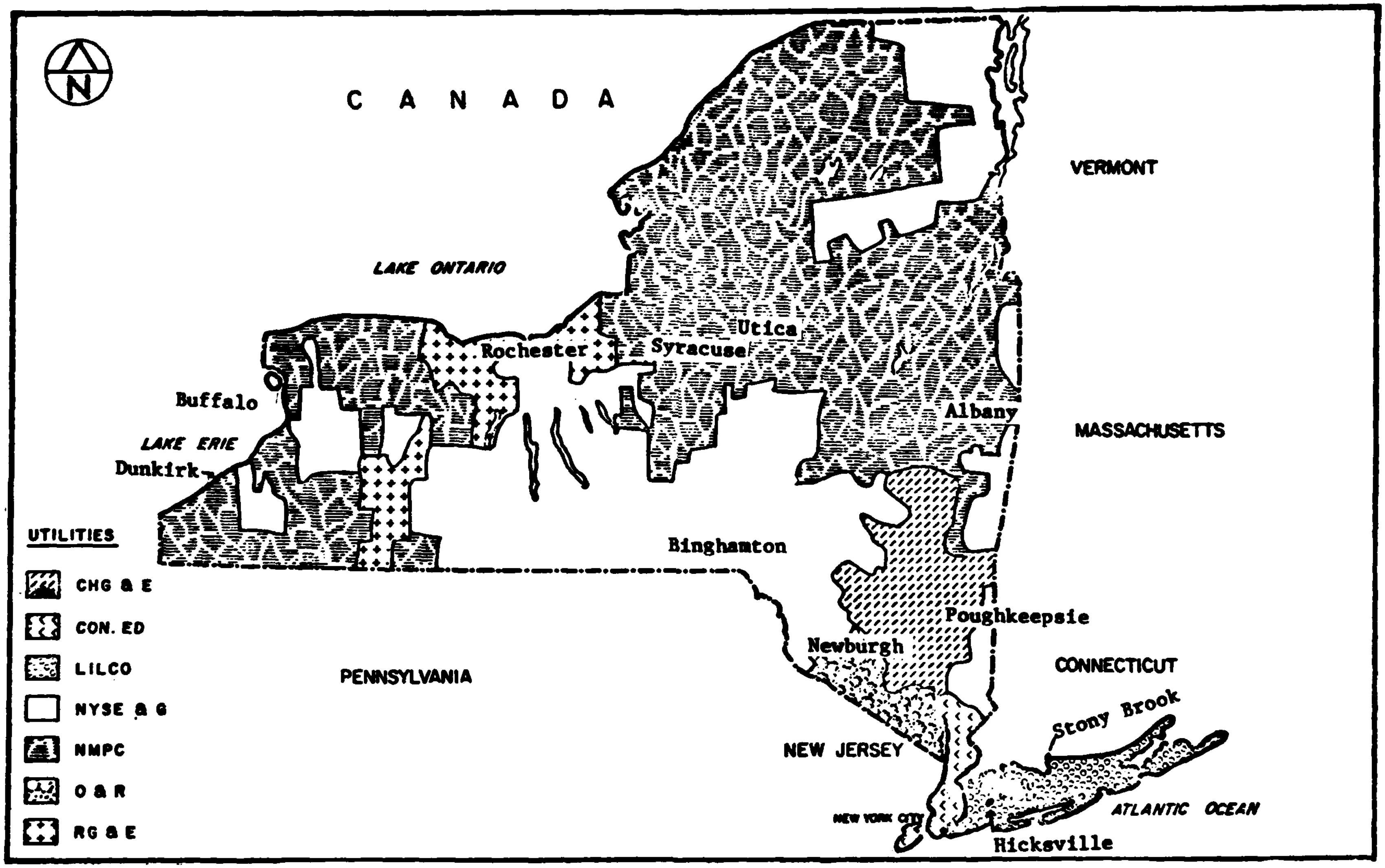
Central Division, and Eastern Division. The Western Division covers the Niagara Frontier, Metropolitan Buffalo, and the sections of New York State bordering on Lake Erie. The Central Division extends from Syracuse northward to the Canadian border and eastward to East Canada Creek in the vicinity of Little Falls, NY. The Eastern Division extends north and east from the Central Division to a point midway along the western shore of Lake Champlain. At this point, the Eastern Division sweeps southward along the Vermont and Massachusetts border and terminates at the Dutchess County line. Municipal distributing systems and islands of service territory allocated to other utility companies are interspersed throughout the Niagara Mohawk service area. Figure 1-1 is a map of New York State showing the applicant's service area in relation to other New York State utilities.

THE APPLICANT'S GENERATING AND TRANSMISSION FACILITIES

1.007
The applicant's current generating facilities include oil, coal, and nuclear base load units along with gas turbine, diesel, and hydroelectric units for peaking power. Seven of these stations have a capacity of more than 100 megawatts electric (MWe) and there are numerous stations of similar capacity. Roseton, one of Niagara Mohawk's major stations, is shared with Central Hudson Gas and Electric Corporation and is located in Central Hudson's service area. Table 1-1 demonstrates the various components of the Niagara Mohawk generating system (New York Power Pool, 1976).

1.008
The largest transmission lines now in use by the applicant are operating at 345 kilovolts (kv), although a system of 765 kv lines has been proposed for future use in the Niagara Mohawk service area. A 345 kv corridor runs from the vicinity of Utica, New York to Pleasant Valley, New York by way of Albany, and another corridor branches from this and crosses southern Rensselaer County to connect to New England. A 230 kv corridor also runs between Utica and the Schenectady-Albany areas and continues eastward across northern Rensselaer County, to again connect with New England utilities. In the applicant's Western Division, a 230 kv corridor parallels the Lake Erie shore and the Niagara River Region, tying power plants sited on those waterbodies to the Buffalo metropolitan area and to the New York State Electric and Gas Corporation system (at Gardenville) serving south-central New York.

1.009
These major transmission lines are supplemented by numerous 115 kv lines which frequently parallel the larger lines in both location and function. The 115 kv lines also bring power from Lake Ontario to



NEW YORK STATE
SERVICE AREAS OF THE MAJOR ELECTRIC UTILITIES
FIGURE 1-1

TABLE 1-1

NIAGARA MOHAWK POWER CORPORATION

EXISTING GENERATING UNITS - JAN 1, 1977
(SHEET 1 OF 2)

Station	Location	Number of Units	Station Net 4-hour Capability Rating[1] Summer	Winter	Energy Source
Huntley	Tonawanda, NY	6	830 Mwe	830 Mwe	Coal
Dunkirk	Dunkirk, NY	4	640 Mwe	640 Mwe	Coal
Oswego	Oswego, NY	5	1225 Mwe	1225 Mwe	#6 Oil
Albany[2]	Bethlehem, NY	8	541 Mwe	578 Mwe	#6, #2 Oil
Nine Mile Pt	Scriba, NY	1	610 Mwe	610 Mwe	Uranium
Roseton[3]	Newburgh, NY	2	465 Mwe	465 Mwe	#6, Oil
Rotterdam	Rotterdam, NY	8	120 Mwe	168 Mwe	#2 Oil

TABLE 1-1 (Sheet 2 Of 2)

Aggregate Additional Units					
Misc Diesel Stations	Various	8	9 Mwe	9 Mwe	Kerosene
Misc Hydroelectric Stations[4]	Various	90	649 Mwe	639 Mwe	Water

Total NMPC	Summer	Winter
Base Load Oil	2090	2090
Base Load Coal	1470	1470
Nuclear	610	610
Gas Turbines	261	346
Diesels	9	9
Conventional Hydro	649	639
	5089	5164

1. Individual station values exclude diesel units of < 3 Mwe capacity which may be located on the same site as larger units; all diesels are listed as "aggregate additional units"

2. Includes 4 base load 100 Mwe units burning #6 oil and 4 gas turbines burning #2 oil

3. Niagara Mohawk's share of Roseton Generating Units which have a total capability of 1163 Mwe.

4. Includes 76 owned hydroelectric plants, 2 leased plants, and 12 purchased plants

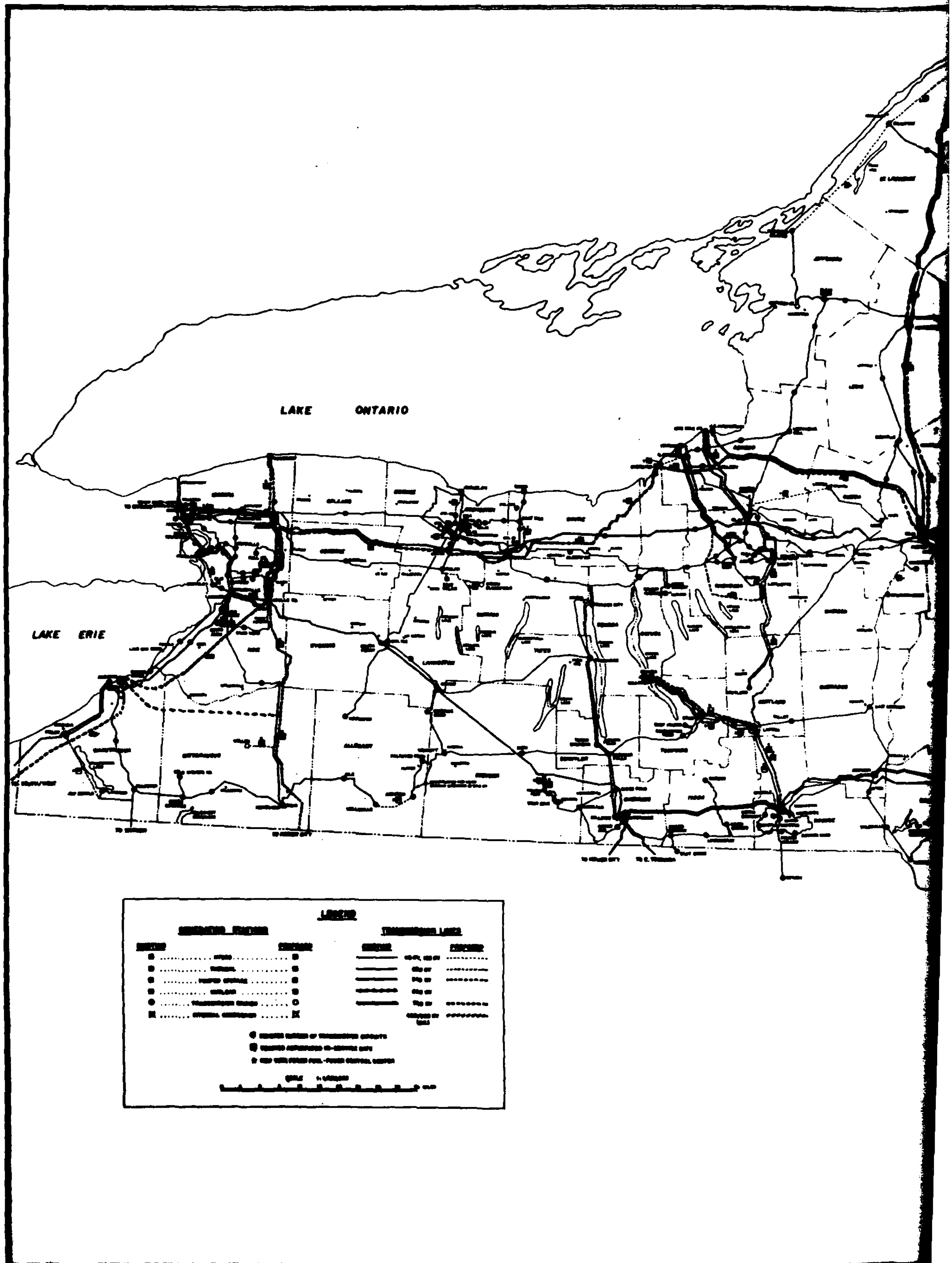
Syracuse, tie the metropolitan areas along the Utica-Albany corridor to the St. Lawrence and Lake Champlain regions, and cross the service areas of New York State Electric and Gas Corporation and Rochester Gas and Electric Corporation to connect the applicant's three service area divisions. Transmission lines of other utilities are also available to help perform these latter functions. The applicant's bulk power transmission corridors and those of neighboring systems are shown on Figure 1-2. This figure also displays the points at which the applicant's system is connected to neighboring systems.

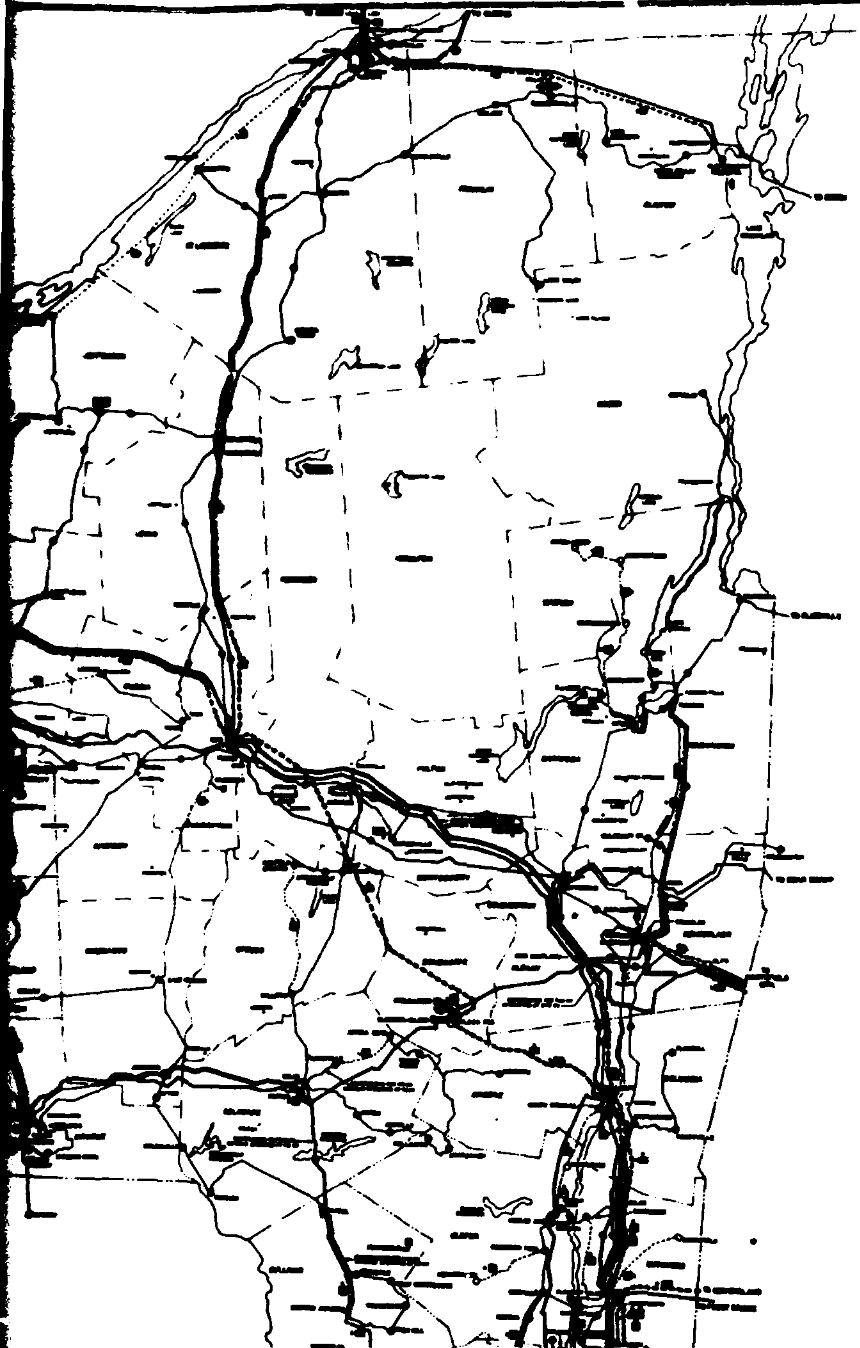
DEMAND FOR ELECTRICITY

1.010
The demand for electricity in the applicant's service area can be discussed in terms of two major demands, power demand in megawatts (MW) and energy demand in millions of kilowatt hours or gigawatt hours (GWH). The Niagara Mohawk system experiences peak demand for electricity during the winter, while peak demand for the New York Power Pool occurs in the summer. Both of these situations are expected to continue through at least the year 1990.

1.011
The annual energy requirements in the applicant's service area increased from 23,486 GWH in 1966 to 29,597 GWH in 1975. Similarly, peak day load requirements or peak power demand increased from 3,987 MW to 5,018 MW during this period of time. The total system capability of 4,408 MW in 1966 was sufficient to meet the power demand and provide a reserve of 10.6 percent. Total system capability was 6,216 MW in 1975 with an actual reserve of 23.9 percent.

1.012
The applicant's projections (1976) of peak day load requirements indicated that power demand would rise to 6,120 MW in 1980, 7,450 MW in 1986, and 8,430 MW in 1990. The corresponding projections of total system capability were predicted at 7,544 MW in 1980, 8,271 in 1986, and 8,271 in 1990. Based only on power demand, total capability, and the maintenance of a 68.3 percent load factor, the applicant's projections do not show a deficit until 1990, at which time demand exceeds capability. However, during the period up to 1990, the applicant's reserves show a steady decline. Table 1-2 shows the power demand, energy demand, capability, reserve, and load factor histories and projections of the Niagara Mohawk Power Corporation from 1968 through 1990 based on 1976 projections. Histories since 1971 and projections through 1990 are given in Table 1-3 for the New York Power Pool. Projections do not include the proposed Lake Erie Generating Station units but do include all other units proposed in the New York Power Pool 1976 Long Range Generation Plan (New York Power Pool, 1976). The capacity projections include


LAKE ONTARIO
LAKE ERIE



EXISTING AND PLANNED GENERATION
AND TRANSMISSIONS 115 KV
AND ABOVE FOR NIAGARA MOHAWK
AND INTERCONNECTED SYSTEMS

FIGURE 1-2

TABLE 1-2 APPLICANT'S WINTER CAPABILITY, POWER DEMAND, RESERVE DATA, ANNUAL ENERGY DEMAND AND LOAD FACTOR[a]

YEAR	TOTAL[b] CAPABILITY WITHOUT PLANT (MW)	PEAK LOAD REQUIREMENTS (MW)	PERCENT RESERVE WITHOUT PLANT (%)	ANNUAL[c] ENERGY REQUIREMENTS (GWH)	LOAD FACTOR BASED ON ANNUAL PEAK LOAD (%)
1966-67	4408	3987	10.6	23,486	67.2
1968-69	4514	4335	4.1	25,402	66.9
1970-71	5418	4614	17.4	27,150	67.2
1972-73	5634	4827	16.7	28,836	68.2
1974-75	6201	4870	27.3	30,426	71.3
1976-77	7499	5100	47.0	30,530	68.3
1978-79	7070	5660	24.9	33,880	68.3
1980-81	7544	6120	23.3	36,600	68.3
1982-83	8246	6540	26.1	39,130	68.3
1984-85	8332	6990	19.2	41,810	68.3
1986-87	8271	7450	11.0	44,550	68.3
1988-89	8271	7910	4.6	47,320	68.3
1990-91	8271	8430	-1.9	50,390	68.3

a - Chart compiled from data supplied by the applicant in the environmental report submitted to the Corps and is based on projections made in 1976.
b - Includes purchases, sales, and credits.
c - "Annual energy requirements" in line 1966-67 refers to calendar year 1966, next line to 1968, etc.

TABLE 1-3 NEW YORK POWER POOL CAPABILITY, POWER DEMAND, ENERGY DEMAND, RESERVE DATA, AND LOAD FACTOR, UNDER SUMMER PEAK CONDITIONS (WITHOUT PROPOSED LAKE ERIE GENERATING STATION)[a]

YEAR	TOTAL CAPABILITY[b] (MW)	PEAK LOAD REQUIREMENTS (MW)	PERCENT RESERVE (%)	ANNUAL[c] ENERGY REQUIREMENTS (GWH)	LOAD FACTOR BASED ON ANNUAL PEAK LOAD (%)
1971	22,100	18,146	21.8	100,262	63.1
1972	23,542	18,943	24.3	105,115	63.0
1974	25,441	19,589	29.9	107,992	62.9
1976-77	28,206	21,000	34.3	110,801	60.2
1978-79	31,379	22,770	37.8	121,774	61.1
1980-81	33,254	24,610	35.1	131,809	61.1
1982-83	34,002	26,600	27.8	141,999	60.9
1984-85	38,740	28,640	35.3	154,289	61.5
1986-87	40,068	30,890	29.7	166,525	61.5
1988-89	41,468	33,280	24.6	179,843	61.7
1990-91	45,832	35,700	28.4	193,461	61.9

a - Chart compiled from data supplied by the applicant in the environmental report submitted to the Corps and is based on projections made in 1976.
b - Includes purchases and sales
c - "Annual Energy Requirements" in line 1976-77 refers to calender year 1976, next line 1978, etc.

deratings expected because of increased use of cooling towers, and net purchases and sales of electricity.

1.013
Both the applicant and the New York Power Pool as a whole have experienced sharp reductions in demand growth since 1973 due primarily to higher energy prices during the oil embargo and a sluggish national economy. The applicant's annual energy requirements increased 4.7 percent between 1971 and 1972 (27,543 GWH to 28,836 GWH) and 5.6 percent between 1972 and 1973 (28,836 GWH to 30,457 GWH). From 1973 to 1974, there was a decline of 0.1 percent (30,457 GWH to 30,426 GWH). Growth between 1974 and 1975 decreased 2.7 percent. The power pool projected demands reflect the results of economic analyses made by National Economic Research Associates and indicate that demand growth will rise sharply from its post-embargo rate, but will remain below its historical pre-embargo rate. These differences in past and projected growth rates are primarily explainable in terms of changing economic factors.

1.014
The applicant's 1976 projections of future energy requirements were analyzed by use of domestic, commercial, and industrial sales models. The domestic sales model for the Niagara Mohawk system incorporates as explanatory factors: population, statewide business activity, per capita income and appliance prices. Trends in all these factors are such that they will be less supportive of energy sales growth in the future than they have been historically. Population growth, it is presumed, will continue at a low level (.06 percent annually), economic growth will proceed at a less vigorous pace (New York State Index of Business Activity rising at 2.5 percent annually or less after 1976), and real appliance prices will hold constant. It is also presumed that rising electricity prices and decreasing availability of natural gas will counteract each other's influence on domestic sales. A decrease in Niagara Mohawk's commercial energy growth rate can be traced to the assumptions that economic expansion will not be as spirited as it was in the 1960's and that real electric prices will rise modestly in the future (2.0 percent through 1985), rather than decline slightly as they did at various intervals in the historic period. Again, electricity price and natural gas availability are presumed to cancel each other out. Slowed economic activity is also the major assumption in projections of industrial demand. Total demand projections are obtained from the component demand projections and therefore contain no separate economic or demographic assumptions.

RESERVE REQUIREMENTS

1.015
The member companies of the New York Power Pool performed studies to determine installed generating capability requirements (New York Power Pool, 1976). These studies concluded that reserves in the range of 22 percent of the coincidental New York Power Pool peak load for the study period 1980-1990 should be provided, and that this level could be achieved if each member company installs a reserve of 18 percent of its annual peak load and maintains this capacity in the subsequent off-peak season. The Federal Power Commission (FPC) commenting on a recent proposal to construct a nuclear facility within the New York Power Pool indicated that many power systems plan for reserves between 15 and 25 percent of annual peak load. This agency recommended that, based on the FPC 1970 National Power Survey, electric utility planning should overall be based on maintaining an average Nationwide reserve margin of approximately 20 percent. The power pool formulated a generation expansion plan to insure a 22 percent minimum reserve based on each but not both of the following conditions:

Accelerated load growth in New York State but with all planned generation in-service as scheduled.

Planned generation in-service dates delayed but with load growth as forecast.

Table 1-2 shows Niagara Mohawk's 1976 projection which indicated that system reserve would fall below 18 percent during the winter of 1985-1986 should the proposed Lake Erie Generating Station not be constructed. On a Statewide basis a reserve of 22 percent could be maintained through 1990 without construction of the proposed facility as long as the two conditions mentioned above do not occur. Should the accelerated load growth condition occur, Statewide reserves would fall below 22 percent in 1987 without the proposed plant. A delay in planned generation in-service dates would result in Statewide reserve deficits by 1988. Table 1-4 shows the projected effect of the delayed in-service data condition and accelerated load growth factor on power pool reserves if the proposed station is not constructed (based on 1976 projections).

More recent predictions (1978 149b report) based on a lower demand than that predicted in 1976 indicate that reserves would not fall below 18 percent until 1988. Based on lowered demand projections, the applicant has rescheduled Unit No. 1 from October 1985 to November 1987 and Unit No. 2 from April 1987 to November 1989. The

Table 1-4

SUMMER STATE-WIDE POWER SUPPLY WITHOUT LAKE ERIE UNITS 1 AND 2
(data in Megawatts unless noted)

	1986	1987	1988	1989	1990
Base Case: Load growth and planned generation in-service as forecast*					
Total Capability	40,068	40,768	41,468	43,650	45,832
Peak Load	30,890	32,060	33,280	34,450	35,700
Gross Reserve	9,178	8,708	8,188	9,200	10,132
Percent Reserve	29.7	27.2	24.6	26.7	28.4
Case 1: Accelerated load growth; planned generation in-service as scheduled.*					
Total Capability	40,068	40,768	41,468	43,650	45,832
Peak Load	32,510	33,720	34,970	36,280	37,628
Gross Reserve	7,558	7,048	6,498	7,370	8,204
Percent Reserve	23.2	20.9	18.6	20.3	21.8
Reserve Surplus** (Deficiency)	406	(-370)	(-1,195)	(-612)	(-74)
Case 2: Delayed service dates; load growth as forecast.*					
Total Capability	37,751	39,768	40,468	41,168	42,088
Peak Load	30,890	32,060	33,280	34,504	35,700
Gross Reserve	6,861	7,708	7,188	6,718	6,388
Percent Reserve	22.2	24.0	21.6	19.5	17.9
Reserve Surplus** (Deficiency)	65	655	(-134)	(-861)	(-1,466)

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*See Section 72.1 of Applicant's Article VIII application and Volume 2 of the New York Power Pool's "149-b Report" (NYPP, 1976).

**"Reserve Surplus" based on 22% requirement for reserve.

peak demands projected in the 1978 149b report for the Niagara Mohawk System are as follows:

1980 (5,700 MW)	1989 (7,480 MW)
1982 (6,060 MW)	1990 (7,710 MW)
1984 (6,440 MW)	1992 (8,140 MW)
1986 (6,840 MW)	1994 (8,590 MW)
1987 (7,040 MW)	1996 (9,070 MW)
1988 (7,260 MW)	1998 (9,560 MW)

On a Statewide basis, the 1978 report shows that a 22 percent reserve could be maintained without the Lake Erie Generating Station units through 1990 based on the accelerated growth and delayed in-service date conditions.

1.016
Should the applicant's reserves fall below 18 percent, significant cost penalties could be transmitted to Niagara Mohawk's customers if supplemental power is supplied by additional use of less economical peaking units or if power is purchased from other utilities. This effect was calculated by the applicant from a series of production cost studies assuming three different conditions. The first condition assumes the proposed units are in-service as originally scheduled. Then, in successive tests, it is assumed that in-service dates are delayed by one and then by two years. The following tabulation based on the 1976 projections displays Niagara Mohawk's production cost considerations:

	Annual Production Cost (millions of dollars)			
	1986	1987	1988	1989
LEGS On-Line as Scheduled	1,013	1,115	1,117	1,267
One Year Delay	1,145	1,140	1,263	1,267
Increased Cost	132	25	146	0
Percentage Increase	13.0	2.2	13.1	0
Two Year Delay	1,182	1,289	1,293	1,429
Increased Cost	169	174	176	162
Percentage Increase	16.7	15.6	15.7	12.8

Pool-wide production cost studies were not performed since the applicant considers replacement power cost to be lower when produced from Niagara Mohawk's own sources.

1.017
The generation plan developed to meet reserve requirements involves construction of units other than the proposed Lake Erie Generating Station. Niagara Mohawk's present system was shown in Table 1-1. Proposed additional units are shown below:

Station	Unit Number	Effective Date	Type	Fuel	Expected Net Capability Addition (MW) Summer	Winter
Winter						
Oswego	6	11/79	Base load	#6 Oil	646	646
Nine Mile Point	2	11/83	Base load	Nuclear	443	443
Sterling Nuclear		05/86	Base load	Nuclear	253	253
Lake Erie	1	11/87	Base load	Coal	850	850
	2	11/89	Base load	Coal	850	850

The figures in the "expected net capability" column display only the share of power to Niagara Mohawk. The Oswego unit has a projected net capability of 850 MW. However, Rochester Gas and Electric has agreed to purchase 204 MW of this capacity. The long range generation plan formulated by the power pool includes numerous capacity additions by members other than Niagara Mohawk. Most additions through 1979 are planned to be base load oil units, and additions thereafter are mostly base load nuclear or coal.

1.018
The capability of generating systems outside the New York Power Pool (NYPP) to transfer power into the pool has been considered in developing capacity requirement criteria. The criteria assume 1000 MW from PJM (a Pennsylvania-New Jersey-Maryland pool). In each case, actions will be required on the part of the NYPP members, neighboring pools, or both to achieve and maintain these values in the early 1980's. These actions are currently planned, and have a reasonable expectancy of timely completion. It was assumed that the above systems would use reserve capacity, up to these limits, to assist the NYPP to the extent that the New York utilities were already operating under emergency conditions. The ability of voltage reductions and voluntary customer curtailments to effect reserve requirements was also considered. Costs associated with construction to meet various reserve levels were calculated and a judgement made of the proper reserve levels to provide a reasonable balance of the many factors such as service reliability, modeling uncertainties, and the cost associated with alternate reserve levels which influence this judgement. In the opinion of the NYPP, pool reserves of 22 percent and

member reserves of 18 percent provide the proper balance of these factors. This corresponds to a "loss of load probability" index value of 0.1; this index value is widely used by utility groups, including the Northeast Power Coordinating Council, as a criterion for acceptable system reliability.

NEED FOR THE PROPOSED FACILITY

1.019
The Niagara Mohawk Power Corporation proposes construction of the two unit Lake Erie Generating Station in order to meet its own system reserve requirements and its obligations to the New York Power Pool. The proposed facility would enable the applicant to maintain its system reserve above 18 percent through the year 1990, and to meet the projected power demand of the early 1990's. The proposed units would also allow the state-wide reserve to remain above 22 percent if power pool units in the planning stage incurred delayed in-service dates while load growth continued as forecast. A 23 percent statewide reserve, with the Lake Erie Generating Station, could be maintained if accelerated load growth occurred but planned generation in-service dates were met. The applicant has concluded that by providing sufficient base load generating capacity to meet its projected demand and reserve requirements, the energy needs of the electric customers can be supplied at lower cost. The applicant's original projections (1976) indicated that reserve requirements and the demand for electricity could be met by constructing two 850 MW units with a construction schedule leading to commercial operation of Unit 1 by October 1985 and Unit 2 by April 1987. More recent projections (1978) made by the applicant indicate rescheduling of the planned in-service dates of Unit 1 to Fall of 1987 and Unit 2 to Fall of 1989. The change in dates is attributable to a lowered Niagara Mohawk winter load forecast for the year 1985 of 6,640 MW. It was on the basis of this lowered forecast that the applicant rescheduled the in-service dates.

1.020
An analysis of the applicant's prospective long-term electric energy sales and capacity requirements was performed by the New York State Public Service Commission. On the basis of total energy sales (residential, commercial, and industrial), this analysis forecasts about 1,900 gigawatt hours (GWH) less sales in 1980 than those projected by the applicant in 1976. This difference expands to 2,370 GWH in 1985 and approximately 3,370 GWH by 1990. Essentially, the applicant's 1976 sales forecast is about two years ahead of the State forecast for the period 1980 through 1990. In the residential model, the Public Service Commission used a lower customer growth rate and lower growth rate in sales per customer than predicted by the applicant. This analysis also indicates that income affects the quantity

of electricity demanded by the residential customer and that greater use of heat pumps in the future by residential heating customers will result in lower demand. The State's analysis of commercial sales is based on an average annual compound growth rate of 4.5 percent for 1977 to 1990 while the applicant's model considers a rate of 5.4 percent. The applicant's and State's commercial model also differ in that the State excluded certain variables such as Gross National Product and Index of Business Activity and these were included by the applicant. The Public Service Commission (PSC) anticipates a greater productivity slowdown and lower increase in manufacturing employment than the applicant in projecting industrial sales. Additionally, the State expects the western division industrial customers to be affected by future price increases possibly resulting in lower sales. In the 1978 149b report, the applicant revised its forecasts for all sectors (residential, commercial, and industrial), and utilized a new model for commercial sales. The net effect of the changes is that the PSC's original projection and the applicant's new projections are in near agreement regarding the applicant's long-term energy and peak capacity requirements. The major difference is that the applicant now predicts energy and peak capacity requirements lower than PSC.

1.021
The significant differences between the applicant's 1976 projections and the State's capacity projections are a result of several factors. The State included in its analysis the installation of approximately 159 MW of hydro capacity by Niagara Mohawk between the years 1982 through 1994, and an additional 60 MW of capacity as a result of Central Hudson's declination of purchased power from the applicant's Roseton Plant. The seasonal capacity purchases and credits utilized in the applicant's and State's analyses also differ. These factors accounted for approximately one year of the difference between the applicant's 1976 projections and the State's projections of in-service date requirements. The remaining two years difference in the in-service date requirement for Unit 1 and three years difference for Unit 2 was attributed to the State's lower forecast of future energy sales (residential, commercial, and industrial). Some degree of flexibility exists in the scheduling of in-service dates. The State indicates that in-service date requirements could be earlier if Niagara Mohawk obtained a partner who has need for capacity earlier than Niagara Mohawk or if a change in assumptions such as a revision in the load forecast or assumed capacity additions occurred. Additionally, there is an advantage in having generating units certified far in advance of when needed since this offers flexibility to react to a need which may develop earlier than expected. Earlier in-service dates can, therefore, augment system reliability but usually at additional cost to the consumer.

1.022
In addition to analyzing the applicant's prospective long-term energy sales, the PSC also evaluated the need for the proposed facility. The PSC analysis projects Niagara Mohawk reserve capacity deficiencies of 192 MW in winter of 1988 and 830 MW in 1991. Based on these figures, PSC contended that Unit 1 would not be needed until winter of 1988 and Unit 2 by winter of 1992. On a power pool-wide basis, the State predicted a need for the facility during summer of 1990. This 1990 in-service date was premised on a commitment from other pool members to purchase some of Unit 2 capacity. Although the applicant's 1978 projections and the PSC's original projections of in-service date requirements appear to coincide, the recent history of slackening load growth on the applicant's system and Statewide system has caused PSC to have reservations regarding need. The PSC analysis indicates that although the proposed facility is probably needed at some point in the future the failure of predicted load growth to materialize in recent years and the reduction of all forecasts creates uncertainty as to when the proposed facility fits logically in the electric power system of Niagara Mohawk and the State. The PSC has therefore recommended that the Siting Board temporarily refrain from finding that the facility is needed. This recommendation indicates that certification of need could be held in abeyance until either January 1980 based on the applicant's 1978 projections or January 1981 based on the PSC projections. The ultimate decision concerning need must be made by the New York State Board on Electric Generation Siting and the Environment.

1.022a
Corps staff has reviewed the year-to-year annual energy requirements projected by the applicant in 1976 for the 1978 to 1990 period. The projected increases from year to year were compared to the energy forecasts made by the Federal Energy Administration (FEA) in the report, "1976 National Energy Outlook." The applicant's year-to-year projected increases are shown below:

Year	Energy Requirement (GWH)	Percent Change
1978	33,800	
1979	35,300	4.1
1980	36,600	3.6
1981	37,840	3.4
1982	39,130	3.4
1983	40,460	3.4
1984	41,810	3.3
1985	43,210	3.3
1986	44,550	3.1
1987	45,910	3.0
1988	47,320	3.0
1989	48,780	3.0
1990	50,390	3.3

The FEA report provides projections of future national electrical demand for the period 1974 to 1985, based on three scenarios: business-as-usual; conservation case; and the electrification case. The business as usual case accounts for conservation effects as a result of higher energy prices but not the passage of any energy conservation actions. The conservation case is a modified business-as-usual case and includes conservation actions. The electrification case accounts for substitution of coal and electricity in place of oil and gas. The business-as-usual scenario projects national electric peak demand to increase at 5.4 percent per year. Increases of 4.9 percent and 6.4 percent are projected for the conservation case and electrification case, respectively. The applicant's projections of year to year growth in energy requirements appear to coincide with the lower rates projected by FEA, the results of the economic and demographic conditions in Niagara Mohawk's service territory being different from, and slightly lower, than the national level.

The tabulation shown below summarizes a comparison of past growth rates of energy requirements for Niagara Mohawk's service area, for New York State, and for the nation as a whole. The benchmark for the comparative forecasts is the set of three scenarios prepared by the Federal Energy Administration in 1976.

Comparison of Energy Growth

U.S. - Niagara Mohawk - New York State

Annual Growth Rates - Energy Requirements

Years	U.S.	Niagara Mohawk (NMP)	Ratio NMP/US	NYS	Ratio NYS/US
	(Percent)	(Percent)		(Percent)	
1965-1976	6.2	3.2	.52	4.0	.65
1965-1973	7.5	4.1	.55	5.4	.72

The annual electrical energy requirements for the applicant's service area in the future can be estimated by applying the recent FEA national projected growth rates of electrical energy consumption to the most recent annual Niagara Mohawk data. The growth rate of the electrical energy requirement in the applicant's service areas from 1965 to 1976 has been about 3.2 percent per year as indicated in the above table. However, for the years 1965 through 1973 (prior to the oil embargo) the growth rate was almost 4.1 percent per year. For the nation, the growth rates of electrical energy sales were 7.5 percent per year for 1965-1973 and 6.2 percent per year for 1965-1976.

Thus, the Niagara Mohawk area to national ratio of electricity use was about 0.55 prior to the oil embargo and about 0.52 including the recessionary years following the oil embargo. Applying these factors to the FEA national projections of electricity consumption, Niagara Mohawk's annual growth rate could be 2.5 percent to 2.7 percent with conservation, 2.8 to 3.0 percent for business-as-usual, and 3.3 to 3.5 percent for an electrification case as shown below.

Projected Energy Growth, 1974-1985

		NMP		NYS	
FEA Case*	U.S.*	Low Ratio 1/	High Ratio 2/	Low Ratio 1/	High Ratio 2/
	(Percent)	(Percent)	(Percent)	(Percent)	(Percent)
Conservation	4.9	2.5	2.7	3.2	3.5
Business as Usual	5.4	2.8	3.0	3.5	3.9
Electrification	6.4	3.3	3.5	4.2	4.6
(NMP/NYS Forecast)		2.3		2.5	

*Federal Energy Administration, 1976 National Energy Outlook, U. S. Government Printing Office, February 1976.

1/ The ratio derived from the years 1965-1976.
2/ The ratio derived from the years 1965-1973.

The following tabulation outlines a comparison of the historical trends of key economic and demographic variable for Niagara Mohawk and for the U.S. Forecasts of those variables for Niagara Mohawk's territory are also presented.

Comparison - Economic and Demographic Trends

U.S. - Niagara Mohawk

U.S.

	Population	Per Capita Income	Personal Income	Nonagricultural Employment
	(Percent)	(Percent)	(Percent)	(Percent)
1960-1970	1.3	3.2	4.5	2.2
1970-1976	0.9	2.2	3.0	1.9

Niagara Mohawk

	Population	Per Capita Income	Personal Income	Nonagricultural Employment
	(Percent)	(Percent)	(Percent)	(Percent)
1960-1970	0.5	2.9	3.4	1.7
1970-1977	0.0	0.7	0.7	0.8
1977-1990	0.4	2.4	2.8	0.7

Identifying differences in projected growth of major economic variables such as population and income allows for a comparative projection of the expected rate of growth in demand for electricity within a service area relative to the national rate of growth. A gross comparison between the applicant's service areas and the nation as a whole are presented in the table above and the table shown below. Population is projected in Niagara Mohawk's service area to grow at a rate which is less than that of the national rate during the period 1977 to 1990. Total personal income is anticipated to grow at a rate slightly less than the national rate. The per capita income rate of growth will be slightly less than the U.S. growth rate. Overall, the applicant's service area will probably experience somewhat lower growth rates than the nation as a whole.

Annual Percentage Rates of Change
United States Population, Employment, Personal Income
and Earnings, Actual and Projected, Selected Periods 1962-1990

Item	1970-1980	1980-1985	1970-1990
Population	0.92	0.96	0.96
Per capita income	3.06	2.82	2.47
Total employment	1.94	1.02	1.02
Total personal income	4.19	3.57	3.57

SOURCE: Estimated from 1972-E OBERS Projections, Vol. 1, Table 1, p. 38

POMFRET SITE

THE SITE

1.023
The proposed site consists of approximately 1,054 acres (427 hectares) of land located near the Lake Erie shore in the towns of Portland and Pomfret, Chautauqua County, NY. Figure 1-3 displays the proposed plant layout at Pomfret. Parcels of land for use if the Lake Erie Generating Station were to be expanded to four units are also delineated, although no such expansion is anticipated in the 1977-1991 Statewide generation plan. The location of the site in respect to the surrounding political subdivisions and New York State is shown on Figure 1-4. In its present state, the site consists of 45 percent (470 acres, 190 hectares) active agricultural land including crops, vineyards and pastures; 18 percent (186 acres, 75 hectares) inactive agricultural land; 26 percent (268 acres, 108 hectares) forest land; and 3 percent (35 acres, 14 hectares) heavy manufacturing land used to dispose of Dunkirk Steam Station ash. The site also includes small amounts of land devoted to communications and transportation facilities (52 acres, 21 hectares) and several other types, each composing less than 0.5 percent of the site).

1.024
The Pomfret Zoning Ordinance classifies the Pomfret site as being primarily within a Light Industry District (I-1) and within an Agricultural and Resort District (AG). A very small section of the site east of the drive-in theater is located within a Rural Residence District (RR).

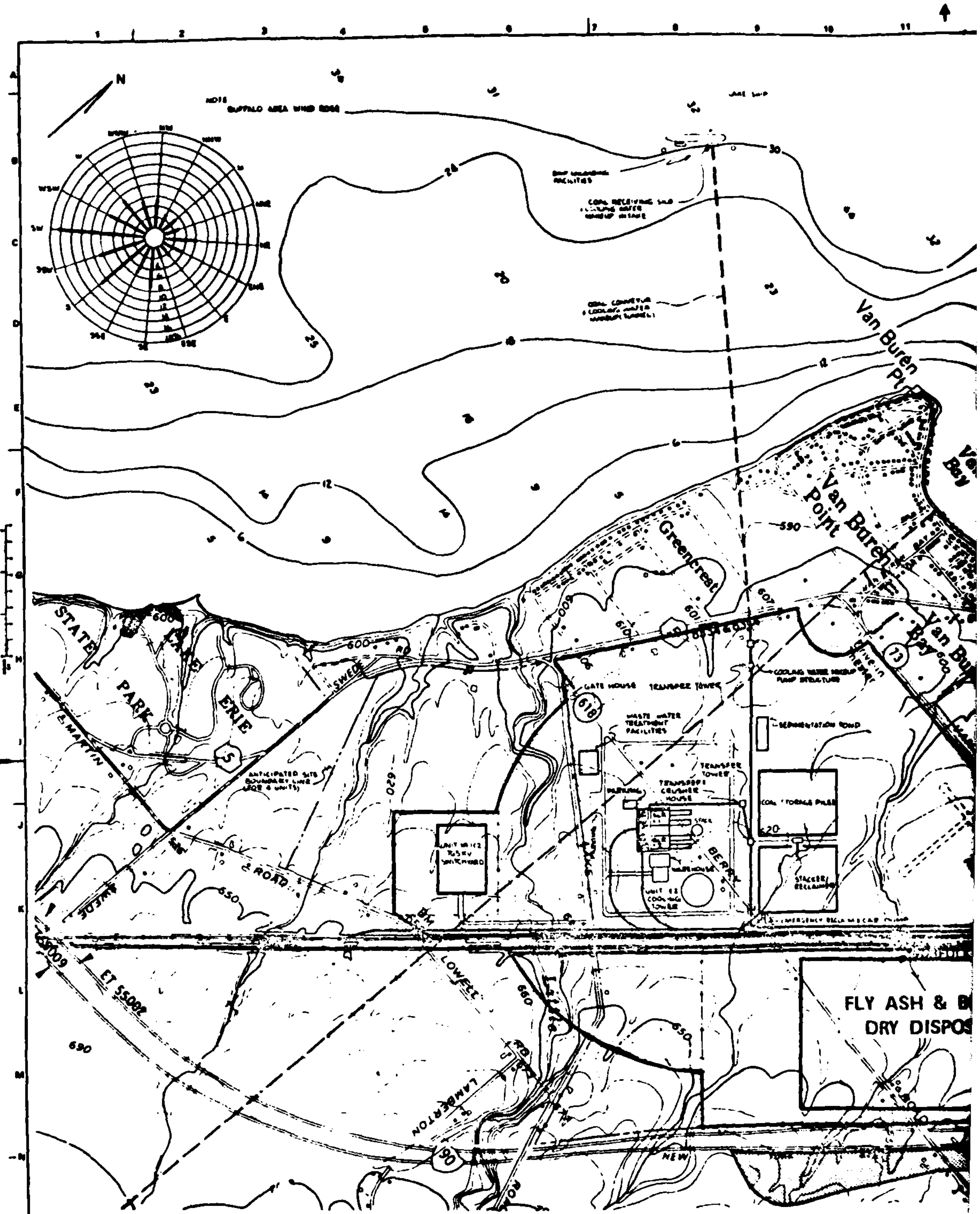
THE ELECTRIC GENERATION STATION

Proposed Plant Operation

1.025
The facility is intended to be base loaded, operating at or near 100 percent facility capacity when in service. Base load units are defined as those operating continuously at a constant output with little hourly or daily fluctuation. The proposed Lake Erie Generating Station is designed as a two unit facility, each unit rated at 850 megawatts (W), with an anticipated life of 30 years for each unit.

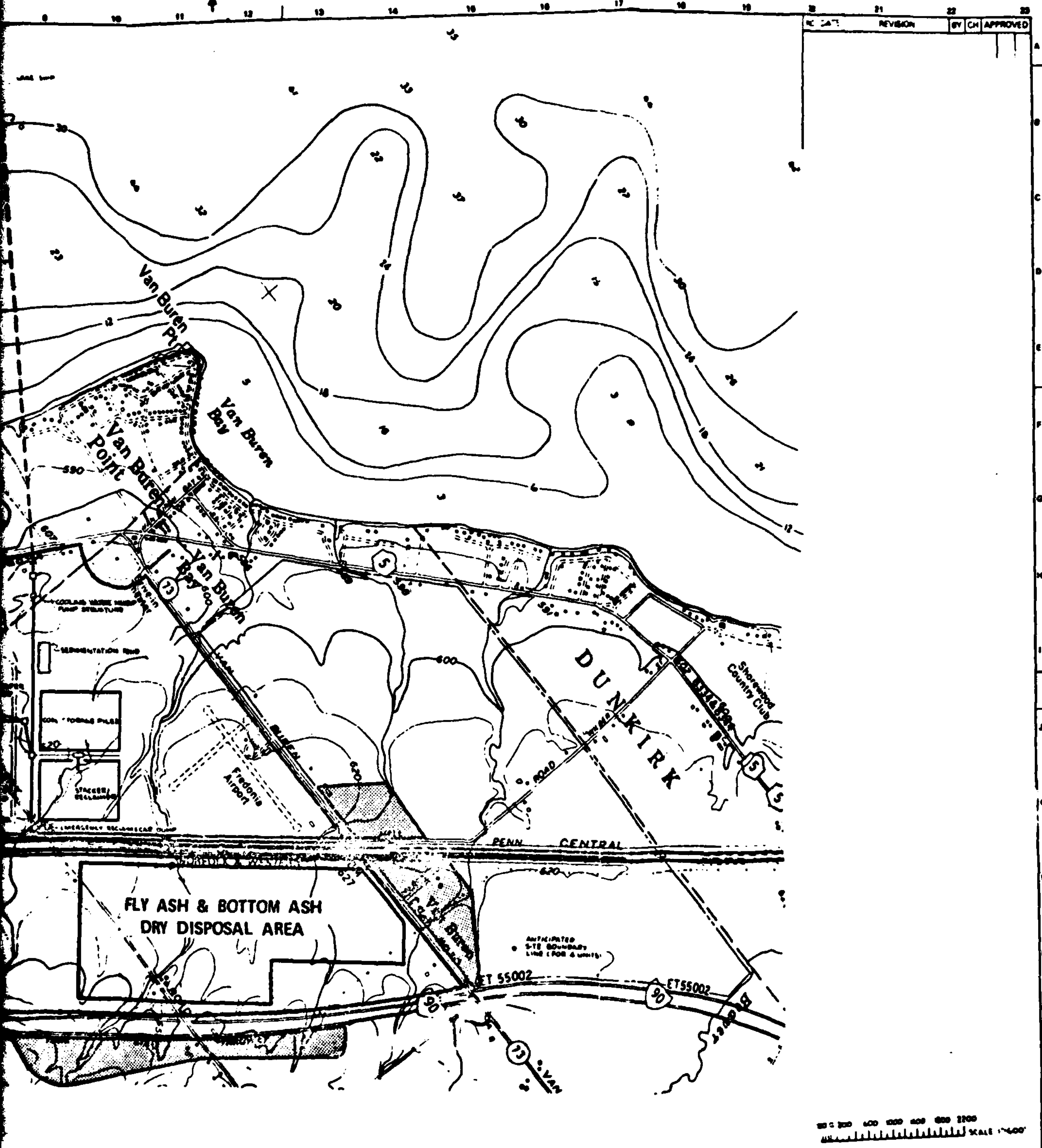
Main Boilers and Turbines

1.026
The proposed electric generation system consists of two high pressure coal-fired steam generators (boilers), two steam turbine-driven electric generators, and associated equipment. The steam generators will be designed to burn low sulfur western coal. Inherent in this design



NOTE: THE SHADED AREA REPRESENTS ADDITIONAL LAND REQUIRED FOR THE DRY ASH HANDLING SYSTEM.

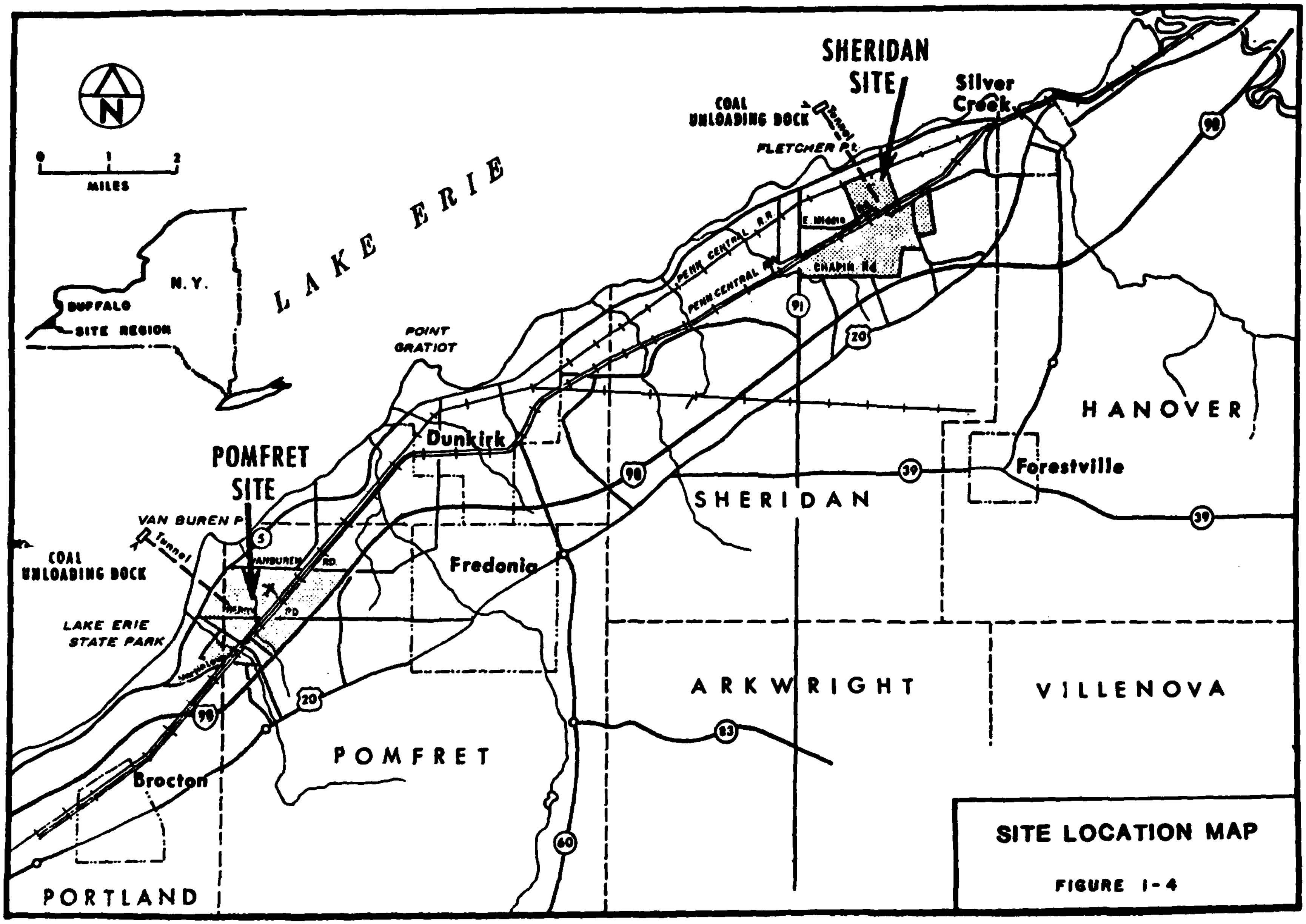
R
O
W



RECOMMENDED SITE BOUNDARY BASED
ON NOISE IMPACT CONSIDERATIONS
WESTERN 0.5 % SULFUR COAL

PLOT PLAN
POMFFET SITE

FIGURE 1-3



SITE LOCATION MAP

FIGURE 1-4

is the capability to burn a wide range of coals. Both units will operate at supercritical steam pressure. Each unit will have an approximate continuous rated capacity of 5,800,000 pounds per hour of steam at the established industry standard superheater outlet conditions of 3,685 pounds per square inch gauge pressure (psig)/1005°F. Single stage reheat will be provided to 1005°F (540°C). The main turbines will be 3,600 rpm (revolutions per minute) tandem compound four flow (TC 4F)units operating at a throttle pressure of 3,500 psig, and 1000°F throttle temperature with 1000°F reheat. Both turbines will have a gross nameplate rating of 850 MW at 3.0 inches of mercury backpressure and zero percent makeup. Each turbine will be connected to a 3,600 rpm hydrogen and water cooled generator.

Auxiliary Boiler

1.027
An auxiliary boiler fired with No. 2 oil will be installed at the proposed generating station and will supply up to 200,000 pounds per hour (lb/hr) of steam for startup of the two generating units. The boiler will operate during startup of the first operational unit and will operate during startup of either unit if the other unit is not capable of supplying steam for start-up. Although the auxiliary boiler has not yet been designed, the operating characteristics have been assumed. The boiler will have an estimated firing rate of 12,820 lbs/hr of No. 2 oil with a heating value of approximately 19,500 British thermal units per pound (Btu/lb). The boiler capacity is assumed to be 250 million BTU per hour and the sulfur content of the fuel is estimated at 0.78 percent. It is anticipated that the auxiliary boiler will operate for approximately 40 hours once per month and the flue gas will be emitted from a 260-foot or 79.3 meter (79.3 m) stack.

FUEL

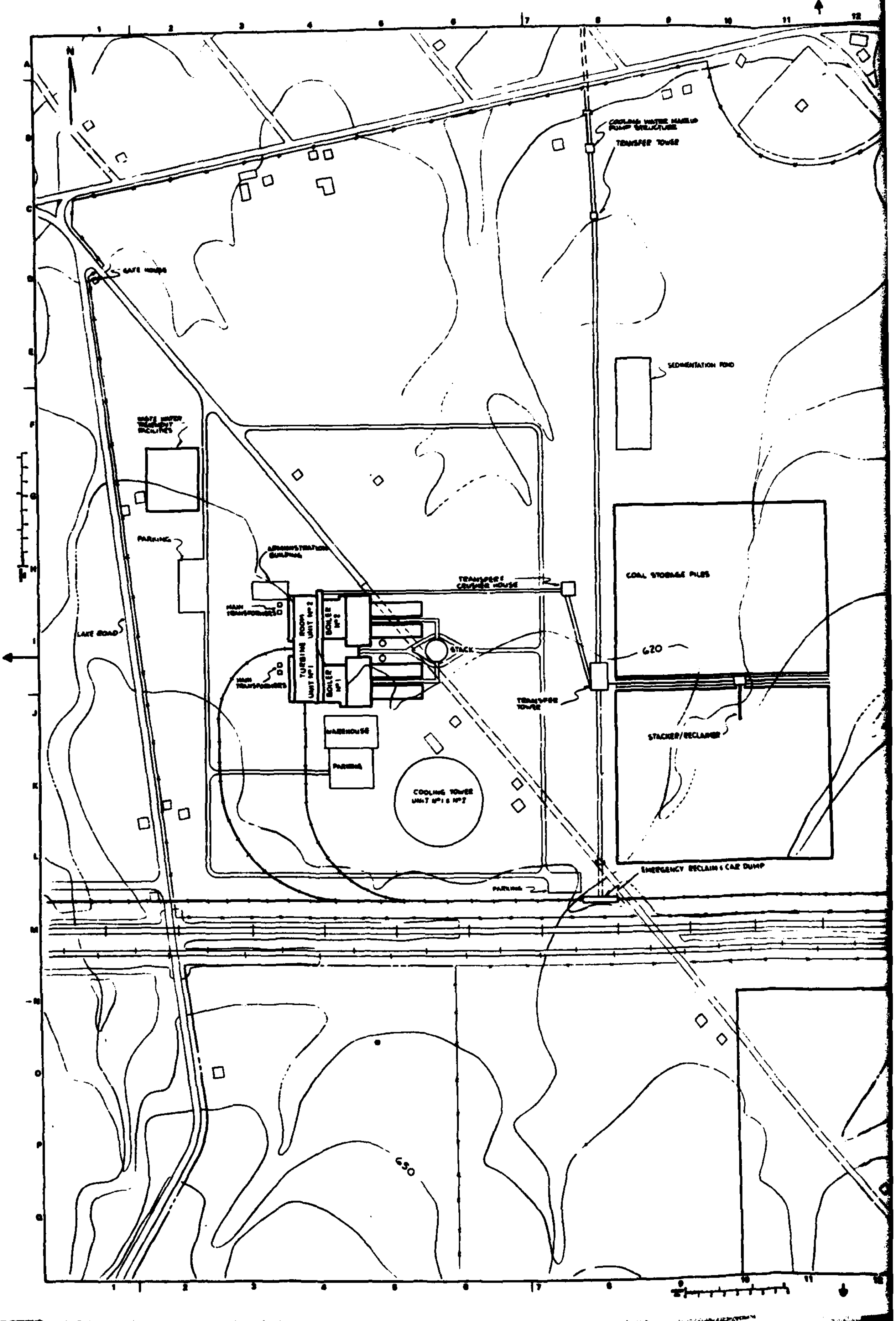
1.028
The Niagara Mohawk Power Corporation has concluded that the proposed Lake Erie Generating Station should utilize coal-fired electric generating units. The reasons for selecting coal are discussed in Chapter Six entitled "Alternatives." Based upon the decision that the station should be coal-fired, Niagara Mohawk performed an initial coal study and then contracted for the performance of more detailed studies concerning the availability, economics, and environmental impacts associated with alternative coal sources. These studies resulted in the selection of western subbituminous coal for use at the proposed Lake Erie site. Conceptual design is based on typical ultimate coal analyses of 0.5 percent sulfur, 0.7 percent nitrogen and 8 percent ash, with a heating value of 8,300 Btu per pound. About 16,000 tons (14,512 metric tons) per day will be required. Based on the 8,300 Btu per pound heating value, 0.5 percent sulfur content

represents the maximum content that will comply with present emission standards without installation of a flue gas desulfurization system (scrubbers). The applicant performed additional fuel supply studies in July 1977 based on United States Senate and House of Representatives bills. These bills ultimately led to the passage of the Clean Air Act Amendments of 1977. Based on this new study, the applicant has tentatively concluded that subbituminous western coal appears to be the preferred fuel for the proposed facility even with the installation of flue gas desulfurization systems. However, a a coat of slightly higher sulfur content would probably be used. It is recognized that during the life of the facility, it may be necessary or desirable to change to a different fuel. With that realization in mind, the plant will be designed with the capability to burn various coals with minimum plant modification. The proposed fuel based on conceptual design without scrubbers will have maximum sulfur content of 0.60 lbs per million Btu (MBtu), a maximum nitrogen content of 0.84 lb per MBtu, and a maximum ash content of 9.64 lbs per MBtu.

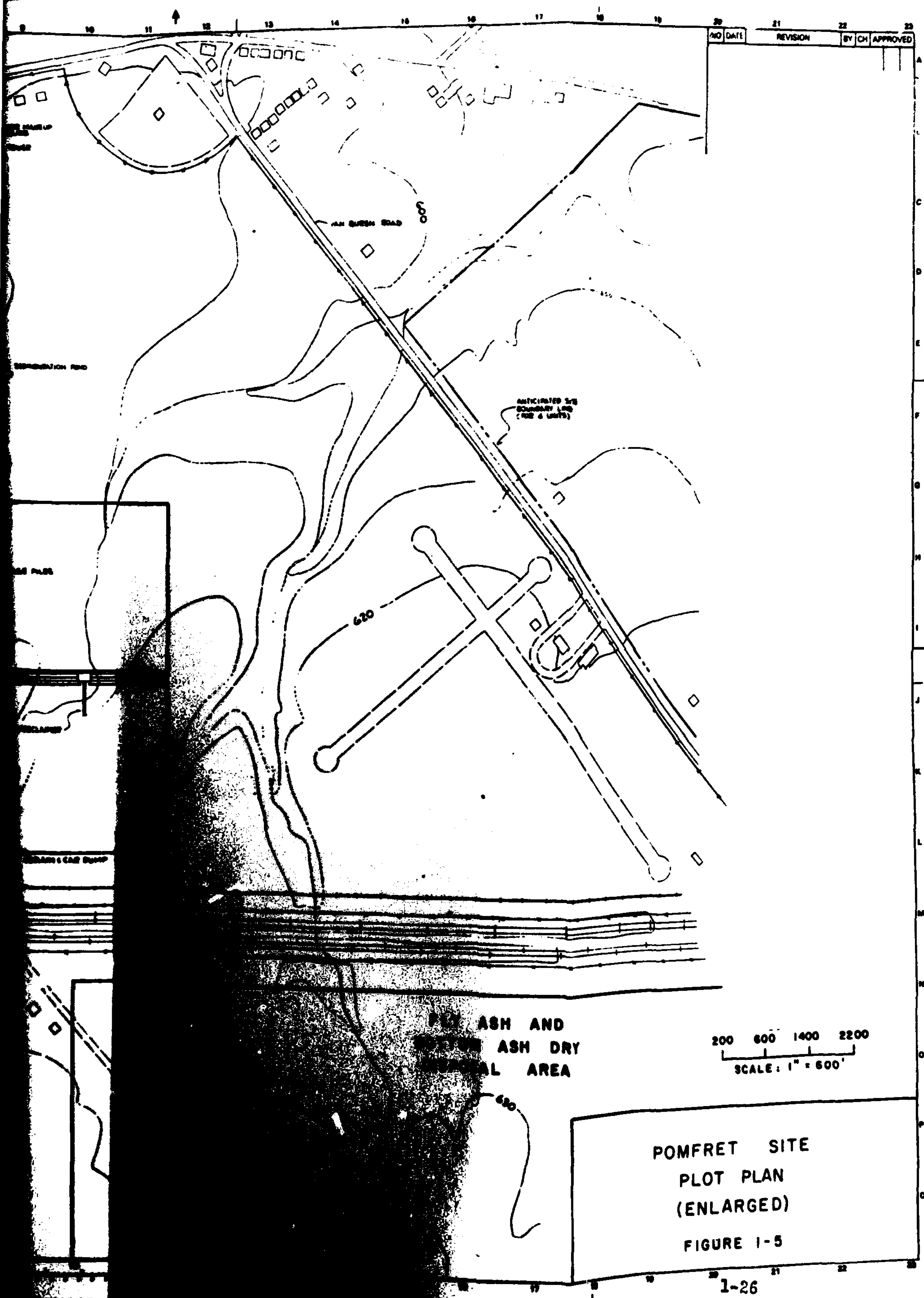
PRINCIPAL STATION STRUCTURES

1.029
The facilities described in this section represent reasonable conceptual engineering practice. During final plant design, these concepts and associated systems will be optimized based on detailed engineering, economic, and environmental considerations. All construction procedures will be in compliance with applicable Occupational Safety and Health Administration (OSHA) regulations.

Main Power Generating Station
1.030
The arrangement of the proposed facility is shown on the plot plan, Figure 1-3. An enlargement of the plant island is portrayed on Figure 1-5. The main buildings, housing the turbine-generator, coal silo, and boilers, are 250 feet tall (76.2 m) and approximately 400 feet (122 m) by 600 feet (183 m) in plan. The plant building will employ a masonry or brick wall around the periphery of the unit. Portions of the interior side of this wall will be lined with "Soundblox", a sound-absorbing structural cement block. The advantages of this acoustical material are good, low-frequency sound absorption characteristics and superior sound transmission loss. From the top of the masonry wall to the building roof the walls will consist of acoustical metal panels. Acoustic air louvers will be provided in the building walls to reduce the noise and permit air flow for the air handling system. Roof construction is rigid insulation and built-up roofing supported on galvanized metal deck attached to purlins. The purpose of the structure is to provide adequate and safe structural support for the enclosed equipment and to protect the



N
COOLING WATER MAKEUP PUMP STRUCTURE
TRANSFER TOWER
GATE HOUSE
SEDIMENTATION POND
WASTE WATER TREATMENT FACILITIES
PARKING
ADMINISTRATION BUILDING
TRANSFER & CRUSHER HOUSE
COAL STORAGE PILES
MAIN TRANSFORMERS
TURBINE ROOM UNIT No 2
BOILER No 2
TURBINE ROOM UNIT No 1
BOILER No 1
STACK
620
LAKE ROAD
TRANSFER TOWER
STACKER/RECLAIMER
WAREHOUSE
PARKING
COOLING TOWER UNIT No 1 & No 2
EMERGENCY RECLAIM & CAR DUMP
PARKING
650



POMFRET SITE
PLOT PLAN
(ENLARGED)

FIGURE 1-5

enclosed equipment and the station personnel from the elements of the weather. The proposed color scheme of the main building is off-white with medium blue accent.

Electrostatic Precipitators

1.031

Four electrostatic precipitators will be located on the east side of the main building complex. Each precipitator is 130 feet (39.6 m) in length, 40 feet (12.2 m) in width, and 36 feet (10.9 m) in height.

Exhaust Stacks

1.032

For exhausting flue gas from the boilers, a single stack is proposed containing separate liners for each unit. The combined stack will have an overall height of 750 feet (228 m) with an outlet shell diameter of 62 feet (18.9 m). Both stack liners will have an exit diameter of 28.4 feet (8.6 m). At conceptual design point load the stack exit velocity will be 90 ft/sec with stack temperature at 260°F (127°C). The exhaust stack will be constructed of natural finish reinforced concrete with steel liners. The Federal Aviation Administration (FAA) has issued a "no hazard" determination for the stack at Pomfret conditioned upon marking and lighting as prescribed in FAA Advisory Circular No. 70/7460/1D. An appropriate type of lighting for cooling towers or stacks over 500 feet consists of flashing high intensity white obstruction lights. The stack and tower at the Pomfret Site are to be marked and lighted in accordance with standards. A self-supporting steel stack is furnished for the auxiliary boiler and extends about 10 feet (3.04 m) above the height of the adjacent boiler building. Auxiliary boiler stack height is 260 feet (79 m).

Switchyards

1.033

There will be one switchyard at Pomfret located southwest of the generating facility, across Little Canadaway Creek (see Figure 1-3). The switchyard dimensions are approximately 750 feet (229 m) by 1,000 feet (305 m) and it will permanently occupy 17.2 acres (6.9 hectares) of land. The main power transformer low voltage windings are rated at 24 kilovolts (kv), and the high voltage windings are rated at 765 kv. Switchyard surfacing consists of crushed stone placed on the compacted subgrade which is sloped for drainage. The applicant will not use transformer oil containing polychlorinated biphenyl (PCB's). If for some reason the use of transformers containing PCB's would occur, the applicant would comply with USEPA rules requiring special marking and disposal methods for PCB's.

Meteorological Sampling Stations

1.034

A 345-foot (105 m) tower equipped with meteorological sensors was installed to collect meteorological statistics representative of the Pomfret site. This Rohn Model 65 tower is located at Van Buren Road. The meteorological parameters that will be measured during station operation are wind speed and direction, air dry bulb and dew point temperatures, visibility, solar radiation, and rainfall.

Other Principal Station Structures

1.035

Other major features of the proposed Lake Erie Generating Station at Pomfret include: the cooling and process water systems; a single natural draft cooling tower; land-based fuel handling and storage facilities; offshore fuel handling structures; ash disposal facilities; erosion control structures; access roads; transmission facilities; and a waste-water treatment building. These systems and facilities are discussed in the remaining paragraphs of this chapter along with descriptions of the anticipated plant discharges and atmospheric emissions.

LAND BASED FUEL HANDLING AND STORAGE

Railroad Spur

1.036

The railroad network which traverses the proposed Pomfret site provides a second delivery system auxiliary to the primary transport system which is an offshore docking facility in Lake Erie. Railroad sidings will be constructed from the Penn Central Railroad tracks to the site itself. There will be a total of 15,500 feet (4,724 m) of permanent rail which will occupy 7.1 acres (2.8 hectares) of land based on a width of 20 feet (6.1 m). Spur site preparation will be accomplished by mechanically clearing vegetation from the right-of-way. The new track is laid in a bed of crushed stone ballast on compacted subgrade. The track layout and details conform to the requirements of the existing railroad system. The crossings of creeks are on fill with properly sized culverts carrying the water under the embankment. The location of the railroad spur is illustrated on Figure 1-3. The primary purpose of the railroad spur is to provide transportation for heavy equipment and facility components. An additional 5,050 feet (1,540 m) of temporary railroad will be installed for use during construction periods only. This temporary spur will occupy about 2.3 acres or 0.93 hectares of land.

Secondary Coal Transfer System

1.037

A railroad bottom car dumper pit is included with the initial installation as a backup system for the lake ship coal unloading facility. The pit also serves as an emergency reclaim to be used if the primary reclaim system fails. Should overland rail shipment of coal be required because of emergency situations, about 600 unit train deliveries per year would be required. This is based on 10,000 ton (9,070 metric tons) unit trains and would average approximately 1.65 unit trains per day.

Fuel Storage Facilities

1.038
A coal pile storage area approximately 2,000 feet (610 m) by 1,300 feet (396 m) will be located east of the main building as shown on Figure 1-3. The maximum height of the coal piles is 50 feet (15.2 m) and the permanent land requirement for coal storage is 59.6 acres (24.1 hectares). A stacker reclaimer will be located near the centerline of the coal pile area. The coal pile is sized to store both a 60-day full load supply of coal on a long-term basis, and also a 120-day full load supply of coal used during the four month period that Lake Erie is normally closed to shipping. Thus, the total coal storage on-site will range between three million tons (2.7 million metric tons) at the end of the shipping season in December and one million tons (0.9 million metric tons) at the start of the shipping season in April.

1.039
Fugitive coal dust emissions from the coal pile will be minimized by using a water spray system with an added binding agent if required. All coal conveyors and transfer points will be enclosed to prevent coal dust emissions during the coal handling system operation.

1.040
Because a limited amount of direct rainfall may seep through the coal and potentially enter the groundwater, the base of the coal pile will be specially prepared. At present, it is planned to reconstitute and compact the upper 2-3 feet (0.6 to 0.9 m) of soil beneath the coal pile to provide a sealed base. Additionally, the base will be sloped to allow for efficient drainage and collection of coal pile filtrate for conveyance to the coal pile runoff pond discussed below. Prior to any construction, the applicant intends to perform site specific testing of the coal pile area to establish a precise base preparation plan which will assure protection of groundwater resources. Consideration will also be given during the site specific testing and demonstration program to the use of soil conditioners, clay liners, etc.

Coal Pile Runoff and Drainage System

1.041
In order to minimize the amount of dust generation and rainfall contact with coal pile contents, a crustating agent will probably be used as a coal pile surface sealer. This crusting material, after drying, is not water soluble. Runoff from the coal pile will be directed to collection ditches and conveyed to a lined pond designed to handle both coal pile runoff and runoff from the ash disposal facility. This settling pond has a volume of 10.5 million gallons, (3.97×10^7 liters), sufficient capacity to provide a 24-hour detention time for the one-in-100 year, 24-hour rainfall event on the ash

and coal pile plus reserve capacity to control surge. Based on a runoff coefficient of 1.0, this one-in-100-year event would produce about 6.9 million gallons ($2.61x10^7$ liters) of coal pile runoff. Runoff will be treated in the lined pond to adjust the pH to within the 6-9 range and to reduce suspended solids to less than 50 milligrams per liter (mg/l). After treatment the water will be discharged to the cooling tower blowdown line at a rate not to exceed 650 gallons per minute (gpm) or 2460 liters per minute (l/m). A schematic of the discharge handling system is shown on Figure 1-6. Stipulations of the applicant's draft discharge permit (Section 402 of the Federal Water Pollution Control Act Amendments) would limit the settling pond discharge to a total of one million gallons per day (3.78 million liters per day) or 10 percent of the actual cooling tower blowdown at the time of discharge, whichever is less.

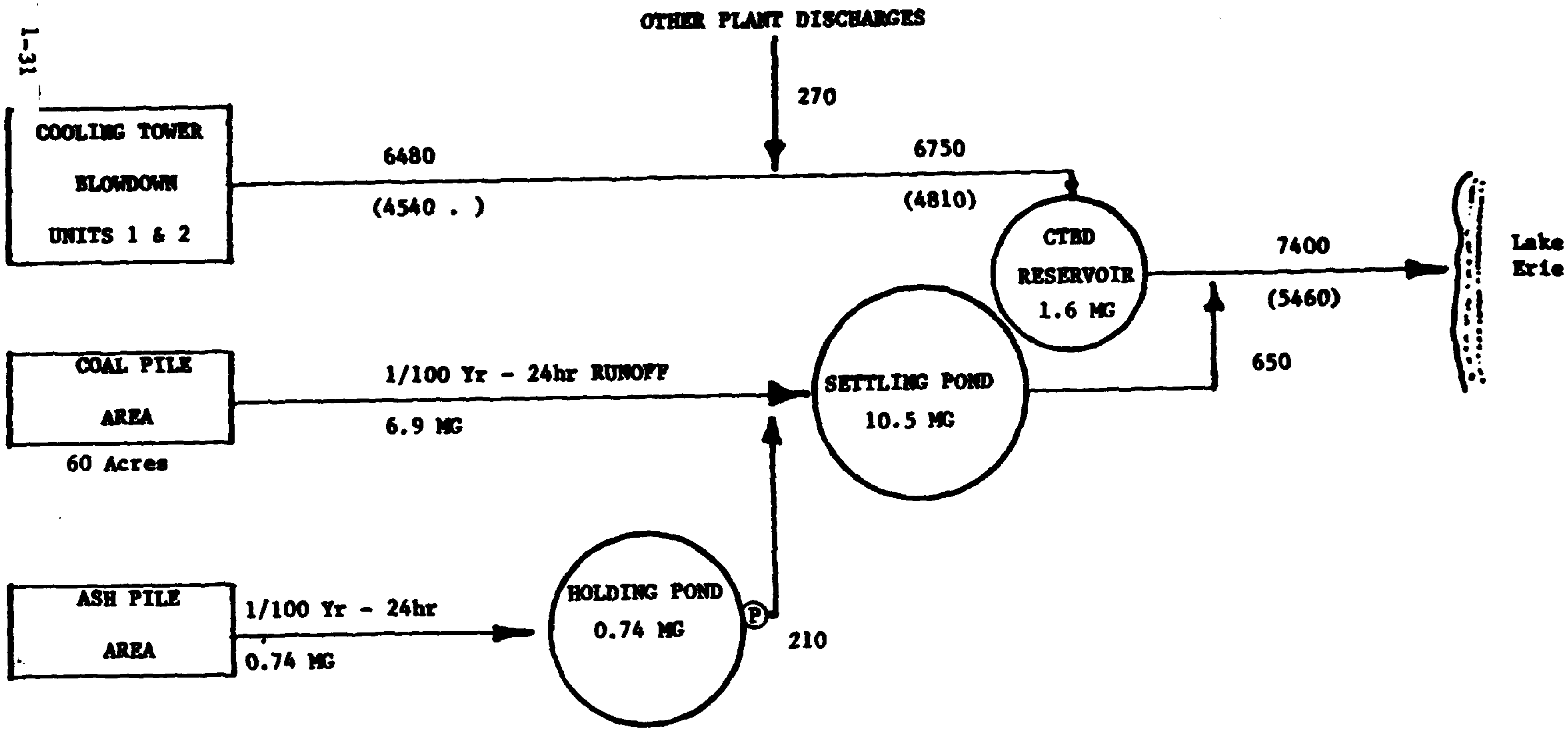
OFFSHORE COAL HANDLING FACILITIES

1.042
The primary coal handling system is a docking and unloading facility in Lake Erie located approximately 4,650 feet (1,417 m) offshore from the proposed Pomfret site. Offshore structures comprising this facility include three 50-foot (15.2 m) diameter mooring dolphins and two 80-foot by 80-foot (24.4 m by 24.4 m) breasting dolphins (docks). These structures will be placed in a linear arrangement and have their orientation in the direction of the prevailing wind. Spacing between the breasting dolphins is 520 feet (158.5 m), spacing between an outboard mooring dolphin and its adjacent breasting dolphin is 320 feet (97.5 m) and spacing between the inboard mooring dolphin and each breasting dolphin is 260 feet (79.2 m). At the docking face of the breasting dolphin, the minimum water depth is 32 feet (9.75 m). A coal receiving silo constructed in one of the breasting dolphins will connect to a 23-foot (7.0 m) diameter coal conveyor tunnel located about 80 feet (24.4 m) below the lake bottom in the vicinity of the dolphin and 50 feet (15.2 m) below the lake bottom near the shoreline. The coal silo is 30 feet (9.1 m) in diameter and extends about 75 feet (22.8 m) above the low water datum elevation of Lake Erie which is 568.6 feet based on International Great Lakes Datum, 1955 (IGLD, 1955). Figure 1-3 shows the location of the offshore unloading facility and Figure 1-7 illustrates design features. The offshore unloading facility and conveyor tunnel incorporate certain elements of the cooling water system. Structures associated with the cooling system are discussed later in this chapter.

1.043
The unloading facility is designed as a concrete gravity structure to resist the forces of heavy seas or moving ice. To protect the concrete silo from possible damage due to ship collision, a circular space between it and the breasting dolphin is designed to allow

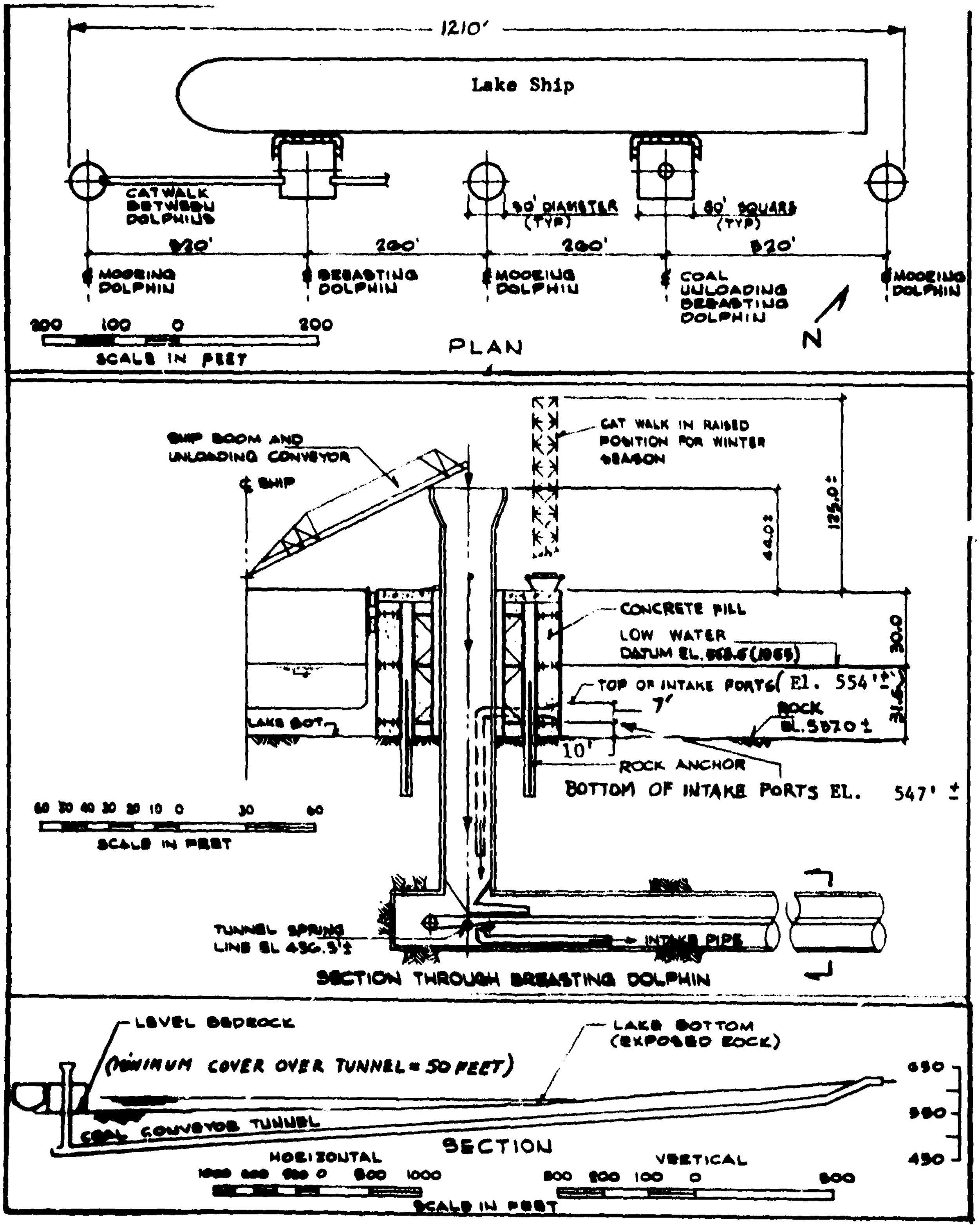
SCHEMATIC OF THE DISCHARGE SYSTEM

FIGURE 1-6



Notes:
1. All flows in GPM unless otherwise indicated
2. Maximum flows based on 100% plant capacity factors
3. Flows in parenthesis are based on 70% plant capacity factor
4. Rainfall events shown and volumes are for hydraulic control. Concentration analysis based on 1/10 yr-24 hr rainfall event

Figure 1-6



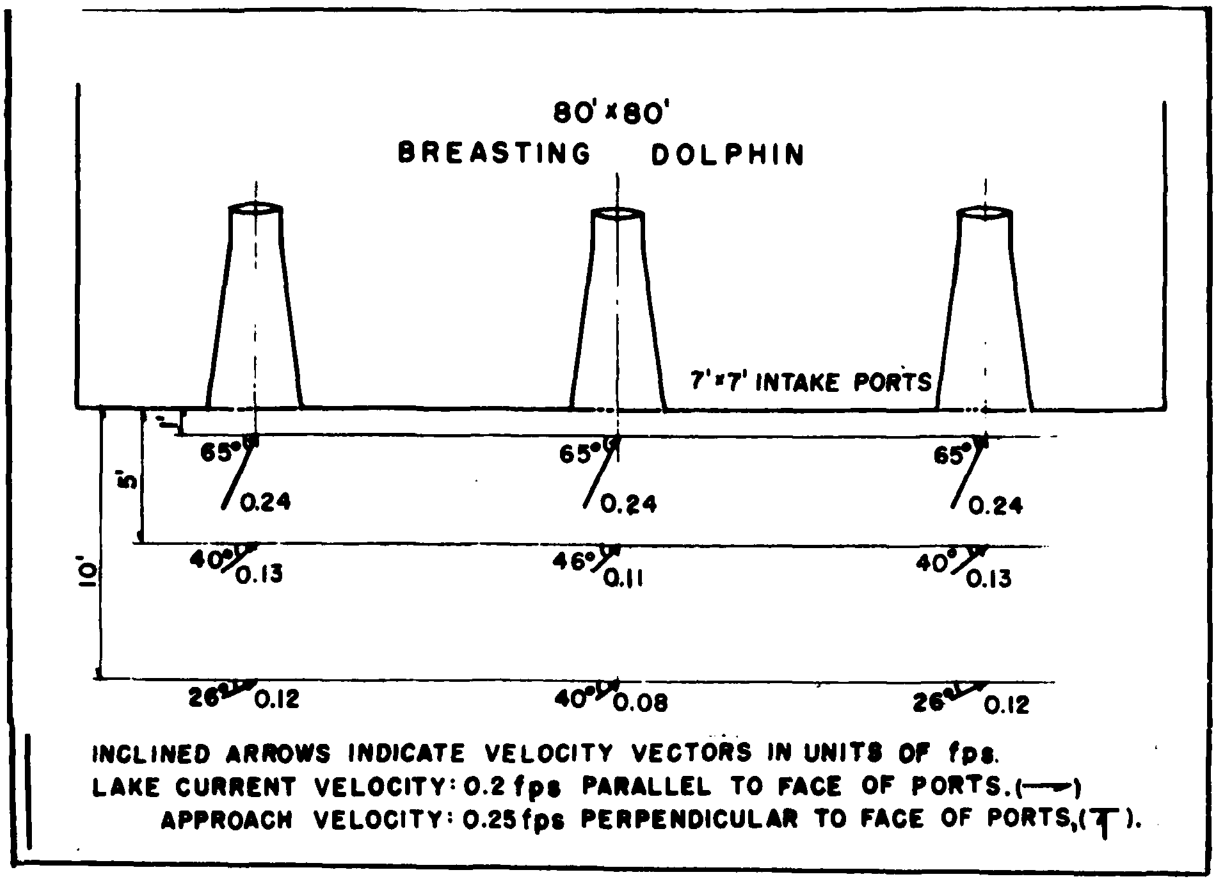
Datum:
International Great Lakes Datum, 1955
Low Water Datum Elevation 568.6 Ft.

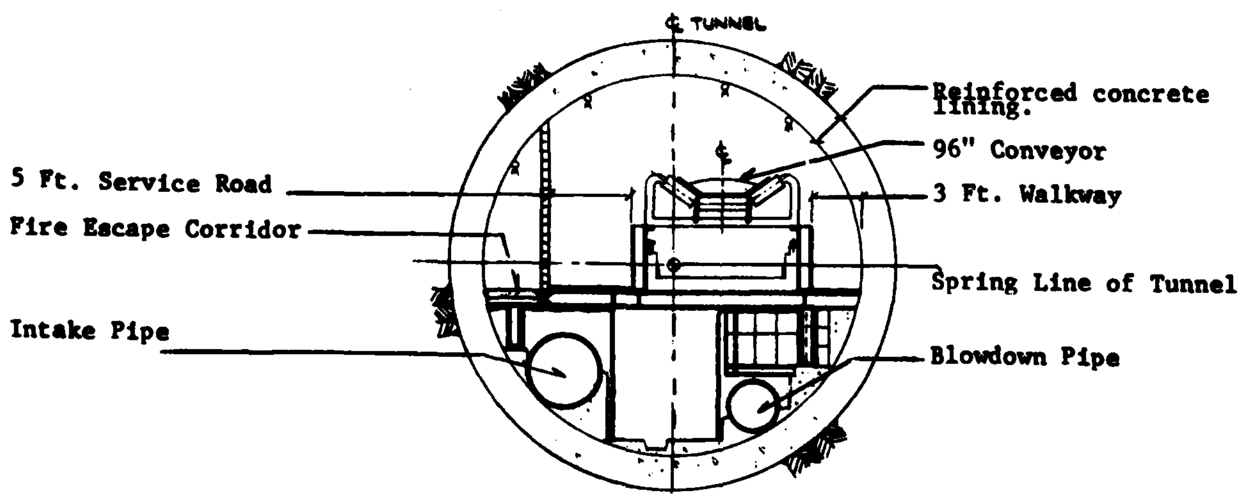
Figure 1-7
Offshore Unloading Facility

deflection of the breasting dolphin without transmitting any impact load to the silo. A fendering system is also provided. The silo consists of a reinforced concrete cylinder extending to the lake bottom and is constructed after the breasting dolphin is in place.

1.044
The site where the breasting and mooring dolphins' foundations rest is prepared by removing all loose materials and unsound rock from the bedrock by dredging. Steel forms for the dolphins are prefabricated onshore and floated out to the prepared site. The forms are sunk to bedrock and filled with a tremie concrete. The volume of concrete estimated to be required for the unloading facility is 39,000 cubic yards (29,835 cubic meters). The construction of the coal unloading and conveyor tunnel will be accomplished by tunneling under the lake bed. Tunneling may be done by any of three methods: conventional tunneling, tunnel boring machine, or tunnel mining machine. The tunnel will be concrete-lined with a 23-foot (7.0 m) finished inside diameter (either of circular or horse shoe type) and will have a total length of about 6,900 feet (2103 m). Approximately 4,650 feet (1417 m) of tunnel is located beneath the lake bottom and 2,250 feet (686 m) extends from the shoreline to the proposed point of emergence at the Pomfret site. Liner thickness will be determined after evaluating tunneling method and rock quality, but will not be less than 8 inches or 20.3 centimeters (cm). Rock bolting will be utilized as required to support the tunnel before it is lined. Tunneling will proceed from the site out into Lake Erie. Construction will take about 30 months based on a 5-day work week. Tunneling wastes will be transported dry to the onshore end of the tunnel from the tunneling face. No tunneling wastes will be removed from the lake end of the tunnel. The applicant anticipates minimum amounts of dewatering during tunnel construction. Any water encountered would be from seepage and could be controlled by sealing the tunnel with grout. A cross-sectional view of the tunnel is shown on Figure 1-8.

1.045
The lake freighters which will deliver the coal are self-unloading and convey the coal at a rate of 6,000 to 10,000 tons per hour (5,442 to 9,070 metric tons/hr). The coal passes from the coal silo, through a vertical shaft, to the conveyor tunnel by gravity. Conveyors within the unloading tunnel will deliver the coal to the storage area on-site at a comparable rate of between 6,000 to 10,000 tons per hour. Delivery via lake transport can presently be accomplished only during eight months of the year because the lake freezes between December and March. Annual shipments of western coal will amount to approximately 6 million tons (5.4 million metric tons) per year. Assuming a 60,000 to 65,000 ton capacity per ship, this requires about 100 trips or three deliveries every week during the





Section Through Conveyor Tunnel

Figure 1-8
Intake Ports and Coal Conveyor Tunnel

240-day shipping season. Each ship can unload in approximately six to 10 hours.

1.046
The following precautions will be utilized to prevent coal dusting or spillage during the transfer of coal from lake vessel to the unloading silo:

- The coal will be sprayed on the lake ship prior to transfer using a wet spray system maintained on the vessel.

- It will be specified that the lake ship's unloading boom be entirely enclosed preventing dust or coal spills to the lake. As a secondary precaution, a flexible tarpaulin may be provided between the unloading facility and the ship.

- To prevent silo overflow, in the event of a coal tunnel conveyor breakdown, a conveyor monitoring system will be installed to insure shutdown of the ship unloading system.

1.047
The offshore facility will have a communication system installed between the shore and unloading dolphin and within the tunnel. An automatic water sprinkler system is installed above the entire length of the conveyor belt. The sprinkler system will be a dry pipe and preaction type, activated by rate of rise, fixed temperature heat detection devices. This system is also equipped with inter-locking devices to stop the conveyor belt drive and give both an audible and visual warning if a fire occurs. Dry chemical or carbon dioxide type fire extinguishers are provided at 300 feet (91.4 m) intervals. A fire standpipe system is provided for the entire length of the walkway portion of the tunnel with hose valve connections located at each point of entry of the conveyor section. Each connection is provided with 150 feet (45.7 m) of woven-jacket rubber-lined hose and a spray nozzle. The entrance to the tunnel on the land side is located within the plant property line and is enclosed within a six-foot (1.8 m) standard chain link fence. A removable cover on top protects the coal unloading silo when not in use. Other access openings to the tunnel are provided with watertight steel doors. The tunnel is drained toward the silo end, through an open trough, to sump pits. Collected drainage water from leakage, washing operations, or from the deluge fire protection system, is pumped back to the plant site and discharged to the coal pile drainage system for treatment.

1.048
The approaching ship lane to the proposed offshore unloading facility will be marked with lighted buoys. The type and characteristics of the warning devices to be placed on the offshore facility itself will

be in accordance with U. S. Coast Guard specifications. Typical warning devices include beacon lighting, warning bells, and radar reflectors. The U.S. Coast Guard will prescribe aids for the protection of marine navigation under Title 33 Code of Federal Regulations (CFR) 66.01-35. Actual marking requirements for the offshore facility will be in accordance with specifications for marking deep water ports although the facility itself is not considered a deep water port. A fog signal with a range of at least one-half mile will be required by the Coast Guard for the protection of commercial and pleasure vessels during periods of low visibility.

1.049
Department of the Army permits are required for construction of the mooring dolphins, breasting dolphins, and coal conveyor tunnel and for the placement of the lighted buoys. A grant of easement from the State of New York Office of General Services is required for the underwater land occupied by the proposed offshore facility.

DREDGING

1.050
Dredging in Lake Erie will be required for the construction of the discharge diffuser, breasting dolphins, and mooring dolphins. It is anticipated that dredging will be performed on an intermittent basis with each operation lasting less than one month. Typically, bucket dredges are used for this activity. Dredging will require the removal or disturbance of approximately 900 cubic yards (698 cubic meters) of material. This material consists of 130 cubic yards (99.5 cubic meters) of fine sediment and 770 cubic yards (589 cubic meters) of weathered rock, mostly shale and siltstone. Approximately 20,000 square feet (1,860 square meters) of lake bottom will be dredged. Nearly all of this area will be in the vicinity of the coal unloading facility. It is anticipated that in the vicinity of the discharge diffuser, only two to four hundred square feet (18.6 to 37.2 square meters) of lake bottom would be affected. No dredging is expected to be required for the maintenance of these facilities. Dredged material will be transported by barge to shore and deposited on the proposed Pomfret site. As presently conceived, all dredged material would be moved by barge to the Dunkirk Harbor and moored at a dock. The material would be transferred to trucks using either a clam shell or front end loader or other appropriate means depending on the actual characteristics of the dredged material. Provisions will be made to prevent any material from spilling into the water during the transfer operation. This could be in the form of a tarpaulin if a clam shell is used, or a solid ramp if a front end loader is used. By following these procedures, no measurable adverse impacts should occur at the shoreline transfer point. Sediment sample analysis and

particle size distribution are described in Chapter Two of this statement. In addition to dredged material, tunnel construction waste disposal will also be onsite. This excavation waste, estimated at 199,000 cubic yards (152,235 cubic meters), will be used for plant grade development. Any material not used for this purpose will be incorporated into a berm between the ash disposal area and the New York State Thruway. Department of the Army permits are required for dredging and tunneling operations.

COOLING WATER SYSTEMS

1.051
The cooling water system proposed for the Lake Erie Generating Station consists of a closed-cycle natural draft evaporative cooling tower, the makeup water intake system and onshore pump structure, a cooling tower blowdown basin, and a submerged multiport discharge diffuser. These structures are associated with operation of the turbine-generator (previously discussed) and the steam condenser.

Condenser
1.052
Steam produced in the boiler under conditions of high temperature and pressure is used to drive the turbine-generator thereby generating electrical energy. The steam cycle is a closed-loop operation in that the spent low energy steam from the turbine is liquified in the condenser and then eventually returned to the boiler for reconversion to steam. The condenser for each unit will be a multipressure, two shell, single pass condenser. The total tube length for both shells will be 72 feet (21.9 m) resulting in a heat transfer surface of 470,200 square feet (43,729 sq. meters). At valves-wide-open, 5 percent over pressue unit operating steam conditions, the condenser heat duty will be $4.3x10^9$ Btu per hour with an average backpressure of 4 inches (10 cm) mercury and a total temperature rise of 26.9°F (14.9°C). The circulating water flow will be 316,000 gpm or $1.20x10^6$ liters/min (l/m) for each unit. The condenser conceptual design data are presented in appendix Table A-1. A diagram of the steam cycle and cooling water system is contained in appendix Figure A-1. In the condenser, large quantities of cooling water are required to effect the phase change of spent steam to water. This process is accomplished by the transfer of the steam's heat energy across the condenser tubing and subsequent absorption by the cooling water. To meet thermal effluent criteria and maximize reuse of the cooling water, an additional heat sink is required to lower the elevated temperatures of the condenser cooling water. This will be accomplished by utilizing a natural draft cooling tower which will dissipate the absorbed heat primarily by evaporation to the atmosphere.

Cooling Tower

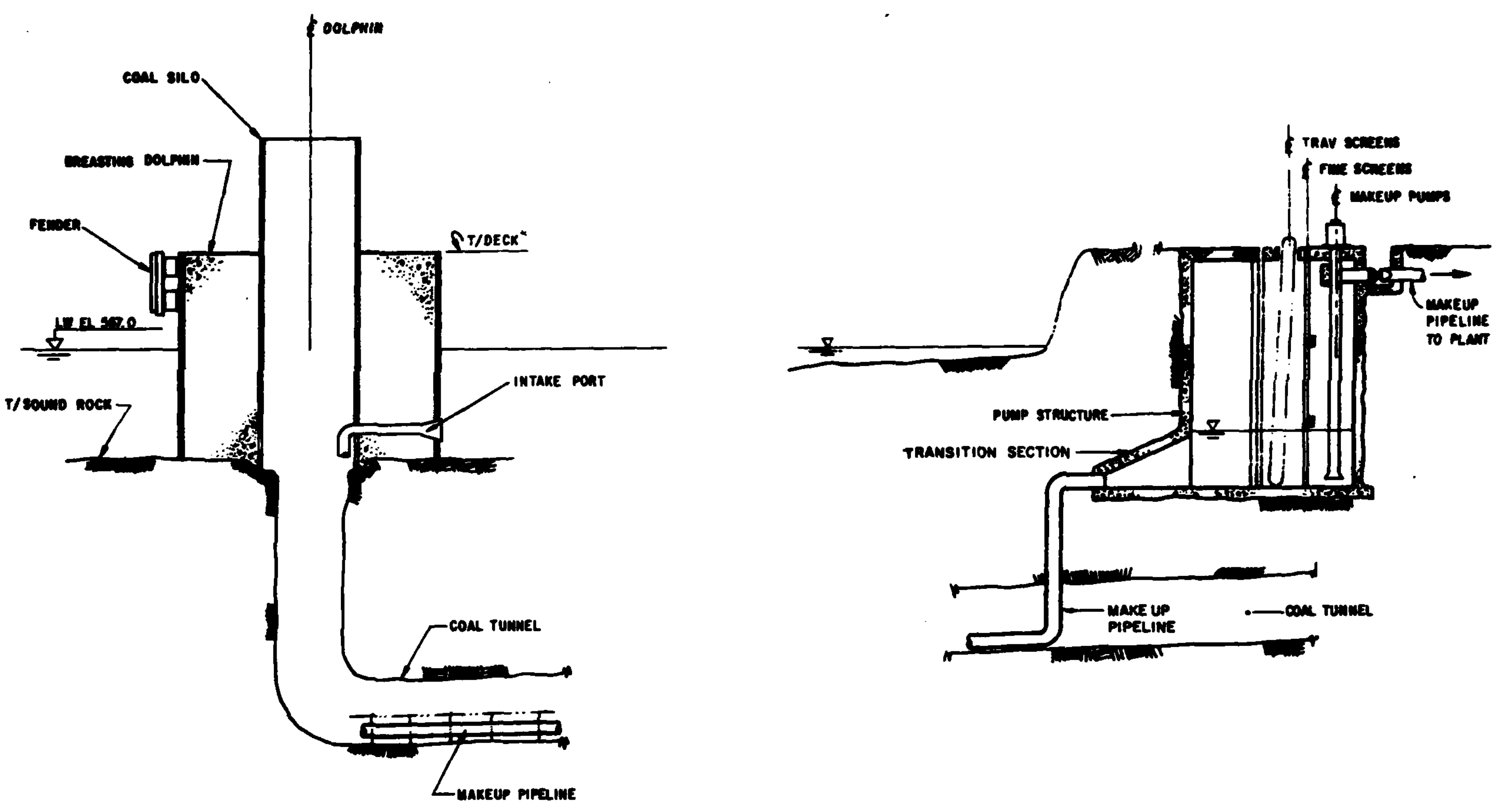
1.053

The cooling water system proposed for the generating station is a closed-cycle natural draft evaporative cooling tower system. A single hyperbolic cooling tower will be designed to handle the heat load from both 850 MW units, which at maximum station output, will be $8.6x10^9$ Btu per hour. Subject to final system optimization, the preliminary design parameters for the cooling tower are a 20°F (-6.7°C) approach to a 74°F (23°C) design wet bulb temperature and a cooling range of 26°F (14.4°C). The total circulating water flow through the tower, consisting of the combined condenser and auxiliary cooling water flows from both units, will be 662,000 gpm ($2.50x10^6$ l/m). The hyperbolic tower will be of reinforced concrete design with a height of 500 feet (152 m) and a base diameter of 480 feet (146 m). The cooling tower conceptual design data are presented in appendix Table A-2. This recirculating condenser cooling water system will require continuous makeup water to replenish water losses through evaporation and drift in the cooling tower and to replace blowdown required to maintain certain water quality parameters within desirable limits. Optimization of these makeup and blowdown quantities from both engineering and environmental viewpoints results in a recirculating condenser cooling water system operating at three cycles of concentration. Makeup water requirements for both units will be provided by submerged intake ports located in one of the offshore breasting dolphins of the coal unloading facility. The intake structure will meet the needs of both the natural draft cooling tower (makeup water) and miscellaneous station water systems.

Makeup Water Intake and Pump Structures

1.054

Water to supply the requirements of the proposed Lake Erie Generating Station will be withdrawn from Lake Erie through a set of three ports located on the easterly breasting dolphin of the coal unloading facility. Figures 1-7, 1-8, and 1-9 show the design of the intake structure and onshore pump. The breasting dolphin housing the intake ports is located about 4,650 feet (1417 m) offshore in approximately 30 to 32 feet (9.1 to 9.8 m) of water at low water datum elevation 568.6 feet (IGLD, 1955). Each of the three intake ports is slightly larger than 7 feet by 7 feet (2.1 m by 2.1 m) in size with its centerline located about 13.5 feet (4.1 m) above the lake bottom and faces in the shoreward direction. The maximum approach velocity to the ports will be approximately 0.25 feet per second (fps) for two unit operation. The three ports and their connecting pipes are sized so that the average velocity at the face of each port is approximately the same. The maximum intake flow rate is projected to be 45 cubic feet per second (cfs) or 1.27 cubic meters per second and the maximum quantity of water withdrawn from Lake Erie will be 2,790 acre-feet



MULTIPORT INTAKE SECTION

Figure 1-9

per month. The intake ports have been designed to withdraw water in a horizontal flow direction from the lake. A separation distance of 800 feet (240 m) is provided between the intake structure and discharge diffuser.

1.055
A vertical section of pipeline located in a partitioned section of the coal silo will connect the intake ports to a 3.75-foot (1.14 m) diameter steel intake pipeline which will be constructed within the coal conveyor tunnel. After entering the ports, the water will flow by hydrostatic pressure difference through the intake pipe to a pump structure located well inland from the actual shoreline. Velocities in the pipeline would be approximately 4 fps (1.2 m/sec). The onshore pump structure for two unit operation, would contain two bays with one or more pumps in each bay. Each bay would also contain a set of traveling screens, and stop log guides. Typical screen mesh for such screens is on the order of 3/8-inch (0.95 centimeter) clear openings. The water would be pumped to the plant via a single concrete pipeline approximately 3.5 feet in diameter (1.1 m). Debris collected on the vertical traveling screen in the pump structure will be removed from the screen by water jets located above the pump structure deck. This debris will then be collected in a trough in front of the traveling screens and sluiced to a sump located adjacent to the pump structure. There, the screen washwater will be separated from the solid waste. The collected debris will then be disposed of at an approved sanitary landfill site. After the removal of debris, the screen washwater will be returned to the pump structure forebay. Bars at the intake structure will prevent the entrance of large logs and tree branches. The debris that will accumulate on the intake traveling screens located in the pump house will, therefore, consist of various materials present in Lake Erie water, i.e., small wood pieces, aquatic flora and fauna, silt, trash, etc.

1.056
To prevent ice buildup on the submerged intake ports, several options are available. The possible procedures are:

- A crossover pipe between the intake pipeline and the blowdown pipeline within the coal tunnel. This will result in the provision to discharge warm water through the intake pipe.

- Electrically heated bar racks at the intake ports.

- Use of bar racks made from pipes through which a small quantity of heated blowdown water could pass.

The selected alternative will depend chiefly on operating experience the applicant gains during the next several winters at other installations.

1.057
The detailed construction method of the dolphin was described earlier in this chapter. The intake ports are fabricated from steel plates and built into the shell of the dolphin before it is positioned at its final location in the lake.

Discharge Structure
1.058
Blowdown water discharge is required to maintain the dissolved solids concentration in the circulating water system at an acceptable level. This continuous blowdown also serves the purpose of discharging heat which is not dissipated to the atmosphere by the cooling tower. Blowdown from the natural draft cooling tower and miscellaneous treated waste systems will be discharged to Lake Erie through a subaqueous multiport diffuser located in the vicinity of the coal unloading tunnel at the 25-foot (7.6 m) bottom contour. The approximate location of the blowdown system is depicted on Figure 1-10. The discharge diffuser design is illustrated on Figure 1-11. The multiport diffuser is about 70 feet (21 m) in length and consists of a 2-foot (0.6 m) diameter concrete encased manifold pipe connected to eleven alternating discharge ports. Ports will have a diameter of approximately four inches (10 cm) and will be spaced 76 inches (193 cm) apart. The manifold of the diffuser will be oriented nearly perendicular to the shoreline and the ports will be oriented about 40° and 220° (clockwise from North) for the Pomfret site. This port orientation is approximately parallel to the shore and perpendicular to the manifold. The diffuser orientation was designed to optimize dilution characteristics and was determined by analyzing water current data. Each port will be located about two feet (0.6 m) above the lake bed and will be elevated at a 20° angle above the horizontal to minimize bottom scour.

1.059
A discharge pipe will extend from the manifold down a 70-foot (21 m) vertical shaft to an 8-foot (2.4 m) diameter horizontal tunnel which leads to the conveyor tunnel. The discharge pipeline will then traverse the coal conveyor tunnel in the shoreward direction and end at an onshore tunnel portal. The portion of pipeline in the conveyor tunnel consists of steel and was sized to discharge water by gravity. The diameter of the pipe varies in size between 18 inches and 36 inches (46-91 cm) depending on the location of the pipe system. Construction of the system will involve dredging a trench for the diffuser manifold, boring the vertical shaft and tunneling the horizontal section which leads to the conveyor tunnel. The need for temporary structures, such as cofferdams, is not anticipated.

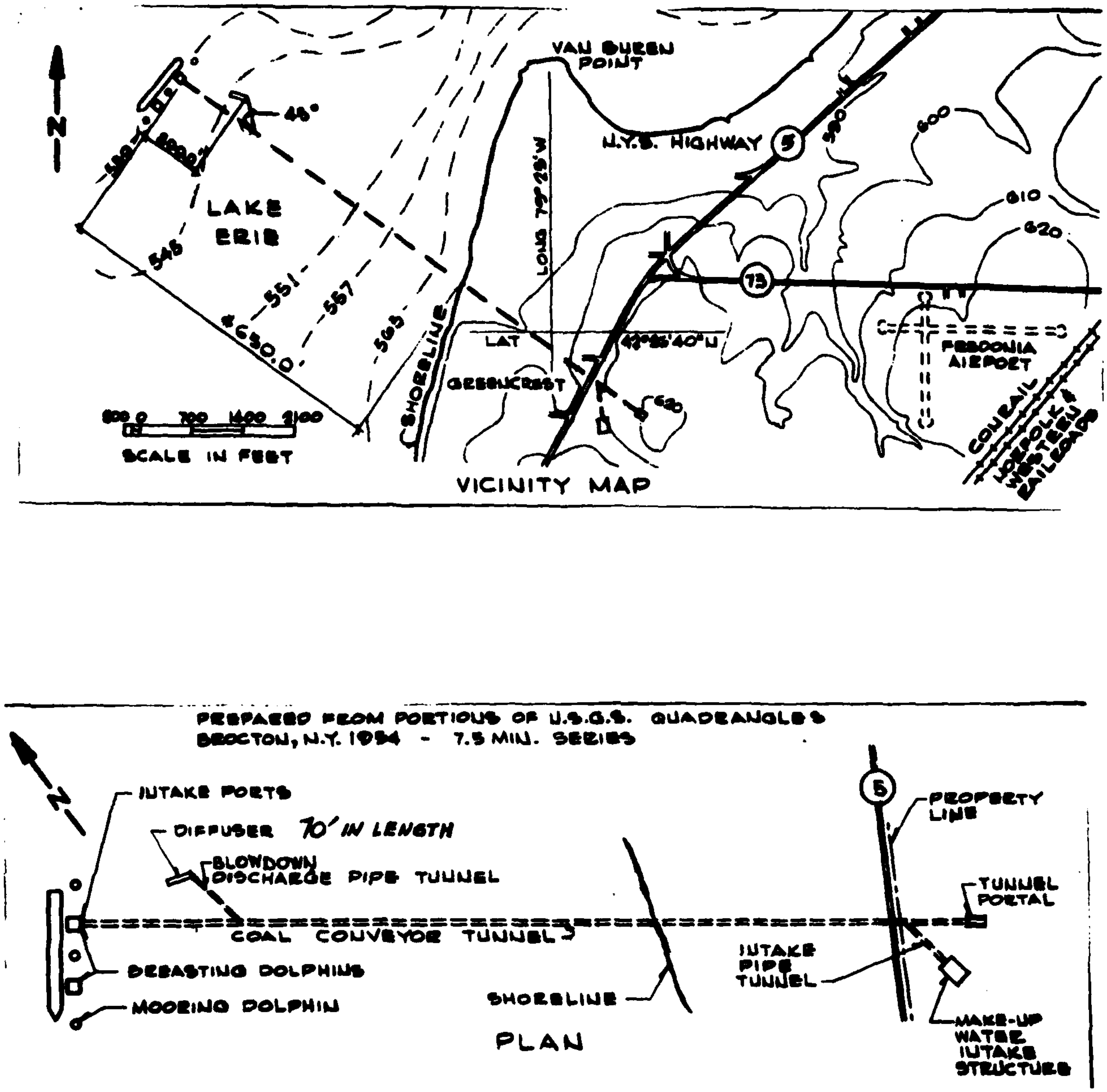
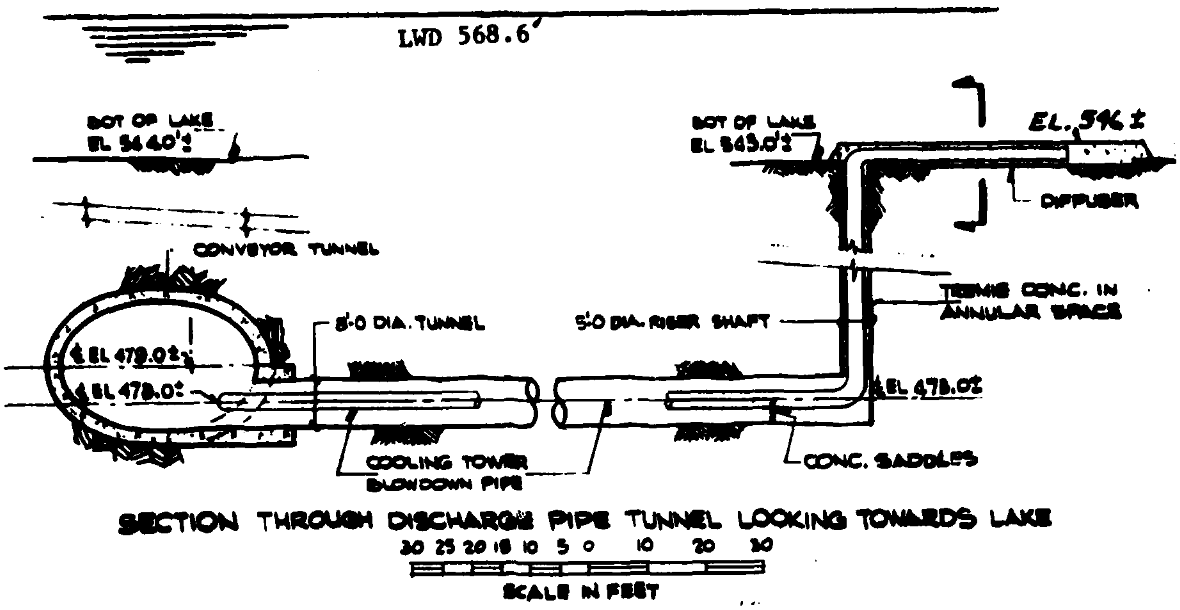
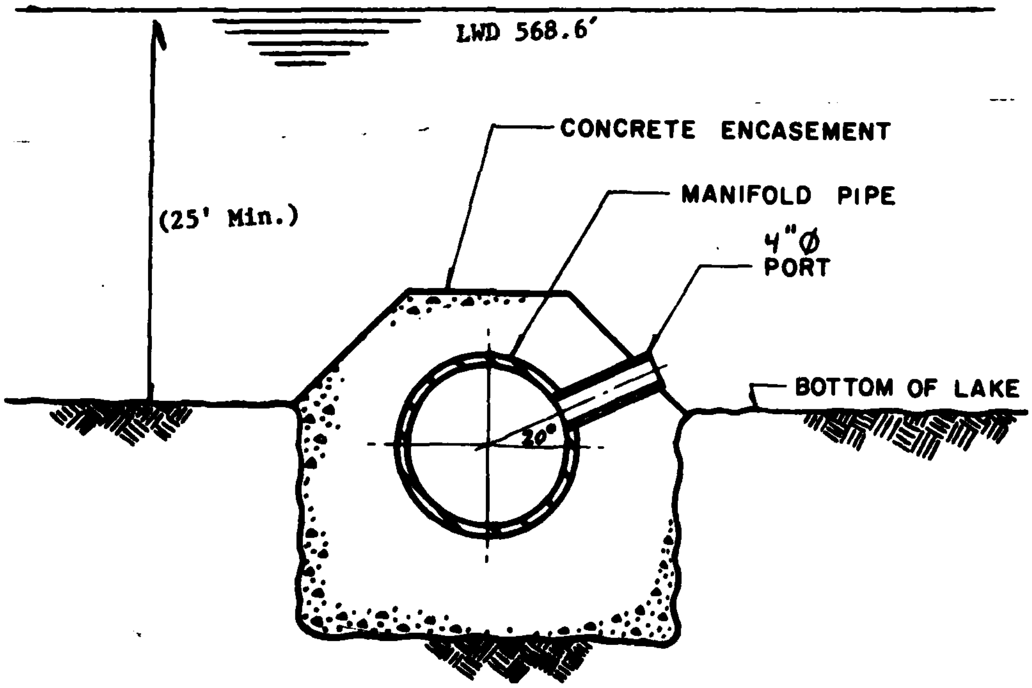


Figure 1-10
Location of Discharge System





Multiport Diffuser

Low Water Datum Elevation 568.6 Ft.
(IGLD, 1955)

Figure 1-11

Discharge System Design

1.060
For normal operating conditions the average combined facility blowdown discharge rate will be 13.1 cfs or 0.37 cubic meters/sec (including approximately 0.4 cfs or 0.011 cu. meters/sec treated wastewater), which produces an exit flow velocity of 13.65 fps (4.16 m/s) at the jet exit. The maximum anticipated combined facility blowdown rate will be 16.46 cfs (0.47 cu. meters/sec) occurring in August with an expected maximum exit velocity of 17.15 fps (5.23 m/s). The monthly average value of blowdown water of 13 cfs (0.37 cu. meters/sec) for two units operating at 100 percent plant capacity is considerably less than the total circulating water flow of 1,400 cfs (39.6 cu. meters/sec) which would be discharged if these units were designed with once-through cooling systems having the same condenser temperature rise. The maximum quantity of water discharged to Lake Erie will be 930 acre-feet per month. The cooling tower blowdown water will be discharged into a cooling tower blowdown reservoir prior to discharge in Lake Erie. This reservoir is an unlined holdup pond with a capacity of 1.6 million gallons (6.06 million liters) and is sized for a four-hour detention time at maximum tower blowdown flow.

System Heat Rejection to Lake Erie
1.061
Table 1-5 lists the two unit heat rejection rates to Lake Erie at design capacity for each month of the year during both average and extreme climatic conditions. The values listed under extreme climatic conditions were derived by using the maximum temperature difference between the lake water and the blowdown using the concurrent blowdown flow rate. The analysis was based on calculated blowdown flow rates and Lake Erie temperatures measured at the Pomfret site from September 1974 to September 1975.

1.062
The blowdown temperature and rate of discharge were computed from a knowledge of the cooling tower evaporation rate and the number of cycles of concentration used. Cooling tower evaporation was determined using a heat and mass balance model developed by the applicant's consultant. The formulations take into account such influences of plant site meteorology as dry bulb temperature, wet bulb temperature and atmospheric pressure. The model used is dependent upon the size and design conditions of the tower under consideration as well as the heat duty to which the tower is subjected. The climatic data were obtained from at least 15 years of records ending in 1973 for Buffalo International Airport, located about 30 miles northeast from the site. For the extreme monthly condition the highest probable relative humidity corresponding to the record-high dry bulb temperature was used. Cooling tower performance is affected by heat rejection rate, approach to wet bulb, temperature range, dry

Table 1-5

DESIGN CAPACITY
AVERAGE AND MAXIMUM HEAT REJECTION RATE
TO LAKE ERIE (BTU/HR)

Month	Average Climatic Conditions BTU/hour ($x 10^7$)	Percent of Total Heat Discharge	Extreme Climatic Conditions BTU/hour ($x 10^7$)	Percent of Total Heat Discharge
January	7.63	0.89	11.60	1.35
February	7.95	0.92	12.10	1.41
March	8.73	1.02	16.15	1.88
April	10.18	1.18	19.37	2.25
May	7.50	0.87	14.79	1.72
June	6.45	0.75	11.50	1.34
July	4.97	0.58	8.78	1.02
August	4.31	0.50	8.48	0.99
September	6.23	0.72	11.39	1.32
October	7.35	0.85	14.14	1.64
November	6.84	0.80	11.76	1.37
December	7.56	0.88	13.00	1.51

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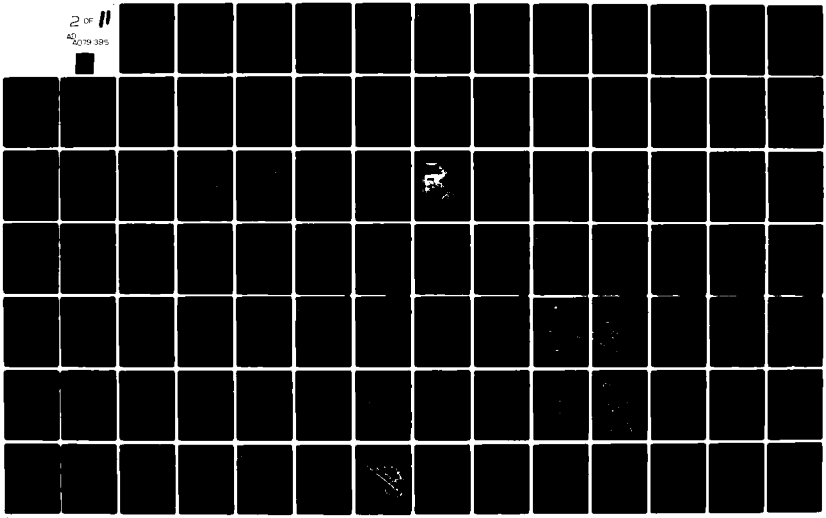


Table 1-6

DESIGN CAPACITY
CHARACTERISTICS OF BLOWDOWN DISCHARGE AND
LAKE ERIE TEMPERATURE UNDER
AVERAGE CLIMATIC CONDITIONS

Month	Blowdown Rate *** (cfs)	Blowdown Temperature (°F)	Lake* Temperature (°F)	Temperature Difference (°F)
Jan	10.87	65.3	34.1	31.2
Feb	10.81	65.0	32.3	32.7
Mar	11.52	68.8	35.1**	33.7
Apr	12.53	74.1	37.9	36.2
May	13.41	79.5	54.6	24.9
Jun	14.09	84.7	64.3	20.4
Jul	14.44	87.7	72.4	15.3
Aug	14.31	87.3	73.9	13.4
Sep	13.91	84.2	64.3	19.9
Oct	13.15	78.6	53.7	24.9
Nov	12.19	72.8	47.8	25.0
Dec	11.27	67.6	37.7	29.9

* Measured at the site during September 1974 to September 1975.

** March temperature was interpolated between February and April because measured value was not available.

*** This does not include treated waste water discharge of approximately 0.4 cfs.

Table 1-7

DESIGN CAPACITY

CHARACTERISTICS OF BLOWDOWN DISCHARGE AND

LAKE ERIE TEMPERATURE UNDER

EXTREME CLIMATIC CONDITIONS

Month	Blowdown Rate *** (cfs)	Blowdown Temperature (°F)	Lake* Temperature (°F)	Temperature Difference (°F)
Jan	12.37	75.8	34.1	41.7
Feb	12.37	75.8	32.3	43.5
Mar	13.80	87.2	35.1**	52.1
Apr	15.03	95.3	37.9	57.4
May	15.64	96.7	54.6	42.1
Jun	15.85	96.6	64.3	32.3
Jul	16.02	96.8	72.4	24.4
Aug	16.06	97.4	73.9	23.5
Sep	15.64	96.7	64.3	32.4
Oct	15.14	95.3	53.7	41.6
Nov	13.68	86.1	47.8	38.3
Dec	13.17	81.7	37.7	44.0

* Measured at the site during September 1974 to September 1975.

** March temperature was interpolated between February and April because measured value was not available.

*** This does not include treated waste water discharge of approximately 0.4 cfs.

bulb temperature, wet bulb temperature, relative humidity and tower design parameters. Table 1-6 shows the estimated monthly characteristics of blowdown temperature and flow rates for plant operation at design capacity under average climatic conditions, and Table 1-7 shows the corresponding characteristics under extreme climatic conditions. For the purposes of this impact statement, "average climatic conditions" are defined as climatic conditions which exhibit mean monthly dry bulb temperature and relative humidity. "Extreme climatic conditions" are defined as the climatic conditions exhibiting the monthly record-high dry bulb temperature and the highest probable concurrent relative humidity.

1.063
A summary of the water supply conceptual operation based on average monthly conditions is presented in appendix Table A-3. This data represents two unit operation of the circulating water system and miscellaneous plant water systems. Appendix Table A-4 shows the anticipated monthly evaporation rates of the cooling tower at maximum facility capacity and the subsequent makeup and blowdown flows required to maintain recirculating cooling water system operation at three cycles of concentration.

Condenser Cleaning and Maintenance
1.064
Scaling of calcium and, to a lesser degree, magnesium is a potential problem in condenser cooling system operation. The deposition of scale on the condenser tubes decreases the heat transfer efficiency of the tubes. However, a slight formation of scale by calcium carbonate can protect the system from corrosion and alleviate the need for chemical inhibitors and corrosion resistant materials. To achieve the correct balance of scaling, the recirculating cooling water will be maintained at a pH of 8.0 by the addition of sulfuric acid. Acid addition controls the water hardness and alkalinity and produces a condition that slightly favors scale formation. When necessary, mild descaling can be accomplished by depressing the pH to 5.0 for about 8 hours once weekly. Mild descaling does not increase the overall rate of corrosion (EPA, 1974). The degree and duration of pH surpression will be controlled and coordinated with chlorine application to ensure that the actual discharge will comply with State Pollutant Discharge Elimination Systems pH limit of 6.0 to 9.0.

1.065
Based on an analysis of the aquatic biota of Lake Erie, chlorine addition to the condenser inlet and potentially the hot side of the cooling tower will be necessary to protect the condenser and the tower distribution system and surfaces against excessive biological fouling. Chlorine discharge will be in complete accord with the Federal EPA effluent guidelines resulting in an average free

available chlorine concentration of 0.2 mg/l in the cooling tower blowdown. This will be controlled by utilizing a feedback amperometric titration unit. In accordance with the draft 402 discharge permit, neither free available nor total residual chlorine will be discharged from the Lake Erie Generating Station for more than two hours per unit per day. Cooling tower blowdown will pass through a holdup pond with a detention time of four hours. With this additional time, no discharge of free available chlorine is anticipated. It can also be anticipated that the free available chlorine will experience some decay in the discharge pipe and will react with the chlorine demand and ammonia concentrations in the lake water immediately upon mixing. This should further reduce the free available chlorine concentration to undetectable amounts. It can also be assumed that combined residual chlorine levels will be low since ammonia concentrations in the lake water are low and, therefore, chlorine dosage should exceed that required by the breakpoint reaction.

AUXILIARY COOLING SYSTEM

1.066
In addition to main condenser cooling, cooling water will be provided for other plant components: bearing cooling water exchangers, pulverizer oil coolers, hydrogen coolers, station air compressors, condensate and boiler feed booster motor pumps, etc. This auxiliary cooling water system will operate in a closed loop, with absorbed heat being transferred through heat exchangers to the recirculating cooling water. Cooling water for the auxiliary cooling system heat exchangers will be derived from the main condenser recirculating cooling water system. The flow required by the heat exchangers will be approximately 30,000 gpm ($1.14x10^5$ l/m) for the two-unit operation at 100 percent facility capacity. This water will come from the cold side of the circulating water system and flow through the auxiliary cooling water heat exchangers, through the cooling tower, and then back to the cooling tower basin. The total recirculating cooling water flow for both units, including auxiliary cooling water, is estimated at 662,000 gpm ($2.50x10^6$ l/m).

CHEMICAL CLEANING OPERATIONS

1.067
Chemical cleaning operations associated with major periodic maintenance events will result in three individual liquid waste sources: air preheater, stack and precipitator washings; boiler fireside and economizer cleaning; and boiler steamside cleaning.

Air Preheater, Stack and Precipitator Washing

1.068

The air preheaters transfer waste heat contained in the boiler flue gases to the incoming combustion air via a rotor, resulting in increased boiler efficiency. Deposits of soot and fly ash from the flue gases accumulate on the air preheater surfaces, reducing heat transfer rates. Periodic washing of these surfaces to remove the deposits is necessary to operate at high transfer efficiencies. This cleaning operation will be accomplished by utilizing a high pressure water spray. The air preheaters in each generating unit will be washed approximately once every four months using 1,000 gpm (3,780 l/m) of lake water for a period of 5-24 hours. One washing produces about 797,000 gallons ($3.02x10^6$ liters) of wastewater. The spent wash water primarily contains high concentrations of suspended solids from the slag which has accumulated on the surface of the air preheater as well as various corrosion products. This wastewater will be discharged to the bottom ash sluice circuit via a settling pond downstream of the bottom ash dewatering bin. At present time, it is not anticipated that the stack and precipitator will require any washing.

Boiler Fireside and Economizer Cleaning

1.069

Periodic cleaning of the fireside of the boiler tubes is necessary for continued operation at high heat transfer efficiencies. Deposits of fly ash, corrosion products and airborne dust can develop on the tubes, decreasing the boiler's efficiency. Manual scraping and, if necessary, a high pressure water spray is used to clean the boiler fireside. Operational cleaning of the economizer also uses a high pressure water spray to remove any accumulated soot and/or fly ash from its surfaces. The furnace fireside and economizer will normally be washed concurrently, requiring up to 12 hours and producing a maximum of 360,000 gallons ($1.36x10^6$ liters) of wastewater. The spent wash water contains high centrations of suspended solids from the accumulation of deposits on these surfaces. The waste will enter the recirculating bottom ash sluice circuit via a settling pond downstream of the bottom ash dewatering bin. The economizer and boiler fireside will be cleaned approximately once a year.

Boiler Steamside Cleaning

1.070

Operational cleaning of the boiler steamside is performed approximately once every three to five years to remove corrosion products and scale. It is anticipated that this operation will consist of an acid cleaning mixture to remove hardness scale as well as copper and iron oxides, followed by alkaline passivating rinses to neutralize residual acidity and to remove additional amounts of iron, copper, and/or silica. This waste will be treated by boiler injection to evaporate the waste. Injection will be at a controlled rate.

PROCESS WATER USAGE

1.071
In addition to the auxiliary and condenser cooling systems, there will be four other major water use systems at the proposed Lake Erie Generating Station: condensate system uses, service water system, fire protection, and miscellaneous. The source of all makeup water for the station will be Lake Erie.

Condensate System Use
1.072
This system requires a total flow of 260 gpm (984 liters/min) per generating unit. The water will be used for steam cycle makeup, cycle makeup demineralizer regenerant water requirements and condensate polishing demineralizer-regenerant water requirements. These waters will be subject to pretreatment consisting of coagulation-sedimentation and gravity filtration for the removal of suspended solids. Coagulation, the addition of aluminum sulfate and lime, and sedimentation will be combined in a single coagulation/clarifier. Effluent from this clarifier will then undergo gravity filtration: three parallel sand filters followed in series by three parallel carbon filters. After pretreatment, these waters will undergo demineralization for dissolved solids removal. The demineralization process consists of cation exchange, degasification, anion exchange and polishing demineralization.

Service Water Systems
1.073
Service water systems include potable water supply, air conditioning and laboratory uses. Similar to condenser cooling, the air conditioning system requires makeup to offset atmospheric evaporation in the heat exchanger unit. Makeup requirements will be approximately 40 gpm (151 l/m). The plant will have a laboratory capable of supporting all plant functions. The laboratory will use an estimated 10 gpm (37.8 l/m). It is anticipated that the potable water treatment system will have a 120 gpm (454 l/m) capacity and will provide treated water for consumptive purposes. This will satisfy requirements for human consumption, showers, and lunchroom purposes. The treatment system will also provide the makeup for both air conditioning and the laboratory. All potable water will be subject to pretreatment consisting of coagulation-sedimentation and gravity filtration for removal of suspended solids as described in the paragraph on Condensate System Uses. This will be followed by chlorination to meet U.S. Public Health Standards. The applicant may be able to satisfy service water requirements by securing supplies from the Fredonia municipal water system.

Fire Protection

1.074

The fire protection system consists of a pressurized pump and hydrant arrangement. System supply will be provided from the pump structure at the onshore end of the makeup pipeline.

Miscellaneous Water Use

1.075

Miscellaneous water use systems at the Lake Erie Generating Station include groundkeeping and fugitive dust control.

ACCESS ROADS

1.076

The proposed station requires the construction of temporary and permanent access roads. These roads will be used to facilitate construction, operation, and maintenance of the Lake Erie Generating Station. On the Pomfret site, 14.2 acres (5.75 hectares) of land will be utilized for permanent roadways. This area is based on a total road length of 12,370 feet (3,770 m) and a width of 50 feet (15 m). Permanent roads consist of a four-inch (10 cm) base course of asphalt concrete Type 1A on well-compacted subgrade, a 1.5 inch (3.8 cm) asphalt binder course, and a 1.5 inch (3.8 cm) asphalt concrete surface course. This is in accord with New York State Public Works specifications. The temporary construction roads will be unpaved and will occupy about 11.3 acres (4.57 hectares) of land based on a total road length of 12,270 feet (3,740 m) and a width of 40 feet (12 m).

1.077

Fill removed during the grading process will be used elsewhere on site for grading or will be sold as solid fill. Cleared vegetation will be disposed of either on-site or off-site in a regulatory approved manner. Open burning of this material is not planned at present, but if conducted, would be in strict accordance with Rules on Open Fires Title 6, applicable state regulations (New York State, Chapter III, Subchapter A, Part 215). Fugitive dust from unpaved construction roads will be controlled by using water sprays as required. Use of these roads will be discontinued after construction. Where access roads cross creeks or streams, the crossings are on fill with properly sized culverts carrying the water. At this time, no definitive program of access road maintenance has been formulated.

1.078

During construction, these roads will be used by workers traveling to and from the site and by trucks delivering construction equipment and materials. The greatest influx of workers to the site will occur during a one-and-a-half-year peak period when there is an employment overlap for the two fossil units. The greatest impact on roadways will occur during this period. Using the conservative assumption of 1.5 persons per car, the worst possible situation would involve a peak of 1,721 cars estimated to occur in January 1984. The average number of workers per month for the first year of construction is estimated to be about 168, and for the last year the average per month will be about 247. The monthly average for the second and fifth year is estimated at 813 and 968, respectively. The applicant estimates approximately 20 to 25 truck deliveries per day. This is based on past experience during the construction of two 850 MW units at Oswego, New York. An operating force averaging 60-70 people for both units would be traveling to the facility daily.

SEDIMENT AND EROSION CONTROL

1.079
Prior to major construction activities, a permanent erosion control system will be implemented. Sediment and erosion control will be accomplished by use of individual settling ponds for collection of construction-related runoff from the switchyard, plant island, the coal pile area, and the ash pile area. The runoff will be treated and discharged into adjacent on-site streams.

1.080
Sediment and erosion control will be accomplished by limiting the acreage of areas to be disturbed in the plant island, coal pile and ash pile areas to 330 acres (134 hectares) for each site. Topsoil from the stripped areas will be stockpiled for revegetation. Areas that experience heavy construction traffic will require stabilization and protection. Construction roads and parking areas will be covered with a coarse base material and compacted. Other areas disturbed by construction will be shielded and/or stabilized to reduce erosion. Soil erosion will also be minimized by reducing the length of time that the disturbed soil will be exposed. All cut and fill slopes will bear no construction traffic after their completion, making it possible to cover the soil and seed these slopes with quick-growing grass very early in the construction process, as soon as weather permits. Shrubbery may also be planted in accordance with the final landscaping plan. Once a grass cover has been developed on these slopes, erosion will be reduced to approximately one percent of that expected from exposed soil (EPA, 1973a).

1.081
The method selected for treating storm water runoff consists of collection via diking, pH control, and solids separation via sedimentation. The settling ponds are sized to accommodate runoff from the one-in-ten-year 24-hour rainfall event which is 9.7 million gallons (36.7 million liters) for the plant island, 5.7 million gallons (21.5

million liters) for the ash pile area, 3.4 million gallons (12.8 million liters) for the coal pile area, and 1.0 million gallons (3.78 million liters) for the switchyard. Each pond would have an approximate average water depth of 8 feet (2.4 m) plus additional depth for sediment. The sizes of the ponds for the plant island, ash pile, coal pile, and switchyard are 4 acres (1.6 hectares), 2.5 acres (1.0 hectares), 1.5 acres (0.6 hectares), and 0.38 acres (0.15 hectares) respectively.

1.082
Sedimentation testing of site soils at the proposed Pomfret site indicates that suspended solids in sedimentation pond discharges contained extremely small fines which do not settle out during the designed 24-hour settling period. Based on settleability tests performed for the site soils, it is projected that for a hard class of rain (i.e., one inch in 24 hours) the effluent from the sedimentation ponds would contain suspended solids concentrations of 100 parts per million. The one inch in 24 hour rainfall event occurs approximately four times per year. For very hard rainfall conditions (i.e., two inches or more of rainfall per day) the projected concentrations of total suspended solids (TSS) in the settling pond effluent is 400 parts per million or less. The very hard rainfall event occurs approximately 0.8 times per year. In these instances, utilizing the technology of ponding and sedimentation, Niagara Mohawk would be discharging construction runoff in excess of the former 50 milligrams per liter TSS standard of the U.S. Environmental Protection Agency. A representative five-year analysis of the monthly distribution of daily precipitation values indicates that for at least 87.6 percent of the rainfall events, the applicant's sedimentation treatment system would meet the 50 mg/l former TSS standard. The same mathematical model used to predict the sedimentation pond inlet solids concentration (EPA's Storm Water Management Model) was used to predict preconstruction ambient runoff characteristics. These other studies indicated that during the more severe rainfall events, the ambient TSS levels in the on-site streams will be much greater than the 100-400 mg/l being discharged from the sedimentation ponds. The draft 402 discharge permit limits the discharge to a maximum of 380 mg/l TSS except when 10-year, 24-hour storm runoff is exceeded. Compliance with applicable effluent discharge standards is discussed in Chapter 4. Basins which will treat construction phase runoff from the switchyard, the coal pile, and ash pile areas will be dewatered, filled, and regraded prior to commencement of operations. Topsoil will be replaced and the area revegetated at the filled coal pile and switchyard ponds but the ash pile pond will be prepared to serve as a base for future ash piles. The present plan is to reuse the plant island pond, with certain modifications, for the coal pile runoff settling pond. One of the large construction-phase ponds will also be used as a chlorine decay pond during plant operation.

LIQUID WASTES

1.083
Liquid wastes associated with the operation and maintenance of the proposed Lake Erie Generating Station include: pretreatment wastewaters; cooling tower blowdown; ion exchange wastewaters; condensate demineralizer bed regenerant wastes; plant floor drainage; yard drainage; heating, ventilating, and air conditioning system (HVAC) blowdown; potable water system wastes; coal pile and ash pile runoff; metal cleaning wastes, laboratory wastes, and sanitary wastes. Construction-related liquid wastes include: concrete batch plant wastewaters; storm water runoff; construction refuse leachates; pesticide, fertilizer and herbicide runoff; chemical and fuel spills; dewatering effluents; and sanitary wastewaters.

Construction Phase Liquid Wastes and Treatment

Concrete Batch Plant

1.084
The proposed Lake Erie Generating Station construction site may be equipped with a batch plant operation (i.e., materials storage and processing) to produce all concrete necessary for the Lake Erie Generating Station construction. Liquid wastes would be produced by mixer, truck and other associated equipment washdown, and by floor washdown. Rainfall runoff from the materials storage area, batch plant area, and areas where recent concrete pours have been made will also generate liquid wastes. Waste generation would, of course, be dependent on the degree and extent of concrete production, the extent of dry cleaning performed prior to wet cleaning of plant floor areas, the extent of accidental material spills, etc. It is expected that the primary pollutant parameters of concern will include suspended and settleable solids. These pollutants will be managed by conveying all batch plant operation wastewater and runoff to the plant island settling basin which will be part of the erosion and sediment control system. It is estimated that batch plant process wastewater discharge could reach a maximum of approximately 150 gpm (568 l/m) assuming three hose stations were in operation at the same time. With respect to suspended solids concentrations, the preliminary estimation is that both the untreated process wastewaters and runoff could contain 2,000-5,000 mg/l.

Storm Water Runoff

1.085
Site preparation activities will primarily consist of clearing, grubbing, grading, and limited demolition. The major liquid waste source during this phase of construction will be storm water

runoff, which will contain the suspended solids eroded from the exposed soil. Both the runoff volume and the associated solids concentration will be extremely variable, being influenced by: the intensity and duration of the rainfall event; the particle size distribution and the infiltration and percolation rates of the soil types at the plant site; the type and extent of plant cover; and the physical characteristics of the site (e.g., the slope of the land, the total land area affected). Suspended solids concentrations ranging between approximately 75 and 5,000 mg/l could be experienced if not properly managed. Measures which will be taken to control and treat the storm water runoff were discussed in a previous section entitled, "Sediment and Erosion Control."

Construction Refuse Leachates

1.086
The finer fractions of construction-related solid waste materials could result in a liquid waste if allowed to be in contact with storm water runoff or direct rainfall. Proper solid waste handling procedure will minimize this potential. Also, the erosion and sediment control facilities will effectively control these wastes should they be carried by runoff. Therefore, no discharge of this material to any water resource is anticipated and no estimates of source character are given.

Pesticides and Herbicides

1.087
No herbicides are currently planned for use during construction and startup of the proposed Lake Erie Generating Station and, therefore, no liquid waste discharges related to the use of these materials (e.g., those caused by storm water runoff contamination) are expected to occur. Pesticide use on similar large construction projects has been successfully limited to fogging with a 20-22 percent solution of Malathion for mosquito control, and to rodenticides containing Warfarin if rodents become a problem. Application of such products is seasonal and strictly limited to levels needed to control pests and to improve construction worker comfort, sanitation, and health, and will follow the guidelines set by the Federal Environmental Pesticide Control Act of 1972 and all other applicable Federal, State, and local regulatory requirements.

Fertilizers

1.088
Fertilizers will be used during the establishment of both temporary and permanent vegetative covers. The amount of fertilizer used and method of controlled application will be based on the recommendations

of the U.S. Soil Conservation Service and the Chautauqua County Agricultural Cooperative Extension Service in order to minimize application quantities. Only those types and quantities of fertilizers which are generally recognized as acceptable to the appropriate regulatory agencies will be used. This material can become a liquid waste source if excess quantities are applied to the soil and subsequently carried to a water resource by rainfall runoff. It should be noted that large portions of both sites are presently utilized for agricultural purposes involving the controlled application of fertilizers.

Oil, Grease, Paints, and Solvents

1.089
Liquid wastes can result during construction activities from the use of oils, grease, lubricants, paints, cleaning chemicals and other aqueous and oil-based materials. These wastes could also occur as a result of leaks from construction equipment, spillages in storage areas, accidents during material transfer operations, and from maintenance areas and parking lots if proper and adequate management and control procedures are not adopted and maintained. The quantities of these wastes will be minimized by restricting equipment maintenance areas, keeping equipment and construction vehicles in good operating condition and by regular inspection and housekeeping of equipment storage facilities. No direct discharge of these potential pollutants is expected or planned.

Sewage

1.090
The applicant is investigating the feasibility of tying into the local sewer district and intends to utilize it if possible. The applicant expects the municipal facility to be available prior to station construction. However, if tying into the municipal system is not possible, on-site sewage treatment systems will be constructed. During the construction and start-up phase it is estimated that a maximum of 2,000 personnel will be on site. The on-site waste treatment plant is sized for a design population of 1,450 persons. The sanitary waste water will be treated by two extended aeration, prefabricated, package-type sewage treatment facilities. The total design flow of the two units is 30,000 gallons (113,500 liters) per day based on a 20 gallon (76 liter) per day per person contribution. During the construction phase, stabilized sanitary waste waters will flow to the plant island erosion and sediment control basin prior to discharge into an on-site stream. The sanitary waste facility for the remaining maximum work force of 550 is anticipated to be a number of chemical toilets. The waste generated at these toilets will be intermittently pumped out from the holding tanks by an outside

licensed contractor for off-site disposal (operated in accordance with the Resource **Conservation** and Recovery Act of 1976).

Dewatering Effluents

1.091
During excavation and foundation placement periods, groundwater, surface run-off and direct rainfall will accumulate in excavated areas. In order to facilitate employee activities while providing a safe work environment, such areas will be dewatered. Because such ponded waters would probably contain high suspended and settleable solids concentrations (currently inestimable), the discharge will be conveyed to the plant island sedimentation pond.

Operational Phase Liquid Wastes

Cooling Tower Blowdown

1.092
A major source of liquid waste is the cooling tower blowdown. Based on three cycles of concentration, two-unit operation and a 100 percent capacity factor, a peak summer blowdown of 6,480 gpm (24,500 l/m) will be derived from the tower basin. The blowdown water quality will essentially be lake water concentrated three times, except for changes in pH; alkalinity; sulfates and chlorides resulting from the addition of sulfuric acid and chlorine; and certain metals such as iron, nickel, and copper. Sulfuric acid is added to prevent scaling in the tower, thereby maintaining recirculating cooling water pH at 8, while chlorine is added to prevent biological growth on condenser surfaces. Cooling tower blowdown will be discharged to a 1.6 million gallon (6.06 million liter) capacity reservoir prior to discharge into Lake Erie. With the exception of sulfates and sodium, the maximum surface concentrations of chemicals after discharge are within ten percent of the ambient lake levels.

Pretreatment Wastewaters

1.093
Pretreatment wastewaters, consisting of clarifier underflow at 10,000 gallons (37,800 liters) per day and filter backwash water at 28,000 gallons (106,000 liters) per day will be collected and pumped to the bottom ash sluice water settling tank.

Ion Exchange Wastewaters

1.094
Ion exchange wastewaters will have a maximum flow of 120 gpm (454 l/min) when all steam cycle makeup ion exchangers are regenerated on

the same day. The anion and cation exchangers will be regenerated once every 12 hours while the mixed bed polishing demineralizers will be regenerated once every 120 hours. This wastewater will be treated in a neutralization/equalization basin for pH control.

Condensate Demineralizer Regenerant Wastes

1.095
Six Condensate demineralizer beds will each be regenerated once every 36 hours. Regeneration flows are estimated at 30,000 gallons (113,500 l) per bed. This added wastewater flow increases total regenerant wastewater flow to 160 gpm (606 l/min) when two beds are regenerated. This wastewater will also go the neutralization/equalization basin. Plant drains and sumps will be handled separately from plant storm sewers, as they are regulated by the U.S. EPA.

Plant Floor Drainage

1.096
The sources of plant floor drainage are normal maintenance washdowns, equipment drains, and washdowns from areas used primarily for the servicing of mechanical equipment which use lubricants as part of their function or process as well as abnormal liquid discharges. The main contaminants expected in floor drainage are suspended solids and oil and grease. Total average daily flow from these drains and sumps is estimated to be 100 gpm (380 l/min). To treat this flow, a sedimentation/oil separation unit will be used. Suspended solids removed by the unit will be discharged to the ash disposal pile. Oil separated during treatment will be disposed of offsite by a private contractor in accordance with applicable regulatory standards and the Resource Conservation and Recovery Act of 1976. The oil and solids removal unit discharge will be directed to the cooling tower blowdown reservoir.

Heating, Ventilation, Air Conditioning (HVAC) System Blowdown

1.097
Blowdown from the HVAC system will not require treatment since the air conditioning, similar to condenser cooling, concentrates total dissolved solids (DS) due to evaporation and this discharge will not exceed TDS standards. It is estimated that 20 gpm (76 l/min) of blowdown will be discharged from this system to the plant's storm sewer system which discharges to an onsite stream.

Potable Water System Wastes

1.098
Wastewater from the potable water system will flow by gravity to the 10,000 gpd (37,800 liter/day) extended aeration package treatment plant. It is expected that this form of treatment will attain greater than 85 percent BOD_5 and suspended solids removal. This flow will be discharged to Lake Erie.

Laboratory Wastes

1.099
The generating station will be provided with a laboratory capable of supporting all required plant functions. Laboratory procedure will ensure that no reagent used for chemical analysis will result in a significant wastewater problem. Streams containing toxic substances will be collected separately and treated by either precipitation or evaporation.

Coal Pile Runoff

1.100
Rain falling on the 60-acre (24 hectares) coal pile area causes coal fines to be washed out with the runoff. Chemical constituents of the coal also leach into solution. Flow from the one in ten year, 24-hour rainfall event is 5.5 million gallons (20.8 million liters), and the flow from the one-in-one hundred year, 24-hour rainfall event is estimated at 6.9 million gallons (26 million liters). Coal pile runoff generally is acidic and contains high suspended and dissolved solids levels along with high sulfate concentrations. Typical elements found in coal pile runoff include copper, cadmium, lead, iron, nickel, manganese, chromium, mercury, and zinc. The treatment procedure for coal pile runoff was discussed in paragraph 1.041.

Metal Cleaning Wastes

1.101
Metal cleaning wastes are derived from the periodic boiler cleaning, tube cleaning, boiler fireside cleaning, air preheater cleaning and other metal cleaning procedures. Boiler cleaning (steamside) wastes will contain high concentrations of iron and copper and will be treated by boiler injection to evaporate the wastes. Cleaning of the air preheater, boiler fireside, and economizer will produce a total waste flow of 2.75 million gallons (10.4 million liters) a year, containing 20,250 lbs or 9,185 kilograms (kg) of iron per year. The air preheater will be washed three times a year and the boiler fireside and economizer will be cleaned once a year. One washing of the boiler fireside and economizer produces 360,000 gallons ($1.36x10^6$

liters) of wastewater at an average iron concentration of 100 mg/l or 300 pounds (136 kg) of iron. One washing of the air preheater produces approximately 797,000 gallons ($3.02x10^6$ liters) of wastewater at an average iron concentration of 1,000 mg/l or 6,650 iron pounds (3,012 kg) of iron. This is a total waste wash water volume of 1,157,000 gallons ($4.38x10^6$ liters) with 6,950 pounds (3,148 kg) of iron for one washing of the boiler fireside, economizer, and air preheater. This wastewater is used as makeup to the bottom ash sluice system. The blowdown from this system is used to wet fly ash produced at the proposed site to about 20 percent by volume. This ash is then trucked to the ash pile for disposal.

Yard and Area Drainage

1.102
Rainfall runoff from the plant yard and area drainage basin will generate a liquid discharge. This discharge is essentially storm water and will not require treatment since contact with contaminated process or material storage areas is not anticipated. Thus, when construction is complete and the area has been revegetated or paved, roof and yard runoff is considered to be non-contaminated and not subject to effluent limitations.

Ash Pile Runoff

1.103
Fly ash and bottom ash will be disposed of in a dry ash pile at the proposed Pomfret site. A description of the disposal facility is presented later in this chapter under solid waste disposal. Rainfall runoff from the ash pile will produce a liquid waste with high suspended solids and sulfate concentrations. The runoff would also contain iron from the ash itself and from the metal cleaning wastewater disposed of in the ash pile.

Sewage

1.104
If tying into the municipal sewage system is not feasible, operation phase wastes will be treated by the pre-fabricated type extended aeration treatment unit to be set up during the construction phase. This system is discussed in the next section of this chapter.

Liquid Waste Treatment

1.105
During the commercial operation of the proposed facility at Pomfret, the following distinct waste management programs and associated facilities will be implemented: equalization/neutralization

facility; sanitary waste treatment facility; plant drainage treatment system; yard and area drainage; ash pile runoff treatment; and metal cleaning waste treatments. Treatment procedures for coal pile runoff and metal cleaning wastewaters were discussed previously. In addition to these specific facilities, a general program of proper "housekeeping," spill prevention, containment, (i.e., using curbing and diking) and personnel education will be implemented in Lake Erie Generating Station site to formalize environmental control requirements and measures, and environmental protection and management procedures.

Equalization/Neutralization Facility

1.106
Wastewaters from demineralizer regeneration will be produced and conveyed on an intermittent basis to the equalization/neutralization basin currently conceived to be located in the central waste treatment area. The basin will be provided with an impervious lining to prevent wastewater seepage and subsequent groundwater contamination. The basin will provide for equilization of the acidic and caustic regenerant stream by self-neutralization.

This basin will also be provided with a pH monitoring and control system which will automatically adjust pH to within a range of 6.0 to 9.0. This pH control will consist of a pH sensing/control device which will automatically add acid or caustic reagents as required to adjust pH within acceptable regulatory levels prior to its combination with the cooling tower blowdown. The equalization and neutralization basin will have a minimum 36-hour detention period for the wastewater flows generated on the maximum regeneration activity day. Therefore, the capacity of the basin will be 350,000 gallons ($1.32x10^6$ liters). This capacity together with the pH control system will provide adequate neutralization of the wastewater, as required. After the wastewater is combined with cooling tower blowdown, it will flow to the cooling tower blowdown reservoir which has a 1.6 million gallon (6.0 million liter) capacity. The purpose of this unlined reservoir is to remove the total residual chlorine in the blowdown flow. The pond is sized for a four-hour detention time at maximum tower blowdown flow. This would permit decay of total residual chlorine by the chemical reactions that would convert chloramines to chloride ion. Discharge from the reservoir is then sent to the cooling tower blowdown line to Lake Erie at a maximum discharge of 6,750 gpm (25,500 l/m) and an average discharge of 4,810 gpm (18,200 l/m). This discharge includes the combined cooling tower blowdown, equalization/neutralization wastewater, and wastewater from the oil and solids removal unit.

Sanitary Waste Treatment Facility

1.107
If the applicant is unable to use the municipal sewer system, a prefabricated type aerobic biological treatment unit will be provided to manage both construction and operation level sanitary wastes. The treatment plant is currently conceived to be located in the central waste treatment area and will provide a secondary level of treatment. The package treatment plant will consist of a screening-comminutor chamber, an aeration tank, a clarifier and a chlorine contact chamber. During the station's operation, treated effluent will be discharged to the cooling tower blowdown line. Conditions of the applicant's draft discharge permit would allow the discharge of treated sanitary effluent to onsite streams during the construction phase if the municipal sewer is not available. This is based on the condition that treated effluent is combined with concrete batch plant washwater and plant island construction runoff in a sedimentation basin which will provide additional treatment and dilution prior to discharge. Waste biological solids produced by the treatment plant will undergo aerobic digestion.

1.108
Raw sewage will first pass through the screening-comminutor chamber, where large solid objects will be removed or shredded. The sewage will then pass through the aeration tank where microorganisms and sewage will be intimately contacted in the presence of oxygen. Following aeration, the wastewater will flow to the effluent clarifier. The secondary clarifier will provide for the separation of suspended solids and treated wastewater. The sludge which settles in the clarifier will be returned to the aeration tank for contact with influent sewage and excess sludge will be wasted to the aerobic digester. Supernatant from the digester will be returned to the aeration tank for treatment. The clarified effluent will be chlorinated for disinfection in the chlorine contact tank and reaerated and then transported to the cooling tower blowdown line system for discharge during the operation phase and plant island sedimentation pond during construction. A single treatment unit having a design flow capacity of 20,000 gpd (75,700 liters/day) will be operated during normal construction periods. At the beginning of the peak construction period another unit having a design flow capacity of 10,000 gpd (37,850 liters/day) will be installed to handle any increased waste loadings. The total facility will, therefore, be capable of treating a wastewater flow of 30,000 gpd (113,500 liters/day). The total prefabricated extended aeration sewage treatment facility will have a capacity to treat 60 pounds or 27.2 kilograms (kg) of biochemical oxygen demand (BOD). After construction is complete, the 20,000 gpd unit will be phased out and the 10,000 gpd unit will remain for the operational phase. The operational phase treatment plant will have the capacity to treat 16.7 lbs

(7.6 kg) of BOD per day. The aeration tank will have a volume of approximately 1,300 cubic feet (36.8 cu. meters) and will provide a retention period of 24 hours at design flow. The effluent clarifier will have a volume of approximately 260 cubic feet (7.4 cubic meters) and provide a retention time of approximately four hours. The chlorine contact chamber will provide a fifteen minute contact period at peak flow. The aerobic digester will have 310 cubic feet (8.8 cubic meters) capacity and will handle excess biological solids produced by the treatment system. The package sewage treatment plant will provide a secondary level of treatment and will remove 85 percent or more of the influent BOD and suspended solids. The discharge concentration of BOD and suspended solids is expected to be less than or equal to 30 mg/l. The package treatment facility will produce approximately ten pounds (4.5 kg) per month of digested inert matter. This inert matter will be disposed of along with other plant refuse.

Plant Floor Drainage Treatment

1.109
Plant floor drainage wastewaters will be treated in the floor drainage treatment facility located in the central waste treatment area. This treatment facility will provide treatment for the removal of suspended solids and oil/grease and will require both a primary and secondary treatment stage. The primary treatment stage will consist of a gravity oil/water separator which will accomplish both suspended solids and floatable oil removal. Suspended solids will be removed in either a resettling basin or within the primary oil/water separator unit. These solids will be conveyed to the ash disposal area for ultimate disposal. Floatable oils removed by a surface skimming device or by a plate-type oil separation unit will be collected in sumps and disposed of off-site by a private contractor in accordance with applicable standards. The secondary stage will consist of treatment for the removal of emulsified oils. Typical methods of emulsified oil treatment are cartridge type separators, air flotation units and chemical coagulation. All of these processes are efficient in cracking emulsions with the proper chemical addition. The oil removed by the secondary stage of treatment will also be stored in a sump and ultimately disposed of off-site by a private contractor in a regulatory approved manner. Treated effluent will be discharged to the cooling tower blowdown line and will then flow to the cooling tower blowdown reservoir prior to discharge into Lake Erie. The floor drainage treatment facility will be designed to handle an average daily flow of 100 gpm (380 l/m). The two stage treatment system will provide for removal of suspended solids and oil/grease to below 30 parts per million (ppm) and 15 ppm. Residue removed by the floor drainage treatment facility will consist of suspended solids and oil. Suspended solids conveyed to the ash disposal pile will average approximately 100 pounds (45 kg) per day. These solids are

expected to consist primarily of grit removed in the transport of wastes to collection sumps. The oil separation process will remove approximately fifty pounds (22.7 kg) per day of oil/grease which is approximately 8-10 gallons (30-38 liters) per day by volume.

Yard and Area Drainage System

1.110
The yard and drainage system will consist of a series of interconnected storm sewers which will ultimately discharge to currently unnamed creeks that exist at the proposed Pomfret site. The yard and area drainage system will effectively convey all runoff from the plant site for the basic facility design storm. The system will be capable of conveying the stormwater runoff to the various creeks at the site in such a manner as to minimize potential flooding events at the site and in the receiving streams. The yard and area drainage system will not produce any water residues.

Treatment of Ash Pile Runoff

1.111
Runoff water from the 246 acre (99.6 hectares) ash disposal facility will be collected in lined ditches surrounding the area. The ash pile runoff water would contain contaminants from the ash itself and from the metal cleaning washwater disposed of in the ash pile. Ash disposal will be accomplished in a manner that allows a maximum exposed ash area of 6.4 acres (2.6 hectares) at any one time. The treatment system has been designed to handle runoff from this maximum exposed area. The volume of liquid waste produced from this area during the one-in-ten year, 24-hour storm is 0.6 million gallons or 2.27 million liters. The runoff collected in ditches is conveyed to a lined holding pond with a capacity of 0.74 million gallons (2.80 million liters), the volume of the one-in-one hundred year, 24-hour rainfall event. This pond is provided for hydraulic control only. A portion of the pond water is reserved to spray the ash pile for dust control and the net amount will be discharged at a rate of 210 gpm (795 l/min) to the coal pile area collection system (10.5 million gallon capacity, lined settling pond). This combined coal pile-ash pile runoff settling pond has sufficient capacity to provide a 24-hour detention time for the one-in-one hundred year, 24-hour rainfall event on both storage facilities. The pond provides for settling of suspended solids and pH adjustment within the range of 6 to 9. Water from this pond is discharged to the cooling tower blowdown line at a rate not to exceed 650 gpm (2460 l/min).

Preoperational Cleaning Wastes

1.112
Preoperational cleaning of the boiler cycle will produce a liquid waste. These wastewaters will be evaporated by injection into the

boiler at a controlled rate. Wastewater resulting from periodic cleaning of the boiler steamside during station operation will also be treated by controlled injection. Evaporation in the boiler furnace will eliminate all aqueous discharges of cleaning wastewaters. A portion of the waste will exit with the flue gases and the remainder will be absorbed on fly ash particles and eventually removed to the ash disposal pile.

SOLID WASTES

1.113
Solid wastes will be produced during both the construction and operation of the proposed Lake Erie Generating Station at Pomfret. Construction-related solid wastes will be generated during dredging, tunneling, foundation excavations, concrete batch plant operations, clearing of vegetation and the demolition of existing onsite structures. Additionally, sewage solids and refuse will be produced during construction. The quantities and disposal methods for dredged material and tunnel excavation wastes were discussed in paragraph 1.050. Operational phase solid wastes include: equalization/neutralization system wastes; fly ash and bottom ash; site water pretreatment system solids; coal spillages; intake screening wastes; refuse; sewage solids; and pulverizer rejects. The Resource Conservation and Recovery Act of 1976 (RCRA) was established to promote the protection of health and the environment and to conserve valuable material and energy resources by proper waste disposal management plans and resource recovery. Subtitle C of the RCRA applies to the handling of toxic hazardous wastes and authorizes the Administrator, U.S. Environmental Protection Agency, to establish criteria for the listing of those wastes deemed hazardous.

Generators and transporters of solid wastes listed as hazardous will be required to meet standards and regulations to be established by the Administrator. Owners and operators of hazardous waste material treatment, storage, and disposal facilities will also be required to meet certain standards and regulations, and will be required to have a permit issued pursuant to Section 3005 of the RCRA. Should a determination regarding the toxicity of power plant solid waste result in listing of these wastes as hazardous, Subtitle C of the RCRA would apply to the proposed Lake Erie Generating Station.

The U.S. Environmental Protection Agency believes there will be ample time available for any required site modifications if Subtitle C is deemed applicable since RCRA is scheduled for implementation in 1979.

If Subtitle C is not applicable to power plant solid wastes, the sanitary landfill criteria of Subtitle D, Section 4004 would apply. Implementation of these criteria is expected to encourage the recovery and utilization of solid waste by eliminating unacceptable disposal practices. Facilities which meet the criteria are practices which pose no reasonable probability of adverse effect on health and the environment. The RCRA also prohibits open dumps and mandates closing or upgrading of these facilities. Both onsite disposal at the proposed Lake Erie Generating station and any offsite disposal areas which may be used for station solid wastes will be subject to the RCRA in some manner. There are presently five sanitary landfills operating in Chautauqua County and it is anticipated that by the mid 1980's there will be a single sanitary landfill in the county. The exact location of sanitary landfills which will be available to the applicant at the time of construction and operation of the facility and which will comply with RCRA criteria cannot be determined at this time. However, the RCRA is expected to be implemented prior to construction and any sites used will be subject to compliance.

Construction Phase Solid Waste

Plant Grading and Excavation

1.114
The plant grading process (preparation for the steam generator, turbine and building foundations) and smaller localized excavations for specific facility components will all generate excavated material. Excavated materials from beneath the plant island and cooling tower areas will be transported and stored about the site and will be used to adjust plant grade in areas not required to support structural loads. No excess material is anticipated from any of these operations.

Concrete Batch Plant Solid Waste

1.115
The Lake Erie Generating Station construction site may be equipped with a temporary batch plant operation to produce all concrete necessary for facility construction. Solid wastes (less than 10 cubic yards or 7.6 cubic meters per day) could be generated in the form of wasted and sub-standard concrete and concrete washed from mixers, trucks and other associated equipment. Approximately 100,000 cubic yards (76,500 cubic meters) of concrete will be required for the two-unit facility. Production rate maximums are on the order of 400 cubic yards (305 cubic meters) per day. The quantity of waste concrete will depend on the amount of concrete rejected for failure to meet required specifications, or concrete cleaned from mixing areas or from conveying trucks and equipment. Unused concrete will be utilized on-site to the extent feasible as non-structural fill.

Site Clearing and Demolition Activities

1.116
Site preparation activities will primarily consist of clearing (removal of trees and brush), grubbing (removal of stumps and roots), demolition of existing buildings and structures, and grading (the establishment of the proper construction and operating foundation). Solid wastes resulting from these procedures will primarily include timber, wood, used building materials, brush and mulch. All resultant solid wastes will be either disposed of on-site or off-site in a regulatory approved manner. Where feasible, site preparation solid wastes (for example, merchantable timber) may be sold to interested parties. At the Pomfret site, there will be 551 acres (223 hectares) requiring clearing, of which 29.7 acres (12 hectares) will be forested land. Any timber removed during the site preparation process will be sold to a private contractor for lumber, made available to the public for firewood, trucked to an approved off-site sanitary landfill along with other plant refuse, or burned in compliance with applicable regulations.

Construction Refuse

1.117
Plant refuse that is generated by construction activity, site preparation or employee activities includes scrap metals and wood, paper from packaging and building materials, plastic and glass pieces, food and beverage containers and other solid waste debris. The generation of these wastes will extend over the entire construction phase of operations and will require continuous management. It is currently planned to salvage and recycle any metal, wood, etc., products that are valuable, and residual refuse will be disposed of either on-site or off-site in a sanitary, safe and regulatory approved manner and location. Construction refuse quantities are dependent on phase of construction, rate of material and equipment delivery to the site and number of construction personnel.

Sewage Solids

1.118
During construction and start-up of the proposed station, a prefabricated, package type aerobic secondary sewage treatment facility will be provided to manage domestic-type wastewater from construction personnel. This sewage treatment facility will produce a solid waste (sludge) which will be aerobically digested to achieve stabilization. Occasionally, the primarily inert residue will be removed from the aerobic digester. These solids will be disposed of off-site in an approved sanitary landfill.

Operational Phase Solid Wastes

Site Water Pretreatment

1.119
Water pretreatment consisting of coagulation/sedimentation and gravity filtration (utilizing sand and carbon filters) will supply makeup water for the demineralizer system and other plant water systems. These unit operations will produce solid waste in the forms of clarifier solids underflow and filter backwash solids. The underflow solids will be pumped to the bottom ash sluice water settling tank at an average daily flow of 700 gpd or 2,650 liters per day. The maximum flow anticipated for this system is 10,000 gpd (37,850 liters/day). Filter backwash solids will also be pumped to the bottom ash sluice water settling tank for ultimate disposal. The average flow for this waste stream is estimated at 25 gpm (94 liters/min). These wastes will eventually be distributed in the ash disposal area.

Coal Spillage

1.120
Western low sulfur coal (0.5 percent S) will be transported to the Lake Erie Generating Station by lake bulk carrier and unloaded at the offshore unloading facility located in Lake Erie. The coal will then be transported through the coal conveyor tunnel to the coal storage pile. Any solid wastes associated with coal handling and storage would be the result of coal spillage and dust emissions. The size characteristics of this waste could range from a fine powder to the size of the unpulverized coal being used. Fugitive coal dust emissions from the coal pile will be minimized by using a water spray system with a possible added binding agent. All coal conveyors and transfer points will be enclosed to minimize coal spillage and/or dust emissions during coal handling system operations. Precautions such as spraying the coal on the vessel prior to transfer, enclosure of the ship's transfer boom, a flexible tarpaulin between the boom and coal silo, and an interlock system to shut off the ship's transfer system in the event of tunnel conveyor system breakdown should prevent coal dust or spillage from entering Lake Erie.

Intake Screening Wastes

1.121
The debris that will collect on the intake traveling screens in the pump house will consist of small pieces of wood, silt, trash, aquatic flora and fauna, etc. This waste will be collected during screen backwash and will be disposed of off-site at a licensed disposal

facility. The quantity of this waste material will be variable and is estimated as high as 100 to 150 pounds (45-68 kg) per day.

Sewage Solids

1.122
During the operation of the Lake Erie Generating Station, a package type aerobic biological treatment facility capable of a secondary degree of treatment will be provided to manage the sanitary wastes produced by approximately 200 personnel. Operation of this facility will produce about 10 pounds (4.5 kg) of solid waste per month from the aerobic digester. These solids will be essentially inert and will be dewatered and subsequently disposed of off-site in an approved sanitary landfill.

Refuse

1.123
Solid waste (refuse) will be generated at the Lake Erie Generating Station through normal office activity, maintenance shop work, cafeteria operation and various other sources. It will include paper, cardboard, and various packing materials as well as small amounts of scrap material from normal maintenance operations. It is conservatively estimated that approximately 400 pounds (181 kg) per day of this material will be produced although daily generation will be variable. This solid waste will be trucked to an approved off-site sanitary landfill for ultimate disposal.

Pulverizer Rejects

1.124
All coal will be pulverized prior to use to produce finely-divided particles for firing. Material that resists pulverization will be rejected from the system, producing a solid waste. The amount of pulverizer rejects that will be produced at the site will be a function of the quality control measures implemented at the coal mine. However, it is conservatively estimated at this time that the pulverizing process could result in as much as approximately 25 cubic feet (0.71 cubic meters) of rejected material per day. This solid waste, consisting of pyritic sulfur and other debris, will be trucked to the ash disposal pile for ultimate disposal. Pyrites will be collected during the coal milling process and stored for about one week. At that time, a trench will be constructed in the ash pile and a truckload of pyrites placed and compacted within the trench. The top of the trench will be capped and normal ash pile deposition would then proceed. The cap above the pyrite disposal trenches will consist of compacted bentonitic soil with at lease a six-inch thickness. The State Pollutant Discharge Elimination System (SPDES)

draft permit specifies that the cap above these wastes shall have a maximum permeability of 10^{-7} cm/sec. If this permeability cannot be achieved with the bentonitic soil by itself, an artificial liner will be used along with the soil to obtain the desired permeability. Due to the chemically reactive nature of pyrites, the disposal trenches will not be placed within ten feet (3.0 m) of the finished ash pile surface.

Equalization/Neutralization System Wastes

1.125
The equalization and neutralization of regenerant wastewaters is expected to produce a precipitate of calcium sulfate. The maximum quantity of residue occurring on a maximum regeneration activity day is estimated at approximately 50 pounds (22.7 kg) per day. These solids will be periodically removed from the basin as required and will be conveyed to the ash disposal area.

Ash Disposal

1.126
Combustion of coal in the furnace causes the ash content to divide into two fractions: bottom ash and fly ash. Fly ash constitutes that portion of the total ash content which exits the boiler combined with the flue gases. For the proposed Lake Erie Generating Station, two alternative fly ash transport systems have been considered. These alternatives include pneumatic (dry) and hydraulic (wet) sluicing. The dry system has been selected as the preferred. Eighty percent of the total ash is estimated to be converted to fly ash during combustion while the remaining 20 percent will be converted to bottom ash. Fly ash is removed from the flue gas stream by electrostatic precipitators with an assumed efficiency of 99.4 percent removal, producing 64,880 lbs (29,430 kg) per hour per unit when each 850 MW unit is operating at 100 percent capacity. Bottom ash constitutes that portion of the ash which, following combustion, falls to the lower section of the boiler and then undergoes mechanical grinding to produce particles small enough for sluicing. The estimated bottom ash generation for western low sulfur coal is 16,432 lb/hr/unit (7,450 kg) for each of two units. Based on using low sulfur (0.5 percent S) western coal with an average ash content of eight percent and operation of Units 1 and 2 at a 69 percent capacity factor, the proposed station would generate about 9.2×10^4 tons (8.3×10^4 metric tons) per year of bottom ash and 36.8×10^4 tons (33.4×104^4 metric tons) per year of fly ash. Total ash production is estimated at 46×10^4 tons (41.71×10^4 metric tons) per year or 1.39×10^7 tons (1.26×10^7 metric tons) over the station's thirty-year life.

1.127
The ash disposal facility at the proposed Pomfret site is designed to handle the anticipated thirty-year quantity of Lake Erie Generating Station ash and ash from the applicant's operating Dunkirk Steam Station. The Dunkirk Station generates 3.5×10^4 tons (3.17×10^4 metric tons) of bottom ash per year and 14×10^4 tons (12.7×10^4 metric tons) of fly ash per year for a total yearly ash production of 17.5×10^4 tons (15.9×10^4 metric tons). The plant life ash capacity of the disposal facility is 1.67×10^7 tons (1.5×10^7 metric tons) or 10,300 acre-feet.

1.128
The Pomfret site ash disposal facility will be 246 acres (99.6 hectares) in size with an ash pile maximum vertical height of 45 feet (13.7 m). The ash pile side slopes will be graded to three horizontal units to one vertical unit. An area capable of handling the first several years quanitity of ash would be cleared initially with the size of the area dependent on the economic optimization of the clearing sequence. Lining for leachate control would be placed on a pile base area that would handle a 2 to 3 year quantity of ash. The ash pile would be developed at grade, and the base would be prepared with a suitable sealing material to insure groundwater protection. The base of the ash disposal pile will be prepared by reconstituting and compacting the upper two to three feet of native soil and adding bentonitic material as required to achieve a maximum allowable permeability of 10^{-6} cm/sec. Leachate and surface runoff will be collected in lined trenches and directed to a lined treatment pond.

The sequence for base preparation is as follows:

- The ash disposal area would be prepared by the removal of vegetation, etc., and the area graded as necessary. Top soil cover would be stockpiled nearby the ash disposal area and vegetated for later use as final cover material.

- The soil sealing material (bentonited clay or equivalent) would be added as needed.

- The soil sealing layer would be compacted to the desired density. The base of the pile would be sloped taking natural contours into account to promote drainage of runoff water to a clay-lined trench surrounding the active ash pile area being developed. This lined peripheral trench would allow the runoff water to be sent to the hydraulic control pond located in the vicinity of the ash pile. As the ash pile grows there will be a corresponding expansion of the peripheral runoff water trench. As the active area moves, the trench and/or the runoff pond will be adjusted or relocated as required. The ash pile would be developed in carefully controlled segments whose main purpose is to minimize the area under active disturbance and promote early restoration of the completed areas.

- The sealing material would be covered with 6 to 9 inches of native soil to insure protection from abrasion due to trucks and bulldozers operating on the ash pile.

1.129
The Pomfret site dry ash disposal pile will be located in an area between the railroad tracks and the New York State Thruway. The eastern boundary of the ash disposal pile area will be immediately west of Van Buren Road. When fully developed the ash disposal pile would occupy most of the area bounded by the NYS Thruway, the railroad tracks, Van Buren Road and Berry Road. The ash disposal area will include the section of Berry Road in this area, and eventually cause it to be rerouted. The western perimeter of the ash disposal pile will be approximately 3,400 feet (1,036 m) east of the intersection of Lake Road and Lowell Road.

1.130
Monitoring of ground water quality will be via a minimum of 3 groundwater monitoring wells placed around the ash pile area. At least two of the wells will be located down gradient from the lined ash disposal pile.

1.131
Trucks are required to transport both fly ash and bottom ash from the storage facilities adjacent to each unit's precipitator to the disposal facility. At the Pomfret site, the disposal facility is about 6,500 feet (1,981 m) from the plant island. The criterion for determining the number of trucks required is the ability to transport seven full days' production of ash in five days (35 working hours) when each unit has operated continuously at 100 percent load. Four trucks are required for fly ash transport based on each truck making three trips an hour with a truck capacity of 40 cubic yards or 30.6 cubic meters (21 trips/day/truck). One additional truck is required for transporting bottom ash to the disposal area. The bottom ash truck would make on the order of 19 trips/day. The number of trips indicated is based on the above maximum criteria (i.e., units operated continuously at 100 percent load).

1.132
The ash disposal pile at the Pomfret site would be developed in strips having an approximate base width of 350 feet (107 m) and a height of 45 feet (13.7 m) with side slopes at 3 feet horizontal to 1-foot vertical. As significant portions (several hundred feet) of

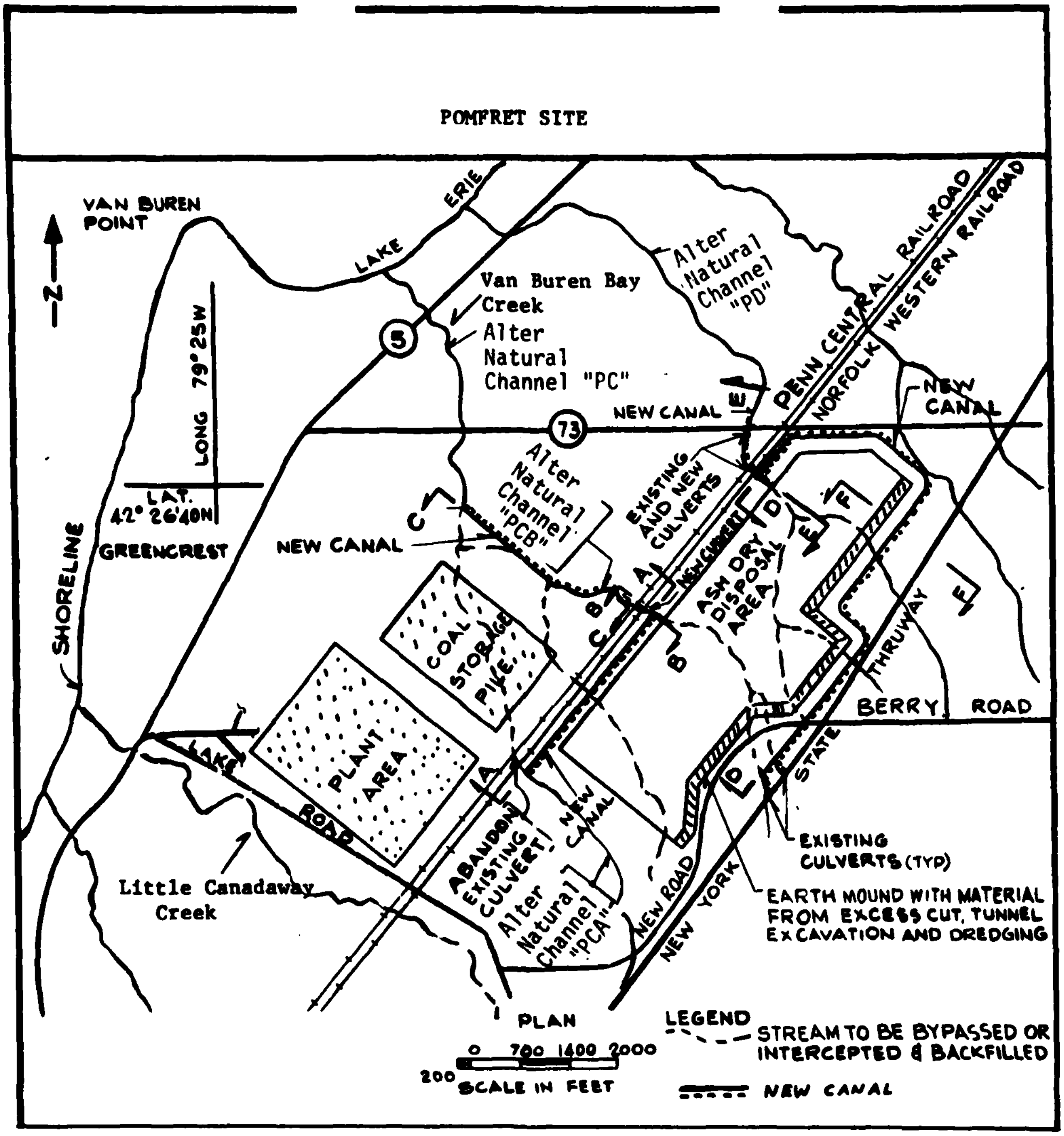
the ash pile are built up to their 45-foot height, the top and side areas forming the final perimeter would be permanently covered with 24 inches (61 cm) of cover, the top 6 inches (15 cm) of which will be topsoil. Fly ash and bottom ash will not be segregated but will be placed at random on the ash disposal pile. However, sufficient quantities of bottom ash will be retained so that bottom ash can be placed over the active pile area at the conclusion of daily disposal activities to effect a dust control layer. During periods when high winds are prevalent, the ash would be piled at lower levels further removed from site boundaries to minimize dust being blown about. Also, during periods of the year when freeze-thaw conditions exist, the disposal area would be kept flexible to insure "trouble-free access" by ash transport and maintenance vehicles. Initial dust control would be promoted by keeping the ash moist as it is transported to the ash pile in the trucks. Keeping the ash in the pile moist by additional water spraying as required would further control dust emissions.

STREAM AND POND ALTERATIONS

1.133
Construction of the proposed facility at Pomfret will require the filling of six small ponds and alteration of three streams by culverting, rerouting, channelization, and filling. Figure 1-12 shows the on-site streams to be altered. Most of the stream alterations are a result of the coal pile area and ash disposal facility constructions. The affected streams included the east branch of Van Buren Bay Creek, the west branch of Van Buren Bay Creek and an unnamed tributary to Lake Erie. The total acreage of the six ponds to be filled is 1.27 acres or 0.51 hectares. These ponds which are shown on Figure 1-13 have been designated P-4, P-5, P-7, P-8, P-13, and P-25. Ponds P-8 and P-25 were constructed for, and served as, fly ash settling basins for Dunkirk Station ash. Although Figure 1-13 shows 25 ponds, only 21 of these are within the site boundary line as presently envisioned.

POWER TRANSMISSION CORRIDOR

1.134
Planning of the transmission circuits which will connect the proposed Lake Erie Generating Station to both the existing and independently proposed transmission system of the New York Power Pool is only at a preliminary stage. While it is recognized that the impact of transmission lines must be considered in assessing a generating station, transmission line corridors in the State of New York are proposed independent of the generating station in accordance with Article VII of the New York State Public Service Law. In Article VII proceedings, the applicant may select several feasible power



KEY

PC - Van Buren Bay Creek
PCA - West Branch of Van Buren Bay Creek
PCB - East Branch of Van Buren Bay Creek
PD - Unnamed On-site Creek

Figure 1-12
Stream Alterations-
Pomfret Site

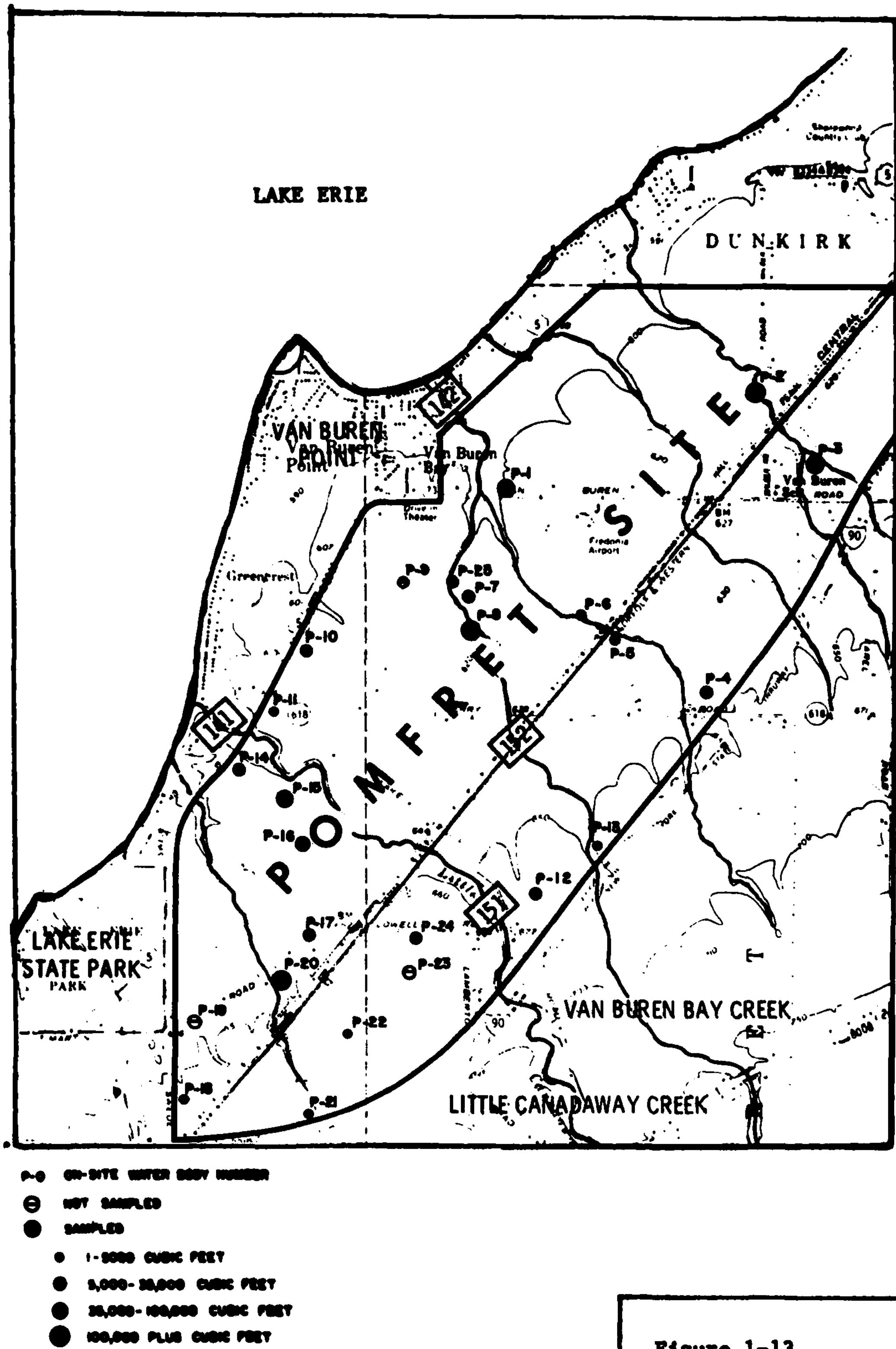


Figure 1-13

On-site Ponds- Pomfret Site

transmission corridors, but the final decision as to which corridor will be certified is made by the State.

The corridor which is ultimately selected may or may not be one of those proposed by the applicant. Thus, only generalized information is now available, and future studies by the applicant and the State may lead to differing proposals from those discussed in this impact statement. Detailed information on the Lake Erie Generating Station's associated transmission facilities will be provided to government agencies as an integral part of the Article VII certification process. At this time it is the applicant's opinion that a transmission corridor from the proposed Lake Erie Generating Station can be identified, constructed, and maintained in an environmentally, socially, and economically acceptable manner. The following paragraphs describe the applicant's potential transmission configuration for the proposed Lake Erie Generating Station.

1.135
The bulk power transmission configuration proposed for the station includes three circuits: Lake Erie to Stolle Road Station (east of Buffalo); Lake Erie to Hinsdale Station (vicinity of Olean, NY); and Lake Erie to the New York-Pennsylvania border (vicinity of Ripley, NY). This configuration is considered to employ transmission lines constructed and operated at 765 kv in conformance with the long-range transmission expansion plans of the New York Power Pool. However, in the event that use of 765 kv is deferred in southwestern New York beyond the in-service date of the proposed station, then the three above-mentioned lines could be installed at 345 kv. It is possible that a line connecting Stolle Road with the Pennsylvania border may be proposed independently of decisions regarding the Lake Erie Generating Station in order to provide for interconnection between the NYPP and Pennsylvania utilities. It is also possible that failure to successfully conclude joint studies and agreements with utilities outside New York might lead to omission of the interconnection circuit entirely. In the former case, connection for the Lake Erie Plant would be provided by tapping the Stolle Road - New York/ Pennsylvania circuit plus installation of a Lake Erie-Hinsdale circuit. In the latter case, a 345 kv configuration for the proposed facility might be developed utilizing one circuit to Hinsdale and two circuits to the Stolle Road Station. In all cases, three circuits would be made available for reliability purposes.

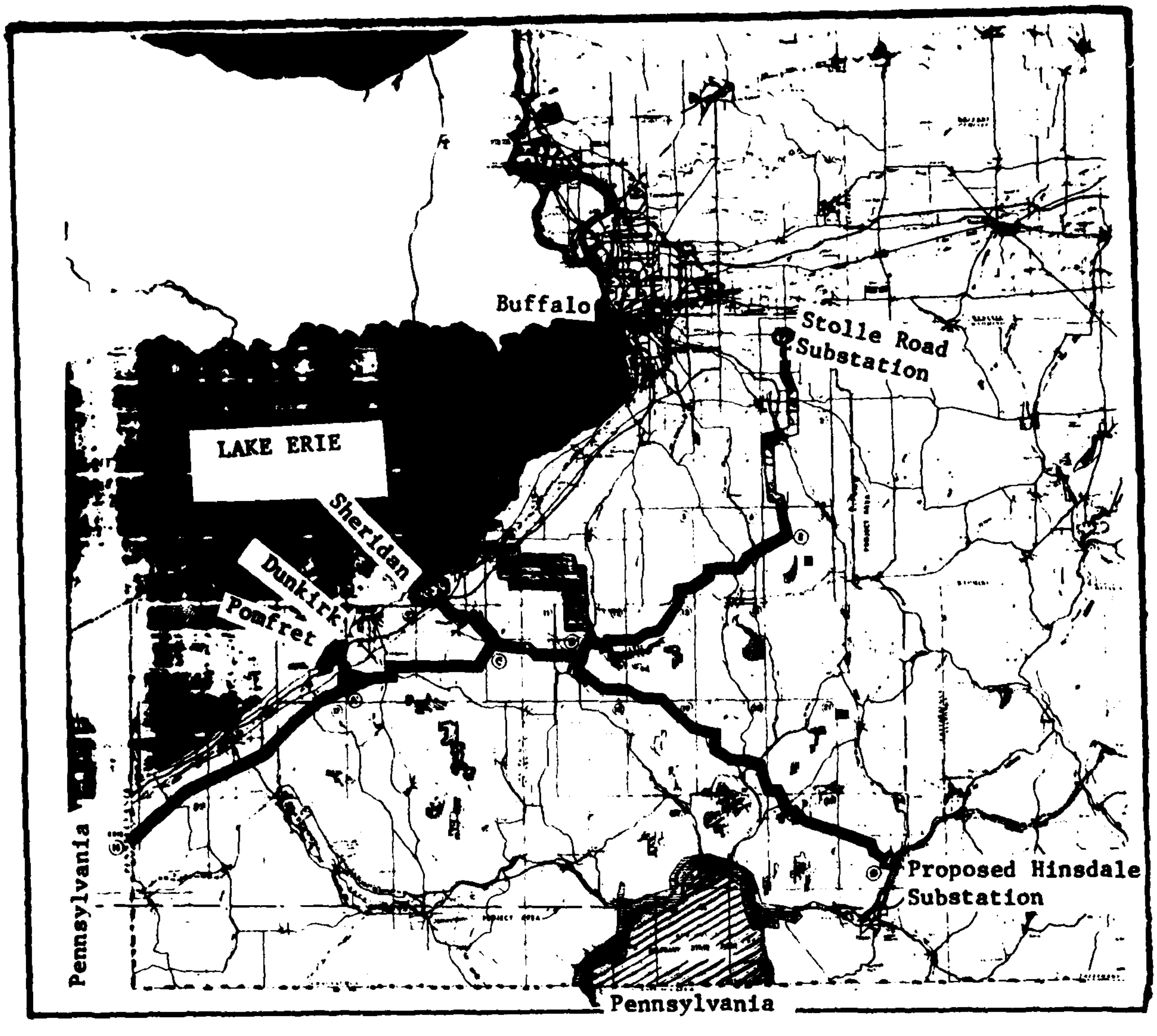
1.136
The proposed configuration would involve construction of approximately 160 miles (257 km) of transmission corridor including about 50 miles (80 km) where existing right-of-way would merely be widened. Each circuit would have a capacity of 4,000 MW (if 765 kv) or 1,450 MW (if 345 kv). Under emergency conditions, one of the 765 kv circuits could provide 4,500 MW. A sample winter condition for 765 kv

lines would involve transmitting about 1,300 MW from the Lake Erie Station to Stolle Road, about 350 MW to Hinsdale, and about 50 MW toward Pennsylvania. Analogous values for 345 kv lines would be about 1,150, 450, and 100 MW respectively. In general, 765 kv circuits would utilize single-circuit, steel-lattice towers. In locations where required, steel-pole towers would be utilized. If 345 kv transmission is provided, the majority of construction would employ circuit, wood-pole H-frame towers. Where required, steel-lattice or steel-pole towers would be used. Typical right-of-way widths would vary from 250 to 650 feet (76-198 m) for 765 kv lines and from 150 to 350 (46-107 m) for 345 kv lines. In both cases, the width of a given stretch of corridor would depend on whether 1, 2, or 3 circuits were present. The average span length for the 765 kv lines would be 1,500 feet (457 m); and for the 345 kv lines it would be 1,000 feet (305 m). Towers would typically be on the order of 135 feet (41 m) high, and the ground clearance over cultivated land typically 50 feet (15 m), although dimensions have not yet been determined exactly.

1.137
The corridor can be considered in terms of several distinct segments. One is the connection between the generating station and the on-site switchyard. Another segment is a wide but short corridor running generally southeast from the switchyard across the New York Thruway and Route 20. This segment represents the "tap" corridor which would connect the proposed station to any independently proposed Stolle Road-Pennsylvania connection. The purpose of the tap corridor is to maintain the three circuits leaving the Lake Erie Generating Station in a single corridor as long as practical. The length and location of the tap corridor will depend on which Lake Erie Generating Station site is certified by the State. A third segment will connect this segment with the Pennsylvania border and roughly parallel the Lake Erie shoreline. The fourth segment runs in an easterly direction to avoid the Cattaraugus Indian Reservation, turns northeast to intersect the recently certified Homer City - Stolle Road 345 kv transmission line and parallels this existing corridor into the Stolle Road Substation. A final segment branches from this latter segment south of the Cattaraugus Reservation and runs in a southeastern direction to Hinsdale (see Figure 1-14).

Pennsylvania Border Segment

1.138
The segment running to the Pennsylvania border is approximately 26 miles (42 km) long. The applicant would expand the existing transmission line corridor which contains the 230 kv Erie-Dunkirk line and the 115 kv Dunkirk-Westfield line. The proposed Pennsylvania border segment traverses the transitional area between the Erie Lake Plain and the Cattaraugus Hills. The area is rural



LEGEND

Wildlife Management Area

Federal or Indian Reservations

State Lands

Figure 1-14
Feasible Transmission
Line Routes

land projected to remain in natural open space, and settled and sparsely settled rural uses except for land near the plant site, where there is some land devoted to low intensity urban use. Areas of particular sensitivity in the corridor region are the population centers of Brocton, Westfield, and Ripley and such natural features as Little Canadaway Creek, Little Chautauqua Creek, Chautauqua Creek (The Gulf), Twenty-Mile Creek and Gage Gulf.

Stolle Road Segment

1.139
The Stolle Road segment extends eastward from the proposed Pomfret site across the Erie Lake Plain which is prime agricultural land. It is not possible to avoid crossing this plain from the Pomfret site, although it is an area in which transmission lines would be highly visible. As the corridor leaves the Erie Lake Plain, it crosses rolling farmland interspersed with woodlots. Once the generally suburban character of the Fredonia area is passed, the region can be considered as predominantly rural with low population densities. Major sensitive areas here are the Fredonia suburban area, the strip development along Route 60 and the Village of Forestville, Fredonia Reservoir, Ball Gulf and wetland areas associated with West Branch Conewango Creek. The visibility of the proposed transmission system will be greatest at the crossing of Routes 60 and 83 south of Fredonia. Buffer zone screening at the crossing can reduce this visual exposure in critical areas. Once out of the lake plain area, the visual exposure is generally low due to the rural nature and varying topographic conditions. Small woodlots and streams, some with associated steep topography, are encountered in this area. It is the applicant's intention to minimize erosion by overseeding as soon as possible during construction. Steep slopes with their attendant fragile soil and vegetative cover will be avoided where possible, and streams will be protected by buffer zones.

1.140
Further east, in the area near the Chautauqua-Cattaraugus County line, the envisioned route would be characterized by rolling topography with long ridges and valleys generally running north and south. At this point, the route is still south and west of the Cattaraugus Indian Reservation. Natural open space, sparsely settled rural areas, and medium viability farmland are found in this section of the route. Major sensitive areas within this region are the wetland areas in the upper valleys of the North Branch Conewango Creek and Slab City Creek, the J N Adam Developmental Center on the hillside south of Perrysburg, and the transmitter tower on the ridge to the south of Perrysburg. The development areas of Perrysburg and Dayton are also contained in this region of the segment as well as some extensive wetlands in the area immediately to the south of

Dayton. Visual impact is expected to be light through this area since the proposed transmission corridor crosses local roads with low traffic volumes. The indicated corridor runs parallel to Route 39, which is the principal east-west travel route in this region, but is generally hidden from view by tree masses and rolling topography. The development regions of Perrysburg and Dayton are avoided in this alignment; interference with projected expansion of these areas is negligible. Several small valleys and wooded areas are crossed by the corridor; however, the major wetlands are avoided. The fragile stream edge and hillsides of the narrow valleys may be spanned by the transmission lines. Smaller wetland areas, if encountered, can be spanned with minimal disturbance of the ground surface.

1.141
The branch then passes south of the Village of Gowanda, crosses the Zoar Valley adjacent to existing industrial land uses, and rises out of the valley into slightly rolling terrain characterized by general rural development. Areas of special sensitivity in the general region would include the Cattaraugus Indian Reservation, the Village of Gowanda, the Zoar Valley Multiple Use Area east of Gowanda, the Village of Springville and various areas of state reforestation lands. A variety of land uses is found within the proposed transmission corridor, ranging from extractive uses (gravel pits), industrial, residential and recreational areas, to natural open space and rural agricultural lands with scattered woodlots. In the area south of Gowanda which the transmission corridor crosses, the residences are on large parcels. A crossing of Cattaraugus Creek takes place at the southern village limits of Gowanda where industrial and extractive uses now exist. Any crossing north of the village is blocked by the Indian Reservation; and the Zoar Valley multiple use area is to the east of the village.

1.142
Potential ecosystem impact exists in those areas where the proposed transmission corridor crosses steep slopes, wooded areas, streams and wetlands. These areas will be avoided as much as possible in the routing, but where encountered selective clearing and special construction techniques will be implemented to minimize the impact. Alternative structure types may also be used if unusually long spans are dictated by the slope or ground conditions.

1.143
The last portion of this branch joins the Homer City-Stolle Road 345 kv transmission line and parallels this existing corridor into the Stolle Road Substation. The existing right-of-way (ROW) is 150 feet (45 m) wide and would be widened to accommodate the proposed system. The land through which this corridor segment passes is rural in character with development density increasing at the north end due

to expanding Buffalo suburban growth pressures in the area. As the area in all directions around the substation is under these developmental pressures, it is the applicant's belief that expansion of an existing corridor would result in less environmental impact than would the establishment of a new corridor. It should be noted in this regard that the existing corridor was carefully located to keep visual and environmental impact to a minimum. The total length from the site vicinity to Stolle Road would be from 65 to 70 miles (105-113).

Hinsdale Branch

1.144
The Hinsdale circuit would branch from the Lake Erie to Stolle Road corridor just described at a point south of the Cattaraugus Indian Reservation and run in a generally southeastern direction for a distance of approximately 40 miles (64 km). The character of the land traversed progresses from rolling farmland with interspersed woodlots and locally steep terrain at creek crossings to increasingly rugged land with sparsely settled valleys and a larger percentage of tree cover. The projected land use in this area is predominantly natural open space and sparsely settled rural land with infrequent crossings of medium and high viability farming areas. Major sensitive uses in this part of the project area are extensive reforestation areas, commercial recreation uses, isolated areas of wetland and the development areas of Dayton, Otto, Cattaraugus and Ellicottville. Prospective environmental impact associated with land use would be temporary and permanent interference with agricultural cropland, forest clearing and usurpation of land in developmental areas suited for other use. Disturbance to sensitive ecosystems might be expected to occur in wetlands, major forest areas, sensitive stream crossings or some of the steeper forested slopes where ecosystems may be fragile. Ecosystems encountered in agricultural lands, retired agricultural land or woodlots are not expected to be particularly sensitive or to experience permanent change. Wetlands and major forest areas will be avoided when possible. Along this segment of the line, the rural character of the landscape will minimize exposure and visual impact is, therefore, expected to be minor. Avoidance routing away from population centers will result in road crossing areas being the principal areas of increased exposure.

Switchyard to Major Corridor Branch

1.145
In addition to the three major corridor branches, use of the Pomfret site would require construction of a 2.4 mile (3.9 km) long segment running from the switchyard to the point where the Pennsylvania circuit would first diverge from the eastern circuits to Stolle Road and

Hinsdale. This particular segment is unique to the Pomfret site although the Sheridan site would require an analogous link. Except for patches of trees in the more poorly drained areas, the land is generally level and open with long unobstructed views to the Cattaraugus Hills region to the east. Major sensitive areas identified in this section are the Dunkirk-Fredonia urban area and the strip development along Route 20. The agricultural lands will undergo temporary disturbances during the construction phase of the proposed transmission line, and small areas of permanent disturbance will occur at the positions of the supporting structures. Careful location of supporting structures at the edges of fields, farm lanes, or in unproductive areas can be accomplished to minimize the potential impact on the agricultural lands. In areas of wooded cover it will be necessary to cut trees within a portion of the right-of-way. Selective cutting rather than clear-cutting of the entire right-of-way will be practiced. The visibility of the transmission lines will be greatest in areas such as the crossing of the New York Thruway and U.S. Route 20. Screening will be preserved or established to further reduce visual implications.

Generator-Switchyard Connection

1.146
Two transmission towers and approximately 2,000 feet (610 m) of line will be required to connect the generating facilities with the on-site switchyard. One acre (0.4 hectares) will be cleared during tower construction and less than 0.01 acres will be permanently required for the footings of the towers. Disturbance will be confined to the proposed station site.

ATMOSPHERIC DISCHARGES

1.147
The initial installation at the proposed Lake Erie Generating Station will consist of two 850 MW nominally rated duplicate coal-fired steam turbine generating units, designed to support continuous base load operation. The air contaminant discharges from the two units which are discussed in this section, are based on load factors which will give rise to maximum air quality impacts although actual electrical power production will not always result in these air contaminant discharge rates.

Coal Characteristics and Emission Rates

1.148
To minimize the Lake Erie Generating Station's contribution of air contaminants to the surrounding area, commercially available air quality control equipment and techniques will be incorporated in the

design of the steam generator and flue gas treatment systems. The resulting emission levels will be in compliance with presently applicable Federal and State emission regulations. The present Federal standards of performance for new stationary sources are shown on Table 1-8. The U.S. Environmental Protection Agency (EPA), in accordance with the Clean Air Act Amendments of 1977, is revising the New Source Performance Standards (NSPS). NSPS revisions will require a percentage reduction as well as a fixed emission limit, and it is likely that the percentage reduction requirements will apply to the proposed facility. This percentage reduction requirement will not be known until promulgation of new EPA regulations. However, the new revisions could result in the need to install flue gas desulfurization (FGD) systems at the proposed facility.

1.149
New York State Department of Environmental Conservation has established emission limitations and regulations applicable to fossil fuel-fired steam generators of more than 250 million British thermal units (MBtu) of heat input. A listing of the State emission regulations applicable to the proposed plant is presented in Table 1-9.

1.150
During full load operations the proposed generating station will burn sub-bituminous coal with an approximate sulfur content of 0.5 percent, at a rate of approximately 1,000 tons/hr (907 metric tons/hr) for each of two units. A typical coal-analysis is presented below:

Typical Ultimate Analysis of 0.5 Percent Sulfur Western Coal

Component	Percentage	Range
Carbon	48.5	43.0-66.0
Hydrogen	3.4	3.0-7.0
Oxygen	11.1	7.0-12.0
Nitrogen	0.7	0.5-2.0
Sulfur	0.5	0.3-0.7
Ash	8.0	3.0-18.0
Moisture	27.8	7.0-37.0

Typical plant operating characteristics and fuel parameters based on this western coal are shown on Table 1-10. These characteristics and parameters have been utilized to calculate air contaminant emission rates. Pollutants which are not collected will be released from the combined (2 flue) 750-foot (228 m) stack. The calculated pollutant release rates of SO_2, NO_x (as NO_2), particulates, carbon monoxide (CO) and hydrocarbons (HC) are presented to Table 1-11. The

TABLE 1-8

FEDERAL STANDARDS OF PERFORMANCE
FOR NEW STATIONARY SOURCES

Parameter	Coal * Fired	Oil Fired	Gas Fired
1. Sulfur Dioxide a/ - lb/MBtu	1.2	0.80	-
2. Particulate Matter - lb/MBtu	0.10	0.10	0.10
3. Nitrogen Oxides a/ (as nitrogen dioxide) - lb/MBtu	0.70 b/	0.30	0.20
4. Opacity c/ - percent	20 d/	20 d/	20 d/

a/ Maximum 3-hour average.

b/ Except for lignite-fired steam generators.

c/ Maximum 6-minute average.

d/ Federal new source performance standards require opacity to not be greater than 20 percent except that a maximum of 40 percent opacity is acceptable for not more than two minutes in any hour.

*Proposed rules were published on 19 Septembe. 1978. These revised NSPS would limit SO_2 emissions to 1.2 lb/MBTU and require 85 percent reduction of SO_2 emissions at all times except to 75 percent reduction for three days per month. The proposed particulate matter emission standard would limit emissions to 0.030 lb/MBTU. The proposed opacity standard would limit the opacity of emissions to 20 percent (six-minute average). For subbituminous coal as proposed for the Lake Erie Generating Station, NO_x emissions would be limited to 0.60 lb/MBTU.

Table 1-9

NEW YORK STATE STANDARDS OF PERFORMANCE
FOR STATIONARY COMBUSTION INSTALLATIONS

Parameter	Coal Fired	Oil Fired	Gas Fired
1. Sulfur Dioxide[a/] - lb/MBtu	1.2	0.8	-
2. Particulate Matter[b/] - lb/MBtu	0.10	0.10	-
3. Nitrogen Oxides (as nitrogen dioxide) - lb/MBtu	0.70	0.30	0.20
4. Opacity - percent	20[c/]	20[c/]	20[c/]

a/ New York State limits the fuel sulfur content to 0.6 pound of sulfur per MBtu for coal-fired and 0.75 percent sulfur by weight for oil-fired facilities. However, certain exceptions may be allowed. Fuel with a sulfur content in excess of that regulated may be utilized where a sufficient portion of the sulfur in the fuel would be retained in the ash and the resulting emission of sulfur compounds (expressed as sulfur dioxide) does not exceed 1.2 pound per MBtu for coal-fired and 0.80 pound for oil-fired facilities.

b/ Maximum 2-hour average.

c/ Opacity must be less than 40 percent for any time period. Opacity must be less than 20 percent for three or more minutes in any continuous 60 minute period.

TABLE 1-10

FULL LOAD PLANT OPERATING CONDITIONS AND FUEL PARAMETERS USED TO CALCULATE AIR CONTAMINANT EMISSIONS FROM EACH 850 MW UNIT BURNING 0.5 PERCENT SULFUR WESTERN COAL

Operating Conditions*

Net Generating Capacity**	876,950	KW
Net Station Heat Rate	9,718	Btu/KWH
Heat Input	8,522	MBtu/hr
Firing Rate	1,026,771	lb/hr
Bottom Ash Collection	20	%

Fuel Parameters

Higher Heating Value	8,300	Btu/lb
Sulfur Content	0.5	%
Sulfur Rejected as Sulfates	3	%
Ash Content	8.0	%

* See Section 72.2 of Applicant's Article VIII application.
** At valves-wide-open, 5 percent over pressure and 3.0" HgA backpressure.

TABLE 1-11

EMISSIONS AND STACK PARAMETERS AS A FUNCTION OF LOAD

	Emissions (lb/hr)					Stack Parameters		
Load (%)	SO_2 1/	NOx 2/	Particulates 3/	CO 4/	HC 5/	Flue Gas Rate (lb/hr)	Exit Temperature (°F)	Heat Release Rate (Kcal/sec)
			Two Units					
50	9,960	5,966	852	513	154	1.132×10^7	215	139,112
68.6	13,665	8,185	1,169	704	211	1.553×10^7	235	196,509
75	14,940	9,948	1,278	770	231	1.698×10^7	240	216,404
100	19,920	11,931	1,704	1026	308	2.264×10^7	260	296,789
			One Unit					
50	4,980	2,983	426	257	77	5.66×10^6	215	69,556
75	7,470	4,474	585	385	116	8.49×10^6	240	108,202
100	9,960	5,966	852	513	154	1.132×10^7	260	148,395

1/ Based on 1.17 lb SO_2 per MBtu

2/ Based on 0.7 lb NO_x (as NO_2) per MBtu

3/ Based on 0.1 lb particulate per MBtu

4/ Based on EPA emission factor of 0.060 lb CO per MBtu

5/ Based on EPA emission factor of 0.018 lb HC per MBtu tall stack will be highly effective in reducing ground level pollutant concentrations in the vicinity of the power plant. Present Federal and New York State emission regulations limit the release of sulfur dioxide to 1.2 lb/MBtu. The Lake Erie Generating Station units will burn western coal with a sufficiently low sulfur content (0.5 percent) and a higher heating value (8,300 Btu/lb) to enable the present 1.2 lb/MBtu standard to be met without the need for a flue gas desulfurization (FGD) system.

1.151
Since the coal for the Lake Erie Generating Station units has not been contracted, toxic substance and heavy metal emissions and impacts cannot be firmly established at this time. However, to estimate these emissions, data for coal from the North Knobs area in Wyoming and Colstrip, Montana in addition to published literature were utilized by the applicant. Estimated toxic substance and heavy metal emissions from the proposed facility are presented below:

Toxic Substance	Emission Rate (lb/hr)	Emission Rate (lb/M Btu)
Beryllium	0.68	0.000040
Fluoride (gaseous)	493	0.029
Mercury	0.41	0.000024
Hydrogen Sulfide	3.9	0.00023

The emission rates are based on the highest toxic substance concentrations found in the previously mentioned three sets of coal data and assume an electrostatic precipitator efficiency of 99.4 percent for particulate (Beryllium) removal and zero percent removal for gaseous products. Many other elements will be emitted which are believed to be volatilized in the furnace and subsequently condensed in the form of sub-micron particles that are too fine to be collected with a high efficiency precipitator. Elements such as chromium, zinc, lead, selenium, and antimony are among those known to escape collection.

Auxiliary Boiler and Equipment

1.152
An auxiliary boiler fired with No. 2 oil will be located at the proposed facility and will supply up to 200,000 lb/hr (90,720 kg/hr) of steam for startup of the two generating units. The boiler will operate during startup of the first operational unit and will operate during startup of either unit if the other unit is not capable of supplying steam for startup (a minimum one unit load of approximately 30 percent is required). It is anticipated that the auxiliary boiler will operate for approximately 40 hours once per month and

flue gas will be emitted from a 260 ft (79 m) stack at an exit velocity of 60 fps (18.3 m/s) and an exit temperature of 300°F (148.8°C). The estimated flue gas rate is 71,900 ACFM. Operating characteristics of the auxiliary boiler have previously been discussed in paragraph 1.027 of this Chapter.

1.153
Although the auxiliary boiler has not yet been designed, operating characteristics have been assumed in order to estimate the maximum air contaminant emission rates.

Based on these characteristics, the estimated emission rates utilizing No. 2 oil with a 0.78 percent sulfur content (maximum) are 200 lb (90.7 kg) per hour of sulfur dioxide, 75 lb (34 kg) per hour of nitrogen oxides, and 25 lb (11.3 kg) per hour of particulates. The applicant expects to meet the present Federal New Source Performance Standards for oil-fired steam generators (Table 1-8) without the addition of control equipment. The EPA has published emission factors for oil-fired boilers which confirm that these emission rates can be achieved by selective use of No. 2 oil in tangentially fired boilers (EPA, 1976).

Cooling Tower Emissions

1.154
Operation of the natural draft cooling tower will result in the discharge of large quantities of heat and water vapor to the atmosphere and the emission of salts contained in drift (entrained water droplets). The chemical composition of salts emitted from cooling towers approximates that of blowdown water. The main ionic components of cooling tower salts are: sulfates comprising 31 percent of the salt by weight; and calcium and chloride comprising 23 and 15 percent by weight, respectively. The maximum predicted monthly, seasonal, and annual salt deposition rates are 0.077 lb (34.9 grams)/acre/month, 0.211 lb (95.7 grams)/acre/season, and 0.43 lb (195 grams)/acre/year. Cooling tower drift loss is estimated at 13 gpm (49 l/min) and evaporation loss is projected at 11,400 gpm (43,150 l/min). The predicted heat rejection rate to the atmosphere is 8.6×10^9 Btu/hour.

Auxiliary Equipment

1.155
Internal combustion engines will be used at the facility as auxiliary equipment. Such equipment will be used on a limited basis, for emergencies and during routine testing. Gasoline and diesel engine emissions contain CO, hydrocarbons, NO_x, SO_x and particulate matter.

Emission Control Systems

1.156
As indicated earlier, SO_2 emissions will be controlled by the use of low sulfur coal. An FGD system wil be added if core analysis of contracted coal indicates that either the average sulfur content of the fuel is too high, or that the variability of the sulfur content is so large that coal blending would not be expected to sufficiently reduce the sulfur content of the as-burned mixture to meet Federal and State New Source Performance Standards for SO_2. Additionally, flue gas desulfurization systems, which are discussed in Chapter Six of this statement, may be required to meet impending revisions to the New Source Performance Standards.

1.157
The removal of nitrogen oxides (NO_x) from the flue gases is not feasible at the present time. The steam generator design features which may significantly affect NO_x generation include the spacing of burners and methods of firing. The latter include off-stoichiometric combustion, two-stage combustion and flue gas recirculation. Boiler manufacturers guarantee that NO_x emission from their units will comply with the NO_x (as NO_2) emission standard of 0.7 lb/MBtu.

1.158
Particulate matter will be removed from the flue gas streams by electrostatic precipitators. They will be designed to a fly ash removal efficiency of at least 99.4 percent in order to comply with the 0.1 lb/MBtu particulate standard. This efficiency will assure that this particulate emission standard will be met even with the maximum anticipated variations in the coal ash content (up to 18 percent ash content) and/or partial precipitator outages. The particulate matter leaving the precipitator may be expected to have a composition similar to that of the coal ash as follows:

Typical Ash Analysis
0.5 Percent Sulfur Western Coal

Component	Ash Percent
Silica	34.0
Ferric Oxide	5.0
Alumina	16.0
Titania	1.0
Lime	30.0
Magnesia	5.0
Sulfur Trioxide	7.0
Sodium Oxide	2.0

1.159
This chapter has described only the actual discharges to the atmosphere by the operation of the proposed Lake Erie Generating Station. The impact of these emissions on ambient air quality, the calculated ground level concentrations, and compliance with applicable State and Federal air quality standards are presented in Chapter Four.

CHEMICAL DISCHARGES

1.160
There will be essentially four operational phase waste streams discharging through the diffuser into Lake Erie when there is runoff to be handled. These are cooling tower blowdown, equalization/neutralization basin discharge, oil and solids removal unit wastewater, and combined runoff water from the ash and coal piles. The average flow for the three plant discharges combined (exclusive of runoff water) is 4,810 gpm (18,200 liters/min) based on a 70 percent plant capacity factor and 6,750 gpm (25,550 liters/min) based on a 100 percent capacity factor. This combined plant blowdown flows to the 1.6 million gallon (6.06 million liter) capacity unlined holdup pond. The chemical parameters of the combined plant discharges of cooling tower blowdown, oil and solids removal wastewater and equalization/neutralization basin flow are shown on Appendix Table B-1. Ash pile runoff will flow to a 0.74 million gallon (2.8 million liters) capacity hydraulic control holding pond and then to the 10.5 million gallon (3.97×10^7 liters) capacity lined settling pond. Appendix Table B-3 displays the quality of the ash pile runoff water. This runoff contains contaminants from the ash itself and from metal cleaning wastes. Appendix Table B-4 shows those contaminants from the ash alone and Appendix Table B-5 estimates the metal cleaning waste contribution. Runoff from the coal pile is discharged directly to the 10.5 million gallon lined settling pond and is combined with ash pile runoff. The combined runoff water is treated in this settling basin for removal of suspended solids and pH adjustment and is then discharged at a rate not to exceed 650 gpm (2,460 liters/min) to the cooling tower blowdown line. The quality of this combined runoff discharge is shown on Table 1-12. The chemical parameters of the coal pile runoff prior to combination with ash pile runoff are presented in Appendix Table B-2. The runoff discharge and combined plant discharge produce a water quality in the blowdown line which is shown on Table 1-13. These are the concentrations which would exist at the exit of the diffuser. The multiport diffuser is used to maximize mixing of the combined plant effluent with lake water. Dilution and mixing of the effluent with lake water is related to the anticipated behavior of the thermal plume and diffuser performance.

TABLE 1-12

COAL AND ASH PILE COMBINED RUNOFF WATER QUALITY

Parameter	Concentration (mg/l)
Copper	0.0723
Cadmium	0.0006
Lead	0.12
Iron	7.56
Nickel	0.136
Manganese	1.247
Chromium	0.062
Zinc	0.320
TSS	50
TDS	2,476
Sulfate	1,173.5
Sulfite	0.047

NOTE: Based on one in ten year, 24 hour rainfall event.

TABLE 1-13 (page 1 of 2)

MAXIMUM MONTHLY AND AVERAGE ANNUAL CONCENTRATIONS OF CHEMICAL DISCHARGES IN THE COMBINED PLANT BLOWDOWN WITH STORM WATER RUNOFF POMFRET SITE

	Average Annual Concentrations(1) (mg/l)	Average Annual Concentrations(1) (lbs/mo)	Maximum Monthly Concentrations(1) (mg/l)	Maximum Monthly Concentrations(1) (lbs/mo)	Month(s) of Max Discharge Conc Occurrence
Alkalinity ($CaCO_3$)	18.3507	31,820.0	17.0668	45,500.0	Feb
Aluminum	0.9349	1,620.1	2.8485	7,594.0	Jul
Antimony	0.0175	30.4	0.2035	542.6	Feb
Arsenic	0.0024	4.2	0.0022	5.8	No variation
Barium	3.5333	6,126.8	17.0154	45,363.0	Jul
Beryllium	0.0029	5.0	0.0026	7.0	No variation
Boron	0.1471	255.1	0.2424	646.3	Jul
Bromide	0.2920	506.0	0.2688	716.7	Jul
Cadmium*	0.0029	5.0	0.0081	21.6	No variation
Calcium	109.6100	189,953.0	118.1414	314,965.0	Dec
Carbonates	0.1408	244.0	0.1313	350.0	Jul, Aug
Chloride (Cl)	62.3358	108,090.0	69.0885	184,190.0	Jul
Chromium*	0.0029	5.0	0.0968	258.1	Jul, Aug
Cobalt	0.0146	25.3	0.0134	35.8	No variation
Copper*	0.0233	40.4	0.0924	246.3	Jun, Jul, Aug
Cyanide	0.0292	50.6	0.0268	71.7	No variation
Fluoride	0.4672	809.7	0.6182	1,648.1	Jul
Iron	0.2784	482.0	1.5329	4,086.7	Jul
Lead*	0.0292	50.6	0.1638	436.7	Jul, Aug
Magnesium	27.3038	47,345.0	35.4321	94,462.0	Jul
Manganese*	0.0409	70.9	0.2332	621.7	Jul, Aug
Mercury	0.0006	1.0	0.0066	18.0	No variation
Molybdenum	0.0584	101.2	0.0537	143.2	No variation
Nickel*	0.0234	40.6	0.1275	339.9	Jul, Aug
Ammonia - N	0.0951	164.8	0.2342	624.3	Jan
Nitrate - N	0.5324	922.6	1.3143	3,504.0	Jan
Nitrite - N	0.0143	24.9	0.0215	57.2	May
Oil & Grease	3.1700	5,494.0	31.3192	83,497.0	Jul
pH (Units)	7.9707	-	-	-	Aug
Phenols	0.0146	25.3	0.0140	37.2	Jan, Feb, Mar

TABLE 1-13 (page 2 of 2)

MAXIMUM MONTHLY AND AVERAGE ANNUAL CONCENTRATIONS OF CHEMICAL DISCHARGES IN THE COMBINED PLANT BLOWDOWN WITH STORM WATER RUNOFF POMFRET SITE

	Average Annual Concentrations(1) (mg/l)	Average Annual Concentrations(1) (lbs/mo)	Maximum Monthly Concentrations(1) (mg/l)	Maximum Monthly Concentrations(1) (lbs/mo)	Month(s) of Max Discharge Conc Occurrence
Phosphate (Ortho)	0.0176	30.5	0.0389	103.6	Apr
Potassium	4.8109	8,337.0	7.9565	21,212.0	Jul
Selenium	0.0023	4.0	0.0022	5.8	Jun, Jul, Aug, Sep
Silica	0.3078	533.4	0.6027	1,606.8	Jan, Feb
Silver	0.0029	5.0	0.0027	7.1	No variation
Sodium	59.6609	103,390.0	58.7134	156,530.0	Feb
Solids (Dissolved)*	638.7783	1,107,000.0	1,329.6858	3,544,942.3	Sep
Solids (Suspended)*	62.7314	108,710.0	50.0000	133,300.0	Jun
Sulfate (SO_4)*	221.4550	383,778.0	329.3933	878,162.5	Feb
Sulfide (S)*	0.0146	25.3	0.0134	35.7	No variation
Sulfite (S)*	5.8248	10,094.0	5.3690	14,318.8	Jun
Thallium	0.0584	101.2	0.0538	143.5	No variation
Tin	0.2919	505.9	0.2688	716.7	Jul
Titanium	0.0030	5.2	0.0027	7.3	No variation
Vanadium	0.0584	101.2	0.0538	143.5	No variation
Zinc*	0.0496	86.0	0.1518	404.7	Jul, Aug
Chlorine	-(3)	-	-	-	-

Notes: (1) Average concentrations are based on 70% CF (4810 gpm) and average Lake Erie water quality. Storm water runoff was not included since it would be unrealistic and misleading to apply the 10-year - 24-hour storm and its influence to annual average conditions.

(2) Maximum concentrations are based on 100% CF (6750 gpm) and maximum Lake Erie water quality, and storm water runoff (650 gpm). Maximum pounds per month assumes a 30-day bleed flow of 650 gpm from the storm retention pond. Contaminants that are contributed by the storm water runoff is shown with an asterisk(*). Based on data in the June 1977 Proposed Operating Phase Discharge Plan, it is assumed that there is no pick-up of the other contaminants from runoff water except those parameters indicated.

(3) The current plan provides for a chlorine decay pond; no discharge of chlorine is anticipated.

Source: Draft EA, Niagara Mohawk Power Corporation, April 1977, Table I-25.

ANTICIPATED BEHAVIOR OF THE THERMAL PLUME

1.161
The effectiveness of the discharge diffuser to maximize dilution of chemical and thermal effluents was estimated by a jet plume model developed by Koh and Fan (1970). The Koh and Fan model is explained in Appendix B. Based on this model, the mixing time required to reach surface concentrations at the intersect of the plume centerline with the surface is eleven seconds. The maximum resultant surface concentrations of most parameters are within ten percent of ambient lake concentrations with the exception of sulfate and sodium. The increased sulfate concentration is due mainly to the addition of approximately 90 mg/l sulfuric acid to the recirculating water for pH control while the sodium concentration is due to demineralizer regeneration with sodium hydroxide. Monthly surface dilution ratios are shown in Table 1-14. The minimum surface dilution ratio is 33 to 1.

1.162
Most thermal energy dispersion takes place after the effluent has traveled about 6 port diameters (about 24") from the point of jet exit. The thermal energy of the jet is transferred to the ambient water through convection due to water movement as well as turbulent diffusion. By the time the jet reaches the zone of impingement (near the surface), the plume's centerline velocity and temperature will have been reduced considerably. Mathematical models were applied to predict the vertical temperature distribution from the jet exit to the surface and the horizontal distribution of surface temperature. The vertical plume rise of the jet was modeled after the method of Koh and Fan (1970). Surface impingement effects were evaluated after Shin (1974), and surface spreading from a model developed by Prych, Davis and Shirazi (1974). Results from a series of hydraulic model tests were also used to evaluate the surface temperature increase due to diffuser operation. In conjunction with these models, the applicant performed dye dispersion studies and current monitoring programs. Descriptions of the mathematical and physical models, currents, dye dispersion tests, and the behavior of the thermal plume are presented in Appendix B. This appendix also addresses the potential for recirculation of heated effluents, and evaporative water loss as a result of the thermal discharge (forced evaporation).

1.163
During extreme climatic conditions, the Koh and Fan mathematical model results show a maximum surface temperature increase, after surface impingement effects, of 1.7°F (0.9°C). This worst case condition occurs during the month of April. The hydraulic model (physical model) test was performed by the Iowa Institute of Hydraulic Research in a 12-foot by 26-foot test basin using an undistorted 1 to 25 scale. The hydraulic model tests show that the

TABLE 1-14

AVERAGE AND MINIMUM SURFACE-DILUTION RATIOS*

Month	Surface Dilution Ratio: Average Climatic Condition	Surface Dilution Ratio: Extreme Climatic Condition
January	35.4	34.2
February	35.5	34.3
March	35.1	33.5
April	34.7	33.3
May	34.6	33.3
June	34.7	33.9
July	35.5	34.5
August	35.1	34.2
September	34.6	33.6
October	34.4	33.5
November	34.6	33.8
December	35.1	33.9

* The ratio of the concentration increment above ambient lake levels at the stagnation point of the plume centerline (the surface) to the concentration increment at the diffuser discharge.

highest surface temperature rise during critical stagnant and extreme April climatic conditions is 2.6°F (1.4°C) which is slightly higher for this extreme case than is predicted by the mathematical model. A major factor responsible for the difference between the effluent and ambient water in the hydraulic model is larger than that in the prototype after some dilution along the jet trajectory. This is due to the nonlinear relation of the water density with temperature at low temperature. Additionally, the jet trajectory will be longer and the surface dilution higher in the prototype than that observed in the model. Considering these factors, it is predicted that the resultant surface temperature rise will always be lower than 2.6°F and that New York State Thermal standards will be met at all times.

1.164
After the buoyant jet impinges on the lake surface, it spreads and dissipates heat to the atmosphere. During extreme climatic conditions in the month of April (worst case) the 0.5°F (0.27°C) surface isotherm is expected to occupy a surface area of 2.8 acres (1.13 hectares). With average climatic conditions in April, the size is reduced to 2.2 acres (0.9 hectares). The month representing average conditions is October. The 0.5°F surface isotherm during October under average climatic conditions is predicted to be 1.2 acres (0.5 hectares). Table 1-15 shows the maximum lake surface temperature increase at the jet impingement region (a height of 19.17 feet above the jet exit or 5/6 of the total depth above the exit) under average and extreme climatic conditions. This is the maximum height of the free buoyant jet before surface inpingement effects begin. The isotherms of temperature rise enclosing the thermal impact area and the expected increased evaporative water loss are given on Table 1-16 for extreme climatic conditions and Table 1-17 for average climatic conditions. Graphic representations of the vertical distribution of isotherms for the months of January, April, June, August, and October under average climatic conditions are displayed on appendix Figures B-1 through B-5. Figure B-6 shows the vertical distribution during extreme climatic conditions in April. The surface isotherms for April during average and extreme climatic cases are presented on Appendix Tables B-7 and B-8 and the October surface isotherm (average) is on Figure B-9.

1.165
Outside of the region characterized by the mathematical model, the applicant used results of a dye dispersion test to characterize heat dispersion. The dye study which is discussed in Appendix B indicates that an additional 10-dilutions of the plume already diluted by the diffuser should occur within a distance of 450 feet (137 m) during prevailing flow conditions. For near stagnant and onshore flow conditions, the distance to achieve 10-dilutions increases to about

TABLE 1-15

MAXIMUM LAKE SURFACE TEMPERATURE INCREASE AT THE JET IMPINGEMENT REGION

Month	Temperature Rise at Jet Exit		Maximum Surface Temperature Rise	
	Average Climatic Condition (°F)	Extreme Climatic Condition (°F)	Average Climatic Condition (°F)	Extreme Climatic Condition (°F)
Jan	30.1	40.4	0.85	1.18
Feb	31.6	42.2	0.89	1.23
Mar	32.6	50.6	0.93	1.51
Apr	35.0	55.9	1.01	1.68
May	24.2	41.0	0.7	1.23
Jun	19.8	31.5	0.57	0.93
Jul	14.9	23.8	0.42	0.69
Aug	13.0	22.9	0.37	0.67
Sep	19.4	31.6	0.56	0.94
Oct	24.1	40.5	0.7	1.21
Nov	24.2	37.2	0.7	1.1
Dec	28.8	42.7	0.82	1.26

TABLE 1-16

ESTIMATED INCREASE OF LAKE ERIE EVAPORATIVE WATER LOSS DUE TO OPERATION OF LEGS* PLANT UNDER EXTREME CLIMATIC CONDITIONS

Month	Increased Evaporative Water Loss (%)	Thermal Impact Area (acres)	Isotherms of Temperature Rise Enclosing the Thermal Impact Area (°F)
January	8.8	0.5	1.0 and 1.18
	6.0	3.1	0.5 and 1.0
February	9.7	0.5	1.0 and 1.23
	6.5	3.2	0.5 and 1.0
March	14.8	0.8	1.0 and 1.51
	8.8	2.8	0.5 and 1.0
April	31.2	0.6	1.0 and 1.68
	17.3	2.2	0.5 and 1.0
May	12.2	0.3	1.0 and 1.23
	8.1	1.4	0.5 and 1.0
June	8.2	3.2	0.5 and 0.93
July	5.7	1.0	0.5 and 0.69
August	5.2	0.8	0.5 and 0.67
September	8.5	2.9	0.5 and 0.94
October	13.1	0.5	1.0 and 1.21
	8.8	5.6	0.5 and 1.0
November	9.3	0.3	1.0 and 1.1
	6.6	3.1	0.5 and 1.0
December	9.9	0.3	1.0 and 1.26
	6.6	1.5	0.5 and 1.0

* Lake Erie Generating Station

TABLE 1-17

ESTIMATED INCREASE OF LAKE ERIE EVAPORATIVE WATER LOSS DUE TO OPERATION OF LEGS* PLANT UNDER AVERAGE CLIMATIC CONDITIONS

Month	Increased Evaporative Water Loss (%)	Thermal Impact Area (acres)	Isotherms of Temperature Rise Enclosing the Thermal Impact Area (°F)
January	5.4	1.8	0.5 and 0.85
	3.0	4.5	0.25 and 0.5
February	5.9	2.3	0.5 and 0.89
	3.2	3.3	0.25 and 0.5
March	8.3	2.4	0.5 and 0.93
	4.4	5.6	0.25 and 0.5
April	17.4	2.2	0.5 and 1.01
	8.6	3.4	0.25 and 0.5
May	6.5	1.2	0.5 and 0.7
	4.0	3.2	0.25 and 0.5
June	6.1	0.8	0.5 and 0.57
	4.3	2.1	0.25 and 0.5
July	3.2	2.0	0.25 and 0.42
August	2.7	1.4	0.25 and 0.37
September	6.2	0.51	0.5 and 0.56
	4.4	4.1	0.25 and 0.5
October	7.1	1.2	0.5 and 0.7
	1.7	3.2	0.25 and 0.5
November	5.3	1.2	0.5 and 0.7
	3.3	3.1	0.25 and 0.5
December	5.8	1.3	0.5 and 0.82
	3.3	4.5	0.25 and 0.5

* Lake Erie Generating Station.

2,300 feet (701 m). The ten dilutions correspond to a temperature decrease from the predicted 0.5°F (0.27°C) surface contour to 0.05°F (0.027°C).

1.166
Based on eight months of water current measurement, the applicant calculated the potential of discharged water to recirculate to the intake. The possibility of recirculation is predicted to be less than five percent for the prevailing flow in the direction of the intake. The maximum predicted intake temperature increase during the month of worst case conditions (April) is predicted to remain below 0.05°F (0.027°C).

COST OF THE PROPOSED FACILITY

1.167
The investment cost of the generating station and appurtenant structures is estimated as 1.45 billion dollars. Additional total interest expenditure is estimated as approximately 30 percent of the investment cost, or .44 billion dollars. Production expenses are expected to be 130 million dollars during the first full year of operating both units (1989), including 113 million dollars in fuel costs. The facility is expected to provide energy during that year at the cost of 6.2 cents per kwh, excluding transmission costs. Costs later in the plant's lifetime will depend heavily on long-term trends in coal prices. No Federal funds are involved in either the construction or operation of the proposed station.

PROJECT CONSTRUCTION SCHEDULE

1.168
Assuming regulatory permission is granted, preparation of the site (clearing, grading, etc.) is scheduled to begin in March 1980. Excavation for the station itself is scheduled to begin in January 1981. Work on Unit 2 will lag beyond work on Unit 1 by 18 months. This lag is a compromise between construction advantages of a shorter period between bringing the two units on line and capacity requirements arguing for a longer separation. Unit 1 planned for completion to the point of power testing by April 1987, and for full commercial operation during November 1987. Corresponding dates for Unit 2 are April 1989 and November 1989, respectively.

BENEFITS OF THE PROPOSED FACILITY

1.169
The primary benefits of the proposed facility lie in the availability of electrical energy to meet expected demand by Niagara Mohawk's customers and by customers of nearby utilities. Failure to provide

adequate energy supplies is widely acknowledged to have severe social consequences. Although the applicant has no specific plans to retire or derate any specific unit through at least 1990, construction of the proposed generation station would allow less reliance on more costly peaking units and power purchases. It would also provide for less frequent and severe service interruptions than would otherwise be the case.

1.170
The proposed units are expected to have a service life of thirty years and to achieve a levelized capacity factor of 68.6 percent. During this period, they will, therefore, produce 3.07×10^{11} kwh of electricity. At 1976 rates, this would produce revenue to the applicant of nearly eight billion dollars. Actual revenues, even ignoring inflation, are expected to be somewhat higher than this because the real price of electricity is expected to increase between now and the early 21st Century.

1.171
During the construction period, the average monthly employment and annual payroll will be as shown in Table 1-18. During plant start-up operations, employment at the plant will be about 75; by the time both units are in full operation, permanent staff requirements will be about 100. The payroll will be approximately 2.2 million dollars in 1987 and 3 million dollars by 1989, assuming a 5 percent annual escalation in current salary levels. Construction personnel are expected to commute from labor markets as far away as Buffalo and Erie, Pennsylvania, rather than relocate to the area. Permanent staff will come partly from transfer from other Niagara Mohawk facilities, including the Dunkirk Station, and partly from new hires. Only a fraction of the permanent staff is, therefore, expected to relocate to the immediate site vicinity. Secondary employment opportunities are not expected to result from the project since the payroll will be paid to workers residing throughout the eastern Lake Erie region. Local businessmen and merchants should experience some increased sales volume particularly in retail and convenience purchases such as food and gasoline.

1.172
The major fiscal impact of the proposed project if built at the Pomfret site will be the generation of substantial property tax revenues. It has been estimated that by 1987, the applicant will pay some 7.5 million dollars in property taxes annually. In 1975, the site produced $16,833 in taxes. Owing to the way in which property taxes are distributed in New York, the tax benefits received from the proposed project will be spread far beyond the boundaries of the town of Pomfret, though the impact should be substantially greater on the Brocton school district than on other government jurisdictions. In

TABLE 1-18

CONSTRUCTION EMPLOYMENT AND PAYROLL

Date	Average Monthly Employment	Annual Payroll
1981	168	$ 34,910,000
1982	813	110,300,000
1983	1947	176,790,000
1984	1927	125,865,000
1985	968	83,810,000
1986	247	40,945,000
	Total	$572,620,000

Payroll for each year in that year dollars.

TABLE 1-19

PERMIT REQUIREMENTS (SHEET 1 OF 2)

Federal

Agency: Federal Aviation Administration.

Activity: Determination of No-Air-Hazard from erection of facility structures.

Status: Received for Pomfret site; Application will be made in a timely manner for Sheridan if necessary; No pending application.

Agency: United States Coast Guard.

Activity: Permits to establish Navigational Interference Markers during construction and operation.

Status: Application to be made in a timely manner.

Agency: United States Army Corps of Engineers.

Permits to construct and place intake and discharge structures, and offshore unloading facility in Lake Erie; to dredge in Lake Erie and to place warning buoys along approach lane. Permits to alter certain onsite streams fall under nationwide permit status.

Status: This document submitted pursuant to application; administrative public hearing held on 16 May 1978.

Agency: Environmental Protection Agency.

Activity: Permit to discharge wastewater and run-off (NPDES); Certification of Compliance with ambient and non-deterioration air quality standards.

Status: Delegated to State of New York and incorporated into Article VIII proceedings. Except USEPA must perform a PSD analysis including best available control technology review, and issue a PSD permit.

TABLE 1-19

PERMIT REQUIREMENTS (SHEET 2 OF 2)

State

Agency: State Board on Electric Generation Siting and the Environment

Activity: Article VIII Certification of Environmental Compatibility and Public Need (comprehensive treatment of station facilities and siting).

Status: Public hearings pursuant to certification have been completed, initial briefs have been filed.

Agency: State Board on Electric Generation Siting and the Environment.

Activity: Article VII Certification of Environmental Compatibility and Public Need (comprehensive treatment of transmission facilities connecting LEGS with existing transmission network).

Status: Application to be made in a timely manner to insure that transmission certification decision will not be impacted by previous financial commitment to LEGS.

Agency: Office of General Services.

Activity: Permit to use State lands under Lake Erie in connection with intake and discharge structures and, if applicable, shoreland protection devices.

Status: Application will be made within 360 days of Article VIII certification.

Local

Local permits are superseded by State Certification.

Possible Future Permit Requirements

A permit in accordance with Subtitle C of the Resource Conservation and Recovery Act (RCRA) of 1976 will be required for any operating facility used for the treatment, storage, or disposal of hazardous waste. Should any power plant wastes be listed as hazardous by the Administrator, U.S. Environmental Protection Agency, a permit would be required. If Subtitle C is inapplicable, the sanitary landfill criteria contained in Subtitle D, Section 4004 of RCRA would apply.

TABLE 1-20

CONSULTANTS

1) Ebasco Services, Incorporated, 2 Rector Street, New York, New York. (architect-engineer)

2) Envirosphere Company, 19 Rector Street, New York, New York. (overall project environmental services)

3) National Economic Research Associates, 80 Broad Street, New York, New York. (statewide power demand projections)

4) Environmental Research and Technology, Incorporated, 696 Virginia Road, Concord, Massachusetts. (air quality and meteorology, land use and aesthetics, socioeconomic impact)

5) Ecological Services, Division of Texas Instruments, Incorporated, 13500 North Central Expressway, Dallas, Texas. (aquatic ecology and water quality)

6) Bolt Baranek and Newman, Incorporated, 50 Moulton Street, Cambridge, Massachusetts. (environmental acoustics)

7) Dames and Moore, Baldwinsville, New York. (geology, soils, storm surge and seiche)

8) Aviation Systems Associates, 500 North Washington Street, Alexandria, Virginia. (impact on air transportation)

9) Terrestrial Ecology Specialists, 8398 Oswego Road, Liverpool, New York. (terrestrial ecology)

10) Walace-Champagne Associates, P O 450, Clifton Park, New York 12065. (traffic studies)

11) Equitable Environmental Health, Incorporated, 333 Crossways Park Drive, Woodbury, New York 11797. (terrestrial ecology)

addition to property tax revenues, additional income and sales tax revenues will be forthcoming due to the plant payroll.

PERMITS REQUIRED

1.173
Article VIII of New York's Public Service Law limits the permits, consents, or applications which can be required of the applicant by state agencies.

Certification of a site under Article VIII proceedings also supersedes local zoning and permit requirements, although such local requirements are considered in the state proceedings. In addition, certain authority to grant Federal permits has also been delegated to the State of New York by responsible Federal agencies. Table 1-19 lists all the known Federal, State, and local permits required for the construction and operation of the Lake Erie Generating Station.

THE APPLICANT'S CONSULTANTS

1.174
The name and address of each consultant having responsibility for the planning and design or the environmental analysis of the proposed facility is listed in Table 1-20.

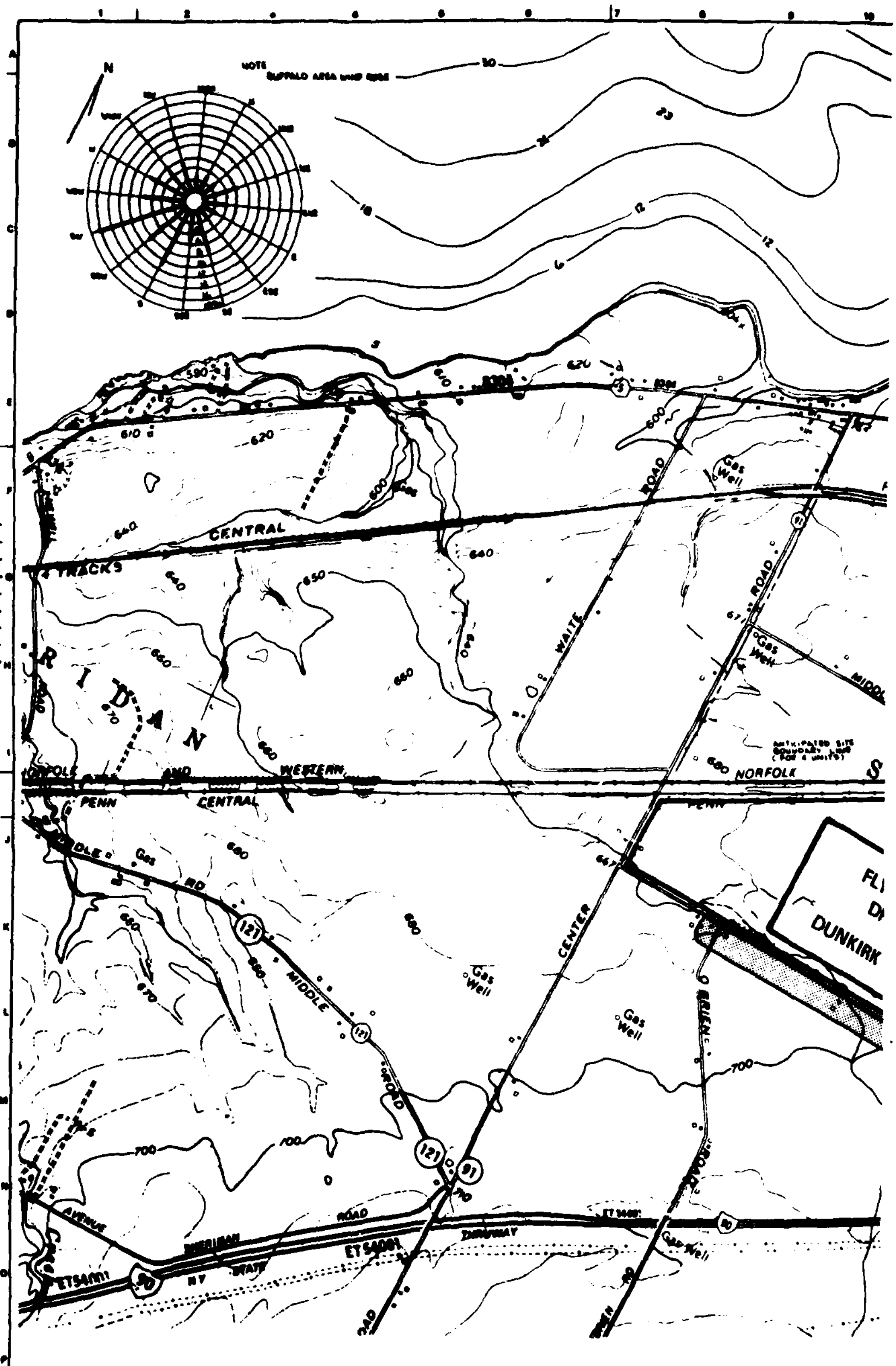
SHERIDAN SITE

INTRODUCTION

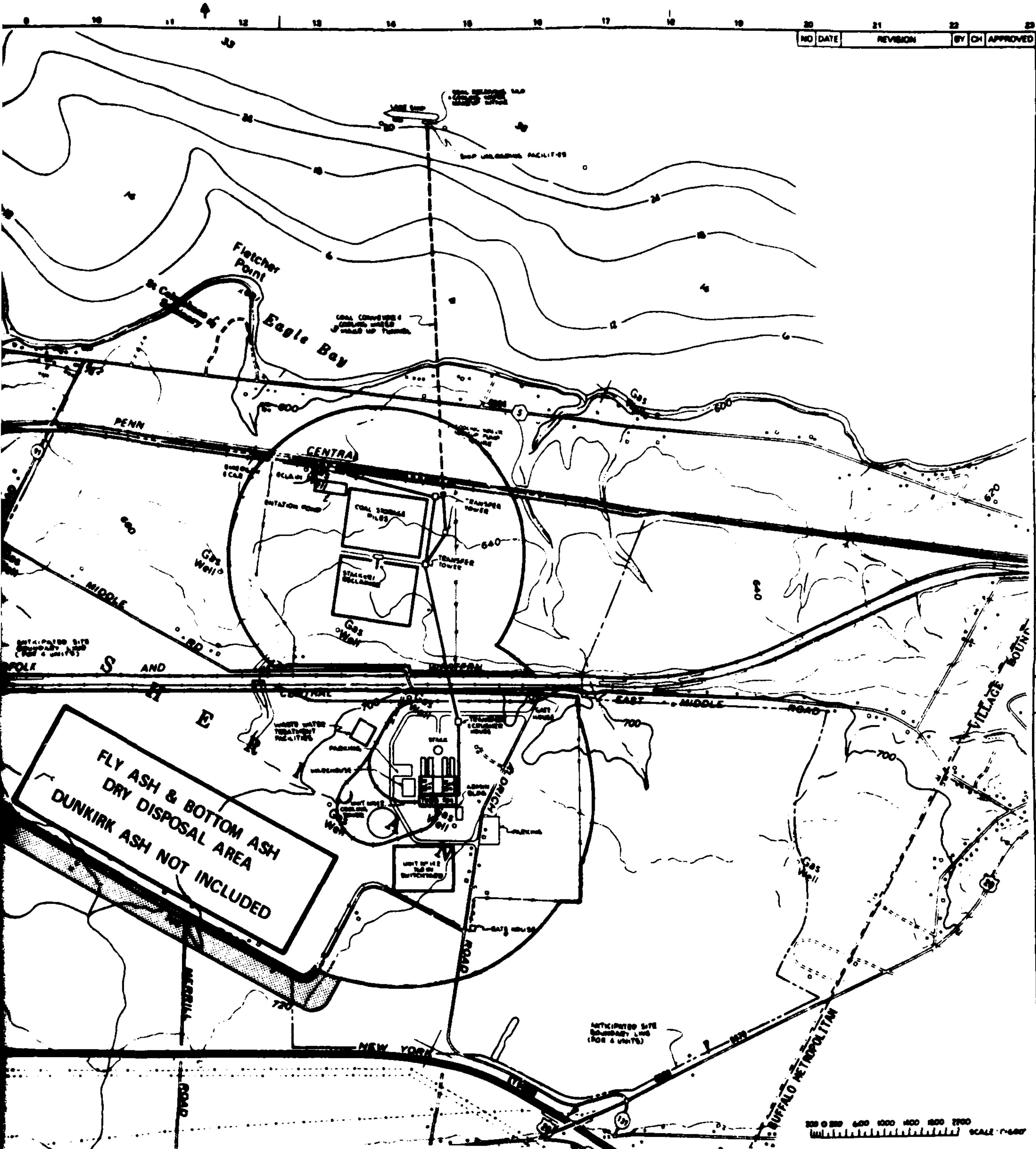
1.175
The proposed Lake Erie Generating Station at Sheridan is designed basically the same as that proposed for Pomfret. Although the layout of the facility is different, the prinicpal station structures, waste treatment procedures, cooling and service water systems, fuel handling methodologies, chemical discharges, and atmospheric emissions are nearly identical. This section will, therefore, discuss only those discharges, facility designs, or operating and construction procedures which differ from the Pomfret station. Information on the applicant, the demand for electricity and the need for the proposed facility is identical to that presented in the Pomfret section.

THE SITE

1.176
The proposed Sheridan site consists of approximately 986 acres (399 hectares) of land located near the Lake Erie shoreline in the town of Sheridan, Chautauqua County, New York. The proposed plant layout is



NOTE: THE SHADED AREA REPRESENTS ADDITIONAL LAND REQUIRED FOR THE DRY ASH HANDLING SYSTEM.



RECOMMENDED SITE BOUNDARIES BASED
ON NOISE IMPACT CONSIDERATIONS
WESTERN 0.5 % SULFUR COAL

PLOT PLAN
SHERIDAN SITE

FIGURE 1-15

displayed on Figure 1-15 for the Sheridan site. In addition to parcels of land for the site itself, (inside the security fences), land for use if the facility were to be expanded to four units is also delineated, although no such expansion is anticipated in the 1976-1991 state-wide generation plan. Figure 1-4 shows the Sheridan site in respect to the surrounding political subdivisions and New York State. The site consists of 52 percent (515 acres; 208 hectares) active agricultural land including crops, vineyards, and pasture forage; 15 percent (149 acres; 60 hectares) inactive agricultural land; and 33 percent (321 acres, 130 hectares) forest land.

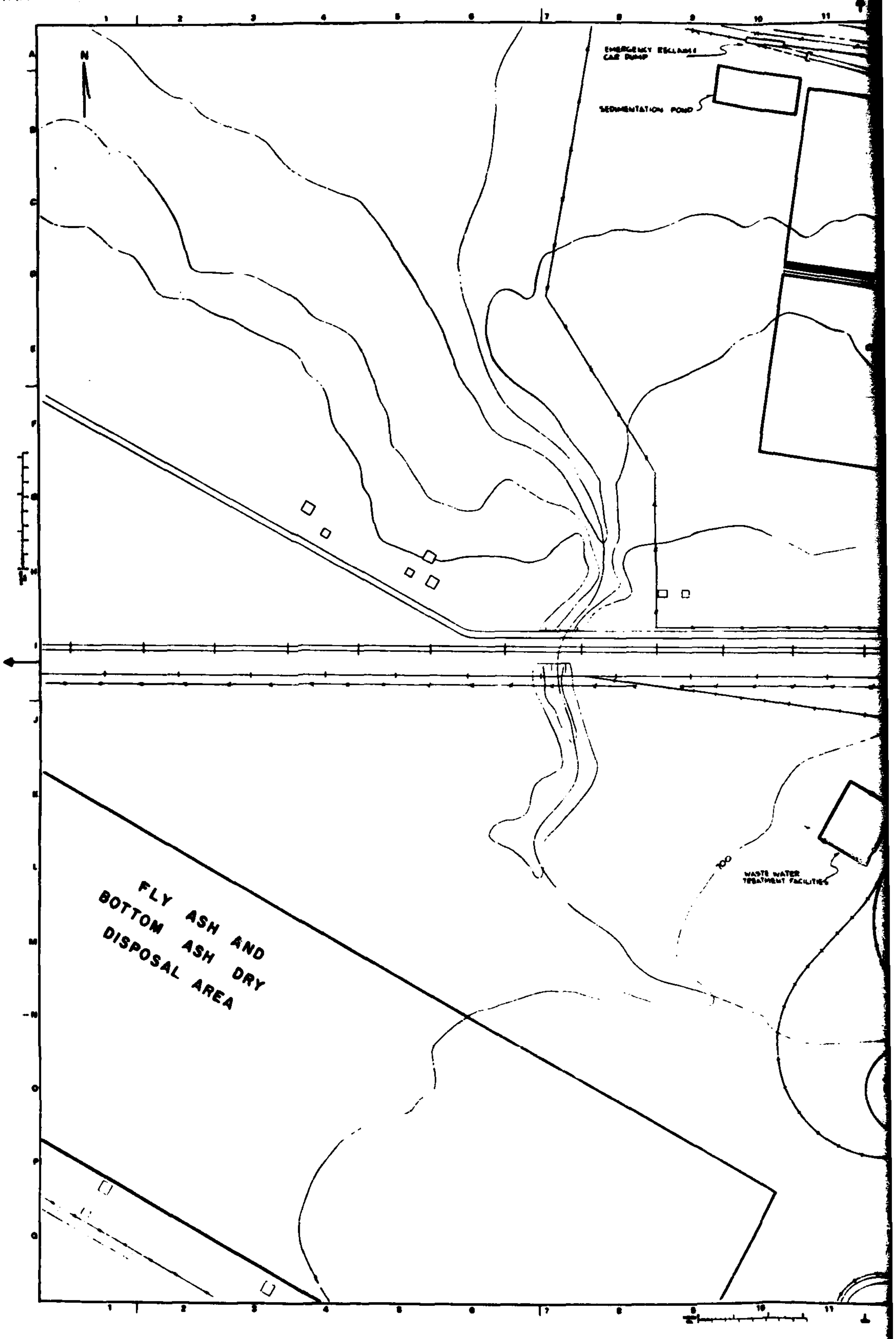
1.177
The Sheridan Zoning Ordinance classifies the entire site as being within an Agricultural-Residential II District, an area where power plants are not an identified permitted use. The status of local zoning for power plants under New York's Public Service Law has already been discussed in this chapter.

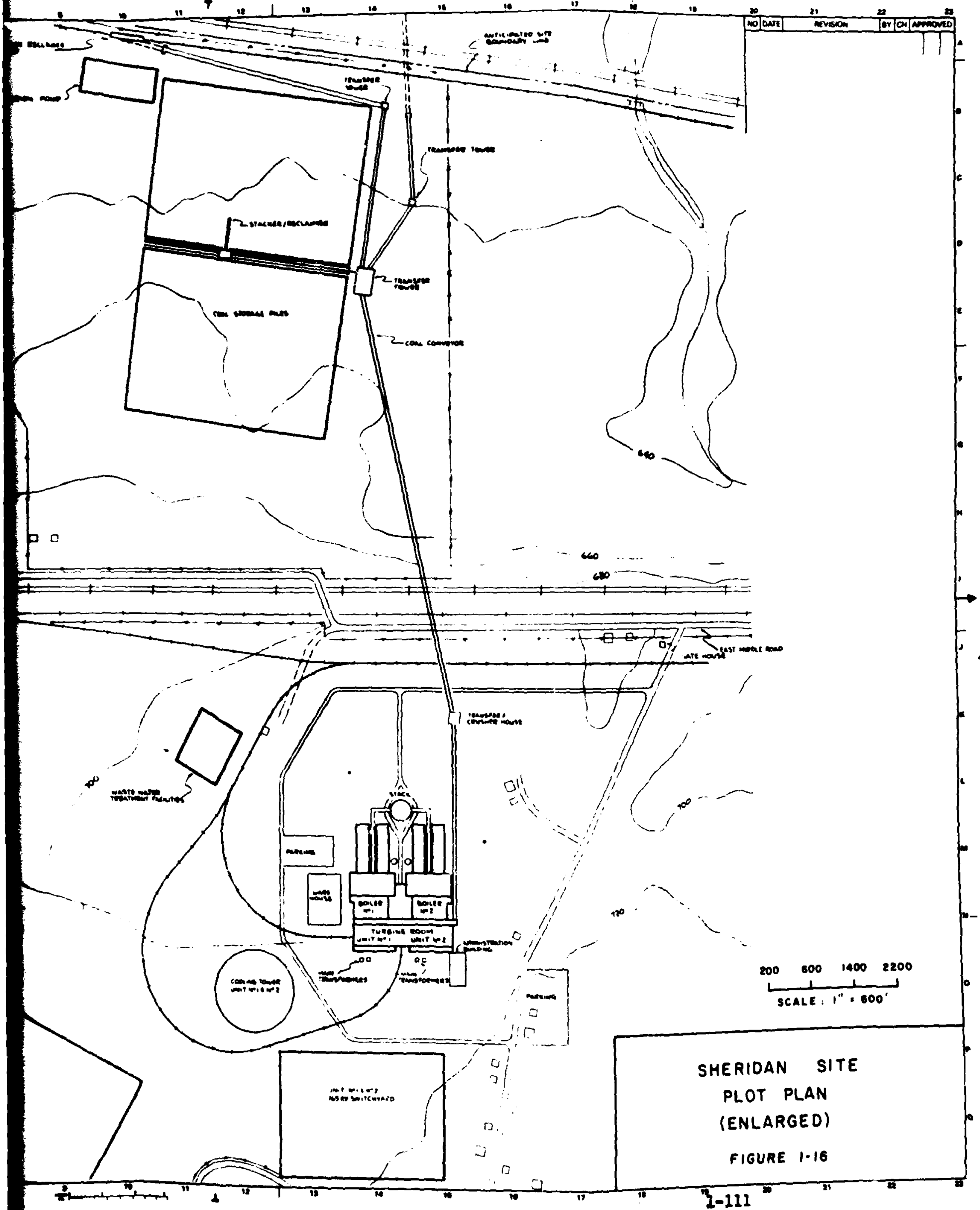
PRINCIPAL STATION STRUCTURES

1.178
Two 850 MW coal-fired units are planned for the development of the generating station at the Sheridan site if this site is the one certified by the State of New York. With the exception of the location, the main power generating station's conceptual design is identical to the proposed Pomfret facility. An enlargement of the "plant island" at Sheridan is depicted on Figure 1-16.

Exhaust Stacks
1.179
The main boiler's single exhaust stack at Sheridan could be determined to be a hazard by the Federal Aviation Administration (FAA) under current operating procedures for the Dunkirk Airport. Modified operational procedures for the airport are being prepared in order to provide for a determination of "No Hazard" by the FAA. Proper marking and lighting of the stack would be required as discussed in the Pomfret section.

Meteorological Sampling Stations
1.180
A 345-foot (105 m) Rohn Model 65 tower with meteorological sensors was installed to collect meteorological statistics representative of the Sheridan site. Since the proposed Sheridan site is located within the approach zone to the Dunkirk Municipal Airport, the tower was located at Kuhrt Road, the most available location near the Sheridan site. The meteorological parameters that will be measured during station operation are wind speed and direction, air dry bulb and dew point temperature, visibility, solar radiation, and rainfall.


N
EMERGENCY RECLAIM
CAR DUMP
SEDIMENTATION POND
FLY ASH AND
BOTTOM ASH DRY
DISPOSAL AREA
700
WASTE WATER
TREATMENT FACILITIES



SHERIDAN SITE
PLOT PLAN
(ENLARGED)

FIGURE 1-16

LAND BASED FUEL HANDLING AND STORAGE

1.181
The railroad network which traverses the site provides a second delivery system auxiliary to the primary transport system utilizing lake ships. Permanent railroads will require 21,700 feet (6,614 m) of road bed, 20 feet (6.1 m) wide, and will occupy 10.0 acres (4.0 hectares) of land. The location of the railroad spur is shown on Figure 1-15. Railroad sidings will be constructed from the Penn Central Railroad tracks to the railroad bottom car dumper pit which is used as a backup system for the offshore coal unloading facility. The dumper pit also serves as an emergency reclaim to back up the primary system. The crossings of creeks are on fill with properly sized culverts carrying the water under the embankment. The primary function of the railroad spur is to provide transportation for heavy equipment and facility components. In addition to the 21,700 feet (6,614 m) of permanent track required for maintenance and operation of the facility, an additional 1,200 feet (366 m) of temporary railroad will be installed for construction. This temporary railroad will occupy approximately 0.5 acres (0.2 hectares) of land.

1.182
Operation of the secondary coal delivery system and the design of the coal storage facility are identical to the Pomfret site. The location of the coal storage pile is shown on Figure 1-16.

OFFSHORE COAL HANDLING FACILITY

1.183
The primary coal handling system at Sheridan is a docking and unloading facility in Lake Erie located approximately 3,750 feet (1,143 m) offshore in 30 feet (9.1 m) of water. The design, construction, and operation of the facility is the same as that described for the Pomfret site. Construction of the coal conveyor tunnel will produce about 156,700 cubic yards (119,812 cu. m) of solid waste. The tunnel waste will be used for plant grade development and a berm along the southern border of the ash disposal facility. Construction of the offshore coal unloading facility (including the cooling water discharge structure) will require dredging an area of approximately 20,000 square feet (1,858 sq. m). Dredging will produce approximately 900 cubic yards (688 cu. m) of material (130 cubic yards of fine sediment and 770 cubic yards of weathered rock). Dredged material will be transported by barge to shore and be deposited on the Sheridan site. The location of the offshore facility is shown on Figure 1-17.

COOLING WATER SYSTEM

1.184
The cooling water system proposed for the Lake Erie Generating Station at Sheridan consists of a closed-cycle natural draft cooling tower, the makeup water intake system with intake ports located in one of the breasting dolphins, an onshore pump structure, a cooling tower blowdown basin, and a submerged multiport diffuser.

Intake Structure

1.185
Because of the similarity between the topography, meteorology, geology, hydrology and the arrangement of plant facilities at both the Pomfret and Sheridan sites, similar designs were evaluated for each site, with data specific to each site to evaluate each design. The description of the intake structure at Pomfret is equally applicable to the Sheridan site with the exception of the offshore distance.

Discharge Structure

1.186
Blowdown from the cooling tower basin and treated facility wastes will be discharged through a submerged multiport diffuser into Lake Erie. The approximate location of the blowdown system is shown in Figure 1-17. Because of the similarity of the lake bottom configuration, topography, geology, and the arrangement of plant facilities at each of the proposed sites, the discharge system description presented for the Pomfret site is also applicable to the Sheridan site, with the exception of the location and the port orientation. The ports of the diffuser will be oriented about 70° and 250° clockwise from North for the Sheridan site. This orientation is approximately parallel to the shore. This diffuser orientation, which was determined by analyzing current data, will optimize dilution characteristics.

ACCESS ROADS

1.187
A total of 18,820 (5,736 m) of temporary construction roads, 40 feet (12.2 m) wide, will be required for the transportation of equipment and material at Sheridan. Permanent roads at Sheridan, 5,140 feet (1,566 m) long and 50 feet (15 m) wide, will require 5.9 acres (2.4 hectares) of land. All other information supplied regarding access roads at the Pomfret site is applicable to the Sheridan site as well.

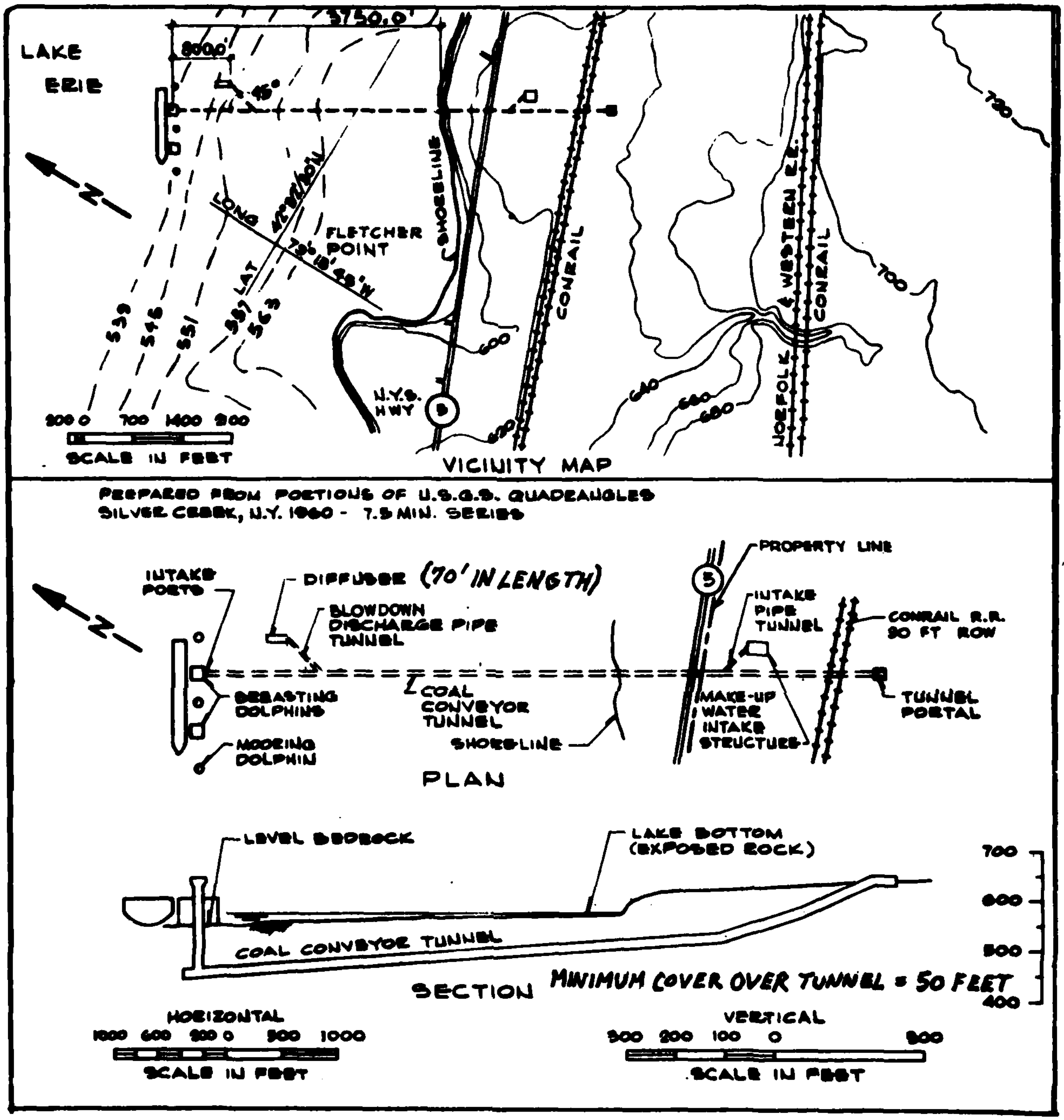


FIGURE 1-17

Offshore Coal Unloading Facility at Sheridan

SEDIMENT AND EROSION CONTROL

1.188
The sediment and erosion control plan at the Sheridan site is similar to that proposed for the Pomfret site. The major difference is that the close proximity of the switchyard to the plant island at Sheridan negates the construction of a separate switchyard collection basin for runoff. At Sheridan, runoff will be created from the plant area, the coal pile area and the ash pile area and subsequently treated and discharged to adjacent on-site streams. Each of these three areas will have a separate sedimentation basin designed to handle the once-in-ten-year, 24-hour rainfall event. The treatment procedure is identical to runoff treatment at Pomfret. The acreage of areas to be disturbed in the plant island, coal pile and ash pile areas will be limited to 330 acres (134 hectares) for each site.

ASH DISPOSAL AREA

1.189
The Sheridan site ash disposal area will be located north and west of Chapin Road and south of the railroad tracks. The eastern perimeter of the ash disposal area will be about 700 feet (213 m) west of the north-south leg of Chapin Road. An ash disposal area at Sheridan will require 205 acres (83 hectares) and will accommodate only the fly ash and bottom ash from the Lake Erie Generating Station. The plant life ash capacity of the disposal area is 1.39×10^7 tons (1.26×10^7 metric tons) or 9,615 acre-feet. The ash pile vertical height is 45 feet (13.7 m).

1.190
Trucks required to move fly ash and bottom ash from the storage facilities to the disposal area will travel a distance of about 3,000 feet (914 m) as compared to the 6,500 foot distance at Pomfret. The amount of truck traffic will be less at Sheridan since Dunkirk ash will not be disposed of at this site.

1.191
Preparation of the ash pile base, groundwater monitoring, disposal area construction methods, and the handling of ash pile runoff are nearly identical to the methods proposed for Pomfret. A program of ash pile development similar to that followed at Pomfret will be used at the Sheridan site.

POWER TRANSMISSION CORRIDOR

1.192
The information on power transmission supplied for Pomfret is also applicable to the Sheridan site. Specific portions of the

transmission corridor connecting Sheridan with existing facilities are discussed in the following sections.

Pennsylvania Border Segment
1.193
The configuration of this segment is identical to the Pomfret proposal. However, the total length of this branch would be approximately 40 miles (64 km) rather than the 26 miles indicated for Pomfret.

Stolle Road Segment
1.194
The transmission corridor branch leading to the Stolle Road substation from the Sheridan vicinity would have a total length of 50 to 55 miles (80-88 km) rather than the 65 to 70 miles for Pomfret.

Hinsdale Branch
1.195
The Hinsdale branch for Sheridan is identical to that described for Pomfret.

Switchyard Connection to Major Corridor Branches
1.196
In addition to the three major corridor branches discussed above, use of the Sheridan site would require construction of a six mile long (9.6 m) segment running from the switchyard to the point where the Pennsylvania circuit would first diverge from the eastern circuits to Stolle Road and Hinsdale. This particular segment is unique to the Sheridan site although the Pomfret site would require an analogous link. Three and one-half miles (5.6 m) of this segment lie in the farming area of the Erie Lake Plain.

1.197
The generally level farm belt is unobstructed except for patches of trees remaining in creek valleys and poorly drained areas. This offers long views of the Cattaraugus Hills region to the east. The remaining portion of this corridor climbs the rolling farmland east of Forestville. General farmland with a mixture of woodlots typifies this rural area. The greatest visual exposure will occur at the New York Thruway crossing, the Route 20 crossing, and the Route 39 crossing east of Forestville. The high visibility areas must be crossed, but with the proposed ameliorative measures, the applicant believes the visual impact can be minimized. Impact to ecosystems consists of tree cutting where the proposed transmission corridor passes through some minor woodlots, ground and vegetative disturbance resulting from construction activities, and possible disturbance at several stream crossings. Selective clearing within the right-of-way will be undertaken as permitted by conductor security. Avoidance

routing will bypass significant tree masses; edges of such areas will be used as much as possible in the route selection within the proposed corridor. The designation and maintenance of buffer zones at stream crossings and the avoidance of steep slopes will reduce the impact in these critical areas. Development patterns in the area of this segment indicate suburban growth in the Fredonia area. The proposed corridor does not conflict with that growth except for typical strip development, which will not experience critical impact. The rural natural of the remainder of this region is projected to continue.

PROCESS WATER USAGE AND WASTE STREAM CHARACTERISTICS

1.198
Information presented on plant water systems for the Pomfret site is also applicable to Sheridan. The waste stream characteristics for both sites are identical with the exception of blowdown characteristics. The combined plant blowdown characteristics for the Sheridan site are shown on Table 1-21.

PLANT HEAT DISSIPATION SYSTEM

1.199
The discussions presented in the condenser section, cooling tower section, and system heat rejection section for Pomfret are equally applicable to the Sheridan site. An exception is the total retention time in the condenser cooling system. The total retention time for planktonic organisms in the circulating water system at Sheridan, including the makeup intake system and blowdown system, would be approximately 6,500 seconds for Unit 1 and 6,700 seconds for Unit 2. At Pomfret the retention times are 8,250 seconds for Unit 1 and 8,570 seconds for Unit 2. The retention times can be broken down into the following component system retention times (in seconds):

POMFRET - RETENTION TIME (sec)

Component System	Unit No. 1	Unit No. 2
Makeup Intake System (intake ports, intake pipeline, and pump structure)	2,710	2,710
Circulating Water System (condenser cooling tower and circulating water pipelines)	1,820	2,140
Blowdown System (blowdown pipeline and diffuser)	3,720	3,720
Total	8,250 (138 min)	8,570 (143 min)

TABLE 1-21 (page 1 of 2)

MAXIMUM MONTHLY AND AVERAGE ANNUAL CONCENTRATIONS OF CHEMICAL DISCHARGES IN THE COMBINED PLANT BLOWDOWN WITH STORM WATER RUNOFF SHERIDAN SITE

	Average Annual Concentrations(1) (mg/l)	Average Annual Concentrations(1) (lbs/mo)	Maximum Monthly Concentrations(1) (mg/l)	Maximum Monthly Concentrations(1) (lbs/mo)	Month(s) of Max Discharge Conc Occurrence
Alkalinity ($CaCO_3$)	18.4960	32,053.3	17.0671	45,500.9	Feb
Aluminum	0.5845	1,012.9	2.5812	6,881.4	Jul
Antimony	0.0175	30.3	0.1614	430.2	Jul
Arsenic	0.0026	4.5	0.0211	56.2	No variation
Barium	4.0587	7,033.7	18.2784	48,730.3	Jul
Beryllium	0.0029	5.0	0.0027	7.3	Jul, Aug
Boron	0.1463	253.5	0.2421	645.4	Jul, Aug
Bromide*	0.2919	505.9	0.2687	716.7	Jul
Cadmium	0.0029	5.0	0.0135	36.0	No variation
Calcium	111.1505	192,622.2	121.5180	323,967.0	Feb
Carbonates	0.1409	244.2	0.1315	350.7	Jul
Chloride (Cl)	63.3632	109,807.5	60.4821	161,245.4	Jul
Chromium*	0.0029	5.0	0.0941	250.9	Jul, Aug
Cobalt	0.0146	25.3	0.0134	35.7	No variation
Copper*	0.0292	50.6	0.1057	281.8	Jun - Sep
Cyanide	0.0292	50.6	0.0268	71.4	Jun - Aug
Fluoride	0.4672	809.7	0.7526	2,006.4	Jul
Iron*	0.3043	527.4	1.5876	4,232.5	Jul
Lead*	0.0263	45.6	0.0992	264.5	Jul, Aug
Magnesium	28.1652	48,839.1	35.8613	95,606.3	Jul
Manganese*	0.0292	50.6	0.2115	563.9	Jun - Sep
Mercury	0.0006	1.0	0.0046	12.2	No variation
Molybdenum	0.0584	101.2	0.0537	143.2	No variation
Nickel*	0.0049	8.5	0.3399	906.2	Jul
Ammonia - N	0.1147	198.8	0.3308	881.8	Nov
Nitrate - N	0.5453	945.0	1.9814	5,282.4	Jan
Nitrite - N	0.0139	24.1	0.0215	57.2	May
Oil & Grease	3.1687	5,491.3	39.9414	106,489.0	Jul
pH	7.9843	-	-	-	Jul
Phenols	0.0146	25.3	0.0134	35.8	No variation

TABLE 1-21 (page 2 of 2)

MAXIMUM MONTHLY AND AVERAGE ANNUAL CONCENTRATIONS
OF CHEMICAL DISCHARGES IN THE COMBINED PLANT BLOWDOWN
WITH STORM WATER RUNOFF
SHERIDAN SITE

	Average Annual Concentrations(1)		Maximum Monthly Concentrations(2)		Month(s) of Max Discharge Conc Occurrence
	(mg/1)	(lbs/mo)	(mg/1)	(lbs/mo)	
Phosphate (Ortho)	0.0180	31.2	0.0359	95.8	Jun
Potassium	5.0078	8,678.4	7.7412	20,638.0	Jul
Selenium	0.0020	3.5	0.0022	5.8	Jun - Sep
Silica	0.3078	533.4	1.0118	2,697.5	Jul
Silver	0.0029	5.0	0.0027	7.1	No variation
Sodium	60.7117	105,212.5	58.7763	156,697.7	Jan
Solids (dissolved)*	611.9597	1,060,517.2	1,160.6837	3,094,382.7	Sep
Solids (suspended)*	56.5498	98,000.0	50.0000	133,300.0	Dec
Sulfate (SO_4)*	220.6795	382,434.3	330.7760	881,848.8	Jan
Sulfide (S)	0.0146	25.3	0.0134	35.8	No variation
Sulfite (S)*	5.8248	10,094.3	5.3715	14,320.4	Jul
Thallium	0.0584	101.2	0.0537	143.2	No variation
Tin	0.2920	506.0	0.2688	716.7	Jul
Titanium	0.0030	5.2	0.0027	7.3	No variation
Vanadium	0.0559	96.9	0.0213	56.9	Jun - Sep
Zinc*	0.0555	96.2	0.1518	329.8	Jul, Aug
Chlorine	- (3)	-	- (3)	-	-

Notes: (1) Average concentration based on 70% CF (4810 gpm) and average Lake Erie water quality. Storm water runoff was not included since it would be unrealistic and misleading to apply the 10-year - 24-hour storm and its influence to annual average conditions.

(2) Maximum concentration based on 100% CF (6750 gpm) and maximum Lake Erie water quality, and storm water runoff (650 gpm). Maximum pounds per month assumes a 30-day bleed flow of 650 gpm from the storm retention pond. Contaminants that are contributed by the storm runoff water is shown with an asterisk(*). Based on data in the June 1977 Proposed Operating Phase Discharge Plan, it is assumed that there is no pick-up of the other contaminants from runoff water except those parameters indicated.

(3) The current plan provides for a chlorine decay pond; no discharge of chlorine is anticipated.

Source: Draft EA, Niagara Mohawk Power Corporation, April 1977, Table I-50.

SHERIDAN - RETENTION TIME (sec)

Component System	Unit No. 1	Unit No. 2
Makeup Intake System (intake ports, intake pipeline and pump structure)	2,590	2,590
Circulating Water System (condenser cooling tower and circulating water pipelines)	1,530	1,740
Blowdown System (blowdown pipeline and diffuser)	2,380	2,380
Total	6,500 (108 min)	6,710 (112 min)

ANTICIPATED BEHAVIOR OF THE THERMAL PLUME

1.200
Appendix B contains information relating to the behavior of the thermal plume at the Sheridan site. The effectiveness of the discharge diffuser to maximize dilution of chemical and thermal effluents was estimated by the Koh and Fan jet plume model.

STREAM AND POND ALTERATIONS

1.201
Construction of the proposed facility at Sheridan will require the alteration of several small streams. Alterations include rerouting, culverting, filling, and channelizing portions of these streams to facilitate construction of the ash disposal facility and plant island. Figure 1-18 shows the proposed stream alterations. It should be noted that the position and configuration of the ash disposal area on Figure 1-18 does not correspond to that shown on Figure 1-15. Figure 1-18 is the latest proposal whereas Figure 1-15 was the original plan. The original configuration of the ash pile was changed to reduce the amount of channelization needed for stream S1. The placement of plant structures at Sheridan will eliminate five ponds totaling about 17,000 square feet of surface area. These ponds, which have been designated as S-11, S-12, S-13, S-14, and S-18, are shown on Figure 1-19.

BENEFITS OF THE PROPOSED FACILITY

1.202
The major fiscal impact of the proposed project, if built at the Sheridan site, will be the generation of substantial property tax

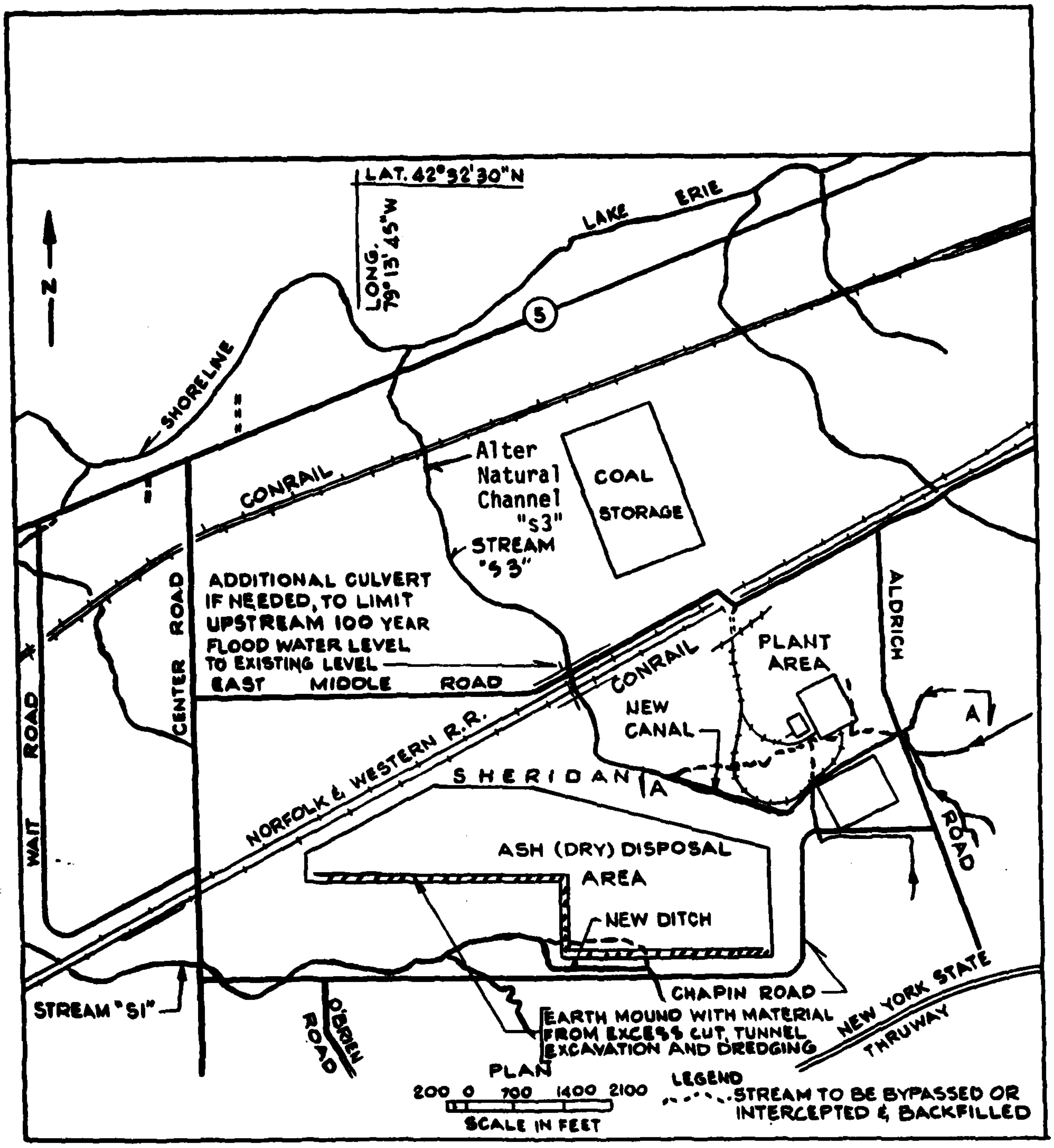


FIGURE 1-18

Stream Alterations-Sheridan Site

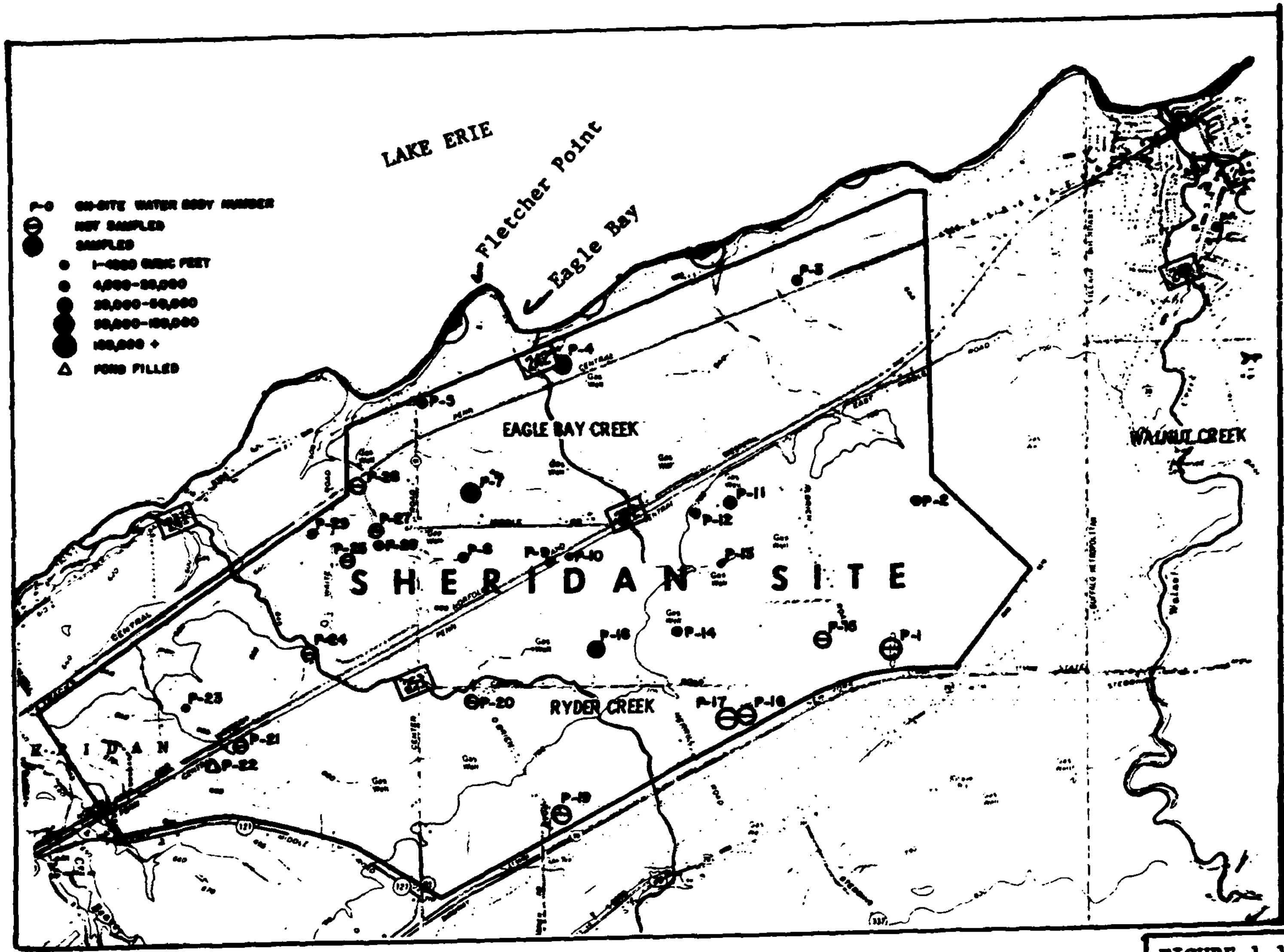


FIGURE 1-19
Location of on-site
Ponds- Sheridan

revenues. It has been estimated that by 1987 the applicant will pay some 6.5 million dollars in property tax annually. In 1975, the site produced $19,000 in taxes. Owing to the way in which property taxes are distributed in New York, the tax benefits received from the proposed project will be spread far beyond the boundaries of the town of Sheridan, though the impact should be substantially greater on the Silver Creek school district than on other government jurisdictions. In addition to property tax revenues, additional income and sales tax revenues will be forthcoming due to the plant payroll.

COST OF FACILITY AND PROJECT SCHEDULE

1.203
The investment cost of the generating station and a purtenant structures is estimated at 1.44 billion dollars. Additional total interest expenditure is estimated as approximately 30 percent of the investment cost, or .43 billion dollars. Production expenses are expected to be 130 million dollars during the first full year of operating both units (1989), including 113 million dollars in fuel costs. The proposed station is expected to provide energy during that year at a cost of 6.2 cents per Kwh, excluding transmission costs. Costs later in the plant's lifetime will depend heavily on long-term trends in coal prices. No Federal funds are involved in either the construction or operation of the proposed station. Scheduling information for the Sheridan site is identical to that for Pomfret.

CHAPTER TWO: ENVIRONMENTAL SETTING WITHOUT THE PROJECT

POMFRET SITE

LOCATION

2.001
The proposed power plant will be situated on a 1,054 acre site within the town of Pomfret which is located in the northern sector of Chautauqua County, NY. The Pomfret site is approximately 68 acres larger than the Sheridan site since the Pomfret site will accommodate ash from the existing Dunkirk Steam Station. Specifically, the site lies within the central lowlands physiographic province bordering Lake Erie and is approximately one quarter mile from the lake at its nearest point. Fuel handling facilities and the water intake and discharge for the proposed power plant will be constructed offshore at points where water depths of 25 and 30 feet are available (approximately 0.75 mile offshore) and connected to the site by means of an underground tunnel. The anticipated latitude and longitude of the main plant buildings on this site will be 42°26'6"N and 79°24'35"W.

2.002a
Pomfret is one of several communities which comprise the Dunkirk-Fredonia area. The city of Dunkirk and the applicant's Dunkirk Steam Station are situated about five miles northeast of the project site while the villages of Brocton and Fredonia lie about five miles to the southwest and south, respectively. Within a five mile radius of the proposed site, land use is predominantly agricultural and open space (woodlands). In general, the lowlands bordering Lake Erie near the site are known for their grape production.

2002b
Primary and secondary impacts of facility construction and operation would be expected to pervade an area approximately 15 miles in any direction from the proposed project site. Included in this impact area are three distinct community types:

- Highly urbanized areas, consisting of the city of Dunkirk and the village of Fredonia.

- Moderately urbanized areas to the west, such as the village of Brocton.

- Rural-suburban fringe communities surrounding the more urbanized areas, represented by the town of Pomfret (excluding the village of Fredonia), Dunkirk, Sheridan, and Portland.

Figure 1-4 shows the corporate boundaries of the municipalities and towns in the immediate vicinity of the site and their location with respect to New York State.

2.002c
Since the proposed site boundaries do not coincide with property lines, the residential inventory includes all dwelling units situated on any land parcel which is either wholly or partially located with the site boundaries. Based upon this assumption, there are 26 houses and one mobile home on the Pomfret site. All of these dwellings are year-round and are predominantly of wood frame construction with between one and two floors. According to tax records, the average assessed valuation of a site house is $11,323 (as of 1 May 1974). It has been reported that the market value of residential homes in this area is approximately 1.8 times the assessed value.

DEMOGRAPHY

Regional Population
2.003a
In 1970, Chautauqua County had a total population of 147,305 persons (127 persons/square mile) as compared to the total population for New York State of 12,236,951 persons (381 persons/square mile). Projections through the year 1985 indicate a continued disproportionate population distribution. The largest population center in the region are Buffalo, New York and Erie, PA.

Local Population
2.003b
Areas of high population concentrations such as Dunkirk (3,500 people/square mile) and the village of Fredonia (2,000 people/square mile) are relatively small in size. The town of Pomfret, although it includes the village of Fredonia within its boundaries is otherwise sparsely populated and essentially rural. The total 1975 residential population within 15 miles of the proposed site is estimated to be more than 55,000 persons with a density of 152 persons per square mile. The largest city in the vicinity of the proposed site is Dunkirk with a population of 16,855 people in 1970.

2.003c
A rough index of family size, the average number of persons per household, shows that, in general for the county, Pomfret and Fredonia, the number of persons per household in 1960 was around 3.2 The effect of net migration is evidenced the 1960-1970 figures for Pomfret and Chautauqua County, with Pomfret going from 3.2 to 3.6 and Chautauqua County going from 3.1 to 2.7. The nonwhite households represents a very small number of the population's residences (2.1%). However, for the "Region," the nonwhite category nearly doubled in

percent between 1960 and 1970; the town of Pomfret decreased 40 percent; Fredonia increased by 167 percent and the county experienced a 40 percent increase.

2.003d
Population fluctuation within the study area is apparent with certain communities declining in population (city of Dunkirk) while others experienced incremental increase (village of Brocton) and a few demonstrated significant growth (Pomfret). Population losses have been attributed primarily to economic problems centering in the highly urbanized areas as unemployment forces people to emigrate to the other more industrialized and diversified market areas. A notable exception is the town of Pomfret, which has increased. Current population trends and projected growth for the municipalities and towns in the immediate vicinity of the site are presented in Table 2-1.

Site Specific Population
2.003e
The proposed site consists of an estimated 95 residents who are located primarily along State Route 5 and Berry Road.

COMMUNITY DEVELOPMENT
2.004
Since 1960 there has been a definite decline in the percent of people working in Chautauqua County. The more industrial and economically diversified market areas such as Buffalo, NY and Erie, PA have attracted many Chautauqua County residents. Relatively low wage scales and the inability of the county's private sector to create jobs are probable causal factors (Dunkirk-Fredonia Master Plan Update, Part I, 1972, pg. 8). In 1973, the civilian labor force in the county was 62.6 thousand with 59.2 thousand employed and the remaining 3.4 thousand unemployed. This amounted to an unemployment rate of 5.5 percent, as compared to the State of New York rate of 5.4 percent.

2.005
Personal income provides a measure of income that flows to the household sector. In 1972, personal income for residents of Chautauqua County totaled 595.7 million dollars. This resulted in a per capita amount of $4,036, while the New York State per capita amount was $5,242. The sources of the county's personal income were farm income (10.4 million dollars); Government income disbursements (171.5 million dollars); and private nonfarm income (413.8 million dollars).

COMMUNITY COHESION
2.006
The State University College of New York at Fredonia (SUNY Fredonia), manufacturing establishments, and agriculture employ most of the

TABLE 2-1

POPULATION GROWTH
THE REGION'S MUNICIPALITIES

	1930	1940	1950	1960	1970	1980	1990	2000
City of Dunkirk1/	17,802	17,713	18,007	18,205	16,855	16,600	16,400	16,200
Village of Fredonia1/	5,814	5,738	7,095 3/	8,477 3/	10,326 3/	12,500 3/	15,000 3/	18,240 3/
Village of Brocton1/	1,301	1,293	1,380	1,416	1,370	1,400	1,425	1,450
Town of Dunkirk1/	726	672	887	1,541	1,646	2,200	3,025	4,150
Town of Pomfret1/	2,248	2,044	2,501	2,982	3,564	4,200	5,000	5,800
Town of Portland1/	1,700	1,672	1,959	2,189	2,432	2,700	3,000	3,350
Town of Sheridan1/	2,035	1,826	2,037	2,539	2,527	2,800	3,150	3,525
Hanover Town1/	5,993	5,846	6,375	7,301	7,829		9,892 2/	
Forestville Village1/	677	692	786	905	908		1,333 2/	
Silver Creek Village1/	3,160	3,067	3,068	3,310	3,182		4,260 2/	

1/ Source: Dunkirk-Fredonia Region Master Plan Update Part I, 1972,, pg. 2; U. S. Bureau of the Census, Census of Population 1930, 1940, 1950, 1960, and 1970.

2/ Source: Town of Hanover Comprehensive Plan, 1971, pg. 6; 1990 was the only year for which population projections post-1970 were available.

3/ Includes SUNY figures

labor force in the town of Pomfret and, therefore, affect social trends. SUNY Fredonia currently provides educational, research and technical services, in addition to serving cultural needs. Faculty members, staff and their families, as well as students live in the community, purchase local goods and services, and offer leadership in community affairs. On the whole, Pomfret is considered by community leaders to be a progressive town, but with a small town atmosphere. During election periods, approximately 80 percent of the village voters cast ballots. The Businessman's Improvement Party and the Taxpayer's Party are two local and independent political parties. In summary, the town of Pomfret has a sense of community and values highly its smallness, friendliness, quietness and neighborliness.

PUBLIC SERVICES AND FACILITIES

2.007
The adequacy of services and facilities, combined with land availability and economic climate, can often be used as an indicator of an area's population capacity. The 1975 population of institutions such as schools and hospitals within a 15-mile radius of the site is estimated to be 21,283 and by 1985 estimated to decline to 20,418. In addition to the general population trends discussed above, a future decline in parochial school attendance plus a general decrease in the size of the school age population are causal factors (NYS Department of Commerce). This decline in institutional populations and the low population growth expected for the area as a whole indicates that these institutions should have sufficient future capacity.

Law Enforcement and Fire Protection
2.008
The Dunkirk-Fredonia Region is served by nine year-round police agencies. There are currently eight fire departments providing protection to the seven municipalities in the Region. Police and fire services in the area are adequate to serve present and future needs.

Water Supply
2.009
Water is supplied by municipal distribution systems or groundwater wells depending on the density and distribution of the population served. For example, the city of Dunkirk owns its own water supply and distribution system. Water is obtained from an intake structure in Lake Erie approximately 1,100 feet lakeward of Point Gratiot. Recently, this plant has been enlarged to 8.0 MGD which is sufficient to meet projected increases in population. In other areas communities may purchase water and distribute it to their own residents or obtain it from single or multiple groundwater wells. It appears that the municipal and private supplies of groundwater will be sufficient to support projected increases without the plant.

Waste Disposal

2.010

Within a 15 mile radius of the Pomfret site sewage is either collected and treated in conventional treatment plants where population density is high or disposed of through the use of septic systems where population density per square mile is low. Currently, the city of Dunkirk is completing a three-phased construction program in which wastewater facilities will be upgraded to provide secondary treatment. The first and second phases of construction involved the installation of a sewer outfall in Lake Erie and an 84-inch mainline interceptor. In the third phase the main treatment plant will be upgraded to a secondary treatment facility with activated sludge tanks and chemical addition facilities to achieve phosphorus removal. The design capacity of the completed system is 6 MGD although at peak flows the treatment plant is capable of handling 18 MGD. Other communities within this area are currently installing or upgrading sewage treatment facilities to accommodate future population growth. For example, Fredonia has completed plans to build a new treatment plant which would involve secondary treatment by an activated sludge process and would discharge into the lake proper at a point approximately 3/4 mile east of the Pomfret site and approximately 1,500 feet offshore.

Other Services

2.011

The capacity of the local area to provide other services is also adequate. Local and regional planning projections indicate that the prevailing vacancy rate and present supply of residential structures and mobile homes are sufficient to meet existing and future demands. There are enough schools and educational facilities to provide services for both the existing and projected population. The present extent of health services, recreational sites, and other public and semi-public services in the local area is ample to meet the existing needs and those that might prevail in the future.

LAND USE

Regional

2.012

In 1974, the U.S. Department of Agriculture inventoried existing land usage for Erie County, PA and the New York counties of Niagara, Erie, Cattaraugus, and Chautauqua, and projected land use changes through the year 2020 (Lake Erie Basin Study, USDA, 1974). While Erie County, PA, and Erie and Niagara Counties in New York contain some substantial urban areas, a large portion of land use in these counties is similar to Chautauqua and Cattaraugus Counties being forest land and agricultural land. At present, land use in this region falls into three categories: forestland (44.4%), agriculture (36.2%), and urban (15.8%). Existing and future land use trends for the region are presented in Table 2-2a. For example, a gradual increase of 7.5 percent in urban land use is projected by the year 2020. This trend suggests that the area will remain in agriculture with only 23.3 percent of the land committed to urban use.

Local

2.013

Local land use in the area of the Pomfret site is characterized by a predominance of forestland, primarily in the Fc LUNR classification (forests under 30 feet). The next major land use in the area is vineyard (Av), which comprises about one-fifth of the land use within 5 miles of the site. Cropland/cropland pasture (Ac) makes up about 10 percent of the local land use. The remaining land use is essentially residential, especially in the vicinity of the Dunkirk-Fredonia area, along with recreational, public and other forms of agricultural usage. Figure 2-1 illustrates current land use patterns both onsite and within a one mile radius of the proposed power plant. A summary of the acreage utilization per land use type for the area defined in Figure 2-1 is presented in Table 2-2b. Table 2-3 defines the land use classification symbols used in Figure 2-1 and Table 2-2b.

High Intensity Land Use

2.014

According to the land use data presented in Table 2-2b about 0.6 percent of the site and 6.2 percent of the area within one mile of the site is classified as high intensity land use. The high intensity classification includes industrial, commercial, mining, residential, and urban land use.

2.015

It should be noted that the LUNR area classification system does not delineate farm residences nor does it map rural nonfarm residential activities unless there are more than four residences per 1,000 feet of road frontage (Hardy et al., 1971). Thus, the absence of residential acreage figures (Rs, Rl, Rk) in Table 2-2b should not be interpreted as meaning that such uses do not exist on the site. Since the site boundaries do not coincide with property lines, the residential inventory includes all dwelling units situated on any land parcel which is either wholly or partially located within the site boundaries. Based upon this conservative assumption, there are 26 houses and one mobile home on the site. Utilizing these data and the occupation factor for the Pomfret site (3.53) the total number of residents occupying the dwellings was calculated to be about 95.

2.016

Four commercial land users occupy the Pomfret site. These are Hemenger's Auto Repair Service, Tilburg's Lawn Care Equipment, Don

Table 2-2a

REGIONAL LAND USE*
PRESENT AND PROJECTED

Category	Present		1980		2000		2020	
	Acreage (X 1000)	Distribution (%)	Acreage (X 1000)	Distribution (%)	Acreage (X 1000)	Distribution (%)	Acreage (X 1000)	Distribution (%)
Urban & Urban Build-up	485.0	15.8	537.6	17.5	630.4	20.5	716.1	23.3
Cropland	858.7	28.0	841.2	27.4	810.4	26.4	781.9	25.5
Pasture	252.6	8.2	247.5	8.1	238.4	7.8	230.0	7.5
Forest Land	1,364.5	44.4	1,336.7	43.5	1,287.7	41.9	1,242.5	40.5
Other	109.1	3.6	106.9	3.5	103.0	3.4	99.4	3.2
Total	3,069.9	100.0	3,069.9	100.0	3,069.9	100.0	3,069.9	100.0

*Regional area is defined by Subarea 4.4 of the Lake Erie Basin (U S D A, 1974).

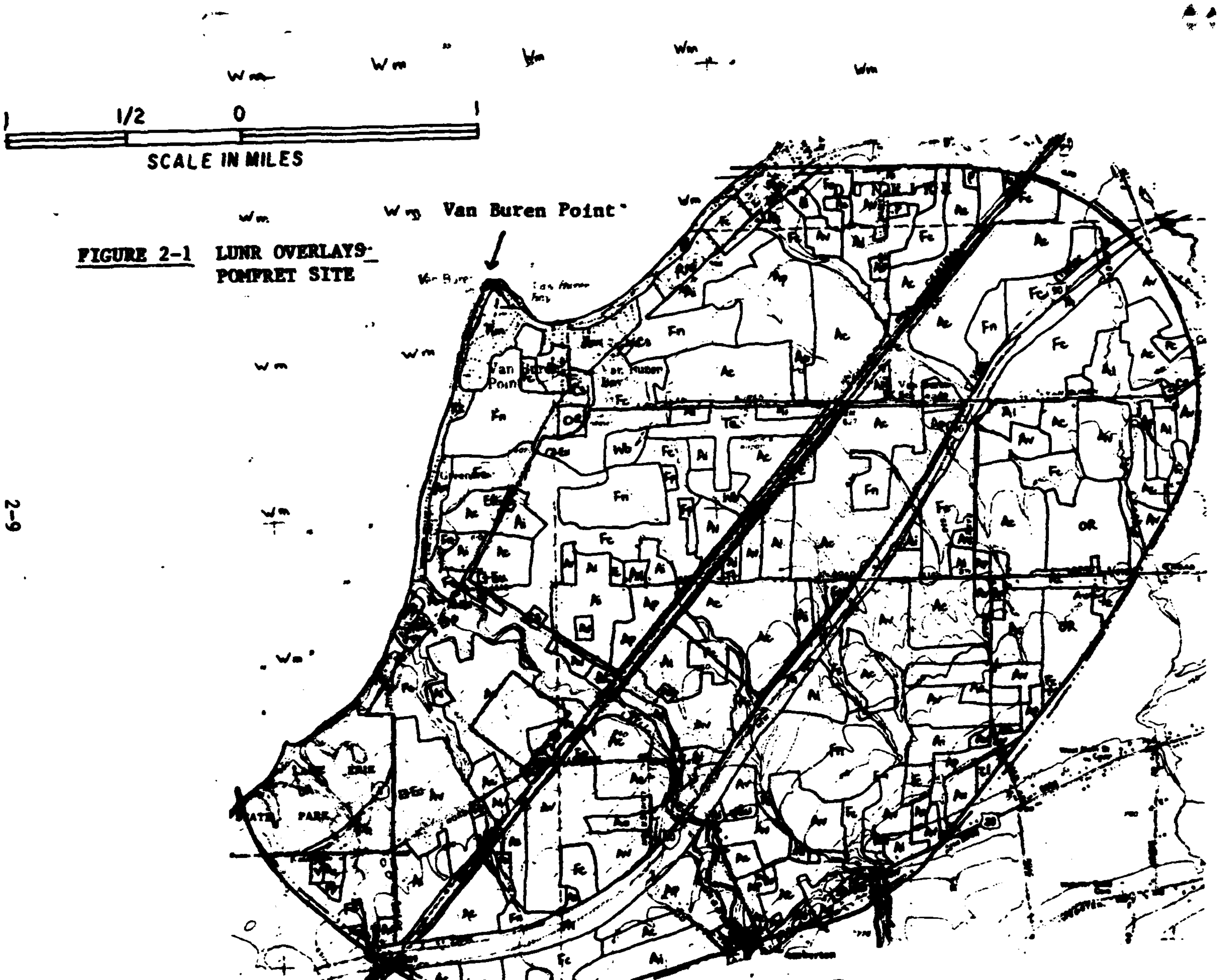


FIGURE 2-1 LUNR OVERLAYS-POMFRET SITE

POMFRET SITE
LUNR OVERLAYS-1975 1 MILE EXTENDED AREA

FIGURE 2-1

Table 2-2b

SITE SPECIFIC LAND-USE ACREAGE SUMMARY

LUNR Category	Pomfret Site Acreage	Pomfret Site Percent Distribution	Adjacent One-Mile Area Acreage	Adjacent One-Mile Area Percent Distribution
High Intensity				
Rm	0.0	0.0	126.0	2.6
Rl	0.0	0.0	42.0	0.8
Rs	0.0	0.0	17.3	0.3
Rk	0.0	0.0	87.7	1.8
Cs	2.4	0.2	16.1	0.3
Il	0.0	0.0	8.6	0.2
Eu	4.7	0.4	8.6	0.2
Sub Total	7.1	0.6	306.3	6.2
Low Intensity				
Av	106.7	10.1	1.005.7	20.5
Ac	305.9	29.0	859.3	17.5
Ap	57.0	5.4	233.5	4.8
Ai	186.1	17.7	452.2	9.2
Fc	213.4	20.3	1,143.5	23.3
Fn	80.7	7.7	344.7	7.0
Fp	9.5	0.9	14.8	0.3
Wb	33.2	3.2	2.5	0.1
Or	2.4	0.2	295.3	6.0
P	0.0	0.0	4.3	0.1
Sub Total	994.9	94.3	4,355.8	88.8
Corridors and Services				
Th	0.0	0.0	243.4	5.0
Ta	49.7	4.7	0.0	0.0
Tt	2.3	0.2	0.0	0.0
Sub Total	52.0	4.9	243.4	5.0
Grand Total	1,054.0	100.0	4,905.5	100.0

Source: Field survey program undertaken jointly by ERT and Cornell University's Resource Information Laboratory on November 13, 1975.

TABLE 2-3

LUNR CLASSIFICATION SYSTEM

Active	
Ao	Orchard
Av	Vineyard
Ah	Horticulture
At	High intensity
Ac	Cropland/Cropland pasture
Ap	Permanent pasture
Inactive	
Ai	Ag. extensive
Ui	Urban intensive
Uc	Under construction
Specialty Farms	
Ay	Mink, game, aquatic ag., horse farms
Forestland	
Fc	Brush cover up to fully stocked poles less than 30' (may be Fb, early map)
Fn	Forests over 30'
Fp	Plantations - any size
Water	
Wn	Natural - any size
Wc	Artificial 1 acre
Ws	Streams, rivers 100'
Wetlands	
Wb	Bogs, shrub wetlands
Ww	Wooded Wetlands
Wm	Marine waters - navigable (St. Lawrence and Great Lakes)
Wh	Hudson River
Non-productive	
Ns	Sands
Nr	Exposed rocks
Public	
P	All categories
Residential	
Rh	High density - 50' frontage
Rm	Medium density - 50'-100' frontage
Residential (Cont'd)	
Rl	Low density - over 100' frontage
Rs	Strip with max. of 1/3 intermixture of Cs commercial
Rr	Rural hamlet
Re	Estates 5 acres
Rc	Farm labor camp
Shoreline	
Rk	Shoreline developed
Commercial	
Cu	Urban (downtown)
Cc	Shopping center
Cs	Commercial strip with max. of 1/3 intermixture of Rs or density housing
Cr	Resorts
Industrial	
Il	Light manufacturing
Ih	Heavy manufacturing
Outdoor Recreation	
Or	All categories
Extractive	
Eg	Gravel, sand
Es	Stone quarries
Em	Minerals, cement, clay
Eu	Oil, gas, salt
Transportation	
Th	Highway (limited access)
Tb	Barge canal (channel, lock)
Tp	Port or deck
Tl	Locks or dams
Ts	Shipyards
Ta	Airport - any type
Tr	Railroad
Communications	
Tt	Area of service facilities

Source: Hardy, Ernest E.; Shelton, Ronald L.; Belcher, Donald J,; Roach, John T. (Center for Aerial Photographic Studies, Cornell University), New York State Land Use and Natural Resources Inventory: Classification and Inventory Methods, Final Report, Volume II, January 1971.

Frame Trucking, Inc., and Van Buren Flying Club, Inc., which operates out of Fredonia Airport, a facility owned by the applicant. In addition to these four commercial land users, there are also two natural gas wells on the site.

Low Intensity Land Use

2.017

Ninety-four percent of the acreage within the site boundaries, and 89 percent of the area within one mile of the site is classified as low intensity land use. Forty-five percent of the site is in active agricultural use (Av, Ac, A) while an additional 18 percent is considered to be inactive agricultural lands (Ai). The predominant non-agricultural land use on the site is forest land (Fc, Fn, Fp), a land use designation which includes nearly 26 percent of the site. The relative distribution of land uses in the adjacent one mile area generally reflects those patterns which exist on the site, particularly with regard to the predominance of agricultural and forest land activities.

2.018

Three distinct land use types have been identified as having special value or character. These include vineyards, forestland, and wetland. Vineyards (Av) constitute approximately 10 percent of the acreage found on the site and 20 percent of that contained in the adjacent area. The soils and microclimatic conditions found in the general Chautauqua Grape Belt region make vineyards a unique and irreplaceable agricultural resource (Pearce, 1975). Wetlands are not present on the proposed site and comprise only 0.05 percent of the land area within a one mile radius of the proposed plant.

Corridors and Services Land Use

2.019

Five percent of the acreage within the site and within one mile of its boundaries is classified as corridor and service land use. The only major interstate highway in the area is the NY State Thruway (I-90), which provides the major connection to destinations east and west of the site area. Major arterials serving the site include U.S. 20, S.R. 5, and S.R. 60. Routes 20 and 5, for the most part, run parallel to I-90. S.R. 60 lies perpendicular to the other principal state arterials and connects then with I-90. These roadways are defined in the Dunkirk-Fredonia Master Plan category as "Arterials," which connect major population concentrations by a reasonably direct route. Two railroads, the Norfolk and Western and Conrail, traverse the site. The Conrail (formerly Penn Central) provides a direct connection between Buffalo and Cleveland. There are also two Conrail branch lines in the region. One runs south from Dunkirk through Fredonia and beyond. Another runs south to Pennsylvania from the Village of Brocton. The Norfolk & Western main line runs alongside that of Conrail. The Fredonia Airport, owned by the applicant, occupies 4.7 percent of the acreage within the site boundary, while the Dunkirk Steam Electric Generating Station is located 4.5 miles NE of the proposed site area.

Prime and Unique Farmland
2.019a
An analysis of prime and unique farmland at the Pomfret site was performed using soils maps and prime farmland mapping units supplied by the U. S. Department of Agriculture, Soil Conservation Service. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has a special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Prime farmlands are those whose value derives from their general advantage as cropland due to soil and water conditions. In areas where farmlands qualify for prime, as well as unique, the prime farmland classification takes precedence. Table 2-3a shows the prime farmland mapping units for the Pomfret area. Approximately 8.5 acres of the proposed power plant site at Pomfret consists of unique farmland. Prime farmland occupies about 768 acres of the 1,054 acre site. Those prime farmland mapping units encountered on the site are as follows:

33B-Collamer silt loan, 3-8 percent slopes
38A-Niagara silt loam, 0-3 percent slopes
38B-Niagara silt loam, 3-8 percent slopes
42B-Galen fine sandy loam, 3-8 percent slopes
43-Canandaigua silt loam

A soil survey of Chautauqua County is currently in progress, thus information is not presently available for a comparison of the acreage of prime and unique farmland on-site versus the acreage within the county or region. The single most important agricultural product of the Pomfret site is grapes. However, according to an analysis performed by Mr. Wallace Washbon of the New York State Department of Agriculture and Markets, ". . . the site has almost no acreage of the moderately well and well drained soils best suited to grape production. The site has a large portion so poorly drained that it is not being used for crop production." The Washbon report was dated 14 January 1975. The impact of power plant construction on prime and unique farmland is discussed in Chapter Four.

TABLE 2-3a

TOWN OF POMFRET
CHAUTAUQUA COUNTY, NEW YORK

PRIME FARMLAND MAPPING UNITS

2	Hamlin silt loan
4	Teel silt loam
22A	Allard silt loam, 0 to 3 percent slopes
22B	Allard silt loam, 3 to 8 percent slopes
23A	Braceville gravelly silt loam, 0 to 3 percent slopes
23B	Braceville gravelly silt loam, 3 to 8 percent slopes
25A	Chenango gravelly silt loam, 0 to 3 percent slopes
25B	Chenango gravelly silt loam, 3 to 8 percent slopes
27	Castile gravelly silt loam
28	Scio silt loam
31B	Dunkirk silt loam, 3 to 8 percent slopes
33A	Collamer silt loam, 0 to 3 percent slopes
33B	Collamer silt loam, 3 to 8 percent slopes
38A	Niagara silt loam, 0 to 3 percent slopes
38B	Niagara silt loam, 32 to 8 percent slopes
40A	Williamson silt loam, 0 to 3 percent slopes
40B	Williamson silt loam, 3 to 8 percent slopes
42A	Galen fine sandy loam, 0 to 3 percent slopes
42B	Galen fine sandy loam, 3 to 8 percent slopes
43	Canandaigua silt loam
48A	Arkport fine sandy loam, 0 to 3 percent slopes
48B	Arkport fine sandy loam, 3 to 8 percent slopes
50A	Canaseraga silt loam, 0 to 3 percent slopes
50B	Canaseraga silt loam, 3 to 8 percent slopes
71B	Danley silt loam, 3 to 8 percent slopes

WATER USE

Groundwater

2.020

A groundwater survey of the Pomfret site revealed 36 wells, either drilled or dug, with a total of 21 owners. The wells have been used as the sources of potable water for domestic use and for the watering of livestock. Since landowners on the site now have access to public water supply, the wells currently have limited use. Virtually all the surface water bodies on the site are man-made, with most of them built by vineyard owners as a source of irrigation for grapes and other food crops such as tomatoes. Generally, the recreational usage of on-site waterbodies from a fishing standpoint is light. Very few contain sufficient size or quality of habitat to host catchable (from a sport fishing standpoint) size fish.

Natural Waterbodies

2.021

Area water resources are dominated by Lake Erie, which lies only one-quarter mile away from the Pomfret site. Lake Erie is utilized for recreational and commercial purposes as well as a water supply and waste receiver by communities and industries along its shore. Commercial fishing, although constrained by the size and diversity of marketable fish populations, still operates on a small scale from Dunkirk Harbor. There are no specific preferred commercial fishing grounds along the Dunkirk shore. Commercial fishing is not allowed within one mile of shore during the spring and summer months in this area. The commercial gill netters utilize the offshore area from Barcelona Harbor to close to the mouth of Silver Creek. The gill netters move further offshore as summer progresses and back inshore during the fall and spring. The proposed offshore structures are less than a mile from shore and thus are removed from commercial fishing waters. Lake Erie provides numerous recreational opportunities along its shoreline. In Chautauqua County alone, there are more than 16 small craft launching facilities. Parks are numerous as well with the closest being Lake Erie State Park, approximately 0.4 miles southwest of the Pomfret site. Recreational sportfishing is common along the shoreline but is somewhat restricted by the lack of public access to piers and breakwaters.

2.022

The lake in the vicinity of the project site is used by commercial vessels traveling to major ports such as Buffalo, Erie, Cleveland, Toledo, and others. Usage of Dunkirk Harbor by Lake Erie Commerce has declined since 1964 while recreational small craft usage has increased only slightly during this period. In the vicinity of the Pomfret site, water is withdrawn and used for cooling purposes by the Dunkirk Steam Electric Generating Station. The city of Dunkirk also makes use of the lake as a potable drinking water source. Lake Erie is also used as a receiving body for industrial and municipal wastes as well as surface water runoff. For example, the cities of Fredonia and Dunkirk discharge secondary sewage treatment plant effluents into the lake in the vicinity of the Pomfret site.

AIR USE

2.023
There are two airports within the general vicinity of the Pomfret site: the Dunkirk Municipal Airport and the Van Buren (Fredonia) Airport. The Dunkirk Airport is equipped with two paved runways, one 4,000 feet long and the other 5,000 feet in length and is located approximately 6.75 nautical miles north-east of the Pomfret site. There is no scheduled airline service at this airport because of its close proximity to the Greater Buffalo International Airport. The Van Buren or Fredonia Airport is totally encompassed by the Pomfret site and is currently owned by the applicant. Although the airport is used on a private basis, it is likely that it will be closed if the Lake Erie Generating Station is constructed on this site.

2.024
According to the Department of Transportation Federal Aviation Administration, the Pomfret site underlies Federal Airway Victor 14. Other low altitude airway routes in the vicinity of the Pomfret site include Federal Airways Victor 464 and Victor 90. Commercial jet corridors also traverse the area, including routes J-36 and J-68.

CULTURAL RESOURCES

2.025
The National Register of Historic Places and the National Register of Natural Landmarks have not identified any architectural or historical resources on the Pomfret site. A study completed by ARMS (Archeological Resource Management Service of the NY Archeological Council - SUNY Buffalo) using the criteria for eligibility for inclusion for the National Register of Historic Places has revealed no archeological sites of significance within the Pomfret site.

2.026
One structure and two structure complexes were recommended by Cultural Resources Management Services (CRMS) as potentially eligible for inclusion in the National Register of Historic Places. Two sites lie outside of the Pomfret site boundary, while one is within the plant boundary.

2.027
In proximity to the Pomfret site, the Calvin J. Dubert House, the Preston Dedrick Farm, and the former George Frost House with carriage

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FINAL ENVIRONMENTAL IMPACT STATEMENT. PERMIT APPLICATION BY NIA--ETC(U)
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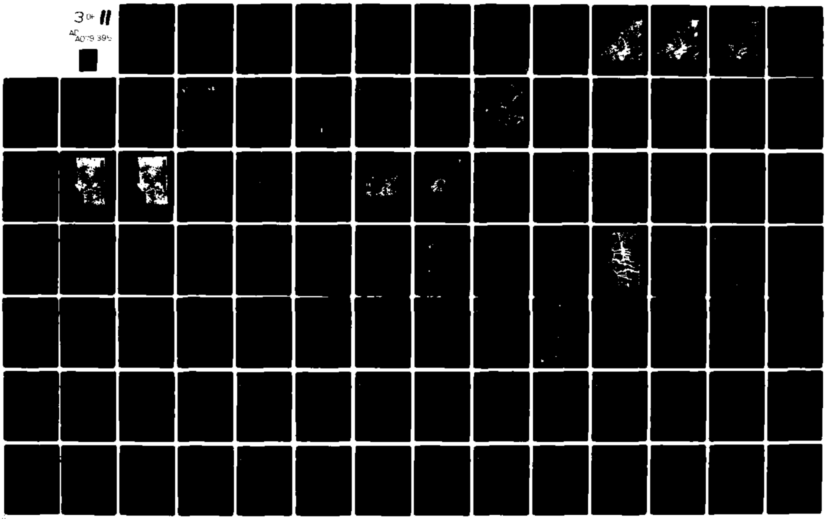


house and barn (Frost Farm) have been recommended for consideration for eligibility to the National Register of Historic Places. The Calvin J. Dubert House is a two-story upright structure with one-story wing construction circa 1840, with Classic Greek Revival detailing and later additions. It is considered to embody the special characteristics of style and later elaboration which is typical of the upper New York State region, and may be considered for eligibility to the National Register of Historic Places, under criterion (3) in that it does "embody the distinctive characteristics of a type." The Frost Farm buildings of house, carriage house, and barn are together a structure complex to be considered for eligibility to the National Register of Historic Places. The house is a 19th century Greek Revival two-story building with later additions. The original section of the house was erected circa 1830. The house has particular artistic value because of murals painted directly on the kitchen walls by Mrs. Frost. These murals have been paneled over by the present occupant of the house. The panels appear to be nailed and the extent of damage to the murals is unknown. The carriage house and barn are Victorian-style structures erected circa 1870-1900. The structure complex may be considered eligible for the National Register of Historic Places under criterion (3) because it "represent(s) a significant and distinguishable entity whose components lack individual distinction," and the house alone may be considered eligible under criterion (3) because the murals represent a significant example of American Folk Art. Presently, the Frost Farm is not occupied and is in a state of general disrepair, being poor in both condition and integrity. The Preston Dedrick house is a two-story Greek Revival structure, likely constructed between 1830 and 1860, with later additions. The interior retains original paneling and architectural details of the style and period. A Victorian hip-roofed barn, a garage and shed complete the structure complex. The barn is no longer present and only the foundation remains. It was given to the Amish by Mr. Dedrick and the new location of the barn is not known. The Dedrick House may be considered to embody the special characteristics of style and later elaboration which is typical of the upper New York State region and may be considered for eligibility to the National Register of Historic Places under criteria (3) in that it does "embody the distinctive characteristic of type." The Dedrick House and the Frost House were constructed by brothers, John P. and Ralph H. Hall, respectively. The Dedrick House remains in the Hall family, being owned by Preston Dedrick, son of Verona Hall Dedrick, granddaughter of J. P. Hall. On 23 June 1978, the Buffalo District submitted a request for a determination of eligibility for inclusion in the National Register to the Keeper of the National Register. This request included documentation on the Frost Farm, the Dedrick Farm, and the Dubert House. The Keeper of the National Register, by letter dated 20 September 1978, determined that all three properties are eligible for inclusion in the National Register.

In making his determination, the Keeper of the National Register provided the following comments:

"The Dedrick House is a good example of a vernacular Greek Revival farmhouse with later additions, and is significant for its association with the development of Chautauqua County during the nineteenth century."

Dedrick House - Applicable criteria: A,C

"The Frost Farm is representative of the agrarian development of Chautauqua County during the nineteenth century. The farm complex is also significant for the vernacular Greek Revival style of the residence and the Victorian barn and other outbuildings which contribute to the complex. The acreage for which the determination was requested, 151.2 acres, appears to be unnecessarily extensive. We recommend smaller parcel, perhaps 12 acres, which would encompass the complex and its immediate setting."

Frost Farm - Applicable criteria: A,C

"The Dubert House is significant for its association with the development of the Chautauqua County region. The house is also representative, despite alterations, of Greek Revival vernacular design. The acreage for which the determination was requested, 63.5 acres, appears to be unnecessarily extensive. We recommend a smaller parcel which would encompass the house and its immediate environment."

Dubert House - Applicable criteria: A,C

Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council on Historic Preservation procedures (36 CFR 800) are completed. In addition to the above structures, the Fredonia Commons Historical District in the Pomfret Township is also being considered for inclusion. This area is located approximately four miles to the east of the Pomfret site.

2.028
During the months of July and August 1975, systematic sampling of the Pomfret site was accomplished by the Archeological Resource Management Service of the New York Archeological Council. Prehistorical archeological data from the Pomfret site indicate transitory, temporary utilization of the area by small groups of people. Some of the occupation is most likely to have occurred during the

Archaic period (6000-2000 B.C.). No habitation loci showing evidence of very prolonged occupation were found although one particular site (Leone Locus) may represent a campsite or fishing station which could have been used for more than an overnight stay.

2.029
The NYAC survey identified five separate habitation loci outside the Pomfret Site but no significant occupation areas within the site itself. The distribution of these loci indicates preferential utilization of elevated ground although not necessarily in proximity to substantial sources of water. A general description of the five sites loci encountered during this field survey is presented below:

- Leone Locus - This site is situated on high ground along Lake (North) Road near the New York State Thruway. Material recovered from the Leone site consisted of a fragment of a projectile point or knife, unmodified flint flakes, a notched stone netsinker, ceramic sherd and many cobbles of field flint. The Leone locus appears to be a possible perhistoric campsite which may have been utilized by fishermen. Although the evidence is scanty, the location of this site (high ground) substantiates the hypothesis suggesting prehistoric occupation of elevated areas near the water sources.

- Sam Locus - This area is located in a field adjacent to Route 5, in Dunkirk, NY. Material obtained from this site includes a flint projectile point, several unmodified flint flakes, and flint field cobbles, glass fragments and historic ceramic sherds. The Sam Locus may have been a prehistoric campsite, but further testing would be required to substantiate this theory.

- Siebert Locus - The Siebert locus is situated in an open field near the junction of Berry Road and the New York State Thruway. Elevations at this site are considerable less than those encountered at the Leone Locus. Items recovered during the exploration of this site include a single ground stone celt, a modified flint flake, several cobbles of field flint, a historic brick fragment and several historic ceramic sherds. Evidence of pre-historic occupation at this site is not abundant although the period during which sampling was conducted may have been the constraining factor.

- Pulci - Sam Locus -- This site is located near an unnamed creek in the vicinity of the intersection of Berry Road and the New York State Thruway. Material recovered from the highground at this location includes a retouched flint core, unmodified flint flakes, field flint cobbles, a historic kaolin pipe stem fragment, many historic ceramic sherds and glass fragments. It appears that this locus is primarily a historic site since ceramic fragments date back to the early 1840's. Prehistoric flints found on the site may be associated with the Siebert Locus which is located a short distance away.

- Leach Locus - This area is located in a field west of Berry Road near the loci previously described. Material found at this site includes a flint scraper, unmodified flint blade, several historic ceramic sherds, and some glass fragments. Evidence indicates that the items recovered from this area are only stray finds and are not representative of any long-term occupations.

2.030
Detailed information on the sampling procedures and methods of analysis employed during this archeological investigation are contained in Section 77-A of the NYS Article VIII Application for the Lake Erie Generating Station.

ECONOMY

Regional 2.031
In 1972 the per capita income in Chautauqua County was $4,036, which is significantly less than the New York State per capita income of $5,242. Median family income for Chautauqua County in 1960 and 1970 was $5,626 and $8,838, respectively.

2.032
Personal income statistics for the year 1972 have been derived for the various economic sectors in Chautauqua County and are summarized in Table 2-4. The data presented in this table clearly illustrate the importance of manufacturing, trade, and services sectors, employing about 32,000 individuals. Employment in the transportation, communication, and public utility sectors, construction, and the finance, insurance, and real estate category were 1,765, 1,695, and 1,555, respectively. This information is based on total available work force (approximately 32,000) covered by unemployment insurance legislation. In addition to the above, there is substantial but unspecified employment in farm work which is not normally covered by unemployment insurance. This includes owners of family farms and often transitory farm workers.

2.033
Agriculture in Chautauqua County is very important as over 100,000 acres are estimated to be actively farmed, the majority of which is

TABLE 2-4

PERSONAL INCOME, 1972: CHAUTAUQUA COUNTY

Income Where Earned (million dollars)

from Wages and Salaries

Total	Farms	Contract Construction	Manufacturing	Wholesale and Retail Trade	Finance, Insurance and Real Estate	Transportation	Communication and Public Utilities	Services	Government	Other
382.2	3.7	20.2	153.5	50.3	10.8	10.3	10.0	36.6	87.0	0.8

SOURCE: New York State Department of Commerce, New York State Business Fact Book, 1974 Supplement, pp. 20-21.

prime agricultural land that lies within the "Grape Belt." The importance of agriculture in Chautauqua County is evidenced by its rank relative to other counties in New York State for selected agricultural products. In 1969, Chautauqua County ranked first in grapes, as measured by acres, first in the total number of farms, and fifth in the total number of sour cherry trees (NY State, 1974). The most notable agricultural products are dairy products, livestock (other than poultry) products, fruits and vegetables.

2.034
Manufacturing firms in Chautauqua County produce a wide variety of items. In a listing of industrial firms located in the area, metals-related firms particularly stand out. Processing of the area's agricultural products also stands out as an important economic activity. These same products are expected to continue to be emphasized in the future.

Unemployment
2.035
The civilian labor force in Chautauqua County during 1973 amounted to 62,600 and of that amount, 59,200 found employment, leaving 3,400 or 5.5 percent of the work force unemployed. The New York State unemployment rate during this period was 5.4 percent, placing Chautauqua County slightly above average. Since these figures were compiled, unemployment in the State and nation have risen substantially so it is likely that these data understate the current unemployment situation in both the State of New York and Chautauqua County. Increased unemployment rates have been attributed primarily to energy-related cutbacks or shutdowns by industry throughout the northeastern United States.

Local
2.036
The median family income for the town of Pomfret was $6,136 in 1960 with manufacturing and agriculture the chief sources of employment. Twenty-five manufacturing establishments in the area employ about 1,500 individuals, which represents approximately one-third of the labor force. There are about 300 farms in Pomfret which average about 60 acres and produce grapes, hay, fresh and processed vegetables, and dairy products. The State University of New York located in the village of Fredonia is also a major source of employment, with approximately 1,100 individuals on the payroll. Allegheny Ludlum Industries is also an important employer in the immediate area, with two divisions located in Dunkirk, one of which employs over 1,000 people. Numerous other facilities in the area employ more than 100 people, including the applicant's Dunkirk Steam Station which employs approximately 150 individuals with an average annual per capita salary of $20,000.

2.037
Within the Pomfret site boundary natural gas and agricultural crops are produced. The total annual value of agricultural products produced on the site is estimated to be $233,191. No estimates are available on the value of natural gas production from on-site gas wells.

AESTHETICS

2.038
The Pomfret site and the surrounding area may be classed as rural with forest land and agriculture the most typical land use forms. Although these characteristics generally prevail, the general appearance of the area is dominated by surface and air transportation corridors. For example, four separate rail lines operated by Conrail, Norfolk and Western, and the Erie-Lackawanna railway either cut through the Pomfret site or pass near it. Similarly, vehicle transportation routes including the New York State Thruway (I-90), State Route 5, and U.S. Route 20, are located either adjacent to the Pomfret site or in the general vicinity of it. Aircraft transportation corridors also traverse the site and surrounding area. Thus, it can be said that although the site and surrounding area is generally rural, noise generated by surface transportation and aircraft tends to be an overriding influence.

2.039
The general appearance of the terrain surrounding the Pomfret Site varies. To the eastward the skyline is generally dominated by the Portage Escarpment, which rises abruptly at the inland terminus of the Lake Plain. North and south of the site, agricultural and forest land are generally present with residential and some commercial establishments interspersed throughout this area. Toward Lake Erie, development is more pronounced and the landscape is generally dominated by a number of seasonal and year-round residences. When viewed from Lake Erie, the Pomfret site and surrounding area appear tree-covered with the Dunkirk Steam Station, City of Dunkirk skyline, and the Portage Escarpment visible above the treeline.

Noise
2.040
As indicated in the section on Aesthetics, the Pomfret site and surrounding area are subjected to noise from various airborne and surface transportaion sources. Specific noise-sensitive receptors in the vicinity of the Pomfret site include the cottages on Van Buren Point and adjacent shoreline residences, Holy Cross Seminary northeast of the site, Lake Erie State Park to the southwest, the campus of the State University of New York at Fredonia and the Chautauqua County Home and Infirmary.

2.041
To establish a baseline for ambient sound, the applicant first identified the various noise-sensitive land uses and homogeneous acoustical regions in the vicinity of the Pomfret site (Figures 2-2 and 2-3, respectively). From this analysis three separate regions were identified where ambient noise sampling would provide useful information. These were designated by the applicant as heavy transportation, coastal residential, and industrial. The largest region "heavy transportation" covers the area where surface transportation noise predominates. The area is quite uniform with many vineyards and roads throughout the region. During the summer carbide cannons are used in grape production areas. Each cannon is fired periodically (every 4 to 6 minutes) to frighten birds. Together with these cannons, which normally operate from sunrise to sundown during the month of August and part of September, mechanical bird tweeters are used as acoustic scarecrows.

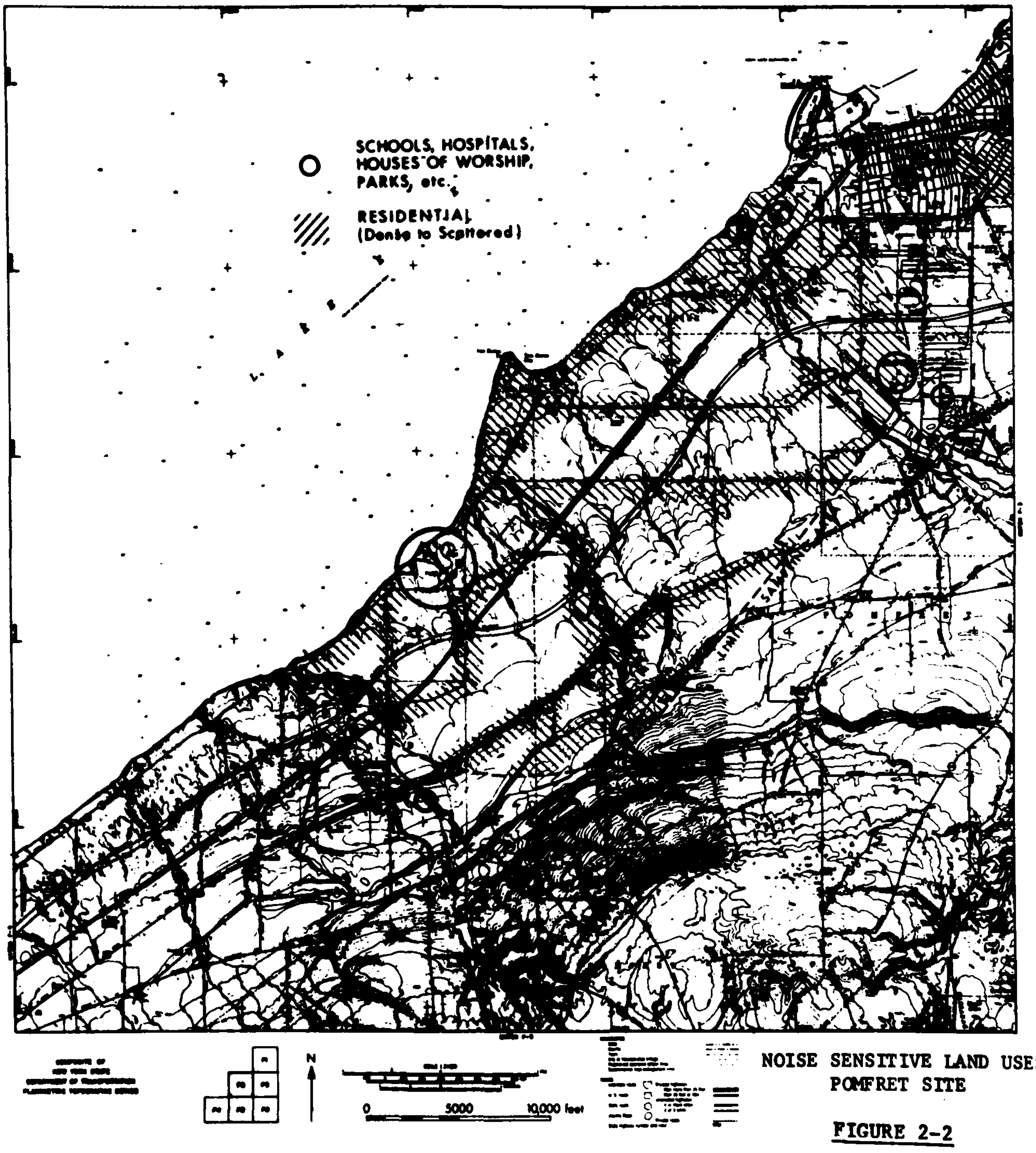
2.042
The area of Van Buren Point is defined as the Coastal Residential Region and is characterized by the sounds of human activity. It is removed from Route 5, and although traffic noise did not affect this region, sounds from lawnmowers, bicycle horns, and children playing were found to be dominant.

2.043
Urban centers in the vicinity of the site contain a few scattered industrial facilities where noise from machinery and other industrial activities is most pronounced. These areas, the industrial region of Dunkirk, border the Pomfret site.

2.044
Figure 2-4 shows the location of sound measurement stations installed by the applicant to determine ambient noise levels in the vicinity of the Pomfret site. Five primary stations were installed where 24-hour monitoring was carried out. The location of each monitoring point is presented below:

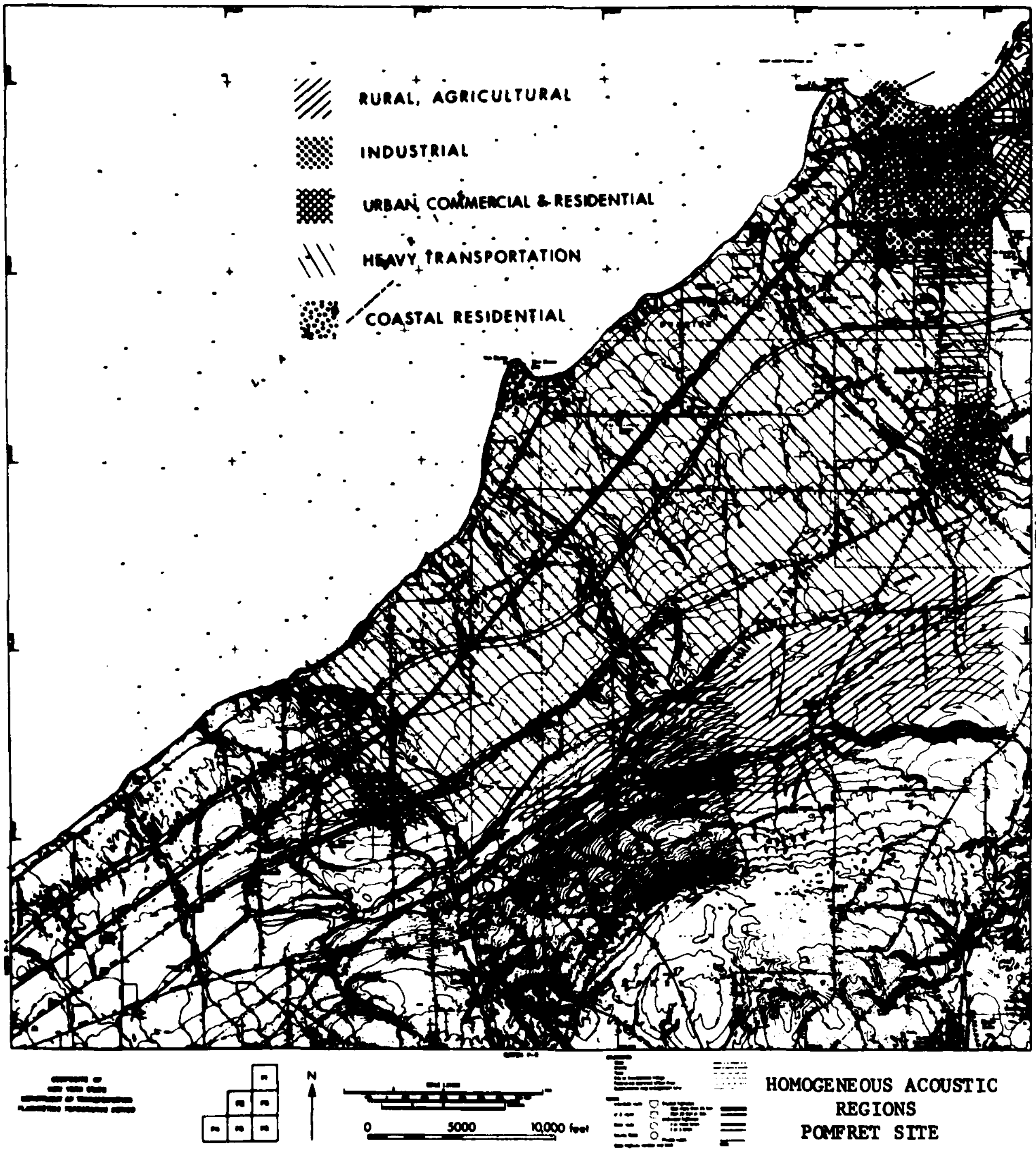
Monitoring Point	Location
A	Van Buren Road
B	Walden Road and Route 20
C	Berry Road and Farel Road
D	Campus Fredonia State
E	Holy Cross Seminary

Traffic noise data were also collected at three separate locations: Hall Road south of Route 5, Lake Avenue north of the New York State Thruway, and Farel Road north of Route 20. Brief observations were



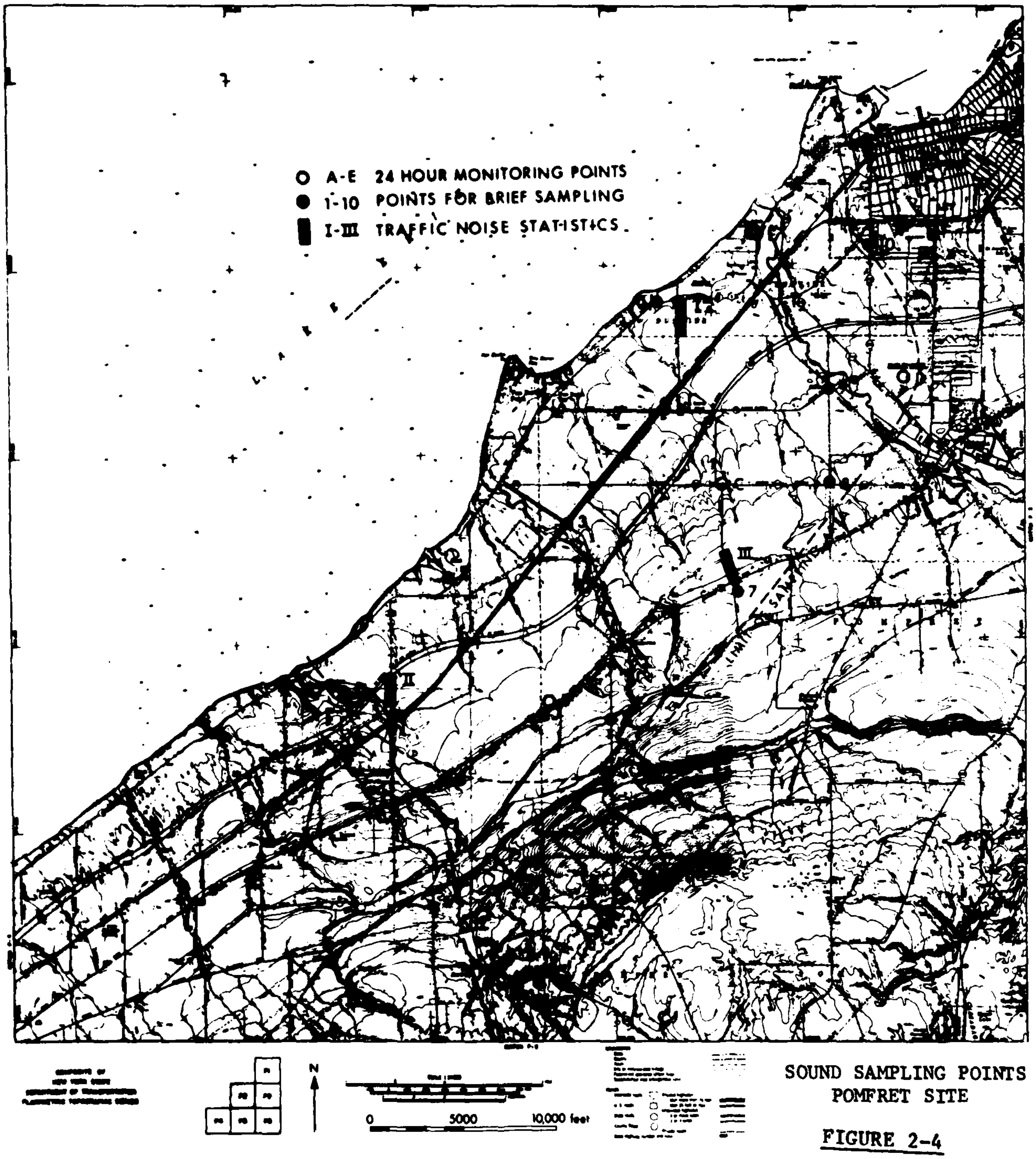
NOISE SENSITIVE LAND USES
POMFRET SITE

FIGURE 2-2



HOMOGENEOUS ACOUSTIC
REGIONS
POMFRET SITE

FIGURE 2-3



SOUND SAMPLING POINTS
POMFRET SITE

FIGURE 2-4

also taken at points 1-10 (Figure 2-4) to further refine homogeneous region definitions and to gain information on prominent sound sources.

2.045
A summary of the data collected at the five primary stations is presented in Table 2-5. The quantities L_{90}, L_{50}, and L_{10} are the A-weighted decibel levels (refer to glossary) that were exceeded 90 percent, 50 percent, and 10 percent of the time, respectively. The quantity of L_{eq} is the "energy equivalent level": i.e., it is the level of an unvarying A-weighted sound which would contain the same energy as that observed for all the actual sounds.

2.046
During summer, the sound levels in the Heavy Transportation Region are seen in the table to be lower during the weekend day than during the weekday. This agrees with the lower truck traffic volume observed on major roads in the region during the weekend. The sound level data includes the noise from railway traffic passing through the Pomfret site; however, this short duration source does not affect the L_{eq}. The Coastal Residential region exhibited higher weekend sound levels due to greater human activity (yard work and recreation) occurring then. During the summer evening hours, insect sound levels dominated the environment of the entire sampling area. Throughout the sampling area, the sound levels were lower for the weekend nighttime period than for weekday nights.

2.047
During winter, traffic noise is again very important in the ambient environment. In general, these traffic noise-dominated sound levels were highest during the daytime, and lowest during the nighttime. The sound levels during the weekday and weekend time periods were similar for the Heavy Transportation Region, and in general, lower than comparable summer observations, due to decreased traffic volume observed during the winter. The Coastal Residential Region exhibited prominent seasonal and weekday-weekend variations. The daytime periods had lower weekend than weekday winter sound levels in this region. Most cottages in the Van Buren Point area were unoccupied during the winter and, therefore, little human activity was noted. However, construction activity in the area did cause higher than anticipated winter weekday daytime sound levels.

2.048
No specific data on the noise contribution of the Dunkirk Steam Station to ambient sound levels in the vicinity of the Pomfret site can be discerned from the data collected. The Dunkirk Station is several miles away from the Pomfret site and as such is only one component of a substantial industrial complex in and around the city of Dunkirk.

TABLE 2-5

SUMMARY OF AUTOMATIC MONITOR SOUND LEVEL OBSERVATIONS - POMFRET SITE - WINTER

Measurement Point	Weekday Day dBA Thur. 12/5				Weekend Day dBA Sun. 12/15				Weekday Evening dBA Wed. 12/4				Weekend Evening dBA Sun. 12/22				Weekday Night dBA Wed.-Thurs. 12/4-12/5				Weekend Night dBA Fri.-Sat. 12/20-12/21			
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}
Pomfret																								
A	51	42	46	52	48	38	45	52	45	38	41	49	47	41	44	51	46	38	41	50	44	33	38	48
B	60	44	53	63	(56	42	51	60)[2]	(57	43	50	60)[4]	55	41	48	59	(55	28	43	56)[5]	(52	37	45	55)[6]
C	57	45	51	58	(56	39	47	58)[3]	(52	43	49	55)[4]	55	43	48	56	(50	34	44	53)[5]	53	39	47	55
D	(50	41	47	53)[1]	50	43	47	52	(49	47	48	51)[1]	46	42	45	48	(49	37	46	52)[5]	49	43	46	52
E	51	35	41	52	(56	41	49	58)[3]	45	33	38	49	56	43	49	59	53	36	45	56	56	39	46	58

[1] Friday 12/6
[2] Sunday 12/22
[3] Saturday 12/21
[4] Thursday 12/5
[5] Thursday-Friday 12/5-12/6
[6] Saturday-Sunday 12/21-12/22

TABLE 2-5 (cont'd)

SUMMARY OF AUTOMATIC MONITOR SOUND LEVEL OBSERVATIONS - POMFRET SITE - SUMMER

Measurement Point	Weekday Day dBA Fri. 8/16				Weekend Day dBA Sun. 8/18				Weekday Evening dBA Thur. 8/15				Weekend Evening dBA Sat. 8/17				Weekday Night dBA Thur.-Fri. 8/15-8/16				Weekend Night dBA Sat.-Sun. 8/17-8/18			
	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}
Pomfret																								
A	48	40	44	50	51	41	45	53	49	41	45	52	53	48	52	55	47	38	43	51	45	41	44	47
B	62	46	54	64	59	41	49	62	62	47	54	64	59	48	54	64	59	44	50	59	56	45	49	58
C	55	47	50	55	(53	42	46	54)*	57	45	53	59	61	45	52	59	58	47	56	62	(51	41	45	53)**
D	50	45	48	52	48	42	45	50	52	46	50	55	50	45	48	53	52	46	50	56	49	42	45	52
E	54	39	47	57	50	36	44	51	56	42	49	61	55	46	51	59	58	37	47	63	51	35	41	54

*Sunday 8/25

**Saturday-Sunday 8/24-8/25

***Friday 8/23

2.049
Additional information on ambient sound levels in the vicinity of the Pomfret site can be found in Section 75.2 of the applicant's New York State Article VIII Application for the Lake Erie Generating Station.

PHYSIOGRAPHY

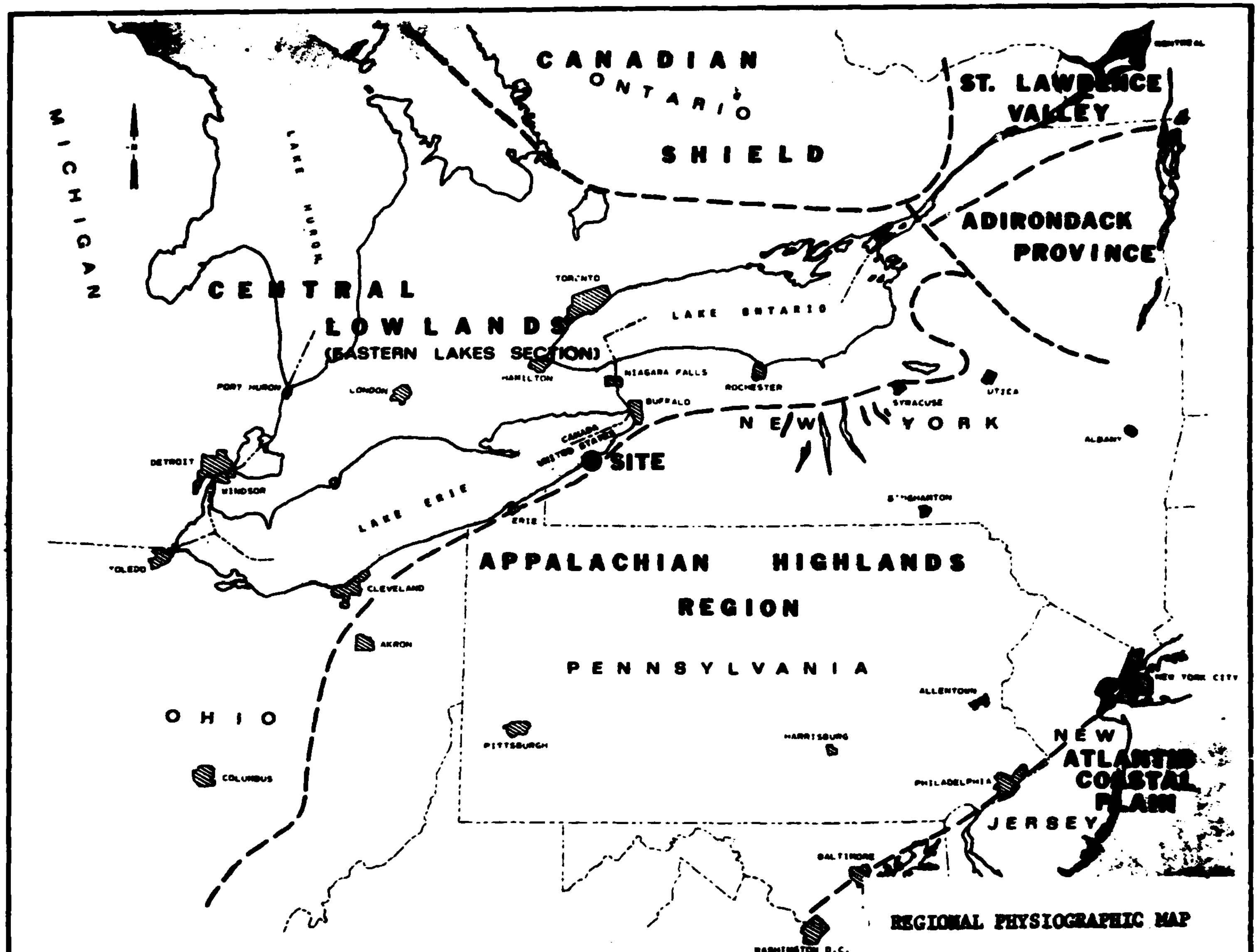
2.050
The Pomfret site is located on the southern shore of Lake Erie in the Eastern Lake Section of the Central Lowlands Physiographic Province (Muller, 1963), Figure 2-5. The Central Lowlands Province encompasses all of the Great Lakes and extends westward as far as the Mississippi River where it adjoins the Great Plains Province. North of the Ohio-Pennsylvania border the Eastern Lake Section narrows in width as it follow the Portage Escarpment which forms the northwestern perimeter of the Appalachian Plateau. The topography of the Central Lowlands is characterized by low rolling landscape and nearly level plains. Most of the area is covered by glacial and postglacial deposits, including ancient lake beds and moraines (Press and Siever 1974).

2.051
In the vicinity of the Pomfret site the ground surface slopes gently upward from Lake Erie at a rate of about 50 feet per mile. This surface represents the accumulated bottom sediments of Lakes Whittlesey and Warren, Pleistocene predecessors of Lake Erie. Drainage in the region of the Pomfret site is limited to six perennial streams that flow roughly at right angles to the Lake Erie Shoreline. There are no significant marshlands on the Pomfret site nor are there any in the general region surrounding it.

GEOLOGY

Regional Geology

2.052
Throughout the region surrounding the Pomfret site, the uppermost Paleozoic rocks are nearly flat-lying Devonian shales and silt stones which attain a thickness of approximately 2,000 feet. Unconsolidated glacial deposits (till and outwash) and post-glacial lacustrine materials overlie this Devonian sequence. In general, the regional structure is homoclinal with the sedimentary strata dipping about 20-50 feet per mile to the south and southwest. The entire Paleozoic Section (approximately 6,000 ft thick) overlies Precambrian basement rock, which may be similar in composition to the rocks found in the Canadian Shield north of Lake Ontario.



REFERENCES:

GREAT LAKES BASIN FRAMEWORK STUDY, 1975, APPENDIX 3, GEOLOGY AND GROUNDWATER, GREAT LAKES BASIN COMM., ANN ARBOR, MICH.; OLMSTEAD, F.H., 1938, MAP OF REGION INCLUDING THE DELAWARE RIVER BASIN SHOWING PHYSIOGRAPHIC UNITS; PRESS, F. AND SIEVER, R., 1974, EARTH, W.H. FREEMAN AND CO.

REGIONAL PHYSIOGRAPHIC MAP

FIGURE 2-5

2-32

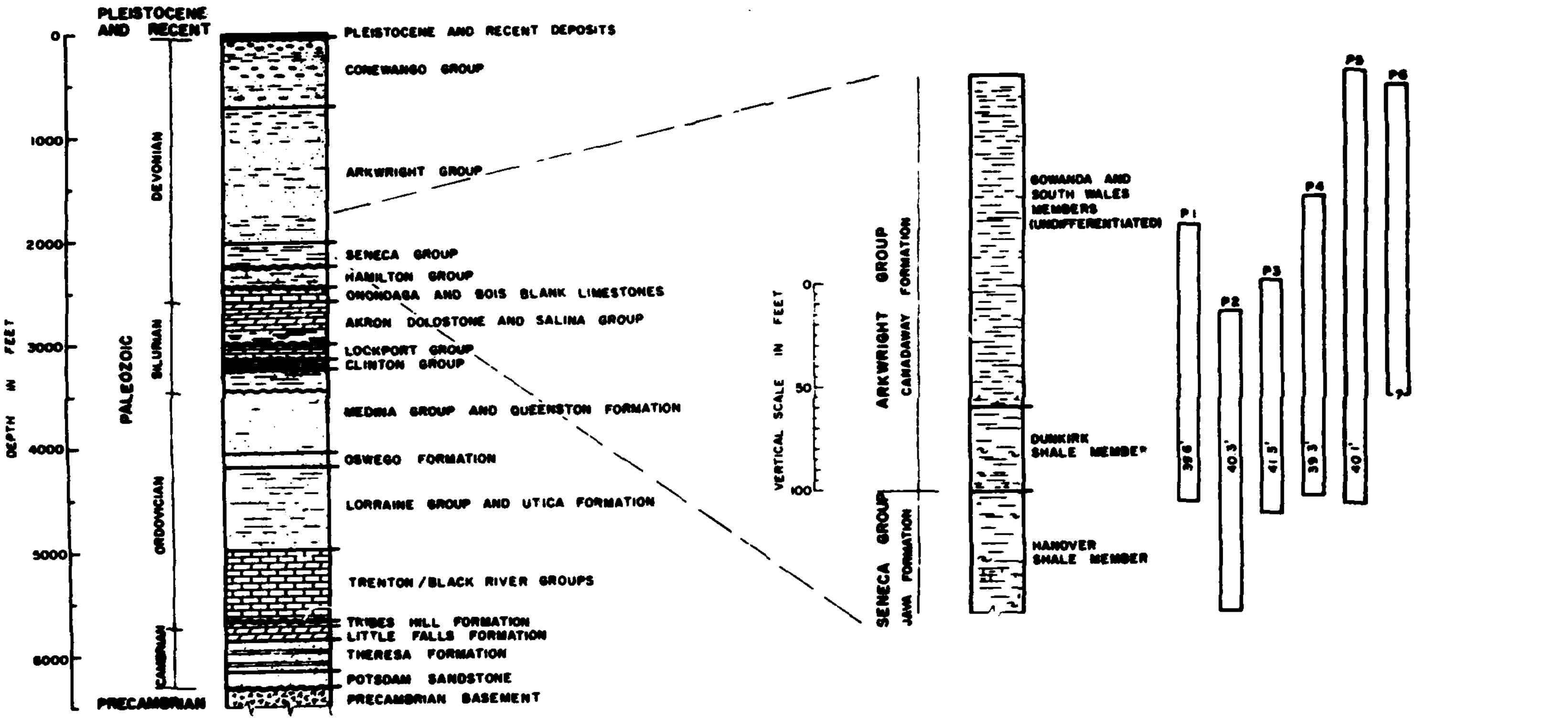
Bedrock Stratigraphy
2.053
In the vicinity of the Pomfret site, the bedrock consists of approximately 2000 feet of Upper Devonian (Chautauqua Series) marine shales, siltstones, and conglomerates. The generalized stratigraphic column, shown in Figure 2-6, represents fine to coarse marine sediments, essentially devoid of limestone. The lower half of the section is comprised mostly of shale and siltstone members which are exposed in nearly parallel bands of progressively younger rock, south and southeast of the Lake Erie shoreline. Most of the remaining upper formations occur in the higher parts of the county, in the area bordering the Appalachian Highlands. All formations dip very gently to the south and southeast, at approximately 20 to 50 feet per mile (Tesmer, 1963). Generally, bedrock units observed at this site are relatively flat-lying and undisturbed.

Surficial Geology
2.054
The Pomfret site is situated in a region of unconsolidated lake bottom sediments deposited in former Lakes Whittlesey and Warren during the Wisconsin glacial stage. For the most part, these types of lacustrine sediments are silts and clays. Littoral and glacial moraine sediments parallel these deposits in the vicinity of the Lake Erie coastline.

2.055
The surficial material consists mainly of lacustrine clays, sands, silts, and soils which have been extensively weathered. In most areas these materials are underlain by deposits of till and overlain by alluvial and recent soils. Alluvial deposits, generally associated with stream channels and flood plains, consist mostly of silt, clay, sand, and gravel. The total thickness of unconsolidated deposits observed in the borings taken at the site varies up to a maximum of about 32 feet.

2.056
Regionally modern soils vary in texture from silts and clays to gravelly silts and clays depending to a great extent on the character of underlying materials. At the Pomfret site silts and clays of low to moderate plasticity are the most predominant soil types. Occasional small areas of more granular (sand and/or gravelly) soils occur on a sporadic basis. However, the major areas of granular soils occur inland to the south and west of the Pomfret site.

2.057
The areas affected by erosion and deposition are limited at the Pomfret site because of its generally low relief. Most erosion is confined to existing stream channels. Elsewhere, flat-lying unconsolidated materials rest on a relatively flat bedrock surface.



DIAGRAMMATIC COMPOSITE STRATIGRAPHIC COLUMN SHOWING ROCK UNITS PENETRATED BY BORINGS

FIGURE 2-6

REFERENCE:

KRIEDLER, W.L., 1963, SELECTED DEEP WELLS AND AREAS OF GAS PRODUCTION IN WESTERN NEW YORK; NEW YORK STATE MUSEUM AND SCIENCE SERVICE. KRIEDLER, W.L., VAN TYNE, A.M., AND JORGENSEN, K.M., 1972, DEEP WELLS IN NEW YORK STATE; NEW YORK STATE MUSEUM AND SCIENCE SERVICE BULL. 418A, 335P. TESMER, I.H., 1963, GEOLOGY OF CHAUTAUQUA COUNTY, NEW YORK, PART I, STRATIGRAPHY AND PALEONTOLOGY (UPPER DEVONIAN); NEW YORK STATE MUSEUM AND SCIENCE SERVICE BULL. 391, 65P.

Bedrock is exposed along the lakefront cliffs adjacent to the site and its presence has limited the rate of erosion of the Lake Erie Shoreline. In general there are no highly erodible areas on or immediately adjacent to the Pomfret site, a unique condition for that portion of the Lake Erie shoreline located within New York State. Deposition of sediments is restricted to channel deposits in streams and to deltaic type deposits where the larger streams enter Lake Erie. These deltaic areas, however, are not located within the site boundaries.

Groundwater
2.058
Groundwater is encountered in both the surficial deposits and bedrock at the site. Surficial deposits in some locations of the site were found to be saturated since the groundwater is unconfined and the permeabilities of the deposits are low. The configuration of the groundwater table is generally a subdued replica of the ground surface topography. Lacustrine deposits and till are relatively impermeable and do not appear to be a potential source of large quantities of groundwater. Bedrock at the site contains groundwater primarily in fractures and openings, but quantities are generally too low to be of any value as a water source. At all test boring sites, groundwater was not under sufficient pressure. These observations as well as data collected on existing wells in the immediate vicinity of the Pomfret site indicate that groundwater is only available in small quantities. No ground water aquifers are known to exist at or near the site with flows sufficient to support commercial or municipal needs.

Economic Resources
2.059
The leading producing horizon of commercial quantities of natural gas in Chautauqua County is the Lower Silurian (Medina) Group, consisting mostly of sandstone with some shale. The producing formation is encountered at a depth of approximately 1,500 to 1,800 feet in the site area, and averages 150 feet thick. At least two gas wells have been drilled within the Pomfret site boundaries. Known gas producing fields exist throughout the general area. Some have been depleted and are now being used for storage (Kiersznowksy 1974). A known field producing from the deep Medina rocks underlies the site area, but the construction, operation, and maintenance of the proposed facility should neither affect nor be affected by gas production in the region (Fakundiny, 1975).

2.060
There are no major quarrying operations in the immediate site region, although glacial and alluvial deposits may be used locally as a source of sand and gravel. Four such deposits are within a distance

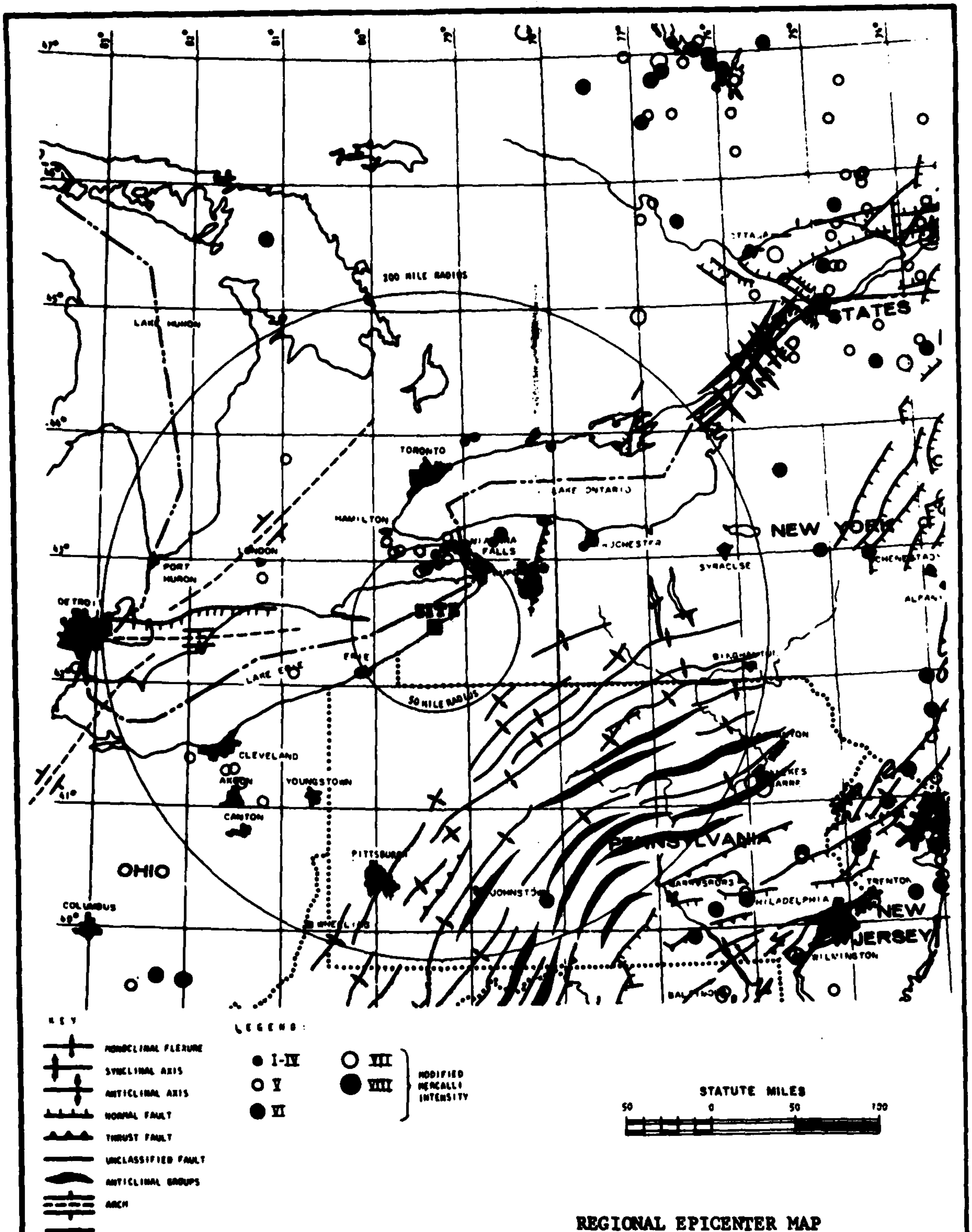
of two miles of the site boundary. These sand and gravel operations would not be affected by the construction, operation, and maintenance of the proposed facility. There are no underground mining operations in the vicinity of the Pomfret site.

Seismology

2.061
The seismic history of the northeastern United States includes more than 300 years of historical data, more than 40 years of which is supplemented by instrumental data. The historical record shows that earthquake occurrences in the northeastern United States are infrequent, usually of shallow focus, and are characterized by low magnitude and/or intensity. The largest earthquakes which have occurred within the State of New York have been measured at Intensity VIII on the Modified Mercalli (MM) Scale.

2.062
The Pomfret site is situated in a region which has experienced a moderate amount of relatively minor earthquake activity. The record of earthquake occurrences in western New York and the surrounding area dates back over 100 years. A number of earthquakes have been reported during this period but none of these have caused more than minor structural damage. No recorded seismic events have resulted in damage to the area within 25 miles of the site and in consideration of the seismic history of western New York, it does not appear likely that the site would be subjected to damaging earthquake ground motions during the economic life of the proposed facility.

2.063
Figure 2-7 shows all earthquakes of Intensity V (MM) or greater which have occurred within a 200 mile radius of the site, as well as earthquakes of all intensities within 50 miles of the Pomfret site. The zone of major earthquake activity closest to the site is in the vicinity of Ottawa, Quebec, in the Ottawa River-St. Lawrence River Valleys, more than 200 miles to the northeast. Shocks are large as Intensity IX-X (MM) have been recorded in this zone; however, the tectonic development of this relatively active region is totally dissimilar to the tectonic development of the site area. The large earthquakes in the Ottawa-St. Lawrence Area are associated with the faulting of the Ottawa-Bonnechere Graben System. There are no geologic or tectonic reasons for extrapolating these large events into the unrelated tectonic province containing the Pomfret site. Areas near Attica and Buffalo, New York are the only local sectors of known earthquake activity within the same province as the site. Most of the recorded earthquake activity in western New York has occurred within a 70 mile radius of the site. There have been four reported earthquakes with maximum Intensities of VI (MM) or greater within



REFERENCE:

THIS MAP WAS PREPARED FROM PORTION OF THE U.S.G.S. "IFR WALL PLANNING CHART EAST AND WEST, 1958."

TECTONIC FEATURES TAKEN FROM A PORTION OF THE "TECTONIC MAP OF THE UNITED STATES BY U.S.G.S. AND AAPG, 1962." BASEMENT FEATURES TAKEN FROM "BASEMENT MAP OF NORTH AMERICA" BY U.S.G.S., 1967.

* GLOSSARY OF GEOLOGY, AMERICAN GEOLOGICAL INSTITUTE, 1972.

NOTE: CLARENDON-LINDEN PORTRAYAL IS DIAGRAMMATIC ONLY - SEE TEXT FOR DISCUSSION. INTERPRETATION OF CLARENDON-LINDEN IS THAT OF NEW YORK STATE GEOLOGICAL SURVEY.

REGIONAL EPICENTER MAP

FIGURE 2-7

this distance since the first historical account in the mid-19th century. These events have been been related to activity along the Clarendon-Linden fault approximately 60 miles northeast of Dunkirk, NY.

2.064
Regional seismicity data indicate that the maximum intensity which could be encountered at the Pomfret site will be Intensity VI on the Modified Mercalli Scale. The soils at the site are not subject to landsliding, settlement, compaction, consolidation, liquefaction, or surface rupture as a result of earthquakes of Intensity VI (MM). Nothing encountered during the site explorations indicated any adverse behavior of subsurface materials during previous known earthquakes.

Aseismic Geologic Hazards
2.065
The only aseismic geologic event that has resulted in damage within 25 miles of the site is flooding and erosion along the shoreline of Lake Erie from wind-induced wave activity. The historical rate of shoreline erosion is 0.39 feet per year. Flooding from lake storms has resulted in some damage near the site. However, analysis of the potential effects of a 50 and 100 year storm show that the maximum estimated water elevation caused by such events is less than the lowest elevation of the site.

Lake Erie Bottom Sediments
2.066
Construction of the coal handling system would require dredging in the near shore waters of Lake Erie. Lake bottom sediments in the proposed dredged areas consist of a layer of fine sediment (between 0.25 inch and 6.0 inch thick, averaging 1.0 inch) and rock fragments (approximately one-foot thick) overlaying shale bedrock. The scarcity of sediment and prevalence of rock fragments and bedrock prevented collection of bottom samples by conventional methods, so divers were used to perform this function. Sediment samples taken from the proposed dredging site were analyzed to determine chemical quality and physical characteristics. A general description of the sediment collected as well as data on percent composition of sediment types and particle size distribution is presented in Table 2-6 and 2-7, while the result of the chemical analysis can be found in Table 2-8. Refer to Figure 2-15, Water Quality Sampling Stations-Pomfret Site, for the locations of sediment sampling stations.

2.067
The bottom structure consists of shale bedrock having numerous cracks running east-west that range from 2 to 8 inches deep and 4 to 10 inches wide and that are often filled with gravel, shells of dead

TABLE 2-6

POMFRET SEDIMENT OBSERVATIONS

Row	Station	General Description	% Bedrock	% Boulder	% Small Rocks and Shale	% Fine Sediment
1	111	Flat shale bottom; some large boulders, some fine sediment on surface, and scattered gravel; regularly spaced transverse cracks and scattered round depressions; no macrophytes	87	3	7	3
	112	Shale bedrock; many transverse cracks; a fine sediment cover; some boulders and gravel; no macrophytes	65	3	7	25
	113	Mostly shale bedrock with transverse cracks and upturned ridge of shale running east-west; silt in cracks up to 5 in. deep; scattered shale pieces on bottom; macrophytes present	70	3	17	10
2	121	Mostly flat smooth bedrock with transverse cracks; sediment, gravel and shells in cracks; macrophytes present	88	3	7	2
	122	Shale bottom with transverse cracks and several large boulders and some gravel; sediment in cracks and depressions; macrophytes present	88	3	7	2
	123	Shale bottom with transverse cracks and many large boulders of shale; much gravel and sand; cracks filled with sediments, gravel, shells; no macrophytes	86	1	9	4

TABLE 2-7

PERCENT COMPOSITION OF SEDIMENT COLLECTED AT POMFRET SITE

		Station											
		111 (5%)*		112 (5%)*		113 (5%)*		121 (5%)*		122 (5%)*		123 (10%)*	
Wentworth Scale	Sediment Size (mm)	Oct 28	Apr 29	Oct 29	Apr 29	Oct 28	Apr 28	Oct 29	Apr 29	Oct 28	Apr 28	Oct 28	Apr 28
Pebble	> 4	45	16	13	58	75	5	74	90	60	No Sediment	10	61
Granite	> 2	36	4	24	7	5	< 1	6	5	5		8	8
Very coarse sand	> 1	7	5	25	7	6	< 1	4	1	7		4	4
Coarse sand	> 0.500	3	19	12	11	8	1	3	2	6		2	2
Medium sand	> 0.250	6	18	17	3	5	1	4	< 1	7		6	3
Fine sand	> 0.125	1	18	3	8	< 1	< 1	7	1	7		30	8
Very fine sand	> 0.062	1	20	4	7	< 1	< 1**	1	1	6		41	1

* Percent of total sediment composed of pebbles and smaller sediment determined by observation during October 1974.

**91% passed through this sieve.

TABLE 2-8

POMFRET CHEMICAL SEDIMENT ANALYSIS, AUGUST 1, 1975

		Row 1						Row 2					
	Station	111		112		113		121		122			
Chemical Parameter	Unit of Measurement	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Total organic carbon	mg/kg	55.6	48.4	56.6	60.4	70.8	75.4	31.2	39.2	36.0	22.8	27.4	37.8
Chemical oxygen demand	mg/kg	74.0	30.0	12.0	80.0	94.0	96.8	41.2	50.0	22.0	15.2	16.0	8.4
Immediate dissolved oxygen demand	mg/kg	7.5	30.0	35.0	29.5	14.0	36.0	26.0	3.5	9.5	2.5	20.0	15.0
Volatile solids	% loss	3.73	2.85	4.98	6.59	5.50	5.83	4.25	3.72	4.69	5.20	3.21	3.30
Total Kjeldahl nitrogen	mg/kg	8.92	3.80	12.76	13.72	22.52	17.56	2.12	3.92	2.16	1.44	3.88	1.60
Nitrogen-nitrate	mg/kg	<0.16	0.24	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	0.32	<0.16	<0.16	<0.16
Orthophosphate	mg/kg	0.016	0.008	0.136	0.016	0.024	0.088	0.024	0.016	0.008	0.008	0.008	<0.008
Oil and grease	mg/kg	8.6	10.6	2.3	12.0	22.6	24.2	4.0	6.6	14.2	6.4	81.0	1.7
Cyanide	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/kg	0.0004	0.0004	0.0044	0.0028	0.0008	0.0032	0.0004	0.0004	0.0020	<0.0004	<0.0004	<0.0004
Cadmium	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.012	<0.004
Copper	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Lead	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Mercury	mg/kg	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.0032	<0.0004	<0.0004	0.0288	<0.0004	<0.0004	0.0028
Nickel	mg/kg	0.200	0.052	0.032	0.036	0.004	0.044	<0.004	0.144	0.012	0.188	<0.004	<0.004
Zinc	mg/kg	0.012	0.056	0.028	0.028	0.032	0.056	0.016	0.012	0.092	0.036	0.004	0.032

organisms, and fine sediments. The bedrock is pockmarked with round depressions of various sizes and depths that collect debris. The shore area is clear of fine particles. It consists of crumbled masses of shale resembling talus slopes in various stages of being washed away by waves. Fine sediments are present at the 10-foot contour only beneath boulders and in cracks. At the 20-foot contour, some sediment is present in protected areas near rocks and low drop-offs but its depth does not exceed 1 mm. The 30-foot zone is almost entirely covered with sediment at depths varying from 0.1 cm to 15 cm, with an average depth of approximately 1.5 cm. Some deposits in deeper crevices are as deep as 30 cm and are stratified in layers of brown, black, and gray; these deeper, more permanent sediments emit odors characteristic of methane and sulfurous compounds. Distribution of fine sediments is probably influenced by water motion or the lack of it. Shallower zones are swept clean by constant water action and sediments move to deeper areas where they settle out. There is little water movement at the 30-foot depth and, when disturbed, fine sediment remains suspended for several hours.

2.068
Sediments were analyzed to determine concentrations of various chemical constituents. Results generally revealed sediment chemistry to be similar throughout the study area. Sediments were composed primarily of shale and rocks, with some decaying detritus containing high values of total organic carbon, chemical oxygen demand, and nitrogen. Nutrient concentrations of nitrate nitrogen ranged from 0.16 mg/kg to 0.32 mg/kg. Orthophosphates appeared in slightly higher concentrations in the sediment in some areas. Cyanide, arsenic, cadmium, chromium, copper, lead, and mercury concentrations were generally near or below detection limits. Nickel and zinc were detected at levels 7.5 and 1.9 times higher respectively than those observed in the water column during a 1974-1975 survey. Oil and grease analyses revealed higher levels within the sediment than in the water column, with concentrations ranging from 1.7 to 81.0 mg/kg and a mean of 16.2 mg/kg. See Table 2-8.

Soils
2.069
The Pomfret study area contains three soil associations: Canaidaigua-Collamer-Caneadea, Caneadea-Canandaigua and Williamson. All of the soil has been formed in calcareous deposits of the glacial lake (USDA, 1972). Both the Collamer and Canandaigua series developed from neutral "lakelaid" silts and very fine sands (Feuer et al., 1955). The moderately well-drained Williamson Association developed on acid "lakelaid" silts, and very fine clays and the poorly drained Canadice and Caneadea developed from "lakelaid" clay. The Williamson association covers only a small portion of the southwestern end of the study area.

2.070
All of the soils sampled were composed of approximately 25 percent sand, 50 percent silt, and 25 percent clay. On this basis, they can be classified as silt loam soils. The Canandaigua and Collamer series are classified as silt loams or fine sandy loams (USDA, 1972). Collamer is usually moderately well drained, whereas Canandaigua is classified as poorly drained soil (Feuer et al., 1955). The mean percent organic matter was 10.0 for the Collamer series and 8.9 for the Canandaigua series. These percentages are near the upper limits of the range of 0.4 to 10 percent reported by Buckman and Brady (1969) as characteristic of mineral soils. Poorly drained soils and soils of finer texture do, however, contain more organic matter than aerated and sand soils (Buckman and Brady, 1969). Also, the soils were sampled in the upper layer where a higher organic matter content is characteristic. Mean pH values of 5.2 and 4.5 were determined for the Collamer and Canandaigua series, respectively. The normal range for forest soils is from 4.5 to 6.5 (Spurr and Barnes, 1973). The pH values are rather low, especially for the Canandaigua series, but both soils are reported as acidic (USDA, 1972; Feuer et al., 1955). Also, the soils were sampled in the upper layer and acidity is usually greater near the surface, because of the accumulation of organic matter that yields acidic products upon decomposition (Oosting, 1956). During the 1930's the soils of Chautauqua County were mapped and classified by Howe (1936) according to their natural productivity for fruit growing. This classification is depicted on Figure 2-8. An updated soil association map of Chautauqua County was produced by Feuer et al. (1955). The pertinent information on this map was transferred to a photo and appears as Figure 2-9.

2.071
At the request of the applicant a team of three agricultural experts surveyed the Pomfret study area. They concluded that "the site has almost no acreage of the moderately well-drained soils best suited to grape production." In using a scale from I to VII with I being the best, they rate the Pomfret study area west of Little Canadaway Creek as II with the remainder of the site rated IV. Brown (1975) estimated grape production as four tons per acre per year for the Pomfret study area.

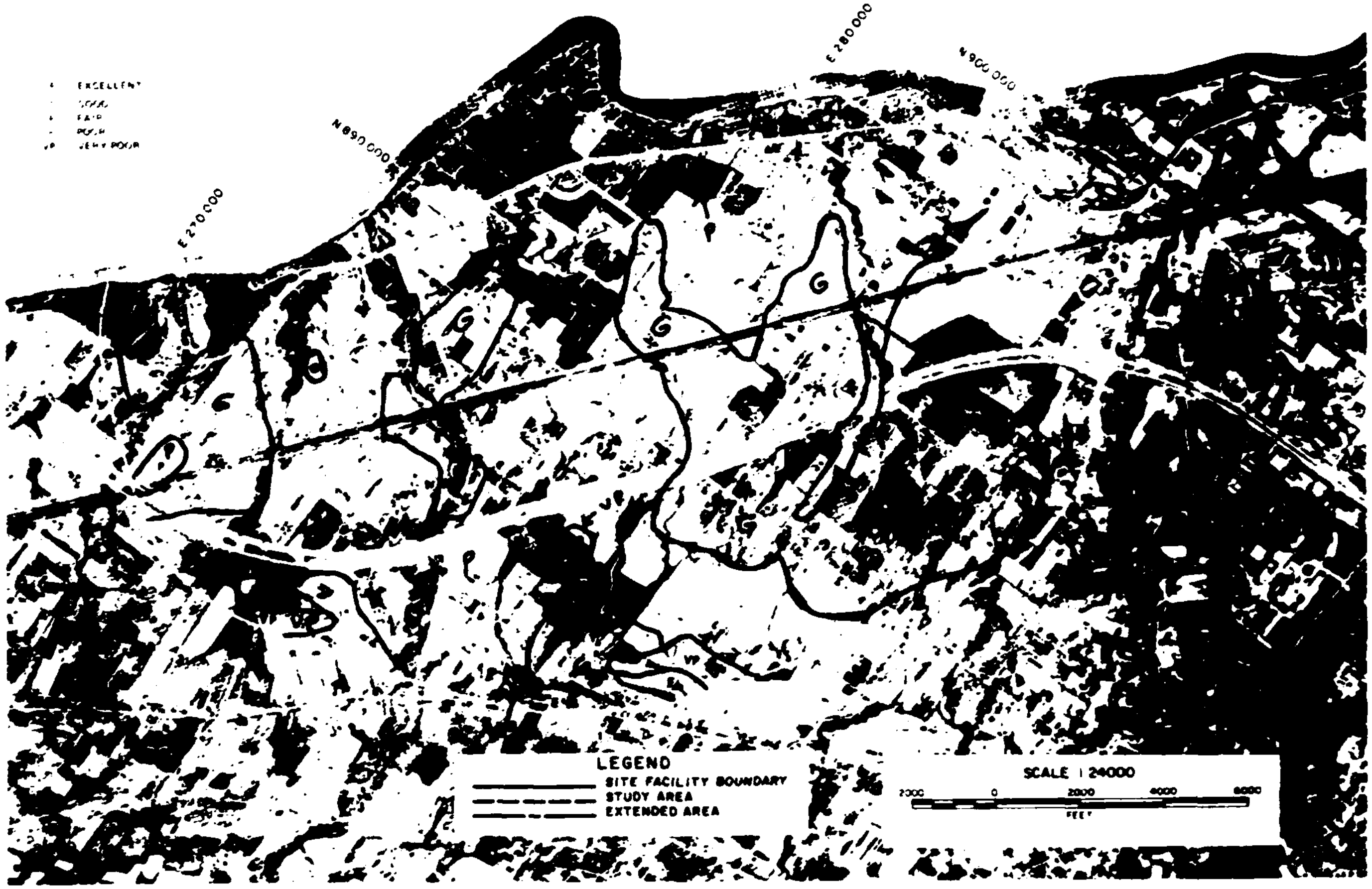
CLIMATE

Regional

2.072
The climate of the lake shore of western New York State is humid continental and is characterized by low mean temperatures. Lake Erie moderates the continental inland climate of the proposed site. Large-scale cyclonic storms are most frequent in winter, and decrease in frequency during summer.

SOILS CLASSIFIED ACCORDING TO THEIR NATURAL PRODUCTIVITY FOR GRAPE GROWING, AFTER HOWE (1936) POMFRET EXTENDED AREA

FIGURE 2-8



SOIL ASSOCIATIONS POMFRET EXTENDED AREA. AFTER FEUER ET AL. 1955

FIGURE 2-9

2.073
A distinct feature of early winter is snow squall activity caused by the flow of cold dry westerly winds over the relatively warm lake. Spring conditions may be delayed until late May or early June because of ice coverage on Lake Erie. It is typically cooler along the lakeshore than further inland at this time. Spring is a windy season owing to large thermal differences in regional air masses. Since the lake offers little frictional resistance to the wind's flow, the Pomfret region tends to be windier than inland areas. Maritime tropical air masses are revalent during the summer season. The lake cools and stabilizes the coastal plain so that temperatures above 90°F are infrequent and thunderstorm activity is suppressed. Autumn is characterized by long dry periods and is usually frost-free until the middle of October. Lake Erie causes thermal instability in the lower atmosphere at this time and early autumn thunderstorms and cloudiness are more prevalent in the Pomfret region than further inland.

2.074
The following meteorological conditions are based on observations made at the National Service offices at Buffalo, New York, which is approximately 35 miles northeast of the Pomfret site, and is representative of the region in general:

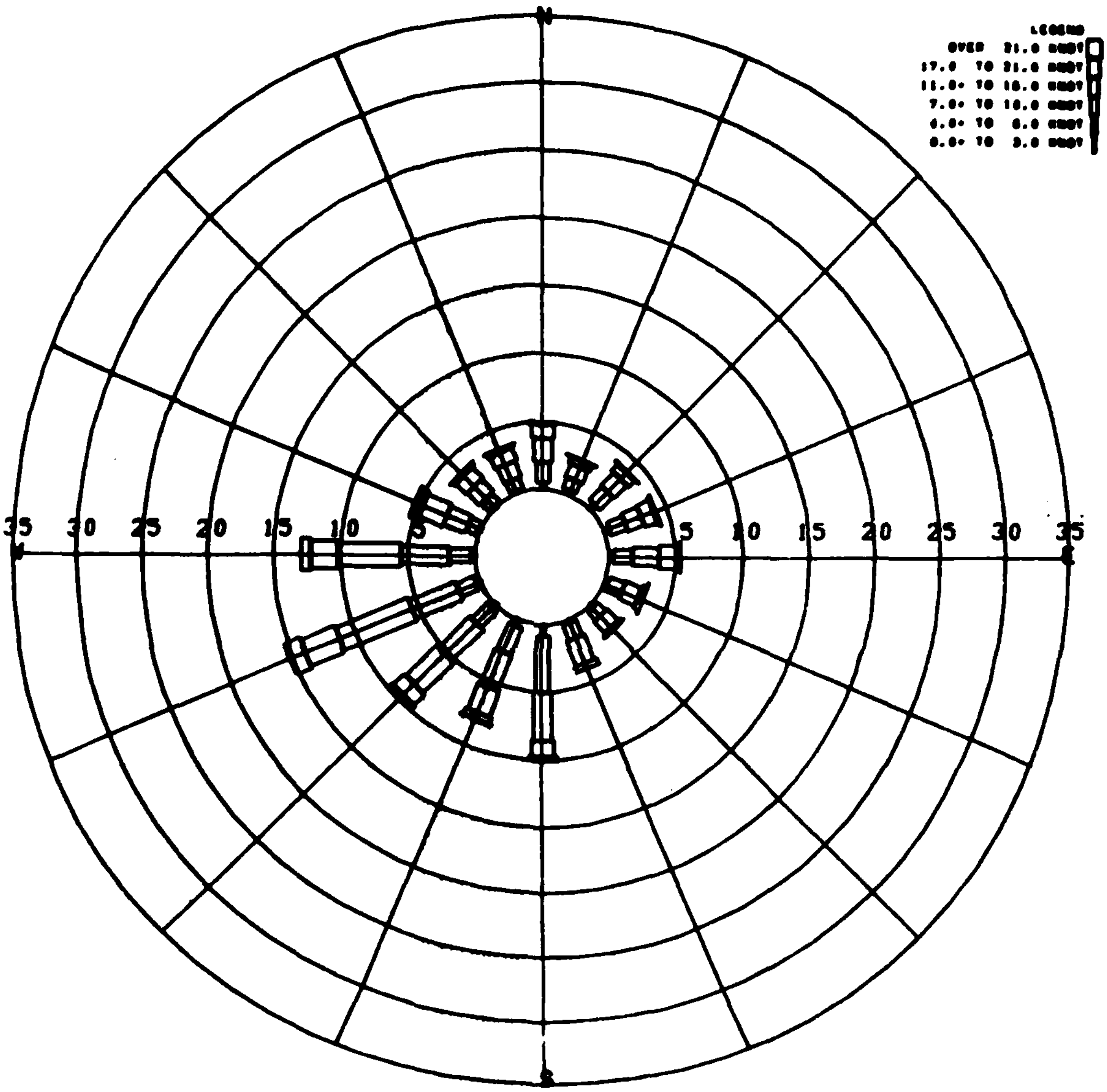
- Regional wind speed data have been collected at the Buffalo International Airport during the period 1964-1973 and are presented in the form of a wind rose (Figure 2-10). The data indicate a high frequency of west to southwest winds which persist throughout the year.

- The mean annual temperature at Buffalo is 47.1°F, while the mean daily maximum temperature does not exceed 80°F and the mean daily minimum temperature does not fall below 15°F. The length of the mean annual frost-free period around the periphery of Lake Erie is approximately 180 days generally falling within the period 30 April-25 October.

- The 30-year mean annual precipitation for the region based on Buffalo data is 36.11 inches. The annual precipitation along the south shore of Lake Erie is marked by a maximum in the late fall and early winter months. The mean annual snowfall in the Buffalo area is 88.9 inches although during 1976-1977 nearly 200 inches were recorded.

- Fog occurs approximately 19 days per year generally during the months of March and April.

GRID VALUES REPRESENT WIND DISTRIBUTION IN PERCENT



BUFFALO AIRPORT
WIND ROSE 1964 - 1973

FIGURE 2-10

- Lake Erie is 90 percent ice-covered during a normal winter. This effectively reduces the near surface frictional drag experienced by wind blowing across the lake.

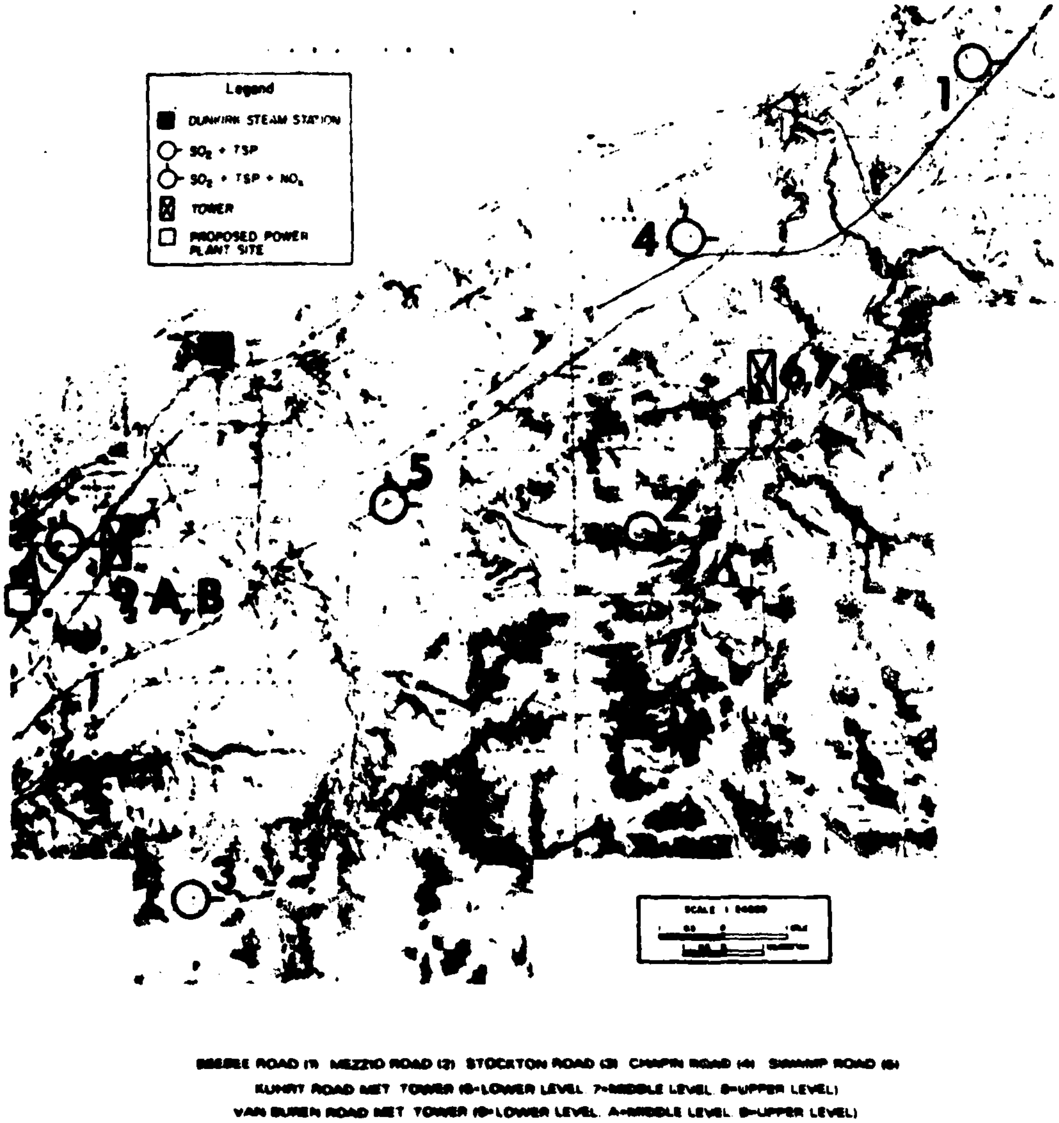
- Historical observations indicate that severe weather conditions will most probably be associated with intense cyclonic events; extratropical cyclones generally move in a straight line from Toledo, OH to Buffalo, NY.

On-Site Meteorology

2.075
Site-specific meteorological conditions were determined for the Pomfret site by a meteorological monitoring program conducted concurrently with the air quality monitoring program. The Lake Erie Generating Station monitoring network location is shown in Figure 2-11. The following seven parameters were measured at the lower (9) level (10m) of the 345-foot meteorological tower located at Van Buren Road near the Pomfret site: wind direction (WD), windspeed (WS), temperature, relative humidity (RH), rainfall, solar radiation and visibility. Van Buren Tower Middle (A) level (50m) and Van Buren Tower (B) level (100m) had instruments which monitored the following: WD, WS, temperature differences (bewteen the 10m and 100m levels and between the 10m and 50m levels) and RH.

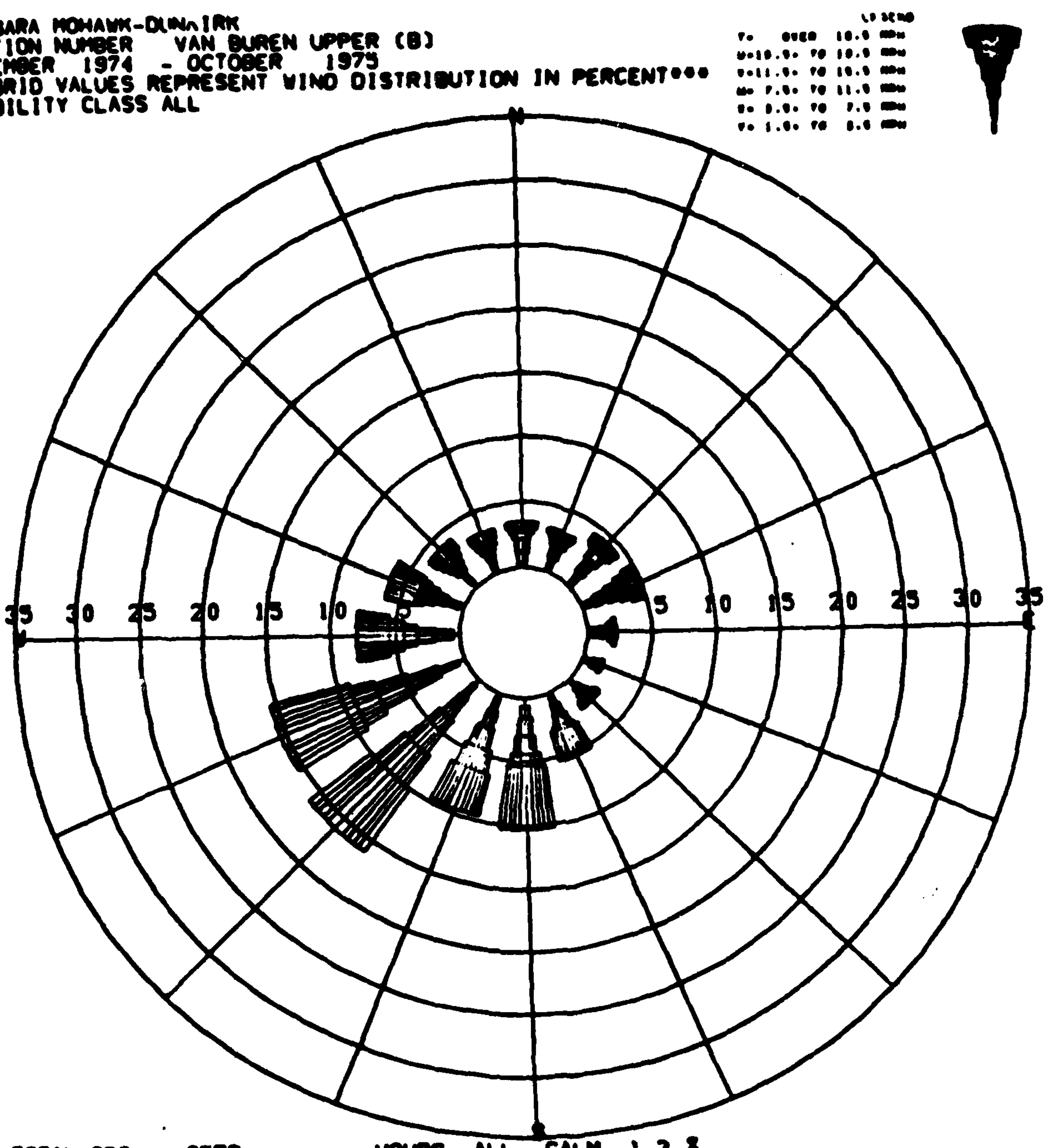
2.076
A meteorological sounding program was conducted for a total of four months (October 1974, January 1975, April 1975, and July 1975). Soundings were taken three times - 6 a.m., Noon, and 6 p.m.- during each weekday to obtain the vertical distribution of temperature, relative humidity, and pressure up to 700 mb (approximately 10,000 feet). The data was measured by a radiosonde borne aloft by a helium-filled balloon. A two-man team launched the balloons and operated the system to obtain the data. This equipment was able to record reference pressures and relative humidities in combination with temperature to obtain altitudes of the temperature readings, using the hypsometric formula, to an accuracy of less than 20 feet. Radiosonde data were received through an antenna and receiver, and automatically recorded on a strip chart recorder.

2.077
Figure 2-12 summarizes the joint frequency distribution of wind speed and direction measured at the upper level of the Van Buren tower. For an annual period, onsite meteorological measurements have indicated southwest winds occur most frequently (13.7%) followed by west-southwest (13.4%) and south-southwest (9.9%) winds. Seasonally, peak frequencies show a more westerly component in spring and summer (west-southwest) than in fall and winter (south-southwest and southwest, respectively). This may be due to the lake-breeze circulation



POMFRET SITE
MONITORING NETWORK
LOCATIONS
FIGURE 2-11

NIAGARA MOHAWK-DUNKIRK
STATION NUMBER VAN BUREN UPPER (B)
NOVEMBER 1974 - OCTOBER 1975
GRID VALUES REPRESENT WIND DISTRIBUTION IN PERCENT
STABILITY CLASS ALL



TOTAL OBS. 6579 HOURS ALL CALM 1.3 %

FIGURE 2-12 THE ANNUAL DISTRIBUTION OF WIND SPEED AND DIRECTION DERIVED FROM OBSERVATIONS AT THE 100m LEVEL OF THE VAN BUREN TOWER which is superimposed upon the large-scale flow during the spring and summer seasons. Average winds speeds decrease from a winter time maximum to a summer time minimum. The relatively high average wind speeds, especially during winter, tend to cause good atmospheric mixing.

2.078
The average monthly temperatures ranged from a maximum of 70.3°F in July to a minimum of 29.3°F in February.

AIR QUALITY

Applicable Standards

2.079
The National Ambient Air Quality Standards (NAAQS) and the New York State Ambient Air Quality Standards (NYSAAQS) are applicable to the Pomfret site. These limitations on ambient air pollutant concentrations are presented in Tables 2-9 and 2-10, respectively. Also related to the Pomfret site are the Federal Prevention of Significant Deterioration (PSD) standards which limit the absolute increase of air pollution in clean areas. The PSD air quality deterioration regulation increments are shown in Table 2-11. In addition, New York State has established ambient standards for settleable particulates based on four levels of social and economic development and pollution potential. The New York State levels for determination of particulate standards are defined in Table 2-12.

Regional Air Quality

2.080
The Pomfret site is located in the Southern Tier West Intrastate Air Quality Control Region (AQCR No. 164). This area has been designated Priority II for sulfur dioxide (SO_2) and total suspended particulates (TSP) and Priority III for nitrogen DIOXIDE (NO_2), carbon monoxide (CO) and photochemical oxidants (hydrocarbons). The AQCR Classification scheme is based on measurements or estimates of the regions air quality levels. The AQCR classification scheme is presented in Table 2-13.

On-Site Air Quality Monitoring

2.081
Air quality and meteorological measurements have been taken at seven monitoring stations in the vicinity of the Sheridan and Pomfret sites to determine existing air quality. The Lake Erie Generating Station monitoring network and its relationship to the proposed Pomfret site and the nearby Dunkirk Steam Station is shown in Figure 2-11. Sulfur dioxide (SO_2) and total suspended particulates (TSP) were monitored at Beebee Road (1), Mezzio Road (2) and Stockton Road (3). Sulfur dioxide (SO_2), oxides of nitrogen (NO_x), TSP, and

TABLE 2-9

NATIONAL AMBIENT AIR QUALITY STANDARDS

	Primary ($\mu g/m^3$)	Secondary ($\mu g/m^3$)
1. Sulfur Dioxides		
a. Annual Arithmetic Mean	80	- - -
b. Maximum 24-hour Average[(a)]	365	- - -
c. Maximum 3-hour Average[(a)]	- - -	1,300
2. Particulate Matter		
a. Annual Geometric Mean	75	60[(b)]
b. Maximum 24-hour Average[(a)]	260	150
3. Nitrogen Dioxide		
- Annual Arithmetic Mean	100	100
4. Carbon Monoxide		
a. Maximum 8-hour Average[(a)]	10,000	10,000
b. Maximum 1-hour Average[(a)]	40,000	40,000
5. Hydrocarbons (as methane)		
- Maximum 3-hour Average[(a)] (6 am - 9 am)	160[(b)]	160[(b)]
6. Photochemical Oxidants (as ozone)		
- Maximum 1-hour Average[(a)]	160	160

[(a)] Not to be exceeded more than once per year

[(b)] Guideline only; not a standard

Table 2-10

NEW YORK STATE AMBIENT AIR QUALITY STANDARDS
(in effect March 1977)

Pollutant[1]	Averaging Period	Level	Conc.	Units	Statistic[2]
Sulfur Dioxide SO_2	12 Consecutive Months	All	0.03	PPM	a.m. (Arith. Mean of 24 hr. avg conc.)
	24-hour	All	0.14[3]	PPM	Max.[2]
	3-hour	All	0.50[4]	PPM	Max.
Carbon Monoxide CO	8-hour	All	9	PPM	Max.
	1-hour	All	35	PPM	Max.
Photochemical Oxidants	1-hour	All	0.08	PPM	Max.
Hydrocarbons (Non-Methane)	3-hour (6-9 a.m.)	All	0.24	PPM	Max.
Nitrogen Dioxide	12 Consecutive Months	All	0.05	PPM	a.m.
Particulates (Suspended) TSP	12 Consecutive Months	IV	75	ug/m³	G.M. (Geometric mean of 24 hr. avg. conc.)
		III	65	"	
		II	55	"	
		I	45	"	
	24 hours	All	250	"	Max.[2]
	30 days	IV	135	"	a.m.
		III	115	"	a.m.
		II	100	"	a.m.
		I	80	"	a.m.
	60 days	IV	115	"	a.m.
		III	95	"	a.m.
		II	85	"	a.m.
		I	70	"	a.m.
	90 days	IV	105	"	a.m.
		III	90	"	a.m.
		II	80	"	a.m.
		I	65	"	a.m.

1 NYS also has standards for Beryllium, Flourides, Hydrogen Sulfide, and Settleable Particulates (Dustfall), see below.

2 All maximum values are values not to be exceeded more than once a year.

3 Also during any 12 consecutive months, 99 percent of the values shall not exceed 0.10 ppm (not necessary to address this standard when predicting future concentrations.

4 Also during any 12 consecutive months 99 percent of the values shall not exceed 0.25 ppm (see above).

5 The State is divided by air quality priorities into four levels. From level I denoting areas of least pollution to Level IV being generally urban areas of heavy pollution.

TABLE 2-10 (continued)

Pollutant	Interval[a]	New York State Standards PPM	ug/m^3 (25°C)	Levels
Flourides	(6 months)			
a. Total Flour- ides as F (Dry Weight Basis	Growing Season	40		All
	Any 60 days	60		All
	Any 30 days	80		All
b. Gaseous Flourides as F (Volume Basis) parts per billion	12 hr. Conc.	4.5 ppb	3.7	All
	24 hr. Conc.	3.5 ppb	2.85	All
	1 wk. Conc.	2.0 ppb	1.65	All
	1 mo. Conc.	1.0 ppb	0.8	All
Beryllium	1 mo. Conc.		0.01	All
Hydrogen Sulfide	1 hr. Conc.	0.01	14	All
Settleable Particulates (Dust Fall)	(Annual) Geometric Mean		.60 mg/cm^2/mo [b]	IV
			.40 "	III
			.30 "	II
			.30 "	I

[a] Except for annual values, the standards are values not to be exceeded more than once a year.

[b] Also 84 percent of monthly values shall not exceed (in mg/cm^2): 0.90 (Level IV); 0.60 (Level III); 0.45 (Level II); 0.45 (Level I) on an annual basis.

Table 2-10 was compiled from the State of New York's direct case in the Article VIII proceedings.

TABLE 2-11

PREVENTION OF SIGNIFICANT
AIR QUALITY DETERIORATION
REGULATION INCREMENTS

Pollutant	Averaging Time	Class I $\mu g/m^3$	Class II* $\mu g/m^3$
Sulfur Dioxide (SO_2)	Annual	2	20
	24-Hour	25	91
	3-Hour	25	512
Total Suspended Particulates (TSP)	Annual	5	19
	24-Hour	10	37

*All areas have been designated Class II by EPA unless redesignated by the respective states. Areas designated as Class III shall be limited to increases in ambient SO_2 and TSP concentrations up to those limits specified by the NAAQS. See Table 2-9.

Reference: Federal Register, "Prevention of Significant Air Quality Deterioration", Volume 39, number 235, pp. 42510 to 42517, December 5, 1974. Revised in accordance with Clean Air Act Amendments of 1977.

TABLE 2-12

NEW YORK STATE
AIR QUALITY CLASSIFICATION SYSTEM
DEFINING AMBIENT AIR QUALITY STANDARDS

Level I - predominantly used for timber, agricultural crops, dairy farming, or recreation. Habitation and industry sparse.

Level II - predominantly single and two family residences, small farms, and limited commercial services and industrial development.

Level III - densely populated, primarily commerical office buildings, department stores, and light industries in small and medium metropolitan complexes, or suburban areas of limited commercial and industrial development near large metropolitan complexes.

Level IV - densely populated, primarily commercial office buildings, department stores and industries in large metropolitan complexes, or areas of heavy industry.

TABLE 2-13

AIR QUALITY CONTROL REGION CLASSIFICATION

Pollutant	Priority I Greater Than	Priority II From - To	Priority III Less Than
SO_2			
Annual Mean	100 (0.04)	60-100 (0.02-0.04)	60 (0.02)
24-Hour Maximum	455 (0.17)	260-455 (0.10-0.17)	260 (0.10)
3-Hour Maximum	NA	1300-00 (0.50-00)	1300 (0.50)
TSP			
Annual Mean	95	60-95	60
24-Hour Maximum	325	150-325	150
NO_2			
Annual Mean	110 (0.06)	NA	110 (0.06)
Photochemical Oxidants			
1-Hour Maximum	195 (0.10)	NA	195 (0.10)
CO			
1-Hour Maximum	55 (48)	NA	55 (48)

Note: NA - Not Applicable

nitrogen dioxide (NO_2) were measured at Capin Road (4). Four parameters were monitored at Swamp Road (5): SO_2, TSP, NO_2, and NO_x. Four air quality parameters were measured at Van Buren Point Road (9): SO_2, TSP, NO_x, and TSP. Air quality and meteorological data were transmitted in real-time by telephone lines to a computer at Environmental Research & Technology, Inc. (ERT) Air Monitoring, Analysis and Prediction (AIRMAP) Central in Concord, Massachusetts. All sensors used strip chart recorders as a backup for the real-time data acquisition system.

2.082
The air quality monitoring network was operated from 1 November 1974 through 31 October 1975. The locations of the air quality and meteorological monitors were selected based on the consideration of preliminary plant design and local meterological, terrain, and land use characteristics. A monitor was placed at each of the proposed power station locations for the purpose of estimating background pollutant concentrations. The other four monitoring sites were located to measure representative background pollutant concentrations in the areas of potential plant impact. A detailed description of the air monitoring network can be found in Section 73.1 and Section 73.1-1 of Appendix 73-A or the applicant's New York State Article VIII Application.

Existing Air Quality
2.083
The seasonal and ambient pollutant levels measured during the course of the air quality monitoring program include the contribution of the Dunkirk Steam Station. A summary of these data are presented below:

TOTAL SUSPENDED PARTICULATE LEVELS. Seasonal TSP concentrations ranged from 17 ug/m^3 to 55 ug/m^3 annual concentrations (geometric means) ranged from 20 ug/m^3 to 39 ug/m^3 over the network. Values were highest in the summer months and lowest during the winter. The maximum 24-hour values recorded at each station for the annual period were as follows:

163 ug/m^3 at Beebee Road (1)
122 ug/m^3 at Mezzio Road (2)
121 ug/m^3 at Stockton Road (3)
174 ug/m^3 at Chapin Road (4)
211 ug/m^3 at Swamp Road (5)
159 ug/m^3 at Van Buren Road (9)

The National Secondary TSP standard was contravened once at Swamp Road, and the New York State Level I 12-month standard was exceeded at Beebee Road. No other National or New York State TSP standards were exceeded at any monitoring station.

SULFUR DIOXIDE LEVELS. Seasonal SO_2 concentrations varied between 0.006 and 0.015 ppm (15.6 and 39 ug/m^3) and annual concentrations between 0.008 and 0.013 ppm (20.8 and 33.8 ug/m^3). Maximum 1-hour SO_2 values monitored at each network station for the annual period were:

0.254 ppm (660.4 ug/m^3) at Beebee Road (1)
0.331 ppm (860.6 ug/m^3) at Mezzio Road (2)
0.127 ppm (330.2 ug/m^3) at Stockton Road (3)
0.150 ppm (390.0 ug/m^3) at Chapin Road (4)
0.296 ppm (769.6 ug/m^3) at Swamp Road (5)
0.137 ppm (356.2 ug/m^3) at Van Buren Road (9)

The highest 3-hour SO_2 values recorded at each station during the 12-month period were:

0.158 ppm (410.8 ug/m^3) at Beebee Road (1)
0.232 ppm (603.2 ug/m^3) at Mezzio Road (2)
0.094 ppm (244.4 ug/m^3) at Stockton Road (3)
0.114 ppm (296.4 ug/m^3) at Chapin Road (4)
0.189 ppm (491.4 ug/m^3) at Swamp Road (5)
0.087 ppm (226.2 ug/m^3) at Van Buren Road (9)

The maximum 24-hour SO_2 values recorded at each station for the annual period were:

0.043 ppm (111.8 ug/m^3) at Beebee Road (1)
0.061 ppm (158.6 ug/m^3) at Mezzio Road (2)
0.039 ppm (101.4 ug/m^3) at Stockton Road (3)
0.048 ppm (124.8 ug/m^3) at Chapin Road (4)
0.058 ppm (150.8 ug/m^3) at Swamp Road (5)
0.037 ppm (96.2 ug/m^3) at Van Buren Road (9)

No National or New York State SO_2 standards were exceeded at any network station.

NITROGEN OXIDE LEVELS. Season NO_x averages ranged from 0.019 to 0.035 ppm (38.0 to 70.0 ug/m^3) and annual averages ranged from 0.023 to 0.031 ppm (46.0 to 62.0 ug/m^3). All but one of the maximum short-term NO_x values listed occurred at Chapin Road. Maximum 1-hour NO_x concentrations over the annual period were:

0.322 ppm (644.0 ug/m^3) at Chapin Road (4)
0.182 ppm (364.0 ug/m^3) at Swamp Road (5)
0.284 ppm (568.0 ug/m^3) at Van Buren Road (9)

The highest 24-hour NO_x values were:

0.100 ppm (200.0 ug/m^3) at Chapin Road (4)
0.060 ppm (120.0 ug/m^3) at Swamp Road (5)
0.087 ppm (174.0 ug/m^3) at Van Buren Road (9)

NITROGEN DIOXIDE LEVELS. The range of seasonal NO_2 values was from 0.002 to 0.018 ppm (4.0 to 36.0 ug/m^3) and annual averages were between 0.011 and 0.015 ppm (22.0 and 30.0 ug/m^3). Maximum 1-hour NO_2 concentrations reported during the annual period were:

0.125 ppm (250.0 ug/m^3) at Chapin Road (4)
0.089 ppm (178.0 ug/m^3) at Swamp Road (5)
0.082 ppm (164.0 ug/m^3) at Van Buren Road (9)

Highest 24-hour values were:

0.050 ppm (100.00 ug/m^3) at Chapin Road (4)
0.034 ppm (68.0 ug/m^3) at Swamp Road (5)
0.039 ppm (78.0 ug/m^3) at Van Buren Road (9)

The National and New York State 12-month NO_2 standards were not exceeded at any NO_2 monitoring station.

SETTLEABLE PARTICULATES (DUSTFALL). Settleable particulate monitoring data for the following sites are presented in Table 2-14: Beebee Road (1), Stockton Road (3), Chapin Road (4), Swamp Road (5), Van Buren Road (9), and Niagara Mohawk Power Corporation (NMPC) office. The monitoring period extended from December 8, 1975 through December 29, 1976. The New York State Standard for settleable particulates states that during any 12 consecutive months, 50 percent and 84 percent of the 30-day average concentrations, measured in Level I or II areas, must be less than 0.30 mg/cm^2/mo and 0.45 mg/cm^2/mo, respectively. The Beebee Road, Swamp Road, Van Buren Road and Niagara Mohawk Power Corporation office data indicate complete compliance with the New York State Standard. The Chapin Road monitor indicates a violation occurred there, but it should be noted that this site is adjacent to and north of Interstate 90, a highway which is used by heavy duty trucks travelling frequently between Buffalo, New York and Cleveland, Ohio. The remaining dustfall monitor at Stockton Road was operated for a 6-month period only so it is difficult to assess compliance with the New York State Standard at this site. Measurements of dustfall rates in the air quality impact area were also taken at the Brooks Memorial Hospital in Dunkirk, NY by the Department of Environmental Conservation.

TABLE 2-14

DUNKIRK SETTLEABLE PARTICULATE DATA FOR PERIOD FROM DECEMBER 8, 1975 THROUGH DECEMBER 29, 1976
(MG/CM^2 Month)

	Level	12/08/75 - 01/10/76	01/11/76 - 02/14/76	02/14/76 - 03/16/76	03/17/76 - 04/20/76	04/20/76 - 05/20/76	05/20/76 - 06/22/76	06/22/76 - 07/24/76	07/24/76 - 08/23/76	08/24/76 - 09/24/76	09/24/76 - 10/25/76	10/25/76 - 11/26/76	11/27/76 - 12/29/76
Swamp	II	0.0566	0.0692	0.2038	0.1923	0.1258	0.0456	0.8599	0.1220	0.1462	0.2275	0.3560	0.2090
Van Buren	II	0.0456	0.1099	1.5637	0.0582	0.1066	0.0423	0.7731	0.1901	0.3714	0.0887	0.1495	0.2420
Stockton	I	0.0225	0.0659	1.1648	0.1242	0.0220	0.0736	------	------	------	------	------	------
Chapin	I	0.0670	0.0923	0.6648	0.1742	0.2494	------	0.7033	0.4841	0.0956	0.0703	0.1879	0.1750
Beebe	I	0.0192	0.0615	0.2431	0.1626	0.1335	0.1341	0.7308	0.6368	0.2747	0.1626	0.3335	0.1180
NMPC Office		0.0923	0.0651	0.0396	0.4093	0.4555	0.1391	0.2907	0.8725	0.2291	0.0846	0.2615	0.1550

Monthly Deposition rates in units of milligrams per square centimeter per month ($mg/cm^2/mo$) were:

November	0.33
December	0.24
January	0.30
February	0.35
March	No Data
April	No Data
May	No Data
June	0.48
July	0.24
August	0.43
September	0.27
October	0.19

OTHER AIR CONTAMINANTS: Ambient levels of carbon monoxide, hydrocarbons, photochemical oxidants, toxic substances, heavy metals and radioactive elements were not measured in the Lake Erie Generating Station monitoring program. Although the combustion of coal will result in emissions of the above contaminant, the maximum ground level impacts are expected to be minor and existing ambient levels are not anticipated to change with the operation of the proposed steam station.

Air Pollution Potential
2.084
Although the area is well ventilated by migrating cyclones and anticyclones, periods of high pollution potential can be expected when the dilution rate of the atmosphere diminishes during conditions of atmosphere stability, weak horizontal windspeed components and little, if any, significant precipitation. Based upon forecasts issued from August 1, 1960 through April 3, 1970, the National Weather Service is expected to issue approximately nine forecast days of high meteorological potential for air pollution in a five-year period for the Buffalo and Sheridan-Pomfret site area. Since the upper air steering currents are strongest during the coldest portion of the year, weather systems move rapidly through the region and result in frequent changes in the weather conditions, which in turn are related to minimum periods of stagnation. The upper air steering currents are weak in the summer and early autumn months, creating conditions more favorable to extended periods of stagnation. The weather pattern most conducive to extended periods of atmospheric stagnation is a stationary or very slow anticyclone moving over the region.

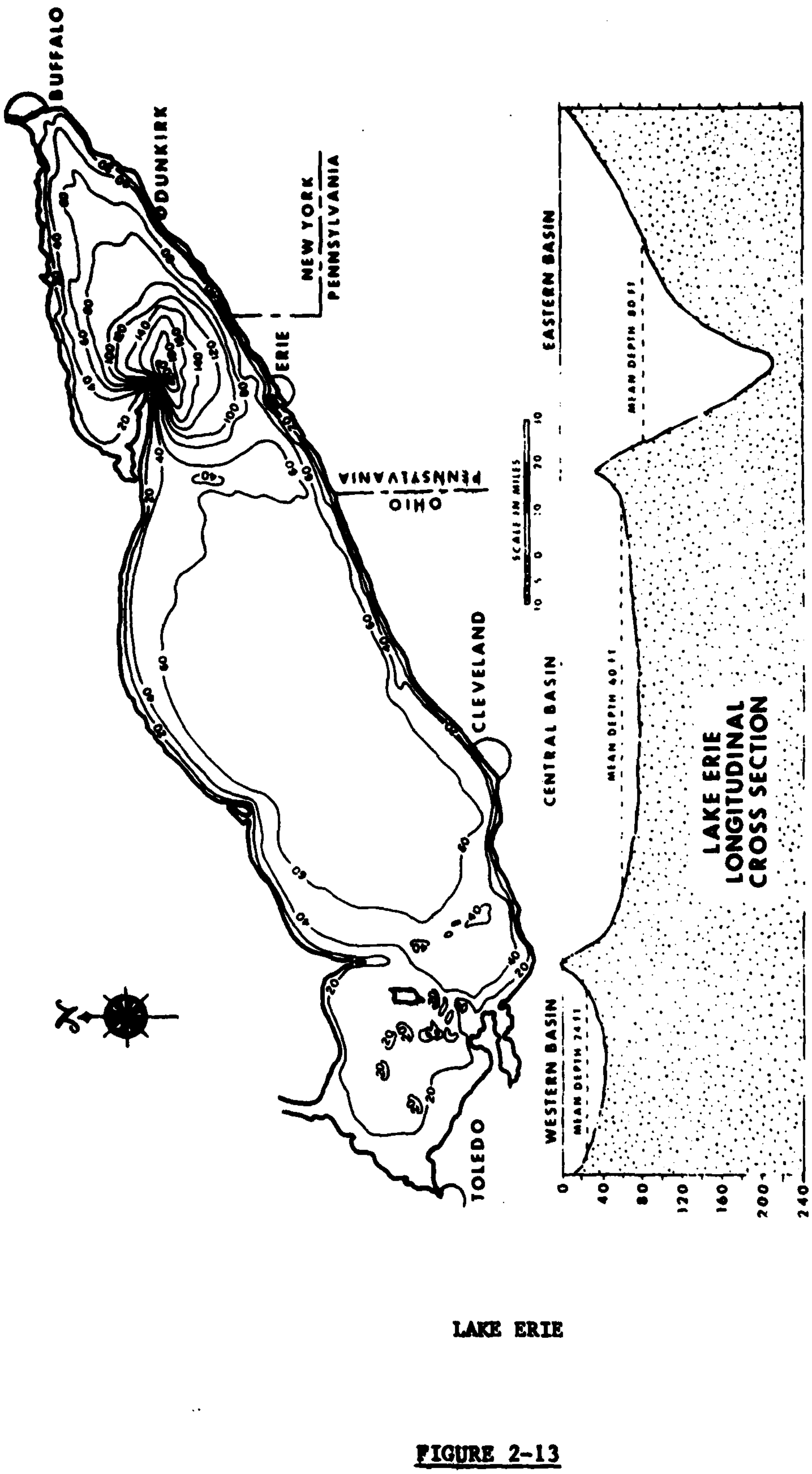
HYDROLOGY

Regional Hydrology
2.085
The Pomfret site is situated on the shore of Lake Erie, which is the shallowest of the Great Lakes. Lake Erie is 241 miles long and 57 miles wide, its drainage basin area is 32,490 square miles and its total water surface area is 9,930 square miles. The average depth for this water body is 58 feet and low water surface elevation is 568.6 feet IGLD (International Great Lakes Datum, 1955). Lake Erie is topographically divided into three basins - East, West, and Central, the deepest being the Eastern Basin (maximum 216 ft; mean 80 ft) in which the Pomret study area lies. The Eastern Basin's water-surface area is 2400 mi^2 See Figure 2-13.

2.086
The New York State portion of the Lake Erie drainage basin is very narrow, lying between the 200- and 300-foot high Portage escarpment on the south and the lake shoreline. Most of the small tributary streams in the Pomfret area originate in or near this escarpment. Little Canadaway and Van Buren Creeks run through the site proper and Canadaway Creek lies approximately one mile to the northeast of the site boundary. These streams constitute the only major flowing water sources on or near the site. Other onsite "streams" were strictly intermittent and held water only for a short period after local rains.

2.087
Surface current and circulation patterns in the Eastern Basin of Lake Erie have been considered to be highly erratic and predominantly wind-driven (Hamblin, 1971). Results of current surveys at the Pomfret site during the 1974-1975 study revealed two basic patterns of surface currents. One of these Patterns occurred during two surveys in May and one during June and September 1975 when winds were prevailing from the southwest. Results indicated that during periods of 10 to 15 mph wind speeds, currents were predominantly moving northeasterly (60-90°) during these periods. No wind direction or velocity data were available from either field collection or meteorological tower sources to correlate with the northeasterly currents observed during the November 1974 survey. Results appeared to agree with previous findings (Hamblin 1971), demonstrating that surface currents are predominantly wind-driven. No direct correlation between variations in wind speed and recorded current speeds was observed during this survey.

Local Hydrology
2.088
The Lake Erie shoreline along the Pomfret site is approximately 2.25 miles long and runs on a SW-NE axis. The site's elevation varies



LAKE ERIE

<u>FIGURE 2-13</u>

from 580 to 620 feet above sea level. The southwestern portion of the shoreline comprises low (5-10 ft) dirt cliffs and beaches up to 30 feet wide. To slow shoreline erosion in this area, many private homeowners have built breakwalls which in some places form a wall hundreds of yards long. Around Van Buren Point, which lies at the center of the site shoreline, shale cliffs 15 to 20 feet high protect Van Buren Point from prevailing southwest winds. The shoreline extending out of the bay to the northeast is characterized by a sand and gravel beach. The extreme northeastern portion of the Pomfret shoreline forms a low shale cliff face; many breakwalls fortify this eroding shoreline. The beach areas along the site slope gradually into the lake. During the course of the year, sand bars and gravel deposits accumulate and then disappear. In the winter ice mounds accumulate along the shoreline or at the leading edge of a grounded or anchored ice cover. These thick ice formations extend to the bottom, scouring the lake floor, often moving large boulders and pieces of shale, changing the bottom configuration.

2.089
The Pomfret plant site including the area within 1.0 mile of the site boundary is drained by several streams which generally flow northward into Lake Erie. The largest stream within the site area is Little Canadaway Creek which drains an area of approximately 7.0 square miles. Other streams in the general area vary in drainage area from 1.08 square miles to 3.55 square miles. A brief description of each of the principal streams traversing the Pomfret site area is presented below:

Little Canadaway Creek: Little Canadaway Creek originates approximately 1.5 miles from the Lake Erie shoreline and drains an area of 6.97 mi^2. It flows northeasterly through the Village of Lamberton, crosses the southwestern sector of the site, and empties into Lake Erie midway between Lake Erie State Park and Van Buren Point. The creek is 3-4 m wide and 0.3 to 0.6 m deep. Streamflow is slow and varies slightly due to precipitation. The bottom is primarily shale bedrock, but there are some small gravel bars. Flow rate varies greatly; spring and fall rains raise water levels and velocity considerably; in summer, however, the creek may dry up until there is no visible inflow to the pool under Route 5 from upstream. Depending on Lake Erie conditions and streamflow, a barrier beach sometimes forms across the mouth of the stream where it enters Lake Erie, backing up the stream 200-300 meters.

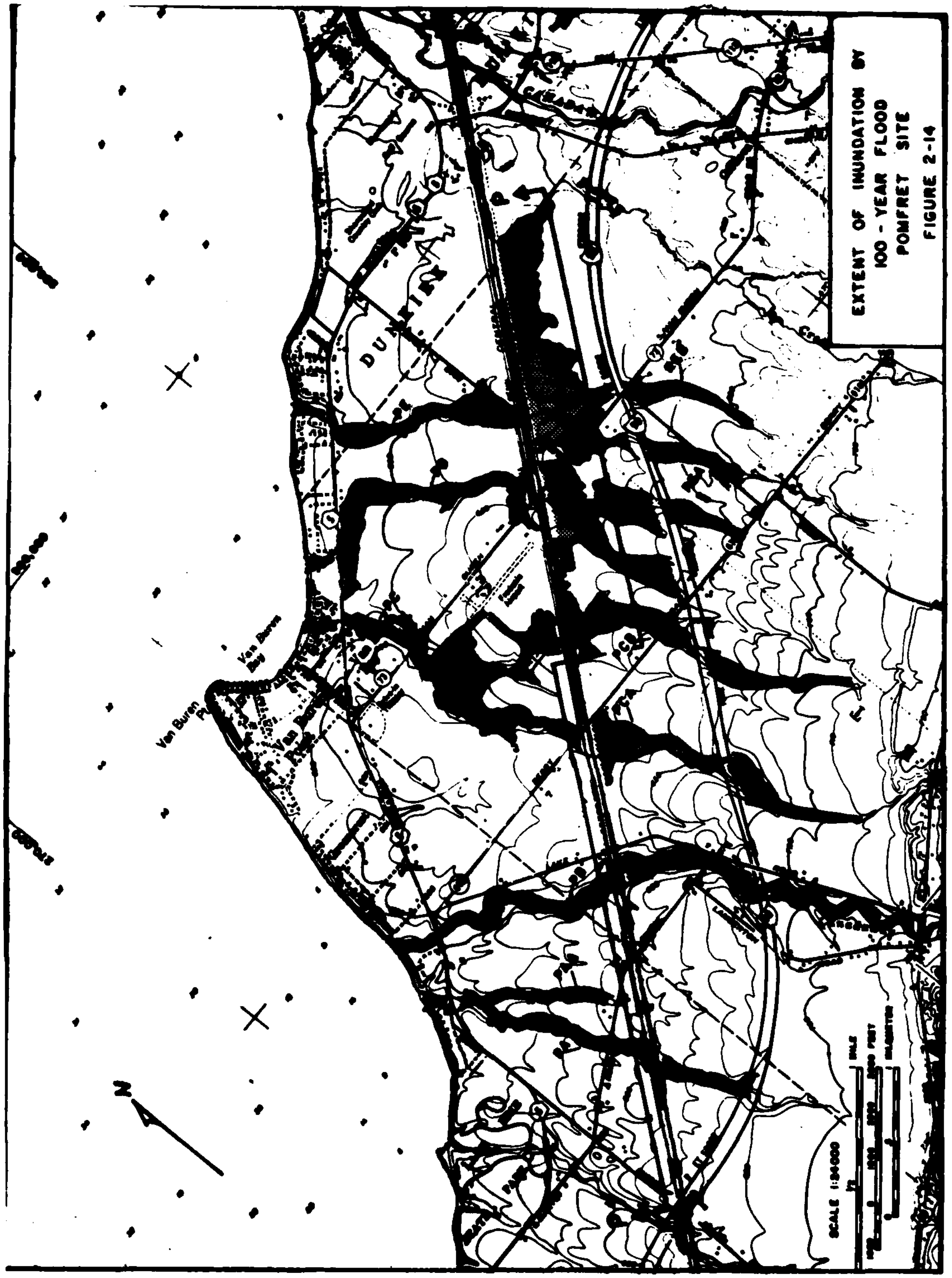
Van Buren Bay Creek: Van Buren Bay Creek originates approximately 3.5 miles from Lake Erie and flows north through the center of the proposed site, emptying into Lake Erie east of Van Buren Point. It drains an area of approximately 3.55 mi^2. The creek is generally small (1 meter wide, 0.3 meters deep) and is virtually obscured by terrestrial vegetation. Bottom substrate varies from sand to mud with large quantities of detritus present. Creek banks are generally low (1.0 meter or less) and water color varies from cloudy to reddish.

Canadaway Creek: Canadaway Creek originates approximately eight miles from Lake Erie and flows northwesterly through the town of Fredonia, emptying into Lake Erie approximately one mile northeast of the site boundary. At no point does Canadaway Creek cross the Pomfret site. Flows in this creek are variable depending on the width of the channel and the elevation gradient. Bottom substrate is composed of sand and gravel. The location of all watercourses on the site and the areas affected by the 100-year flood are shown in Figure 2-14. With the exception of the low areas between the railroad tracks and the Thruway, most of the affected area is confined to the land immediately adjacent to the streams and the site is not subject to general inundation.

2.090
A survey completed in 1975 identified 25 site-vicinity water bodies. When the station facilities were finally laid out and site boundaries were established, 21 ponds were found to lie on-site. Eighteen of these were surveyed because of their proximity to the center of the proposed Pomfret site. All on-site water bodies studied were classified as permanent ponds (water year round) (refer to Table 2-15). The majority of the water bodies on the site were either fed by springs or surface water runoff. Only seven of the ponds were fed by creeks. Nearly all of the water bodies identified were man-made. Three of the man-made ponds (water bodies 7, 9, and 25) had been constructed within the past three years and were used to drain an existing fly ash dumping area. Most of the remaining water bodies were built by vineyard owners to serve as a source of irrigation for grapes and other food crops such as tomatoes. In summary, the on-site ponds can generally be described as very small, shallow bodies of standing water in which plant growth predominates, having an average size of 0.3 acre with a depth of two feet. Bottom sediments generally consisted of clay, silt or gravel.

WATER QUALITY

Lake Erie
2.091
Six sampling stations were located in Lake Erie using the systematic grid system shown in Figure 2-15. Permanent anchors with floating markers and flags were placed at the intersection of columns and rows along the 10 and 30-foot contours to serve as reference points for the horizontal component of the grid. The vertical component of the grid was established by consistent sampling at the surface, mid



EXTENT OF INUNDATION BY 100-YEAR FLOOD POMFRET SITE

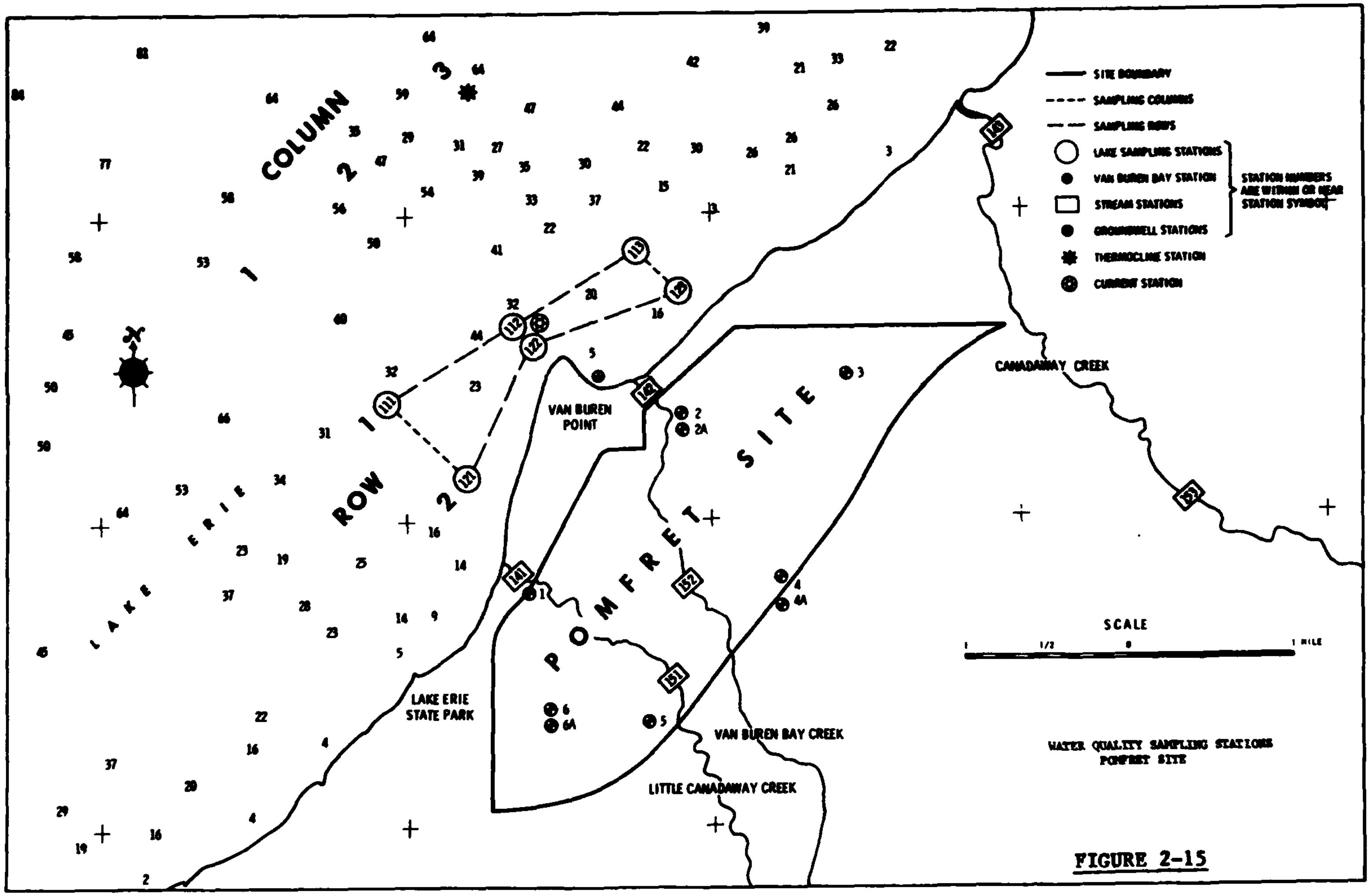
FIGURE 2-14

TABLE 2-15

PHYSICAL MEASUREMENTS AND OTHER IMPORTANT INFORMATION FOR POMFRET ON-SITE WATER BODIES, MAY AND OCTOBER 1975

Water Body	Length (ft)	Width (ft)	Mean Depth (ft)	Area ($ft^2 \times 10^3$)	Volume ($ft^3 \times 10^3$)	Origin	Clarity	Bottom Type	Comments
1	275	39	1.2	10.0	12.4	Creek overflow	Clear	Muck	25% less volume during October
2	272	141	3.4	38.1	129.8	Spring	Murky	Gravel/clay[a]	Agricultural and recreational use
3	102	43	1.9	4.1	7.6	Runoff	Clear	Muck	75% less volume in October
4	102	53	2.0	5.7	11.1	Spring	Murky	Silt/clay	Agricultural and recreational use
5	64	38	1.0	1.9	1.9	Creek	Clear	Muck	25% less volume in October
6	103	46	0.4	3.2	1.4	Creek	Murky	Muck/clay	None
7	168	70	1.7	10.6	17.7	Runoff	Clear	Silt/clay	Drains fly-ash dump
8	235	138	5.6	32.7	184.4	Creek; spring	Clear	Gravel/clay	Drains fly-ash dump; recreational use
9	123	57	1.6	7.1	11.7	Runoff	Clear	Silt/clay	Drains fly-ash dump
10	80	70	1.5	4.5	6.9	Spring	Muddy	Clay	Duck pond in owner's back yard
11	112	38	1.0	3.6	3.5	Runoff	Clear	Silt/sand	Old gas well; almost dry in fall
12	130	68	2.2	7.3	16.3	Drainage; spring	Murky	Detritus/clay	Agricultural use
13	21	11	1.5	0.2	0.3	Creek	Clear	Cobble/bedrock	50% less volume in fall
14	175	36	1.3	5.8	7.4	Drainage	Clear	Muck	50% less volume in fall
15	99	74	1.8	6.5	11.5	Drainage; spring	Clear	Muck/clay	Agricultural use
16	138	65	2.7	9.0	24.0	Drainage; spring	Clear	Muck/clay	Agricultural and recreational use
17	121	52	3.5	7.0	24.5	Spring	Clear	Silt/clay	Household and agricultural use
18	71	45	1.2	3.3	3.9	Runoff	Murky	Clay	Duck pond in owner's front yard
19	91	51	3.3	4.6	15.1	Spring; drainage	Clear	Clay	Recreational and agricultural use
20	274	187	3.3	51.6	171.5	Creek	Murky	Muck	Recreational use
21	18	12	0.5	0.1	0.1	Creek	Clear	Cobble/bedrock	50% less volume in fall
22	86	40	3.0	3.3	9.8	Drainage	Clear	Silt/clay	50% less volume in fall
23	184	77	1.7	14.9	24.6	Drainage	Clear	Detritus/clay	50% less volume in fall
24	87	70	3.0	5.3	15.7	Spring	Clear	Silt/clay	Household use
25	111	73	1.1	5.9	6.7	Drainage	Clear	Silt/clay	Drains fly-ash dump

[a]Gravel/clay - clay bottom covered with gravel.



WATER QUALITY SAMPLING STATIONS
POMFRET SITE

FIGURE 2-15

depth, and bottom. Sampling in this matter afforded the applicant the opportunity to represent the data collected in terms of space as well as time. In addition to the above stations, three other sampling sites were estabished: one in Van Buren Bay, the second at the 50-foot contour to monitor the thermocline, and a current monitoring station off Van Buren Point. The baseline water quality study in the vicinity of the Pomfret site was conducted during the period from September 1974 through September 1975.

2.092
Temperatures at the 30-foot contour and the 10-foot contour increased to maximum levels in early August, declined through the winter months, and began increasing again in April. Fluctuations in lake temperatures followed a seasonal pattern, the result of variations in the degree of solar radiation typical of temperate zone lakes (refer to Table 2-16). During regular weekly sampling throughout the study, a surface-to-bottom temperature differential greater than 1°F (0.5°C) occurred 15 percent of the time at the 30-foot contour and 11 percent of the time at the 10-foot contour. Spatial temperature variations between the surface, mid-depth and bottom were generally less than 0.5°C, with only 11 percent of the fluctuations greater than 0.5° at the 30-foot contour and 23 percent at the 10-foot contour. Results of diel measurements in June, July, and August 1975 revealed that 95 percent, 8 percent, and 28 percent of the samples collected respectively at station 113 displayed a surface-to-bottom temperature differential greater than or equal to 0.5°F. However, measured variation within the vertical column never exceeded 2.1°C. Mean temperature values generally indicated the same temperatures at the 30-foot contour and 10-foot contour except during October through December 1974 and again in May and June 1975. Results during these periods revealed that variations at the 10-foot contour coincided more directly with changes in ambient air temperatures (i.e., decreased more rapidly as the result of declining air temperature during Fall 1974 and increased more rapidly in Spring 1975 as air temperature increased) than did those at the 30-foot contour, possibly explaining the maximum contour to contour variations in mean temperatures during these periods. No true thermocline (a temperature change of 1°C per meter of depth) was found during measurement periods. This is consistent with the findings of Murthy (1971) who implies that the nearshore area is well sized and thermoclines are temporary in these areas.

2.093
Seasonal fluctuations in dissolved oxygen concentrations generally varied inversely with temperature fluctuations. This can be partially attributed to the variation in the solubility of gases in water at different temperatures. Dissolved oxygen concentrations were never less than 69 percent saturation over the year's study.

TABLE 2-16

[illegible]

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	[illegible]	15.6	21.0	18.0	59	15.0	21.0	17.7
Dissolved oxygen	mg/l	[illegible]	8.2	10.3	9.2	59	8.6	10.0	9.6
% saturation	%	[illegible]	85	115	97	59	87	120	97
pH	units	[illegible]	7.8	8.6	8.4	59	7.9	8.6	8.5
Specific conductance	µmhos	[illegible]	295	[illegible]	320	59	[illegible]	[illegible]	320
Biochemical oxygen demand	mg/l	[illegible]	[illegible]	2.2	0.7	54	[illegible]	2.3	0.7
Solids									
Total dissolved	mg/l	[illegible]	165	[illegible]	[illegible]	[illegible]	165	272	[illegible]
Total suspended	mg/l	Not Scheduled							
Nitrogen									
Ammonia	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]*	12	[illegible]	0.019	0.012
Nitrate	mg/l-N	[illegible]	0.16	0.22	0.20	12	0.19	0.22	0.20
Nitrite	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	[illegible]	0.16	0.33	0.25	12	0.17	0.31	0.23
Orthophosphate	mg/l-P	[illegible]	[illegible]	[illegible]	[illegible]*	12	[illegible]	<0.002	[illegible]*
Total phosphorus	mg/l-P	[illegible]	[illegible]	<0.005	[illegible]*	12	[illegible]	[illegible]	[illegible]*
Bacteria									
Fecal coliform	MPN/100 ml	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total coliform	MPN/100 ml	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	36	11.2	13.3	12.3	26	10.0	13.0	11.7
Dissolved oxygen	mg/l	36	8.6	12.6	10.1	26	8.0	11.0	10.2
% saturation	%	36	[illegible]	[illegible]	97	24	87	[illegible]	[illegible]
pH	units	36	[illegible]	[illegible]	8.7	26	8.5	[illegible]	8.7
Specific conductance	µmhos	36	[illegible]	315	[illegible]	26	[illegible]	[illegible]	[illegible]
Biochemical oxygen demand	mg/l	36	[illegible]	1.0	0.5	26	0.7	1.4	0.6
Solids									
Total dissolved	mg/l	[illegible]	130	[illegible]	232	26	140	[illegible]	220
Total suspended	mg/l	Not Scheduled							
Nitrogen									
Ammonia	mg/l-N	[illegible]	0.029	[illegible]	[illegible]	12	0.022	[illegible]	[illegible]
Nitrate	mg/l-N	[illegible]	0.05	0.16	[illegible]	[illegible]	[illegible]	0.15	[illegible]
Nitrite	mg/l-N	6	[illegible]	[illegible]	0.005	[illegible]	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	[illegible]	0.16	0.32	0.25	12	0.13	0.37	[illegible]
Orthophosphate	mg/l-P	[illegible]	[illegible]	[illegible]	[illegible]**	12	[illegible]	[illegible]	[illegible]**
Total phosphorus	mg/l-P	[illegible]	[illegible]	[illegible]	<0.005*	12	[illegible]	[illegible]	[illegible]*
Bacteria									
Fecal coliform	MPN/100 ml	[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]
Total coliform	MPN/100 ml	[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	72	7.2	11.7	[illegible]	[illegible]	[illegible]	[illegible]	8.5
Dissolved oxygen	mg/l	72	[illegible]	[illegible]	10.7	[illegible]	10.1	[illegible]	[illegible]
% saturation	%	72	[illegible]	115	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
pH	units	72	8.2	[illegible]	8.5	[illegible]	8.2	[illegible]	8.5
Specific conductance	µmhos	72	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Biochemical oxygen demand	mg/l	72	0.1	[illegible]	[illegible]	[illegible]	0.2	1.6	[illegible]
Solids									
Total dissolved	mg/l	72	[illegible]	[illegible]	170	[illegible]	[illegible]	[illegible]	[illegible]
Total suspended	mg/l	[illegible]	0.1	16.7	2.2	[illegible]	0.3	16.3	3.7
Nitrogen									
Ammonia	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]
Nitrate	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]*	12	[illegible]	[illegible]	[illegible]*
Nitrite	mg/l-N	6	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	[illegible]	[illegible]	[illegible]	0.21	12	0.10	[illegible]	[illegible]
Orthophosphate	mg/l-P	[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]
Total phosphorus	mg/l-P	[illegible]	[illegible]	[illegible]	[illegible]*	12	[illegible]	[illegible]	[illegible]*
Bacteria									
Fecal coliform	MPN/100 ml	[illegible]	<3	4	[illegible]	12	<3	[illegible]	[illegible]
Total coliform	MPN/100 ml	[illegible]	43	[illegible]	[illegible]	12	[illegible]	[illegible]	543

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	36	3.0	5.0	4.1	36	2.3	[illegible]	3.0
Dissolved oxygen	mg/l	36	10.5	[illegible]	11.9	36	11.6	13.5	12.6
% saturation	%	36	[illegible]	99	[illegible]	36	[illegible]	[illegible]	[illegible]
pH	units	36	8.0	8.2	8.2	36	8.0	8.2	8.1
Specific conductance	µmhos	36	[illegible]	[illegible]	[illegible]	36	[illegible]	325	[illegible]
Biochemical oxygen demand	mg/l	36	0.4	7.0	1.0	36	0.5	1.4	0.8
Solids									
Total dissolved	mg/l	36	[illegible]	226	170	36	[illegible]	213	[illegible]
Total suspended	mg/l	36	0.4	6.5	2.8	36	0.1	22.0	6.2
Nitrogen									
Ammonia	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]
Nitrate	mg/l-N	[illegible]	0.10	0.15	0.14	12	0.12	0.17	0.15
Nitrite	mg/l-N	4	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	[illegible]	0.12	[illegible]	0.16	12	0.10	[illegible]	0.16
Orthophosphate	mg/l-P	[illegible]	<0.002	<0.002	<0.002*	12	[illegible]	0.006	[illegible]*
Total phosphorus	mg/l-P	[illegible]	<0.005	[illegible]	<0.005*	12	<0.005	[illegible]	<0.005*
Bacteria									
Fecal coliform	MPN/100 ml	12	<3	9	[illegible]	12	4	43	13
Total coliform	MPN/100 ml	12	[illegible]	[illegible]	72	12	75	1,100	[illegible]

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	[illegible]	[illegible]	[illegible]	1.3	61	0.3	2.5	1.4
Dissolved oxygen	mg/l	36	11.4	[illegible]	13.2	22	12.2	[illegible]	13.0
% saturation	%	36	[illegible]	[illegible]	95	19	[illegible]	[illegible]	[illegible]
pH	units	36	7.9	8.5	8.1	22	7.9	[illegible]	8.0
Specific conductance	µmhos	36	[illegible]	[illegible]	[illegible]	22	[illegible]	[illegible]	[illegible]
Biochemical oxygen demand	mg/l	36	0.3	[illegible]	1.6	22	0.1	4.6	1.6
Solids									
Total dissolved	mg/l	36	125	237	173	22	[illegible]	[illegible]	175
Total suspended	mg/l	36	1.0	71.5	26.9	22	1.0	72.5	[illegible]
Nitrogen									
Ammonia	mg/l-N	6	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Nitrate	mg/l-N	6	0.22	0.40	[illegible]	4	[illegible]	[illegible]	0.22
Nitrite	mg/l-N	Not Scheduled							
Organic	mg/l-N	6	0.12	0.21	0.17	4	0.15	[illegible]	[illegible]
Orthophosphate	mg/l-P	6	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Total phosphorus	mg/l-P	6	[illegible]	[illegible]	0.013	4	[illegible]	[illegible]	[illegible]
Bacteria									
Fecal coliform	MPN/100 ml	6	4	[illegible]	12	4	<3	4	[illegible]
Total coliform	MPN/100 ml	6	[illegible]	460	[illegible]	4	43	460	223

Parameter	Unit of Measurement	No. of Samples	Year 1 Min	Year 1 Max	Year 1 Mean	No. of Samples	Year 2 Min	Year 2 Max	Year 2 Mean
Temperature	°C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Dissolved oxygen	mg/l	6	[illegible]	[illegible]	13.7	6	[illegible]	13.9	[illegible]
% saturation	%	6	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]
pH	units	[illegible]	[illegible]	[illegible]	8.5	6	[illegible]	[illegible]	7.9
Specific conductance	µmhos	[illegible]	[illegible]	[illegible]	275	6	[illegible]	[illegible]	[illegible]
Biochemical oxygen demand	mg/l	[illegible]	2.9	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Solids									
Total dissolved	mg/l	[illegible]	[illegible]	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]
Total suspended	mg/l	[illegible]	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	40.1
Nitrogen									
Ammonia	mg/l-N	4	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Nitrate	mg/l-N	4	0.17	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Nitrite	mg/l-N	Not Scheduled							
Organic	mg/l-N	4	0.17	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Orthophosphate	mg/l-P	4	[illegible]	[illegible]	[illegible]*	2	[illegible]	[illegible]	[illegible]*
Total phosphorus	mg/l-P	4	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Bacteria									
Fecal coliform	MPN/100 ml	4	4	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Total coliform	MPN/100 ml	4	93	1,100	[illegible]	2	1,100	1,100	1,100

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the maximum detection limit concentrations with other higher values to produce a maximum yearly mean.

[c]Values recorded during October using membrane-filter procedures cannot be directly compared to results of remainder of study.

TABLE 2-16 (cont'd)

Parameter	Unit of Measurement	[illegible] Sites 1 and 2 No. of Samples	Min	Max	Mean	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean
Temperature	°C	ND	ND	ND	ND	72	1.0	6.3	3.0	56	1.4	7.0	3.7
Dissolved oxygen	mg/l	ND	ND	ND	ND	52	9.7	13.0	11.5	44	9.0	14.6	10.3
% saturation	%	ND	ND	ND	ND	52	80	90	86	44	80	106	89
pH	units	ND	ND	ND	ND	18	7.6	8.3	8.1	8	7.6	8.6	8.0
Specific conductance	µmhos	ND	ND	ND	ND	18	230	315	275	8	240	315	280
Biochemical oxygen demand	mg/l	ND	ND	ND	ND	12	0.1	2.4	1.1	6	1.0	3.3	1.9
Solids													
Total dissolved	mg/l	ND	ND	ND	ND	16	115	230	180	8	149	193	174
Total suspended	mg/l	ND	ND	ND	ND	16	8.0	75.0	30.6	8	16.0	65.0	40.5
Nitrogen													
Ammonia	mg/l-N	ND	ND	ND	ND	4	0.023	0.052	0.036	2	0.026	0.032	0.029
Nitrate	mg/l-N	ND	ND	ND	ND	4	0.26	0.27	0.27	2	0.25	0.26	0.26
Nitrite	mg/l-N	Not Scheduled				2	0.007	[illegible]	[illegible]	2	0.007	0.007	0.007
Organic	mg/l-N	ND	ND	ND	ND	4	0.07	0.11	0.09	2	0.09	0.13	0.11
Orthophosphate	mg/l-P	ND	ND	ND	ND	4	0.008	0.012	0.009	2	0.009	0.010	0.010
Total phosphorus	mg/l-P	ND	ND	ND	ND	4	0.027	0.042	0.033	2	0.027	0.030	0.030
Bacteria													
Fecal coliform	MPN/100 ml	ND	ND	ND	ND	10	3	4	3*	12	<3	15	6*
Total coliform	MPN/100 ml	ND	ND	ND	ND	14	4	9	2*	12	9	1,100	230

Parameter	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean
Temperature	72	6.0	16.0	12.1	56	8.0	16.6	13.1	72	14.1	22.5	18.0	56	16.0	22.5	18.7
Dissolved oxygen	40	10.0	13.4	12.1	40	8.9	13.2	11.1	46	8.6	13.6	10.6	28	8.3	11.6	10.0
% saturation	40	95	132	114	40	91	125	106	46	85	138	111	28	80	120	105
pH	18	8.0	8.6	8.4	8	7.9	8.5	8.6	18	8.3	8.6	8.6	8	8.2	8.6	8.4
Specific conductance	18	300	360	326	8	330	360	326	18	300	360	322	8	315	330	320
Biochemical oxygen demand	11	1.5	3.0	2.1	6	1.6	2.3	2.2	16	0.2	2.7	1.7	8	0.4	2.3	1.2
Solids																
Total dissolved	16	136	236	176	8	122	212	180	16	146	272	180	8	136	200	173
Total suspended	16	1.0	36.0	15.0	8	4.4	30.6	18.0	16	1.5	105.2	46.5	8	3.5	67.6	28.5
Nitrogen																
Ammonia	4	0.005	0.030	[illegible]	2	[illegible]	0.015	0.012	4	[illegible]	0.046	[illegible]	2	[illegible]	[illegible]	[illegible]
Nitrate	4	0.46	0.48	0.47	2	0.47	0.48	0.48	4	0.12	0.25	0.19	2	0.15	17	0.16
Nitrite	2	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Organic	4	0.23	0.28	0.25	2	0.18	0.25	0.22	4	0.17	0.18	0.18	2	0.17	0.17	0.17
Orthophosphate	4	<0.002	0.002	0.002*	2	<0.002	<0.002	<0.002*	4	0.005	0.007	0.006	2	0.005	0.007	0.006
Total phosphorus	4	0.011	0.017	0.014	2	0.007	0.017	0.012	4	0.006	0.009	0.007	2	0.005	0.007	0.006
Bacteria																
Fecal coliform	10	<3	43	8*	12	<3	240	26*	10	<3	120	22*	12	<3	240	30*
Total coliform	10	4	460	71	12	43	460	234	10	9	23,000	400*	12	9	22,000	700*

Parameter	Unit of Measurement	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean
Temperature	°C	72	17.5	26.0	22.0	56	20.2	26.0	23.0
Dissolved oxygen	mg/l	45	8.0	11.9	10.0	32	8.0	11.5	9.3
% saturation	%	45	92	136	112	36	92	132	107
pH	units	10	8.3	8.6	8.5	8	8.0	8.6	8.4
Specific conductance	µmhos	18	300	320	309	8	290	310	304
Biochemical oxygen demand	mg/l	16	0.8	2.0	1.3	8	1.0	1.5	1.3
Solids									
Total dissolved	mg/l	16	120	273	175	8	140	182	160
Total suspended	mg/l	16	9.0	105.0	28.0	8	9.0	72.0	31.6
Nitrogen									
Ammonia	mg/l-N	4	0.006	0.012	0.007	2	0.005	0.019	0.013
Nitrate	mg/l-N	4	0.10	0.11	0.11	2	0.10	0.15	0.13
Nitrite	mg/l-N	2	0.002	0.002	0.002	2	0.002	0.003	0.002
Organic	mg/l-N	4	0.16	0.19	0.18	2	0.16	0.16	0.16
Orthophosphate	mg/l-P	4	<0.002	0.002	<0.002	2	0.005	0.007	0.005
Total phosphorus	mg/l-P	4	0.009	0.011	0.010	2	0.012	0.013	0.012
Bacteria									
Fecal coliform	MPN/100 ml	10	<3	7	<3*	12	<3	240	60*
Total coliform	MPN/100 ml	10	4	150	22	12	43	1,100	313

Parameter	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean	[illegible] Site 1 No. of Samples	Min	Max	Mean	Site 2 No. of Samples	Min	Max	Mean
Temperature	72	22.1	26.7	23.2	56	22.5	25.2	23.4	72	16.5	20.9	18.8	40	16.2	20.9	18.7
Dissolved oxygen	65	8.9	9.7	9.3	32	8.6	9.6	9.2	72	8.3	10.4	9.6	40	9.1	10.5	10.1
% saturation	65	100	112	108	32	99	112	106	72	98	107	100	40	95	107	103
pH	16	8.2	8.5	8.3	8	8.2	8.4	8.3	72	8.1	8.6	8.4	40	8.2	8.7	8.6
Specific conductance	16	300	325	311	8	300	320	300	72	290	300	299	40	300	300	302
Biochemical oxygen demand	16	0.6	1.3	1.0	8	0.2	1.5	0.9	56	0.4	1.8	1.0	30	0.6	1.7	1.0
Solids																
Total dissolved	16	116	187	152	8	136	181	134	56	102	217	172	28	122	197	170
Total suspended	16	2.0	93.0	26.3	8	3.0	66.8	30.4	56	1.4	56.2	13.0	28	2.0	60.0	15.3
Nitrogen																
Ammonia	4	0.008	0.009	0.015	2	0.006	0.008	0.007	Not Scheduled							
Nitrate	4	<0.04	<0.04	<0.04*	2	<0.04	<0.04	<0.04*	Not Scheduled							
Nitrite	2	<0.002	<0.002	<0.002*	2	<0.002	<0.002	<0.002*	4	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Organic	4	0.12	0.13	0.13	2	0.15	0.17	0.16	Not Scheduled							
Orthophosphate	4	<0.002	0.005	<0.002*	2	<0.002	<0.002	<0.002*	Not Scheduled							
Total phosphorus	4	0.012	0.070	0.004	2	0.006	0.010	0.017	Not Scheduled							
Bacteria																
Fecal coliform	10	<3	<3	<3*	12	<3	<3	<3*	17	<3	<3	<3*	12	<3	4	<3*
Total coliform	10	4	92	20	12	23	240	75	17	3	44	13	12	7	200	107

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the minimum detection limit concentrations with other higher values to produce a maximum yearly mean.

These results are characteristic of lake waters of high environmental quality with regard to oxygen saturation, showing no effects of oxygen-demanding contamination such as industrial or municipal pollutants. Data from all six Pomfret sampling stations revealed that dissolved oxygen levels varied little from station to station or from one column to the next, with fluctuations usually less than 0.5 mg/l (85 percent of the observations). Vertical differences were generally less than 1.0 mg/l, with only 18 percent of the values indicating larger variations. Mean DO values generally indicated that variations between the 10-foot and 30-foot contour were chiefly the result of temperature fluctuations and not in the DO saturation level. Higher DO levels were observed at all depths during February, May, June, and July at the 30-foot contour with mean values reported as 5 percent, 8 percent, 5 percent, and 5 percent higher in DO saturation than at the 10-foot contours, variations in dissolved oxygen concentration during a diurnal period (24 hr) were 2.0, 2.4, and 2.1 mg/l, respectively for the 30-foot and 50-foot contours. There was no apparent pattern in these diurnal variations. While most researchers indicate that minimal concentrations of dissolved oxygen are to be expected just before dawn (i.e, 0600 hr) because of phytoplankton respiration (Hutchinson 1975), results of the Pomfret site diel oxygen surveys shows lowest oxygen to be at 1130 hr in June, 0800 in July, and 1117 in September. However, these minimum concentrations represented 106 percent, 103 percent, and 102 percent saturation respectively. Vertical dissolved oxygen variations during the diel surveys ranged from zero to 4.9 mg/l with a mean difference of 0.7 mg/l. Similar vertical fluctuation patterns were observed at both the 30-foot and 50-foot contours. DO concentrations were slightly higher at the surface during late July and September indicating the influence of possible wind and surface current aeration. However, results revealed higher DO concentrations at mid-depth and off-bottom during the early July observations. Patterns of low oxygen concentrations have been observed in the central basin when phytolankton densities are high in the transition zone or metalimnion causing a shading effect on the lower layers and consequent oxygen depletion of the lower layers (Kleveno, et al., 1971). Vertical stratification in lakes is directly related to solar radiation, heat conduction, and water mixing through wind and wave action. Results of weekly studies of thermocline patterns at the 50-foot contour during October and November 1974 and April through September 1975 revealed no vertical temperature differences greater than 0.4C during 1974 but differences exceeded 2.5°C in April 1975, and 5.0°C in May 1975. In June, thermocline patterns changed with stratification fluctuating from 1.6°C to 4.4°C and decreasing to 1.4°C in July and 1.0°C in August. September surveys recorded a large difference of 9.2°C within the vertical column because of rapidly decreasing temperatures in the hypolimnion. During this same sampling period, surface temperatures recorded at the 30-foot contour were similar to the 1.65°C-17.0°C values measured at the 50-foot contour surface. A vertical difference in temperatures of only 0.3°C at the 30-foot contour, however, did not compare with 50-foot contour thermocline patterns.

2.094
In addition to temperature and dissolved oxygen the following parameters were also measured during the 1974-1975 survey: pH-specific conductance, biochemical oxygen demand, total dissolved and suspended solids, nitrogen, phosphorus, coliform bacteria, alkalinity, turbidity, color, salinity, bromide, fluoride, silica, sulfate, metals including heavy metals, pesticides, and herbicides. These data are summarized for the twelve-month sampling period in Appendix Table B-8. Additional information on water quality and the data collected can be found in Section 80.2 of the applicant's New York State Article VIII Application.

Lake Erie Tributaries
2.095
Field investigations conducted at the Pomfret site included the monitoring of water quality in two onsite streams, Little Canadaway Creek and Van Buren Bay Creek and one offsite stream, Canadaway Creek. Two sampling stations were established in each stream (one in the upper watershed and a second near Lake Erie) to monitor changes and variations within each watercourse (refer to Figure 2-15). Sampling was generally conducted during the twelve months between September 1974 and September 1975. A summary of the water quality conditions encountered in each stream is presented below:

Little Canadaway Creek

2.096
- Temperature Measurements ranged from 3.2°C in December 1974 to 27.5° in July 1975.
- Dissolved Oxygen concentrations were near saturation throughout the survey, with values ranging from 61 percent to 130 percent saturation, and a mean of 97 percent. All values recorded on Little Canadaway Creek were above New York Water Quality Standards (1974) NYWQS) of 5.0 mg/l DO.
- pH values from 7.2 to 8.9 were recorded.
- Specific Conductance ranged from 150 to 650 umhos, with a mean level of 305 umhos.
- Total dissolved solids (TDS) concentrations displayed large seasonal variations throughout the survey. Levels ranged from 72 to 429 mg/l, with a mean of 167 mg/l. Suspended solid levels displayed similar erratic seasonal variations. Concentrations varied from 0.6 to 149.2 mg/l with a mean of 10.4 mg/l.

- Low concentrations of nitrate, nitrogen, orthophosphate, and total phosphate were present.
- Alkalinity varied from 12 to 136 mg/l with a mean concentration of 42 mg/l.
- High fecal coliform bacteria levels indicated additions of fecal wastes to the stream. A total of 55 percent of the samples exhibited levels of fecal coliform in excess of the 200/100ml level established by the New York State Department of Environmental Conservation (NYSDEC 1974) for Class B waters.

Van Buren Bay Creek

2.097

- Temperature measurements ranged from 4.0°C in November 1974 to 23.0°C in July 1975.
- Dissolved oxygen concentrations varied from 67 percent to 130 percent saturation with a mean of 91 percent. None of the DO measurements recorded fell below the NYSDEC (1974) minimal standard of 5.0 mg/l.
- pH values from 7.2 to 9.5 were recorded during the study.
- Specific conductance ranged from 285 to 625 umhos, with a mean level of 424 umhos.
- TDS concentrations displayed large seasonal variations throughout the survey. Levels ranged from 142 to 459 mg/l with a mean of 245 mg/l. Suspended solids displayed similar seasonal variation. Concentrations ranged from 0.2 to 62.4 mg/l with a mean of 16.8 mg/l.
- Alkalinity measurements varied from 12 to 162 mg/l with a mean concentration of 100 mg/l.
- Nitrate, nitrogen, orthophosphate, and total phoshate levels remained low throughout the sampling period.
- Extremely high fecal coliform bacteria levels indicated additions of fecal wastes to the creek. Seventy-five percent of the samples had levels in excess of the NYSDEC (1974) standard of 200/100ml allowed for Class B streams.

Canadaway Creek

2.098

Canadaway Creek had results similar to the on-site streams. Specific conductance levels ranged from 200 to 500 umhos and dissolved solids varied from 64 to 320 mg/l with a mean of 172 mg/l. High values were observed for total and fecal coliform and could pose a potential hazard to local residents (EPA 1973).

2.099

Water quality data for Little Canadaway Creek and Van Buren Bay Creek are summarized in Table 2-17. Additional data on the chemical

TABLE 2-17

[illegible] ON-SITE STREAM GENERAL WATER QUALITY VARIABLES,
NOVEMBER 1974–SEPTEMBER 1975

Little [illegible] Creek

Parameter	Unit of Measure	Nov 25				Dec [illegible]				Apr 17				Apr 21				May 3				May 8			
		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151	
		Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Water temperature	°C	4.2	4.2	3.9	3.9	3.2	NS	3.1	NS	14.0	14.0	12.0	12.0	16.0	16.0	13.5	13.5	23.0	23.0	21.3	21.3	18.0	18.0	16.5	16.5
pH	units	ND	ND	ND	ND	7.6	NS	7.9	NS	8.2	8.2	8.3	8.3	8.0	8.0	8.0	8.0	7.2	7.2	7.5	7.5	7.4	7.4	7.3	7.3
Dissolved oxygen	mg/l	11.8	12.0	12.0	12.0	14.8	NS	14.2	NS	10.6	10.6	11.9	11.9	9.1	9.1	10.0	10.0	6.0	6.0	7.2	7.2	9.8	9.8	10.1	10.1
% saturation	%	91	92	92	92	109	NS	104	NS	102	102	110	110	91	91	95	95	69	69	81	81	103	103	103	103
Biological oxygen demand	mg/l	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total dissolved solids	mg/l	83	81	72	89	ND	NS	ND	NS	180	188	260	101	94	90	72	75	148	145	136	119	116	115	110	108
Total suspended solids	mg/l	10.7	7.1	4.7	10.0	ND	NS	ND	NS	1.8	6.4	1.2	1.2	1.2	3.4	11.2	4.8	8.6	6.0	7.0	7.0	4.6	5.8	3.6	3.4
Alkalinity (total)	mg/l-$CaCO_3$	12	12	12	12	ND	NS	ND	NS	24	22	24	23	ND	ND	ND	ND	ND	ND	ND	ND	26	23	23	33
Specific conductance	umhos	150	198	150	150	315	NS	270	NS	200	200	185	185	215	215	195	195	255	255	220	220	215	215	170	170

[illegible] Creek

Parameter	Unit of Measure	Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152	
Water temperature	°C	4.4	4.2	4.0	4.0	4.0	NS	3.5	NS	9.0	9.0	8.0	8.0	8.5	8.5	10.0	10.0	20.0	19.0	16.4	16.4	16.5	16.5	14.0	14.0
pH	units	ND	ND	ND	ND	7.5	NS	7.6	NS	7.9	7.9	8.2	8.2	8.3	8.3	7.2	7.2	7.4	7.4	7.4	7.4	7.6	7.6	7.3	7.3
Dissolved oxygen	mg/l	11.4	11.3	10.6	10.7	14.0	NS	14.8	NS	13.2	13.2	14.0	14.0	10.8	10.8	11.6	11.6	7.8	7.8	8.1	8.1	10.6	10.6	10.7	10.7
% saturation	%	88	87	81	82	107	NS	111	NS	111	111	118	118	92	92	103	103	85	85	82	82	108	108	103	103
Biological oxygen demand	mg/l	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total dissolved solids	mg/l	171	192	226	248	ND	NS	ND	NS	459	260	236	216	242	241	176	193	249	264	191	190	227	215	164	164
Total suspended solids	mg/l	15.7	20.1	1.8	2.7	ND	NS	ND	NS	2.4	1.6	1.0	0.2	3.6	4.8	52.8	5.2	29.2	21.6	18.4	20.4	8.8	6.8	9.6	9.4
Alkalinity (total)	mg/l-$CaCO_3$	13	12	23	22	ND	NS	ND	NS	72	72	68	68	ND	ND	ND	ND	ND	ND	ND	ND	50	62	48	ND
Specific conductance	umhos	285	300	335	340	400	NS	390	NS	470	470	350	350	410	410	350	350	440	440	360	380	380	360	380	380

Little [illegible] Creek

Parameter	Unit of Measure	May 14				May 19				May 22				May 29				Jun 4				Jun 11			
		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151		Station 141		Station 151	
		Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Water temperature	°C	17.8	17.8	18.2	18.2	25.0	25.0	25.5	25.5	22.0	22.0	21.7	21.7	22.0	22.0	25.5	25.5	25.5	25.5	21.5	20.5	16.5	16.5	16.0	16.0
pH	units	8.5	8.5	8.7	8.7	7.2	7.2	7.8	7.8	ND	ND	ND	ND	8.1	8.1	8.8	8.7	7.3	7.5	8.2	8.3	7.9	7.9	7.8	7.8
Dissolved oxygen	mg/l	9.6	9.4	9.1	9.2	9.0	9.0	10.8	10.8	7.1	7.1	8.4	8.4	9.0	9.1	10.0	10.0	8.4	8.4	6.6	6.6	9.8	9.8	10.2	10.2
% saturation	%	101	99	96	97	107	107	130	130	81	81	95	95	102	103	106	105	101	101	74	73	99	99	102	102
Biological oxygen demand	mg/l	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total dissolved solids	mg/l	161	170	131	164	ND	ND	ND	ND	171	180	138	156	239	217	199	194	157	172	155	159	123	122	127	116
Total suspended solids	mg/l	3.4	11.4	9.6	9.6	ND	ND	ND	ND	17.0	13.8	10.2	16.0	19.0	18.5	19.4	20.8	3.4	1.8	6.6	3.4	1.0	1.5	1.2	2.0
Alkalinity (total)	mg/l-$CaCO_3$	45	45	38	38	ND	ND	ND	ND	39	39	42	42	38	45	47	49	36	36	72	72	34	34	34	35
Specific conductance	umhos	240	240	215	215	270	270	250	250	295	295	260	260	399	399	385	385	300	300	250	250	270	270	230	230

[illegible] Creek

Parameter	Unit of Measure	Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152		Station 142		Station 152	
Water temperature	°C	8.9	8.9	14.4	14.4	20.0	20.0	21.0	21.0	19.0	19.0	18.0	18.0	18.0	18.0	18.0	18.0	17.0	17.0	16.5	16.5	16.0	16.0	15.5	15.5
pH	units	8.1	8.1	8.2	8.2	9.5	9.5	8.1	8.1	ND	ND	ND	ND	8.2	8.2	7.7	7.7	7.7	7.8	7.9	8.0	7.8	7.8	7.9	7.9
Dissolved oxygen	mg/l	11.4	11.4	9.6	10.0	10.7	10.7	11.7	11.7	7.8	7.8	7.6	7.6	9.4	9.4	10.2	10.2	8.4	8.4	8.6	8.6	9.2	9.1	8.9	8.9
% saturation	%	98	98	93	97	116	116	130	130	83	83	80	80	99	99	107	107	87	87	87	87	91	91	88	88
Biological oxygen demand	mg/l	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Total dissolved solids	mg/l	143	142	170	160	ND	ND	ND	ND	247	255	195	185	274	274	207	200	349	334	210	188	297	293	227	219
Total suspended solids	mg/l	3.8	2.8	7.6	7.6	ND	ND	ND	ND	24.6	28.4	25.8	24.8	25.4	28.0	60.0	62.4	5.0	7.6	26.8	7.4	4.0	5.0	50.5	6.5
Alkalinity (total)	mg/l-$CaCO_3$	103	103	99	99	ND	ND	ND	ND	116	116	119	119	120	124	127	131	110	110	98	98	98	111	111	111
Specific conductance	umhos	360	360	350	350	470	470	380	380	445	445	380	380	519	519	400	400	380	372	340	340	520	520	400	400

TABLE 2-17 (cont)

Little [illegible] Creek

Parameter	Unit of Measure	Jun 18 Station 141 Rep 1	Jun 18 Station 141 Rep 2	Jun 18 Station 151 Rep 1	Jun 18 Station 151 Rep 2	Jun 27 Station 141 Rep 1	Jun 27 Station 141 Rep 2	Jun 27 Station 151 Rep 1	Jun 27 Station 151 Rep 2	Jul 3 Station 141 Rep 1	Jul 3 Station 141 Rep 2	Jul 3 Station 151 Rep 1	Jul 3 Station 151 Rep 2	Jul 10 Station 141 Rep 1	Jul 10 Station 141 Rep 2	Jul 10 Station 151 Rep 1	Jul 10 Station 151 Rep 2	Jul 16 Station 141 Rep 1	Jul 16 Station 141 Rep 2	Jul 16 Station 151 Rep 1	Jul 16 Station 151 Rep 2	Jul 21 Station 141 Rep 1	Jul 21 Station 141 Rep 2	Jul 21 Station 151 Rep 1	Jul 21 Station 151 Rep 2
Water temperature	°C	25.5	25.5	24.5	24.5	26.5	26.5	27.5	27.5	24.0	24.0	23.0	23.0	20.5	20.5	19.0	19.0	22.0	22.0	20.5	20.5	22.5	22.5	21.0	21.0
pH	units	8.2	8.2	8.4	8.4	8.4	8.4	8.9	8.9	7.5	7.5	7.7	7.7	7.4	7.4	8.8	8.8	7.6	7.6	8.7	8.7	7.6	7.6	7.8	7.8
Dissolved oxygen	mg/l	8.2	8.2	8.6	8.6	7.2	7.8	9.3	9.3	5.2	5.2	9.8	9.8	7.9	7.9	10.0	10.0	7.5	7.5	9.6	9.6	7.4	7.4	10.1	10.1
% saturation	%	99	99	102	102	88	88	116	116	61	61	113	113	87	87	106	106	85	85	105	105	85	85	112	112
Biological oxygen demand	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	0.4	0.1	ND	ND	1.0	0.9	1.0	0.8	2.2	2.2	1.4	1.7	0.8	0.5	4.6	2.9
Total dissolved solids	mg/l	146	143	135	205	192	206	220	224	243	244	228	242	283	193	223	236	321	306	304	174	130	299	317	439
Total suspended solids	mg/l	8.0	8.0	12.4	10.4	5.0	7.6	149.2	76.2	3.6	5.0	6.2	6.0	5.8	14.6	1.0	1.2	2.8	10.6	1.6	1.7	17.4	12.6	14.6	18.4
Alkalinity (total)	$mg/l-CaCO_3$	28	30	37	32	36	36	133	133	33	33	136	136	33	33	53	53	33	33	49	49	35	35	61	61
Specific conductance	umhos	220	220	219	219	235	235	315	315	380	380	318	318	400	400	400	400	490	490	360	360	500	500	650	650

[illegible] Creek

Parameter	Unit of Measure	Jun 18 Station 142 Rep 1	Jun 18 Station 142 Rep 2	Jun 18 Station 152 Rep 1	Jun 18 Station 152 Rep 2	Jun 27 Station 142 Rep 1	Jun 27 Station 142 Rep 2	Jun 27 Station 152 Rep 1	Jun 27 Station 152 Rep 2	Jul 3 Station 142 Rep 1	Jul 3 Station 142 Rep 2	Jul 3 Station 152 Rep 1	Jul 3 Station 152 Rep 2	Jul 10 Station 142 Rep 1	Jul 10 Station 142 Rep 2	Jul 10 Station 152 Rep 1	Jul 10 Station 152 Rep 2	Jul 16 Station 142 Rep 1	Jul 16 Station 142 Rep 2	Jul 16 Station 152 Rep 1	Jul 16 Station 152 Rep 2	Jul 21 Station 142 Rep 1	Jul 21 Station 142 Rep 2	Jul 21 Station 152 Rep 1	Jul 21 Station 152 Rep 2
Water temperature	°C	21.0	21.0	20.0	20.0	21.5	21.5	22.5	22.5	23.0	23.0	22.5	22.5	18.0	18.0	19.5	19.5	18.0	18.0	18.5	18.5	21.0	21.0	20.0	20.0
pH	units	7.9	7.9	7.8	7.8	8.2	8.2	8.0	8.0	7.8	7.8	7.9	7.9	7.6	7.6	8.4	8.4	7.8	7.8	7.7	7.7	7.7	7.7	7.8	7.8
Dissolved oxygen	mg/l	8.2	8.2	8.0	8.0	8.1	8.1	7.8	7.8	7.0	7.0	7.9	7.9	8.1	8.1	8.1	8.1	8.4	8.4	8.0	8.0	6.2	6.2	8.0	8.0
% saturation	%	91	91	87	87	91	91	89	89	80	80	90	90	85	85	87	87	88	88	85	85	69	69	87	87
Biological oxygen demand	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	0.2	3.2	0.8	1.6	0.4	0.4	1.4	0.8	2.0	1.5	2.1	3.4	0.3	0.4	7.3	7.8
Total dissolved solids	mg/l	251	263	ND	207	306	316	179	178	353	338	193	180	384	340	284	281	335	340	209	219	250	258	177	289
Total suspended solids	mg/l	18.6	20.6	ND	27.0	40.0	56.2	22.2	15.2	28.8	15.6	10.2	3.8	19.2	20.4	0.8	0.6	1.2	1.0	1.8	2.0	46.8	32.4	29.8	27.4
Alkalinity (total)	$mg/l-CaCO_3$	104	103	97	95	133	133	46	46	111	111	46	46	131	131	153	153	114	114	137	137	111	111	118	118
Specific conductance	umhos	400	400	350	350	490	490	345	345	380	380	360	360	600	600	400	400	490	480	380	380	425	425	360	360

Little [illegible] Creek

Parameter	Unit of Measure	Aug 6 Station 141 Rep 1	Aug 6 Station 141 Rep 2	Aug 6 Station 151 Rep 1	Aug 6 Station 151 Rep 2	Aug 14 Station 141 Rep 1	Aug 14 Station 141 Rep 2	Aug 14 Station 151 Rep 1	Aug 14 Station 151 Rep 2	Aug 21 Station 141 Rep 1	Aug 21 Station 141 Rep 2	Aug 21 Station 151 Rep 1	Aug 21 Station 151 Rep 2	Aug 29 Station 141 Rep 1	Aug 29 Station 141 Rep 2	Aug 29 Station 151 Rep 1	Aug 29 Station 151 Rep 2	Sep 3 Station 141 Rep 1	Sep 3 Station 141 Rep 2	Sep 3 Station 151 Rep 1	Sep 3 Station 151 Rep 2
Water temperature	°C	18.5	18.5	17.7	17.7	24.5	24.5	21.0	21.0	18.5	18.5	17.0	17.0	19.0	19.0	19.0	19.0	19.0	19.0	[illegible]	[illegible]
pH	units	7.7	7.7	7.7	7.7	7.8	7.8	8.4	8.4	7.8	7.8	8.3	8.3	7.3	7.3	7.4	7.4	7.4	7.4	[illegible]	[illegible]
Dissolved oxygen	mg/l	8.2	8.2	8.0	8.0	8.4	8.4	9.5	9.5	9.4	9.4	10.0	10.0	8.2	8.2	8.0	8.0	9.6	9.6	[illegible]	[illegible]
% saturation	%	87	87	84	84	99	99	106	106	99	99	103	103	87	87	85	85	102	102	106	106
Biological oxygen demand	mg/l	ND	ND	ND	ND	1.0	0.9	1.2	0.8	1.1	0.7	0.5	0.6	0.3	0.5	0.7	1.6	0.3	0.2	0.5	[illegible]
Total dissolved solids	mg/l	130	136	135	115	202	206	182	198	ND	ND	ND	ND	188	189	171	166	156	150	161	130
Total suspended solids	mg/l	20.0	18.2	2.4	1.0	10.2	6.4	7.4	13.4	ND	ND	ND	ND	11.8	6.8	8.0	9.6	0.6	0.6	0.8	0.6
Alkalinity (total)	$mg/l-CaCO_3$	29	26	31	32	35	35	50	50	37	37	55	55	33	33	42	42	41	41	41	41
Specific conductance	umhos	280	280	440	440	400	400	375	375	440	440	410	410	500	500	525	525	260	260	230	230

[illegible] Creek

Parameter	Unit of Measure	Aug 6 Station 142 Rep 1	Aug 6 Station 142 Rep 2	Aug 6 Station 152 Rep 1	Aug 6 Station 152 Rep 2	Aug 14 Station 142 Rep 1	Aug 14 Station 142 Rep 2	Aug 14 Station 152 Rep 1	Aug 14 Station 152 Rep 2	Aug 21 Station 142 Rep 1	Aug 21 Station 142 Rep 2	Aug 21 Station 152 Rep 1	Aug 21 Station 152 Rep 2	Aug 29 Station 142 Rep 1	Aug 29 Station 142 Rep 2	Aug 29 Station 152 Rep 1	Aug 29 Station 152 Rep 2	Sep 3 Station 142 Rep 1	Sep 3 Station 142 Rep 2	Sep 3 Station 152 Rep 1	Sep 3 Station 152 Rep 2
Water temperature	°C	18.0	18.0	18.5	18.5	20.0	20.0	21.0	21.0	16.0	16.0	18.0	18.0	20.0	20.0	19.0	19.0	15.0	15.0	15.3	15.3
pH	units	7.9	7.9	7.7	7.7	7.8	7.8	7.7	7.7	7.7	7.7	7.8	7.8	7.2	7.2	7.5	7.5	7.6	7.6	7.4	7.4
Dissolved oxygen	mg/l	9.9	9.9	7.6	7.6	8.6	8.6	7.9	7.9	9.2	9.2	9.0	9.0	6.2	6.2	9.5	9.5	9.6	9.6	9.1	9.1
% saturation	%	104	104	80	80	93	93	88	88	92	92	95	95	67	67	99	99	94	94	90	90
Biological oxygen demand	mg/l	ND	ND	ND	ND	1.3	1.2	1.5	3.0	2.2	2.3	0.5	0.6	0.2	0.6	0.5	1.5	0.9	0.9	0.6	0.9
Total dissolved solids	mg/l	269	249	118	142	211	272	240	271	ND	ND	ND	ND	309	403	313	303	359	376	236	261
Total suspended solids	mg/l	11.6	17.6	15.6	11.6	23.0	19.8	30.8	33.0	ND	ND	ND	ND	13.6	14.8	32.0	14.2	7.4	4.0	2.6	4.6
Alkalinity (total)	$mg/l-CaCO_3$	94	95	72	75	128	128	140	140	123	123	152	152	162	162	97	97	117	117	105	105
Specific conductance	umhos	340	340	360	360	535	535	430	430	600	600	440	440	520	520	625	625	560	560	405	405

TABLE 2-17 (cont)

[illegible] ON-SITE STREAM SURVEY NUTRIENT AND CHEMICAL PARAMETERS AND FLOW RATES, APRIL-AUGUST 1975

Little Goose Creek

Parameter	Unit of Measurement	Apr 16 Station 141 Rep 1	Apr 16 Station 141 Rep 2	Apr 16 Station 151 Rep 1	Apr 16 Station 151 Rep 2	May 14 Station 141 Rep 1	May 14 Station 141 Rep 2	May 14 Station 151 Rep 1	May 14 Station 151 Rep 2
Nutrients									
Ammonia	mg/l-N	0.014	0.013	0.008	0.007	0.006	0.002	0.003	0.006
Nitrate	mg/l-N	0.20	0.20	0.16	0.17	0.22	0.22	0.20	0.20
Organic nitrogen	mg/l-N	0.07	0.07	0.09	0.08	0.27	0.16	0.12	0.12
Total nitrogen	mg/l-N	0.08	0.08	0.08	0.09	0.20	0.17	0.12	0.12
Orthophosphate	mg/l-P	0.008	0.008	0.008	0.008	<0.002	<0.002	<0.002	<0.002
Total phosphate	mg/l-P	0.008	0.008	0.008	0.008	0.005	0.012	0.004	0.007
Bacteria[a]									
Total coliform	MPN/100 ml	43	240	240	460	≥2,400	≥2,400	1,100	1,100
Fecal coliform	MPN/100 ml	4	<3	93	43	43	43	23	23
Chemicals									
Potassium	mg/l	2.740	2.600	2.630	2.650	NS	NS	NS	NS
Calcium	mg/l	18.00	18.60	19.90	19.50	NS	NS	NS	NS
Magnesium	mg/l	7.16	7.26	6.50	6.55	NS	NS	NS	NS
Mercury	mg/l	0.0008	<0.0002	<0.0002	0.0001	NS	NS	NS	NS
Copper	mg/l	0.004	0.003	0.002	0.004	NS	NS	NS	NS
Barium	mg/l	<0.001	<0.001	<0.001	<0.001	NS	NS	NS	NS
Chloride	mg/l-Cl	2.6	2.6	2.8	2.8	NS	NS	NS	NS
Sulfate	$mg/l-SO_4$	36.7	36.7	32.7	33.8	NS	NS	NS	NS
Chemical oxygen demand	mg/l	4.8	4.5	5.0	7.2	NS	NS	NS	NS
Cadmium	mg/l	0.006	0.008	0.008	0.005	NS	NS	NS	NS
Chromium	mg/l	<0.002	<0.002	<0.002	<0.002	NS	NS	NS	NS
Iron	mg/l	0.200	0.207	0.200	0.179	NS	NS	NS	NS
Sodium	mg/l	7.64	7.50	7.22	7.25	NS	NS	NS	NS
Manganese	mg/l	0.008	0.027	0.014	0.014	NS	NS	NS	NS
Stream flow[a]	CFS	6	NS	7	NS	3	NS	11	NS

Parameter	Unit of Measurement	Jun 11 Station 141 Rep 1	Jun 11 Station 141 Rep 2	Jun 11 Station 151 Rep 1	Jun 11 Station 151 Rep 2	Jul 16 Station 141 Rep 1	Jul 16 Station 141 Rep 2	Jul 16 Station 151 Rep 1	Jul 16 Station 151 Rep 2	Aug 6 Station 141 Rep 1	Aug 6 Station 141 Rep 2	Aug 6 Station 151 Rep 1	Aug 6 Station 151 Rep 2
Nutrients													
Ammonia	mg/l-N	0.007	0.012	0.038	0.032	0.008	0.013	0.032	0.034	0.007	0.011	0.008	0.008
Nitrate	mg/l-N	0.26	0.26	0.32	0.33	<0.04	<0.04	0.08	0.07	0.46	0.93	0.74	0.66
Organic nitrogen	mg/l-N	0.10	0.09	0.09	0.10	0.10	0.17	0.16	0.15	0.20	0.13	0.13	0.13
Total nitrogen	mg/l-N	0.11	0.10	0.13	0.13	0.11	0.10	0.19	0.18	0.11	0.14	0.16	0.16
Orthophosphate	mg/l-P	0.006	0.006	0.011	0.005	0.005	0.003	0.003	0.003	<0.002	<0.002	<0.002	<0.002
Total phosphate	mg/l-P	0.008	0.006	0.011	0.005	0.006	0.005	0.014	0.008	0.017	0.008	0.002	0.020
Bacteria[a]													
Total coliform	MPN/100 ml	1,100	1,100	≥2,400	≥2,400	1,500	1,500	2,400	2,400	430	2,400	2,400	1,500
Fecal coliform	MPN/100 ml	240	150	460	460	200	300	930	930	230	430	230	430
Chemicals													
Potassium	mg/l	1.930	2.160	1.970	1.930	NS	NS	NS	NS	3.870	3.930	4.000	4.130
Calcium	mg/l	21.30	20.40	19.90	19.20	NS	NS	NS	NS	26.60	21.90	23.60	25.90
Magnesium	mg/l	9.30	8.74	8.80	8.40	NS	NS	NS	NS	7.98	8.08	8.25	8.37
Mercury	mg/l	0.0024	0.0024	0.0056	0.0060	NS	NS	NS	NS	<0.0002	<0.0002	<0.0002	<0.0002
Copper	mg/l	0.001	<0.001	0.004	0.001	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Barium	mg/l	1.63	1.08	0.83	0.89	NS	NS	NS	NS	4.9	4.9	5.1	5.0
Chloride	mg/l-Cl	16.0	16.0	14.8	14.6	NS	NS	NS	NS	27.8	28.1	26.2	26.2
Sulfate	$mg/l-SO_4$	46.0	46.5	41.6	41.0	NS	NS	NS	NS	59.6	58.4	57.6	57.8
Chemical oxygen demand	mg/l	3.0	8.3	5.0	5.7	NS	NS	NS	NS	7.0	7.0	8.3	7.7
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001	NS	NS	NS	NS	0.001	<0.001	<0.001	<0.001
Chromium	mg/l	0.004	0.003	0.005	0.004	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Iron	mg/l	0.026	0.020	0.023	0.041	NS	NS	NS	NS	0.123	0.122	0.130	0.141
Sodium	mg/l	11.16	10.84	9.50	9.49	NS	NS	NS	NS	5.83	5.67	6.00	6.37
Manganese	mg/l	<0.001	<0.001	0.002	0.001	NS	NS	NS	NS	0.013	0.015	0.006	0.015
Stream flow[a]	CFS	35	NS	35	NS	0	NS	0	NS	0	NS	0	NS

Big Goose Creek

Parameter	Unit of Measurement	Station 142 Rep 1	Station 142 Rep 2	Station 152 Rep 1	Station 152 Rep 2	Station 142 Rep 1	Station 142 Rep 2	Station 152 Rep 1	Station 152 Rep 2
Nutrients									
Ammonia	mg/l-N	0.020	0.060	0.012	0.012	<0.002	0.003	0.012	0.007
Nitrate	mg/l-N	2.73	2.70	0.60	0.67	1.71	1.73	0.32	0.32
Organic nitrogen	mg/l-N	0.11	0.12	0.10	0.09	0.25	0.21	0.13	0.14
Total nitrogen	mg/l-N	0.15	0.15	0.11	0.10	0.25	0.21	0.13	0.15
Orthophosphate	mg/l-P	0.017	0.016	0.013	0.015	0.003	0.003	0.004	0.003
Total phosphate	mg/l-P	0.010	0.017	0.014	0.015	0.013	0.005	0.011	0.008
Bacteria[b]									
Total coliform	MPN/100 ml	460	460	240	290	≥2,400	≥2,400	≥2,400	≥2,400
Fecal coliform	MPN/100 ml	240	43	93	30	290	460	130	93
Chemicals									
Potassium	mg/l	5.410	5.430	4.720	4.770	NS	NS	NS	NS
Calcium	mg/l	40.30	40.80	42.60	42.40	NS	NS	NS	NS
Magnesium	mg/l	12.95	12.80	12.36	12.25	NS	NS	NS	NS
Mercury	mg/l	<0.0002	0.0009	0.0002	0.0002	NS	NS	NS	NS
Copper	mg/l	0.007	0.009	0.009	0.007	NS	NS	NS	NS
Barium	mg/l	0.008	0.006	0.009	0.012	NS	NS	NS	NS
Chloride	mg/l-Cl	6.2	6.1	4.4	4.5	NS	NS	NS	NS
Sulfate	$mg/l-SO_4$	74.4	72.0	36.0	32.4	NS	NS	NS	NS
Chemical oxygen demand	mg/l	8.1	8.0	7.0	6.4	NS	NS	NS	NS
Cadmium	mg/l	0.001	0.003	0.006	0.003	NS	NS	NS	NS
Chromium	mg/l	0.002	0.002	0.008	0.003	NS	NS	NS	NS
Iron	mg/l	0.274	0.277	0.273	0.275	NS	NS	NS	NS
Sodium	mg/l	12.06	11.67	10.46	10.50	NS	NS	NS	NS
Manganese	mg/l	0.004	0.007	0.030	0.009	NS	NS	NS	NS
Stream flow[b]	CFS	3	NS	1	NS	8	NS	5	NS

Parameter	Unit of Measurement	Station 142 Rep 1	Station 142 Rep 2	Station 152 Rep 1	Station 152 Rep 2	Station 142 Rep 1	Station 142 Rep 2	Station 152 Rep 1	Station 152 Rep 2	Station 142 Rep 1	Station 142 Rep 2	Station 152 Rep 1	Station 152 Rep 2
Nutrients													
Ammonia	mg/l-N	0.044	0.040	0.032	0.014	0.047	0.019	0.019	0.027	0.010	0.006	0.032	0.007
Nitrate	mg/l-N	0.13	0.13	0.33	0.33	0.18	0.19	0.13	0.13	0.76	0.53	0.72	0.31
Organic nitrogen	mg/l-N	0.22	0.21	0.17	0.19	0.22	0.23	0.16	0.016	0.36	0.34	0.19	0.10
Total nitrogen	mg/l-N	0.26	0.26	0.20	0.28	0.27	0.25	0.18	0.19	0.35	0.34	0.22	0.21
Orthophosphate	mg/l-P	0.010	0.005	0.005	0.002	0.004	0.005	0.003	0.025	0.030	0.035	0.077	0.006
Total phosphate	mg/l-P	0.010	0.008	0.0034	0.017	0.014	0.010	0.030	0.004	0.076	0.002	0.055	0.63
Bacteria[b]													
Total coliform	MPN/100 ml	≥2,400	≥2,400	≥2,400	≥2,400	4,600	2,400	11,000	2,900	4,600	4,600	11,000	4,600
Fecal coliform	MPN/100 ml	460	460	1,100	460	730	230	1,300	930	2,400	930	4,600	1,500
Chemicals													
Potassium	mg/l	2.720	2.790	2.540	2.630	NS	NS	NS	NS	6.130	6.140	5.150	5.070
Calcium	mg/l	46.40	46.00	35.70	36.60	NS	NS	NS	NS	33.10	33.30	44.70	44.10
Magnesium	mg/l	16.10	16.33	14.16	14.40	NS	NS	NS	NS	10.67	10.74	10.79	10.00
Mercury	mg/l	0.0024	0.0006	0.0002	0.0073	NS	NS	NS	NS	<0.0002	<0.0002	<0.0002	<0.0002
Copper	mg/l	0.003	0.002	0.004	0.005	NS	NS	NS	NS	<0.001	<0.001	<0.001	0.001
Barium	mg/l	0.76	0.78	0.73	0.89	NS	NS	NS	NS	8.6	8.6	7.6	7.0
Chloride	mg/l-Cl	30.4	30.4	20.8	20.8	NS	NS	NS	NS	30.0	30.0	19.0	19.0
Sulfate	$mg/l-SO_4$	83.0	83.5	63.0	63.3	NS	NS	NS	NS	87.6	86.0	62.0	62.0
Chemical oxygen demand	mg/l	12.0	8.3	9.7	11.3	NS	NS	NS	NS	17.0	17.0	13.0	12.7
Cadmium	mg/l	<0.001	<0.001	<0.001	<0.001	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Chromium	mg/l	0.022	0.022	0.017	0.016	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Iron	mg/l	0.220	0.228	0.206	0.205	NS	NS	NS	NS	0.220	0.230	0.223	0.215
Sodium	mg/l	17.37	17.78	13.76	13.74	NS	NS	NS	NS	7.30	7.31	6.00	6.06
Manganese	mg/l	0.005	0.003	0.006	0.003	NS	NS	NS	NS	0.008	0.040	0.013	0.015
Stream flow[b]	CFS	16	NS	11	NS	0	NS	0	NS	0	NS	0	NS

[a]May samples were collected on the 8th, June samples on the 4th, July samples on the 10th, and August samples on the 14th.
[b]May samples were collected on the 9th, June samples on the 13th, July samples on the 2nd, and August samples on the 14th.

quality of Canadaway Creek which lies outside the Pomfret site can be obtained from Section 80.2 of the applicant's New York State Article VIII Application.

Groundwater

2.100
The quality of groundwater resources in the vicinity of the Pomfret site was determined by analyzing nine groundwater wells as shown in Figure 2-15. Parameters sampled include temperature, bacteria, and selected water quality variables including those specified in the Public Service Commission's regulations.

2.101
Analyses revealed a wide range of pH values: certain wells exhibited variations as great as 6.8 to 8.3 and 7.4 to 9.4 during monthly sampling in the 1974-1975 survey. Chemical concentrations generally varied from month to month but remained basically in the same proportions. Bicarbonates and chlorides as well as sulfates were the predominant anions present, with chloride concentrations often increasing from an annual mean level of 30 mg/l to as high as 310 to 1,000 mg/l during increased precipitation and runoff. Sulfates generally decreased slightly as chlorides increased. Aluminum and iron were reported as the most concentrated heavy metals during this survey. Mean aluminum concentrations for the nine groundwater wells ranged from 0.015 to 0.672 mg/l, while iron ranged from 0.094 to 0.332 mg/l. These data indicated that metals in high concentrations in the soils leached into the groundwater in higher levels and were comparable with results of groundwater analyses in this area reported by Fricter (1968). At no time during this study did results indicate a possibility of groundwater contamination by leaching of excess nutrients, metals, or industrial pollutants. Data did, however, indicate leaching of suspended solids and total and fecal coliform bacteria.

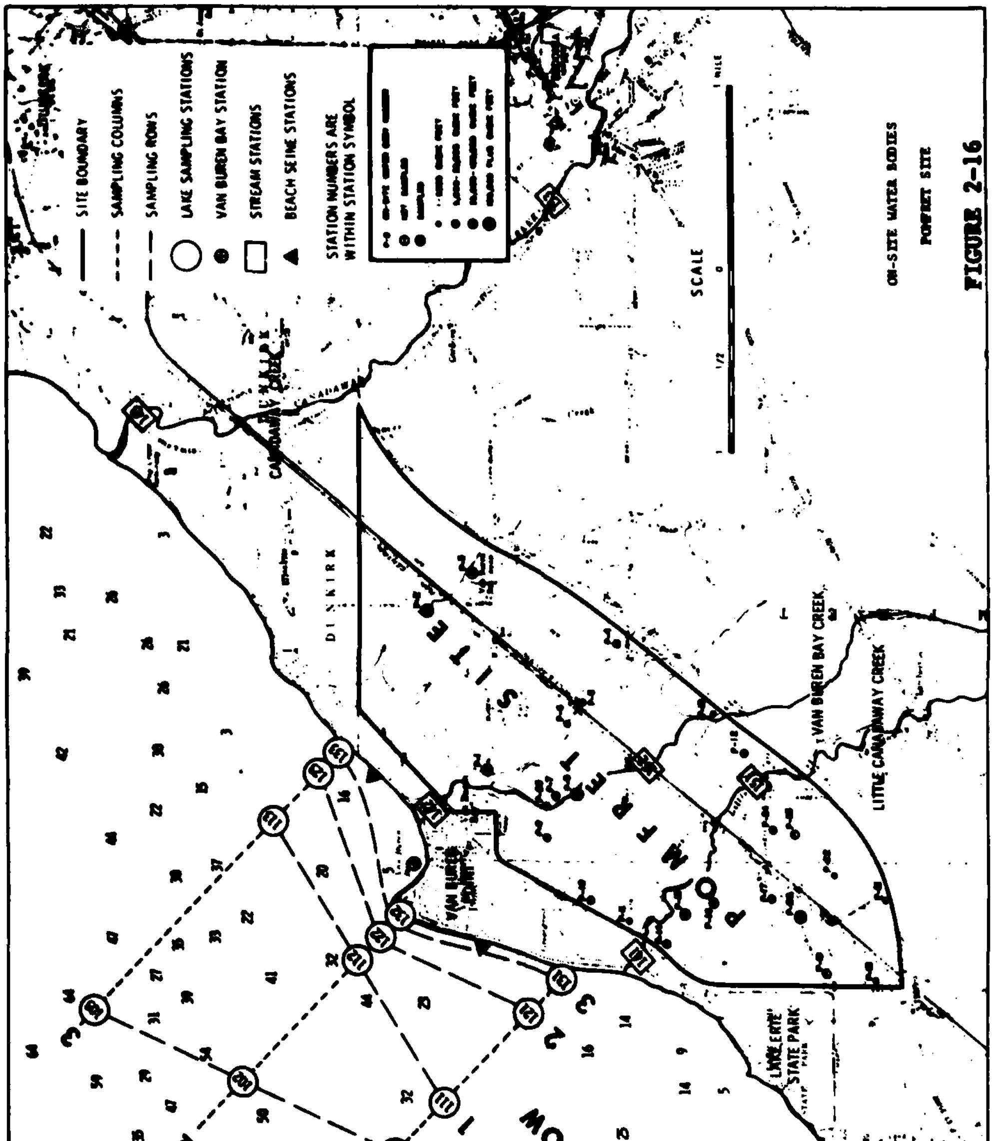
AQUATIC ECOLOGY

2.102
A baseline survey of the aquatic biota of Lake Erie and tributaries in the vicinity of the proposed Pomfret site was conducted from September 1974 until September 1975. A generalized map showing the location of aquatic ecology sampling stations is presented in Figure 2-16. The results of this survey are presented below.

Lake Erie

Phytoplankton

2.103
Lake Erie adjoining the Pomfret site was sampled for phytoplankton, periphyton, and macrophyton during the twelve-month period between



ON-SITE WATER BODIES

POMFRET SITE

FIGURE 2-16

September 1974 and September 1975. During this survey, 144 phytoplankton taxa were identified representing more than eight phyla. The densities and relative abundance of the phytoplankton taxa collected during the sampling period are summarized by phyla in Table 2-18. A more detailed discussion on phytoplankton data collected during the sampling period can be found in Section 74.2 of the applicant's New York State Article VIII Application.

2.104
Phytoplankton are algae, usually microscopic, that are suspended in the water column. Their distribution is affected by turbulence and current patterns in Lake Erie. Phytoplankton along with periphyto and aquatic macroflora are the important primary producers in an aquatic ecosystem. Thus, they are crucial to the survival of consumer communities at higher trophic levels in the food web. Phytoplankton that settle to the bottom of the lake contribute detritus to the benthic consumer community.

2.105
During the twelve-month sampling period at the Pomfret site, the Chlorophyta (green algae) were represented by 75 taxa (52 percent of the total number of taxa collected), the greatest number observed for any division. Bacillario hyta (diatoms) were represented by 26 taxa (18 percent of the total), followed by Cyanophyta (blue-green algae) which were represented by 17 taxa (12 percent). Representative taxa of other divisions included 12 Chrysophyta (yellow-green algae), six Cryptophyta (cryptomonads, or phytoflagellates), five Pyrrhophyta (dinoflagellates), too Xanthophyta (golden-brown algae), and one Euglenophyta (euglenophytes). The greatest number of taxa recorded during any single sampling period (53) was found in early August. A group of unidentified coccoid Chlorophyta from the order Chlorococcales was found in all sampling periods. There were no significant differences in phytoplankton spatial distribution within sampling periods, although it should be noted that short-term variations in distribution in natural waters may occur as a result of turbulence, wind action on the surface, and other ephemeral (temporary) external conditions. Turbulence caused by currents is probably the most important factor affecting spatial distributions; it alone would tend to negate physical and chemical factors that would allow spatial differences to become apparent. In a study of nearshore areas of Lake Huron, Schelske et al. (1974) showed that wind effects on the water's surface tend to cause short-term mixing of the surface water which, in turn, causes homogeneous distribution of the phytoplankton communities from station to station. A similar type of mixing phenomenon by wind effects could be expected in the Pomfret study area.

2.106
Total phytoplankton cell densities fluctuated throughout the year, decreasing from early September to late September, registering a

TABLE 2-18

PHYTOPLANKTON MEAN DENSITIES AND RELATIVE ABUNDANCE BASED ON 18 SAMPLES PER SAMPLING DATE
SEPTEMBER 1974 - AUGUST 1975 (POMFRET SITE)

Phyla	Sep 6 No.*	Sep 6 R.A.	Sep 18 No.*	Sep 18 R.A.	Oct 6 No.*	Oct 6 R.A.	Oct 21 No.*	Oct 21 R.A.	Nov 7 No.*	Nov 7 R.A.	Nov 19 No.*	Nov 19 R.A.	Dec 5 No.*	Dec 5 R.A.	Dec 19 No.*	Dec 19 R.A.	Jan 24 No.*	Jan 24 R.A.	Jan 28 No.*	Jan 28 R.A.	Feb 28 No.*	Feb 28 R.A.
Cyanophyta	351	30.9	220	25.0	753	31.1	642	39.6	443	21.8	262	24.9	211	26.1	33	5.8	262	16.7	97	6.2	50	2.2
Chlorophyta	382	33.6	203	23.1	878	36.2	546	33.7	1,064	52.3	420	4.0	211	26.1	166	29.1	214	13.6	486	31.2	350	15.3
Chrysophyta	1	0.1	9	1.1	4	0.2	28	1.7	57	2.8	9	0.9	14	1.7	3	0.6	1	0.1	2	0.1	20	0.9
Xanthophyta	0	0.0	0	0.0	0	0.0	2	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bacillariophyta	320	28.2	195	22.2	365	15.1	33	2.1	20	1.0	160	15.2	58	7.2	149	26.1	947	60.1	851	54.7	1,799	78.7
Euglenophyta	0	0.2	0	0.0	0	0.0	0	0.0	2	0.1	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pyrrhophyta	9	0.8	9	1.0	16	0.7	4	0.3	2	0.1	2	0.2	0	0.0	1	0.2	0	0.0	0	0.0	0	0.0
Cryptophyta	73	6.4	243	27.7	388	16.0	365	22.5	417	20.5	151	14.4	198	24.5	117	20.5	66	4.2	61	3.9	23	1.0
Unidentified alga	0	0.0	0	0.0	21	0.9	2	0.1	29	1.4	45	4.3	73	9.1	102	17.8	85	5.4	60	3.8	43	1.5
Total	1,136		880		2,425		1,621		2,034		1,052		807		371		1,575		1,557		2,285	

Phyla	Apr 10 No.*	Apr 10 R.A.	Apr 22 No.*	Apr 22 R.A.	Apr 30 No.*	Apr 30 R.A.	May 19 No.*	May 19 R.A.	Jun 2 No.*	Jun 2 R.A.	Jun 17 No.*	Jun 17 R.A.	Jun 30 No.*	Jun 30 R.A.	Jul 15 No.*	Jul 15 R.A.	Aug 5 No.*	Aug 5 R.A.	Aug 18 No.*	Aug 18 R.A.
Cyanophyta	54	3.7	75	7.5	13	2.7	29	2.3	52	28.3	14	1.9	144	13.1	76	7.8	3,287	56.9	2,346	44.3
Chlorophyta	308	21.0	256	25.8	201	39.9	256	36.3	79	42.7	248	32.8	212	19.3	566	58.2	2,021	35.0	2,794	52.8
Chrysophyta	13	0.9	30	3.1	39	7.8	15	1.2	8	4.1	17	2.3	0	0.0	0	0.0	276	4.8	81	1.5
Xanthophyta	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.8	3	0.3	4	0.4	1	0.0	0	0.0
Bacillariophyta	1,020	69.6	554	55.9	108	21.5	21	1.7	2	1.0	36	4.8	16	1.4	18	1.9	33	0.6	6	0.1
Euglenophyta	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.4	0	0.0	0	0.0	0	0.0	0	0.0
Pyrrhophyta	0	0.0	1	0.1	6	1.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	2	0.0	1	0.0
Cryptophyta	51	3.5	70	7.1	84	16.6	706	56.2	41	22.0	428	56.8	712	64.6	307	31.6	157	2.7	65	1.2
Unidentified alga	19	1.3	6	0.6	53	10.5	30	2.4	4	1.9	2	0.2	14	1.3	0	0.0	4	0.1	3	0.1
Total	1,466		991		504		1,258		185		754		1,101		972		5,781		5,295	

* Multiply values by 10^6.
R.A. = Relative Abundance.

slight increase in early October, then gradually decreasing from early November to late December when the lowest density for the first four months was recorded. Both January sampling periods showed a three-fold increase from late December. Fluctuations occurred through April and May, then densities decreased to their lowest of the study during early June. An increase in density occurred in late June and another in early July. Phytoplankton density reached its peak during early August, then slightly decreased in late August. These phytoplankton cell-density trends (high in late summer, decreases in winter, and spring fluctuations rising to late summer highs) are typical of temperate-zone lake conditions (Hutchinson, 1967) and have previously been reported in Lake Erie (Vollenweider et al., 1974). Similar temporal patterns in total cell densities were observed in the Cleveland Harbor area of Lake Erie (Davis, 1969a) during selected years. The yearly mean density for the Pomfret study, 1.63×10^9 cells/m^3, is similar to the 1958-1963 results reported by Davis (1964) who compared nearshore stations in the vicinity of Cleveland Harbor. However, the mean total phytoplankton densities at the Dunkirk water supply intake varied from approximately one-half to one-tenth of those reported for the Pomfret study. It should be noted that the Dunkirk intake data did not take into consideration the nannoplankton, or smaller algal forms, which may account for the observed discrepancy.

2.107
Apparent changes in the living population from sampling period to sampling period can be expressed by means of biovolume of the phytoplankton populations (ul/m^3). Data collected at the Pomfret site indicate the biovolume varied from period to period, peaking in early October, late November, and February. Biovolume at stations was quite variable within each sampling period and generally exhibited no apparent spatial trends. The yearly range was 3 to 6,950 ul/m^3 with a yearly mean of 992 ul/m^3. Yearly mean biovolume by depth revealed that the 10-foot contour mid-depth was slightly higher (1,060 ul/m^3) than the biovolume at the 30-foot contour. At the 30-foot contour off-bottom biovolume (1,032 ul/m was greater than surface (894 ul/m^3). Yearly mean biovolume for columns showed columns 2 and 3 to be higher (1,120 ul/m^3) than columns 1 and 3 (965 and 875 ul/m^3), respectively. Biovolume peaks were closely related to the specific organisms that occurred during those specific periods. In the Eastern Basin, the contribution of major groups to biovolume in this study was similar to that observed by Vollenweider et al. (1974). Throughout the study, diatoms were an important component of or contributor to the biovolume, with green algae contributing higher biovolumes during warm-water periods. It was noted that during August, blue-green algae never contributed a significant portion to biovolume (6 percent in early August and 2 percent in late August) although they were numerically dominant. There were two

peaks in the Van Buren Bay biovolume, 2,758 ul/m^3 in mid-April and 1,244 ul/m^3 in mid-August. The April peak was due to the diatom Stephanodiscus astreae, which comprised 60 percent of total biovolume. During this time, the diatoms were also numerically dominant. Similarly, the peak in August was due to the green algae Pediastrum simplex, which comprised 61 percent of total biovolume. During this time, the green algae were numerically dominant. The two biovolume peaks were higher in the bay than those observed in the lake during these times, due to the higher bay densities of the two dominant organisms observed.

Periphyton

2.108
Periphyton, as defined by Sladeckova (1962) and used in this study, are communities of algae (photosynthetic plants that biochemically incorporate carbon and other nutrients into living material using light energy) colonizing different types of natural and artificial substrates. Periphyton, including settled planktonic algae from the water column, provide food for the secondary consumer community of benthos and fish. Subtle changes in water quality (e.g., increased nutrient levels or decreased turbidity) may be reflected in the species composition of the algal community (Patrick and Strawbridge, 1963; Round, 1965).

2.109
At the Pomfret site, 66 Bacillariophyta taxa were identified and of these, eight were from the order Centrales while the remaining 58 were from the order Pennales. The largest number recorded during any single period was 36 in the month of December. A quantitative list of all taxa collected, the month observed, and the relative occurrence of each taxon is presented in Table 2-19. During the period May through September, 62 taxa were encountered representing the phyla Chlorophyta and Bacillariophyta. The largest number of taxa (33) was collected during the month of September 1975.

2.110
Some taxa found in the periphyton community are considered to be planktonic forms that evidently settled out of the water column into the periphyton community. During certain periods, some of these planktonic taxa comprised an important portion of the density estimates of both the phytoplankton and the periphyton communities. Cyclotella spp., Fragilaria spp., and Stephanodiscus spp., were some of the planktonic diatoms found in both communities; Pediastrum simplex and Scenedesmus ecornis were some planktonic forms of green algae found in both communities during late summer.

TABLE 2-19

CLEARED DIATOMS QUANTITATIVE LIST WITH RELATIVE OCCURRENCE*, POMFRET SITE, SEPTEMBER 1974-AUGUST 1975

	Months Present								
Bacillariophyta	**Sep**	**Oct**	**Nov**	**Dec**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Centrales									
Cyclotella spp.	0.7	1.5	2.1	0.8	0.9	3.8	1.1	<0.1	0.0
Cyclotella meneghiniana	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Cyclotella ocellata	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyclotella stelligera	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Melosira spp.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
Melosira binderana	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Stephanodiscus spp.	<0.1	0.0	0.3	0.0	2.5	0.5	0.3	0.1	0.1
Stephanodiscus astreae	0.1	1.8	0.0	0.0	0.8	3.7	2.2	0.6	0.6
Pennales									
Achnanthes spp.	5.0	1.0	1.9	0.4	0.9	1.2	0.2	0.5	2.4
Achnanthes lanceolata	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Achnanthes linearis	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.0
Achnanthes minutissima	5.6	2.3	0.6	1.1	0.5	0.2	3.8	4.2	24.5
Amphipleura spp.	0.0	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0
Amphora spp.	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Anomoeoneis serians var. *brachysira*	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Anomoeoneis vitrea	0.0	1.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Caloneis spp.	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Caloneis bacillum	0.0	0.0	0.0	0.1	0.0	0.0	0.1	3.2	2.9
Cocconeis spp.	0.4	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Cocconeis placentula	0.5	0.5	0.0	0.3	0.0	0.0	<0.1	0.3	0.3
Cymbella	6.6	5.5	0.9	0.3	0.5	1.1	<0.0	0.1	0.7
Cymbella affinis	<0.1	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0
Cymbella prostrata	0.0	0.0	0.0	0.0	0.0	0.2	1.4	<0.1	0.5
Cymbella sinuata	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Cymbella turgida	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Cymbella ventricosa	2.0	0.0	1.5	0.5	0.0	0.0	0.3	0.0	0.0
Diatoma spp.	0.0	0.0	0.0	0.5	2.1	46.6	3.9	0.6	0.0
Diatoma tenue var. *elongatum*	0.0	0.0	0.0	0.0	0.1	1.5	0.0	0.0	0.0
Diatoma vulgare	0.0	0.0	1.5	2.2	0.0	0.0	0.0	0.0	0.0
Eunotia spp.	0.0	0.0	0.0	0.2	0.7	0.0	0.1	0.0	0.2
(Fragilariaceae)	0.0	0.4	0.9	1.3	0.4	0.0	0.0	0.0	0.0
Fragilaria spp.	2.5	2.0	1.0	0.3	18.4	3.6	0.9	0.4	1.7
Fragilaria capucina	2.0	0.0	0.0	4.4	1.0	0.2	0.0	0.6	0.0
Fragilaria crotonensis	1.0	0.2	0.6	0.5	0.0	0.0	0.0	0.1	0.0
Fragilaria vaucheriae	7.9	7.5	21.3	45.8	7.6	5.4	4.8	49.2	35.1
Fragilaria virescens	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Frustulia rhomboides	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Gomphonema spp.	2.9	0.8	0.9	4.2	23.3	3.1	2.0	1.8	0.0
Gomphonema acuminatum var. *coronata*	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gomphonema angustatum	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Gomphonema constrictum	<0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gomphonema olivaceum	0.0	7.3	1.1	5.5	13.0	1.5	3.4	0.1	0.0
Gomphonema parvulum	0.8	0.0	0.3	0.3	<0.1	0.0	0.3	0.6	0.2
Gyrosigma spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Meridion circulare	0.0	0.0	0.0	1.5	6.4	0.0	0.0	0.3	0.0
Navicula spp.	11.1	0.8	2.6	1.7	3.9	0.5	2.2	0.0	0.4
Navicula accomoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.5
Navicula cryptocephala var. *venata*	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Navicula gastrum	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Navicula longirostris	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula minuscula	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Navicula pseudoreinhartii	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Navicula radiosa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.8	14.0
Navicula salinarum var. *intermedia*	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitzschia spp.	1.4	2.5	25.6	10.0	3.8	13.3	7.0	2.9	2.5
Nitzschia acicularis	0.0	0.0	0.0	0.0	0.1	1.8	0.0	0.0	0.0
Nitzschia dissipata	29.8	50.3	33.1	12.0	0.7	0.7	61.3	5.6	1.2
Nitzschia fonticola	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.0
Nitzschia palea	1.3	0.0	0.4	0.5	0.0	0.0	0.2	0.0	0.0
Nitzschia romana	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Rhoicosphenia curvata	0.4	0.3	0.3	0.5	0.5	0.0	0.1	0.4	0.1
Stauroneis spp.	0.0	0.0	0.0	0.0	0.0	0.0	<0.1	0.0	0.0
Surirella spp.	0.0	0.3	0.0	0.2	0.2	1.5	0.2	<0.1	0.0
Synedra spp.	0.3	0.0	0.1	0.0	0.3	0.1	<0.1	0.0	0.0
Tabellaria flocculosa	0.3	0.5	0.3	0.2	0.3	0.0	0.0	0.0	0.0

*Computed using following equation:

$$\left(\frac{\text{number counted per taxon}}{\text{total number counted for all taxa}}\right) 100$$

2.111
There were no spatial differences within time periods at the individual stations for the diatom community from the artificial substrates. However, shifts in taxa dominance were observed between sampling periods. During September-November, Nitzschia dissipata was the dominant taxon. In December, Fragilaria vaucheriae became numerically dominant. During April 1975, Gomphonema spp. was dominant and Fragilaria spp. subdominant. Diatoma tenue was dominant in May, but June dominance shifted to Nitzschia dissipata. In July and August, Fragilaria vaucheriae was the dominant species with Navicula radiosa subdominant. Another subdominant organism found during August was Achnanthes minutissima.

2.112
Variations to the distribution of the periphyton community through time are related to a variety of changes in the physical and chemical parameters of a water body. Variations in species composition of the periphyton community often indicate past changes in water quality (Weber, 1973). Shifts in taxa dominance may indicate changes in nutrients, temperatures, or other physical factors. Individual diatom taxa respond differently to varying nutrient and physical factors; therefore, their dominance in the same habitat may occur at different time of the year (Lowe, 1974). All taxa found as dominant forms were considered to be common lake periphyton (Lowe, 1974). Lowe indicated that, of all the diatom taxa found in Lake Erie, Nitzschia dissipata and Fragilaria vaucheriae were more characteristic of waters with high nutrient concentrations. During this study, however, nutrient concentrations were never at a high level as might be indicated by these two numerically dominant taxa.

2.113
Results from the whole periphyton analysis indicated that few numbers of taxa were found during May and June, although the number increased from July to September. During August and September, the dominant taxa were representative of Cyanophyta (blue-greens), Chlorophyta (greens), and Bacillariophyta (diatoms). Some algal species recorded as periphyton (e.g., Pediastrum simplex, Scenedesmus ecornis, Fragilaria crotonensis, and Nitzschia acicularis) were also present in the phytoplankton community at Pomfret. Pediastrum simplex and Scenedesmus ecornis were found in the phytoplankton in high densities during August.

Aquatic Macrophytes

2.114
During the field study period, an attempt was made to identify aquatic macrophytes in the vicinity of the Pomfret site. The study revealed almost a total absence of these plant types. The only plant

collected during this investigation was the filamentous algae *Cladophora*, which is not a vascular plant as the term "aquatic macrophyte" implies.

2.115
Four surveys were conducted along the shoreline of the Pomfret site to determine the distribution and abundance of *Cladophora*. The September 1974 survey revealed traces of *Cladophora* along cliff faces and on large rocks (greater than 50 cm in diameter) in shallower (1 m deep) bay areas. During the late October survey, *Cladophora* growth was generally greater on larger rocks in Van Buren Bay than at other locations (i.e., cliff faces). Another survey was conducted using a grappler sampler during early summer (8 June 1975). The grappler sampler was employed to collect 60 samples from depths of 3 feet to 30 feet. These samples revealed good growth of *Cladophora* along Van Buren Point and at column 3 out to a depth of 15 feet. Minimal growth was found in Van Buren Bay. The weight-dry weight relationship shows that approximately 94 percent of the wet weight is water that is driven off in the drying process. The greatest dry weight was observed at the 5- and 10-foot depths.

Zooplankton

2.116
Zooplankton, by nature of their trophic position in the aquatic ecosystem, serve as organisms of transfer between energy contained in the lower trophic levels and energy requirements of organisms higher in the food chain. During the survey 81 taxa were identified and enumerated in the vicinity of the Pomfret site. The taxa included rotifers (19), crustaceans (48), and protozoans (1). The remaining 13 taxa did not fall into any of these categories and are not considered unique or numerically important since they only comprised about one percent of the total population density throughout the majority of the study period. Of the 81 taxa identified, 49 were taken in the 333 u nets and 62 in the 73 u nets. Taxa not collected in the 333 u net consisted mostly of rotifers.

2.117
Total zooplankton density was found to be highest at the 30-foot contour and lowest at the 10-foot contour. At the 30-foot contour about 1.5 km offshore of the Pomfret site, copepods were most abundant while cladocerans were distributed evenly through the area sampled. Previous studies by Roth and Steward (1973) showed that copepod densities were higher in the offshore areas of Lake Michigan while cladocerans exhibited higher densities in the nearshore areas. They also found that *Diaptomus oregonensis*, a calanoid copepod, was uncommon or absent (except November) in nearshore areas while it was always present in offshore samples. Calanoid copepods (primarily

Diaptomus oregonensis) at the Pomfret site exhibited a similar trend to those in Lake Michigan as indicated by the occurrence of 70 percent of the calanoid density at the 30-foot contour. Histograms depicting zooplankton densities at the 30-foot and 10-foot contours have been derived from the 333 u and 73 u net data and are presented in Figures 2-17 and 2-18, respectively.

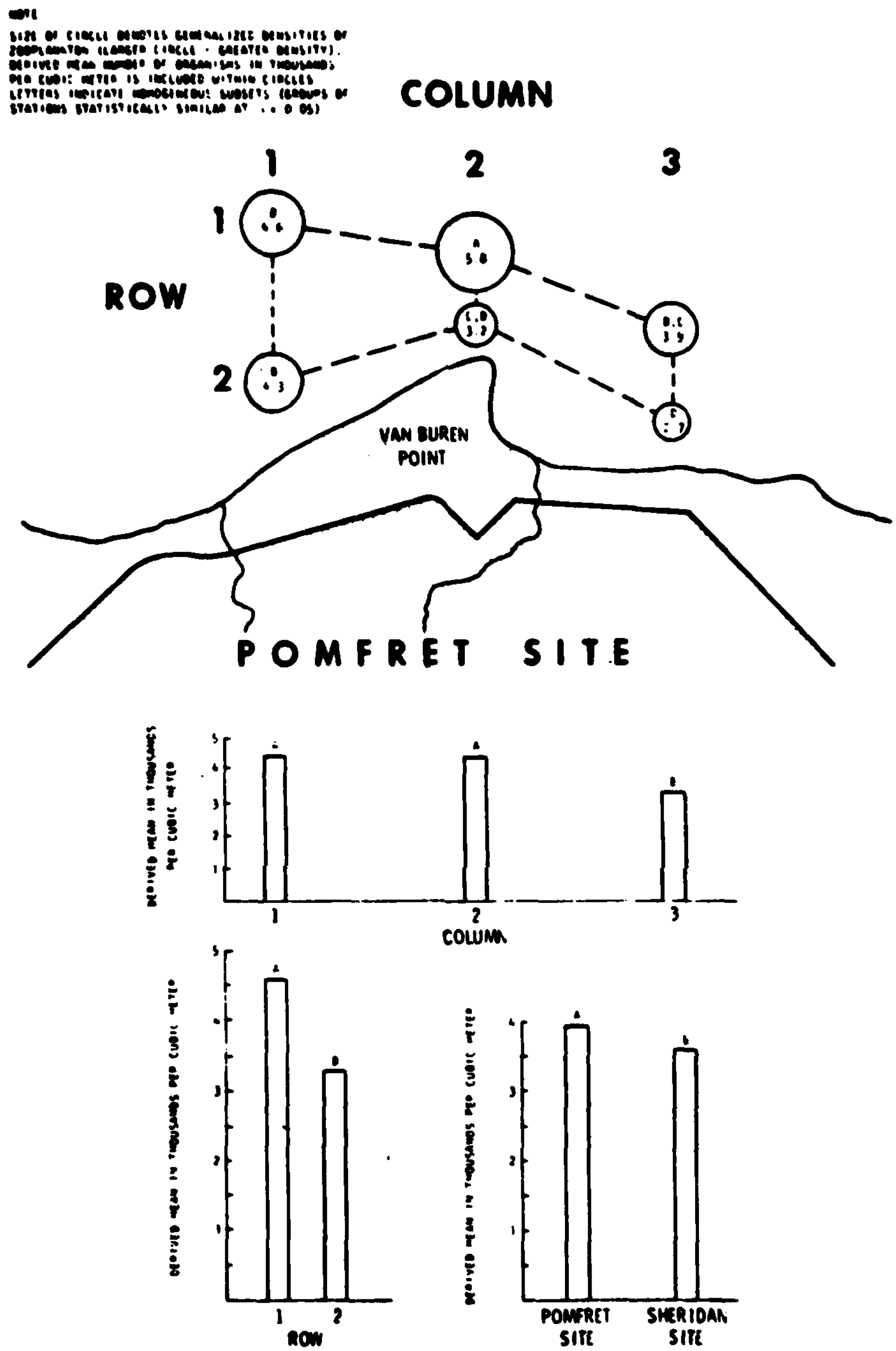
2.118
During the sampling period three peaks in zooplankton density were observed. The highest density value occurred in September and the second highest in November. A third less definite peak occurred during the summer (late June through early August). During the winter when zooplankton densities were low, cyclopoids were generally dominant while cladocerans are most dominant at other times of the year. Rotifers followed a different temporal distribution pattern with maximum densities occurring in September, April, and July. Zooplankton biomass correlated with zooplankton density during all months except late April, late July, and August, probably due to the increased abundance of calanoids.

2.119
Seasonal successions of species observed at the Pomfret site were typical of a northern temperate zone lake (Hutchinson, 1967). Daphnia longiremis, usually abundant during spring, was dominant in late May. Daphnia retrocurva characteristically exhibits a peak abundance during midsummer, followed by two peaks in abundance of D. galeata during the fall. These peaks in Daphnia abundance were also observed at Pomfret. Cyclops, generally the most abundant organisms when water temperature is the lowest in the temperate lakes, dominates winter taxa at the Pomfret site. Mesocyclops, a taxon normally most abundant during summer, exhibited the highest density during September and was uncommon or absent during the winter. Diaptomus oregonensis usually exhibits a peak in abundance in early summer in temperate lakes (observed at Pomfret in late July and early August) and two peaks in the fall (observed at Pomfret in September and November).

2.120
Zooplankton densities and their relative abundance by month are summarized in Table 2-20 (73 u net) and Table 2-21 (333 u mesh). Zooplankton densities for Van Buren Bay have been derived from 333 u net data and are presented in Table 2-22.

Benthic Macroinvertebrates

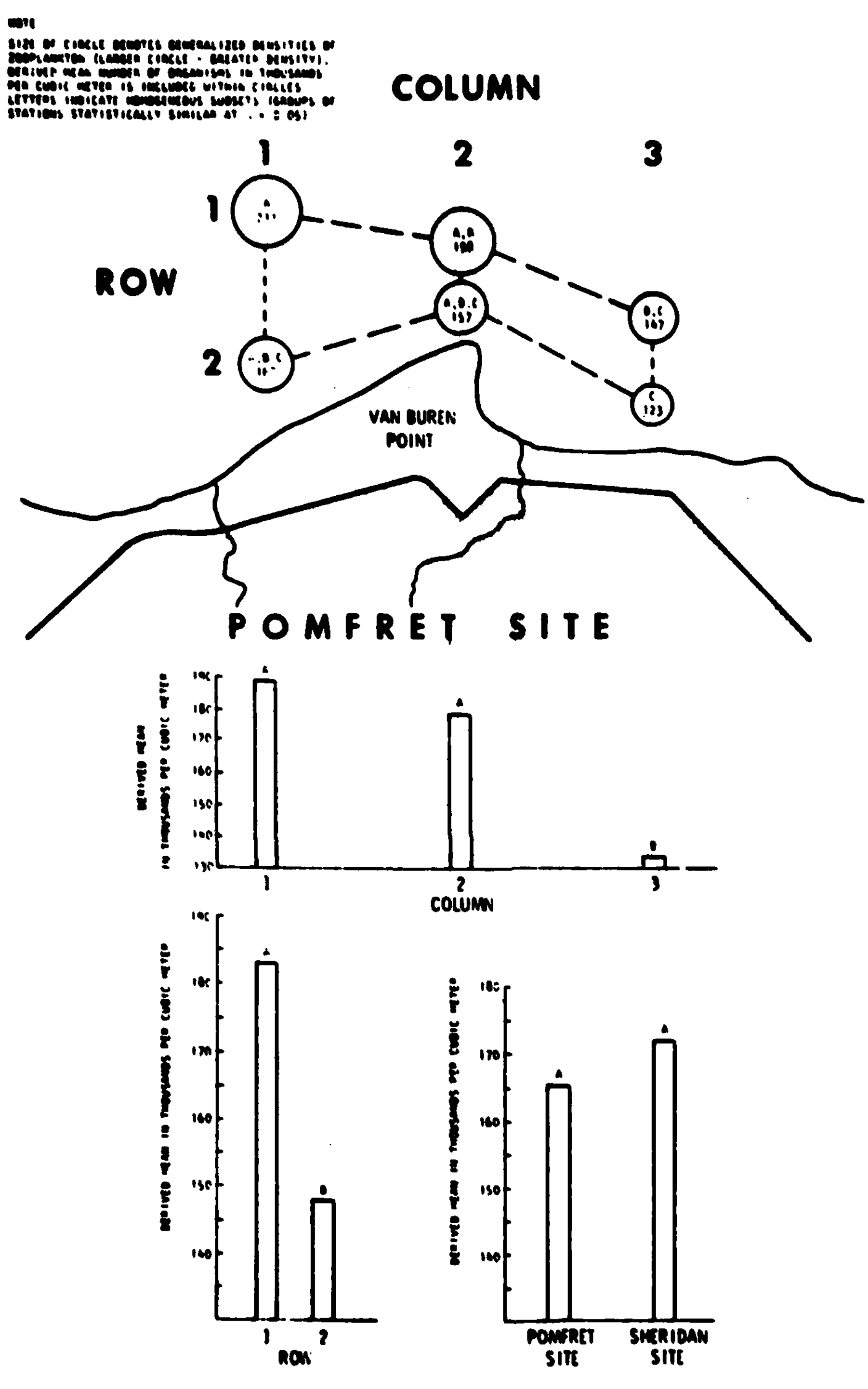
2.121
As a consequence of their sedentary habits, relatively long life span and variety of specific environmental preferences, benthic macroinvertebrates have been established as important indicators of environmental conditions. These organisms also play an important role in



SPATIAL COMPARISONS OF ZOOPLANKTON DENSITIES (333-μ NET FROM ANOVA) SEPTEMBER 1974-AUGUST 1975

POMFRET SITE

FIGURE 2-17



SPATIAL COMPARISONS OF ZOOPLANKTON DENSITIES (73-μ NET FROM ANOVA), SEPTEMBER 1974-AUGUST 1975

POMFRET SITE

FIGURE 2-18

TABLE 2-20

POMFRET ZOOPLANKTON (73-µ NET) SITE MEAN DENSITIES (NO./M³) AND RELATIVE ABUNDANCE (R.A.) IN PERCENT BASED ON 12 SAMPLES PER SAMPLING DATE, SEPTEMBER 1974-AUGUST 1975

	1974								1975											
	Sep 18		Oct 21		Nov 19		Dec 19		Jan 24		Feb 28		Apr 10		Jun 20		Jul 22		Aug 4	
Taxon	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Protozoa	0	0.0	893	0.3	0	0.0	0	0.0	3,309	4.7	745	1.3	0	0.0	0	0.0	0	0.0	0	0.0
Coelenterata																				
Hydra spp.	0	0.0	0	0.0	0	0.0	3	<0.05	9	0.0	8	<0.05	0	0.0	0	0.0	0	0.0	14	<0.05
Rotifera																				
Brachionus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	694	0.2
Kellicottia sp.	2,475	0.7	5,836	2.0	1,765	1.2	428	1.1	1,544	2.1	1,052	1.9	6,682	3.6	23,264	10.6	110	<0.05	0	0.0
Keratella spp.	26,493	7.8	69,630	24.4	39,017	26.4	17,307	46.1	29,214	40.6	21,551	39.0	31,206	16.9	24,127	11.0	25,316	6.1	49,737	22.9
Notholca spp.	0	0.0	0	0.0	404	0.3	0	0.0	786	1.1	2,542	4.6	4,201	2.3	0	0.0	163	<0.05	0	0.0
Lepadella spp.	330	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lecane spp.	0	0.0	0	0.0	468	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Monostyla spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	517	0.1	0	0.0
Ascomorphella spp.	0	0.0	247	0.1	0	0.0	645	1.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Trichocerca spp.	0	0.0	1,394	0.5	735	0.5	0	0.0	184	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ascomorpha spp.	2,499	0.7	0	0.0	0	0.0	1,118	3.0	170	0.2	0	0.0	14,417	7.8	0	0.0	81	<0.05	0	0.0
Asplanchna spp.	0	0.0	0	0.0	0	0.0	0	0.0	658	0.9	0	0.0	570	0.3	0	0.0	0	0.0	0	0.0
Ploesoma spp.	1,609	0.5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2,362	1.1
Polyarthra spp.	174,243	51.3	149,409	52.4	14,403	9.7	6,050	16.1	2,610	3.6	7,346	13.3	47,864	26.0	52,741	24.0	25,312	6.1	33,174	15.3
Filinia spp.	577	0.2	3,611	1.3	0	0.0	623	1.7	453	0.6	0	0.0	0	0.0	526	0.2	0	0.0	0	0.0
Conochilus spp.	46,846	13.8	210	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5,305	2.4	350,031	84.9	75,003	34.6
Ptygura spp.	842	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Collotheca spp.	0	0.0	0	0.0	0	0.0	231	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cupelopagis spp.	330	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Unidentified Rotifera	5,934	1.7	921	0.3	8,460	5.7	1,239	3.3	7,949	11.0	11,974	21.7	58,559	31.8	2,406	1.1	1,524	0.6	10,904	5.0
Nematoda	0	0.0	0	0.0	0	0.0	4	<0.05	84	0.1	34	0.1	0	0.0	31	<0.05	0	0.0	0	0.0
Tardigrada	0	0.0	0	0.0	0	0.0	5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Annelida																				
Naididae	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0	3	<0.05	0	0.0	92	<0.05	0	0.0	0	0.0
Polychaeta	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
Cladocera																				
Leptodora kindtii	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	378	0.2	363	0.1	62	<0.05
Diaphanosoma spp.	409	0.1	170	0.1	101	0.1	0	0.0	0	0.0	0	0.0	0	0.0	71	<0.05	59	<0.05	1,719	0.8
Holopedium gibberum	0	0.0	146	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	<0.05	27	<0.05
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0
Alona spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	15	<0.05
A. costata	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0
Chydorus spp.	0	0.0	122	<0.05	342	0.2	8	<0.05	9	<0.05	0	0.0	0	0.0	92	<0.05	0	0.0	0	0.0
Daphnia	82	<0.05	0	0.0	0	0.0	8	<0.05	22	<0.05	12	<0.05	2	<0.05	1,809	0.8	26	<0.05	70	<0.05
D. longiremis	0	0.0	0	0.0	0	0.0	2	<0.05	20	<0.05	6	<0.05	0	0.0	198	0.1	0	0.0	0	0.0
D. ambigua	0	0.0	0	0.0	0	0.0	0	0.0	67	0.1	0	0.0	7	<0.05	555	0.3	29	<0.05	0	0.0
D. galeata mendotae	45,725	13.5	6,833	2.4	21,244	14.4	195	0.5	86	0.1	10	<0.05	9	<0.05	2,525	1.2	882	0.2	5,555	2.6
D. retrocurva	301	0.1	1,222	0.4	134	0.1	7	<0.05	13	<0.05	0	0.0	0	0.0	16,260	7.4	537	0.1	5,620	2.6
Ceriodaphnia	0	0.0	203	0.1	212	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bosminidae (B. longirostris, E. coregoni, E. hagmanni)	1,092	0.3	20,546	7.2	20,338	13.8	3,299	8.8	5 737	8.0	1,708	3.1	1,158	0.6	28,203	12.9	42	<0.05	261	0.1

TABLE 2-20 (cont.)

Taxon	1974								1975											
	Sep 18		Oct 21		Nov 19		Dec 19		Jan 24		Feb 20		Apr 10		Jun 20		Jul 22		Aug 4	
	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Ostracoda	63	<0.05	0	0.0	55	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	60	<0.05	672	0.2	93	<0.05
Copepoda (nauplii)	13,826	4.1	4,779	1.7	4,712	3.2	774	2.1	7,497	10.4	3,326	6.0	14,643	8.0	11,558	5.3	1,240	0.3	10,097	4.7
Calanoida (copepodid)	2,137	0.6	4,923	1.7	1,551	1.1	146	0.4	473	0.7	32	0.1	67	<0.05	4,090	1.8	773	0.2	5,367	2.5
Epischura lacustris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	30	<0.05	0	0.0	0	0.0
Eurytemora affinis	0	0.0	126	<0.05	37	<0.05	6	<0.05	18	<0.05	7	<0.05	6	<0.05	71	<0.05	0	0.0	0	0.0
Diaptomus spp.	1,290	0.4	0	0.0	0	0.0	5	<0.05	8	<0.05	11	<0.05	35	<0.05	0	0.0	0	0.0	0	0.0
D. minutus	0	0.0	0	0.0	0	0.0	0	0.0	11	<0.05	0	0.0	20	<0.05	30	<0.05	2	<0.05	137	0.1
D. sicilis	0	0.0	0	0.0	0	0.0	0	0.0	17	<0.05	0	0.0	212	0.1	0	0.0	0	0.0	0	0.0
D. ashlandi	0	0.0	6	<0.05	0	0.0	6	<0.05	11	<0.05	5	<0.05	29	<0.05	210	0.1	1	<0.05	15	<0.05
D. reighardi	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	<0.05	0	0.0
D. oregonensis	5,321	1.6	1,821	0.6	6,706	4.5	113	0.3	732	1.0	87	0.2	5	<0.05	278	0.1	196	<0.05	2,223	1.0
D. siciloides	0	0.0	38	<0.05	25	<0.05	0	0.0	20	<0.05	15	<0.05	4	<0.05	169	0.1	9	<0.05	70	<0.05
Cyclopoida (copepodid)	5,046	1.5	7,352	2.6	17,084	11.6	5,002	13.3	9,050	12.6	4,092	7.4	6,361	2.4	41,468	18.9	3,719	0.9	11,992	5.5
Eucyclops speratus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0	1	<0.05	0	0.0
E. agilis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0	1	<0.05	0	0.0
Tropocyclops prasinus	0	0.0	0	0.0	0	0.0	11	<0.05	119	0.2	37	0.1	0	0.0	231	0.1	120	<0.05	278	0.1
Cyclops sp.	21	<0.05	0	0.0	0	0.0	0	0.0	6	<0.05	3	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
C. vernalis	0	0.0	0	0.0	0	0.0	11	<0.05	48	0.1	4	<0.05	0	0.0	129	0.1	0	0.0	0	0.0
C. bicuspidatus thomasi	0	0.0	2,710	1.0	5,075	3.4	296	0.8	979	1.4	597	1.1	91	<0.05	2,276	1.0	155	<0.05	117	0.1
Mesocyclops edax	1,613	0.4	1,859	0.7	4,981	3.4	12	<0.05	0	0.0	0	0.0	0	0.0	82	<0.05	386	0.1	1,482	0.7
Unidentified Cyclopoida	614	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0	0	0.0	0	0.0
Harpacticoida	0	0.0	0	0.0	0	0.0	9	<0.05	0	0.0	32	0.1	0	0.0	34	<0.05	2	<0.05	0	0.0
Hydracarina	0	0.0	0	0.0	15	<0.05	1	<0.05	0	0.0	5	<0.05	0	0.0	0	0.0	0	0.0	15	<0.05
Insecta																				
Chironomidae (larvae)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	58	<0.05	2	<0.05	0	0.0
Totals																				
Protozoa	0	0.0	893	0.3	0	0.0	0	0.0	3,389	4.7	745	1.3	0	0.0	0	0.0	0	0.0	0	0.0
Rotifera	262,178	77.2	231,258	81.1	65,252	44.1	27,639	73.6	43,567	60.5	44,465	80.5	163,500	88.8	108,370	49.4	403,054	97.8	171,755	79.2
Cladocera	47,609	14.0	29,242	10.3	42,372	28.7	3,518	9.4	5,954	8.3	1,736	3.1	1,176	0.6	50,090	22.8	1,930	0.5	13,328	6.1
Copepoda (nauplii)	13,826	4.1	4,779	1.7	4,712	3.2	774	2.1	7,497	10.4	3,326	6.0	14,643	8.0	11,558	5.3	1,240	0.3	10,097	4.7
Calanoida	8,948	2.6	6,914	2.4	8,320	5.6	276	0.7	1,289	1.8	159	0.3	376	0.2	4,839	2.2	985	0.2	7,811	3.6
Cyclopoida	7,095	2.1	11,930	4.2	27,139	18.4	5,332	14.2	10,202	14.2	4,732	8.6	4,454	2.4	44,186	20.1	6,391	1.1	13,870	6.4
Other	63	<0.05	0	0.0	70	<0.05	24	0.1	84	0.1	90	0.2	0	0.0	276	0.1	675	0.2	122	0.1
Total	339,694		285,089		147,864		37,563		71,981		55,253		184,145		219,317		412,260		216,978	

TABLE 2-21

POMFRET ZOOPLANKTON (333-μ NET) SITE MEAN DENSITIES (NO./M^3) AND RELATIVE ABUNDANCE (R.A.) IN PERCENT BASED ON 12 SAMPLES PER SAMPLING DATE, SEPTEMBER 1974-AUGUST 1975

	1974																	
	Sep 6		Sep 18		Oct 1		Oct 23		Nov 7		Nov 19		Dec 12		Dec 19		Apr 10	
Taxon	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.
Coelenterata																		
Hydra sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.2	0	0.0
Turbellaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
Annelida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Naididae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cladocera																		
Leptodora kindtii	36	0.2	67	0.2	84	0.5	27	0.3	22	0.2	5	<0.05	0	0.0	0	0.0	0	0.0
Sida crystallina	0	0.0	0	0.0	6	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Latona setifera	0	0.0	0	0.0	0	0.0	7	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Diaphanosoma sp.	185	0.9	94	0.2	681	4.0	223	2.2	60	0.5	148	0.7	0	0.0	0	0.0	0	0.0
Holopedium gibberum	5	<0.05	96	0.2	76	0.4	90	0.9	3	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
Camptocercus rectirostris	2	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Leydigia quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Alona quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Daphnia sp.	0	0.0	0	0.0	0	0.0	3	<0.05	0	0.0	5	<0.05	4	0.5	0	0.0	0	0.0
D. longiremis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	0.8	2	0.2
D. ambigua	0	0.0	0	0.0	61	0.4	30	0.3	138	1.1	37	0.2	2	0.3	0	0.0	0	0.0
D. galeata mendotae	13,144	60.6	32,429	77.9	10,300	59.9	3,295	32.1	3,535	29.2	9,371	43.7	104	16.9	90	9.4	26	2.3
D. parvula	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. retrocurva	57	0.3	71	0.2	479	2.8	227	2.2	1,359	11.2	719	3.4	4	0.5	3	0.4	1	0.1
D. pulex	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ceriodaphnia sp.	0	0.0	0	0.0	14	0.1	116	1.2	293	2.5	93	0.4	0	0.0	0	0.0	0	0.0
Bosminidae	327	1.5	371	0.9	2,208	12.8	3,567	34.7	2,297	19.0	4,114	19.2	245	39.3	369	38.3	149	12.9
Ilyocryptus sordidus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ostracoda	12	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Copepoda																		
Calanoida (copepodid)	11	0.1	0	0.0	554	3.2	187	1.8	276	2.3	188	0.9	26	4.3	52	5.5	1	0.1
Epischura lacustris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eurytemora affinis	0	0.0	0	0.0	0	0.0	61	0.6	161	1.3	74	0.3	6	0.9	4	0.4	<0.5	<0.05
Diaptomus sp.	323	1.5	168	0.4	0	0.0	0	0.0	0	0.0	6	<0.05	1	0.2	0	0.0	0	0.0
D. minutus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	26	2.2
D. sicilis	0	0.0	0	0.0	0	0.0	43	0.4	15	0.1	0	0.0	1	0.1	1	0.1	114	9.9
D. ashlandi	3	<0.05	0	0.0	0	0.0	0	0.0	7	0.1	31	0.1	1	0.1	4	0.4	30	2.6
D. reighardi	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. pallidus	0	0.0	18	<0.05	0	0.0	8	0.1	68	0.6	0	0.0	<0.5	<0.05	<0.5	<0.05	0	0.0
D. oregonensis	6,415	29.6	6,500	15.8	1,601	9.3	1,266	12.3	2,532	20.9	3,723	17.4	113	18.2	232	24.1	<0.5	<0.05
D. siciloides	22	0.1	363	0.9	0	0.0	12	0.1	113	0.9	265	1.2	0	0.0	<0.5	<0.05	5	0.4
Unidentified Calanoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyclopoida (copepodid)	33	0.2	11	<0.05	253	1.5	78	0.8	56	0.4	121	0.6	15.6	2.4	43	4.5	85	7.3
Eucyclops speratus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	0.0	0	0.0
Cyclops sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
C. vernalis	0	0.0	0	0.0	0	0.0	34	0.3	135	1.1	0	0.0	1	0.2	9	0.9	0	0.0
C. bicuspidatus thomasi	257	1.2	38	0.1	78	0.5	404	3.9	804	6.6	1,870	8.7	97	15.6	144	15.0	718	62.0
Mesocyclops edax	854	3.9	1,343	3.2	805	4.7	595	5.8	232	1.9	657	3.1	0	0.0	<0.5	<0.05	0	0.0
Harpacticoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Amphipoda																		
Hyalella azteca	2	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gammarus sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Hydracarina	3	<0.05	4	<0.05	1	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Insecta																		
Ephemeroptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Trichoptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Diptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Mollusca	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ancylidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Planorbidae	2	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals																		
Cladocera	13,757	63.4	33,128	79.5	13,909	80.9	7,504	73.8	7,707	63.7	14,493	67.6	357	57.6	469	48.8	178	15.4
Calanoida	6,773	31.2	7,129	17.1	2,155	12.5	1,576	15.3	3,172	26.2	4,286	20.0	149	23.9	294	30.6	177	15.3
Cyclopoida	1,144	5.3	1,392	3.3	1,137	6.6	1,111	10.8	1,227	10.1	2,648	12.4	114	18.3	196	20.4	802	69.3
Other	19	0.1	4	<0.05	0	<0.05	0	0.0	0	0.0	0	0.0	1	0.1	2	0.2	0	0.0
Total	21,693		41,654		17,202		10,271		12,106		21,427		620		962		1,157	

TABLE 2-21 (cont.)

Taxa	Apr 22		Apr 30		May 19		Jun 2		Jun 17		Jun 30		Jul 15		Aug 5		Aug 18	
	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.	No./m^3	R.A.
Coelenterata																		
Hydra sp.	0	0.0	0	0.0	1	0.1	7	0.2	0	0.0	0	0.0	0	0.0	<0.5	<0.05	<0.5	<0.05
Turbellaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Annelida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Naididae	0	0.0	0	0.0	<0.5	0.1	1	<0.05	0	0.0	0	0.0	0	0.0	8	<0.05	2	0.1
Cladocera																		
Leptodora kindtii	0	0.0	0	0.0	1	0.2	17	0.4	328	2.5	810	6.0	646	5.3	398	2.3	115	2.4
Sida crystallina	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05
Latona setifera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Diaphanosoma sp.	0	0.0	0	0.0	0	0.0	4	0.1	12	0.1	145	1.1	48	0.4	691	4.1	256	5.4
Holopedium gibberum	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	<0.05	53	0.3	41	0.9
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Leydigia quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	4	0.1
Alona quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	0.1	4	<0.05	0	0.0
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	8	<0.05	0	0.0
Daphnia sp.	0	0.0	0	0.0	0	0.0	3	0.1	0	0.0	6	<0.05	0	0.0	61	0.4	24	0.5
D. longiremis	<0.5	<0.05	3	2.9	176	24.5	222	5.3	2,326	17.7	102	0.8	0	0.0	0	0.0	0	0.0
D. ambigua	0	0.0	0	0.0	<0.5	<0.05	12	0.3	48	0.4	6	<0.05	0	0.0	0	0.0	0	0.0
D. galeata mendotae	16	1.5	4	3.6	4	0.6	108	2.6	2,288	17.4	2,641	19.4	3,385	27.8	3,073	18.0	3,052	64.1
D. parvula	0	0.0	0	0.0	0	0.0	5	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. retrocurva	0	0.0	<0.5	0.1	9	1.2	232	5.6	4,751	36.1	6,410	47.2	664	5.4	5,052	29.6	80	1.7
D. pulex	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0	3	<0.05	0	0.0	0	0.0	0	0.0
Ceriodaphnia sp.	0	0.0	0	0.0	0	0.0	0	0.0	15	0.1	0	0.0	0	0.0	0	0.0	27	0.6
Bosminidae	28	2.6	19	15.5	407	56.8	2,940	70.4	2,120	16.1	1,083	8.0	28	0.2	182	1.1	106	2.2
Ilyocryptus sordidus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05
Ostracoda	0	0.0	0	0.0	1	0.2	0	0.0	3	<0.05	13	0.1	19	0.2	16	0.1	17	0.4
Copepoda																		
Calanoida (copepodid)	9	0.8	2	1.4	11	1.5	57	1.4	108	1.4	307	2.3	766	6.3	970	5.7	53	1.1
Epischura lacustris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	9	0.1	0	0.0	0	0.0
Eurytemora affinis	1	0.1	0	0.0	1	0.1	10	0.2	26	0.2	10	0.1	0	0.0	<0.5	<0.05	<0.5	<0.05
Diaptomus sp.	0	0.0	<0.5	0.2	1	0.1	4	0.1	0	0.0	3	<0.05	0	0.0	0	0.0	0	0.0
D. minutus	8	0.7	8	6.7	3	0.4	24	0.6	54	0.4	70	0.5	20	0.2	0	0.0	0	0.0
D. sicilis	507	46.0	61	50.5	2	0.2	13	0.3	0	0.0	6	<0.05	0	0.0	0	0.0	0	0.0
D. ashlandi	8	0.8	4	3.0	<0.5	<0.05	11	0.3	27	0.2	150	1.1	8	0.1	0	0.0	<0.5	<0.05
D. reighardi	0	0.0	0	0.0	<0.5	<0.05	1	<0.05	0	0.0	0	0.0	0	0.0	5	<0.05	<0.5	<0.05
D. pallidus	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. oregonensis	4	0.4	6	5.0	4	0.6	11	0.3	70	0.5	1,092	8.0	5,349	43.9	5,439	31.9	605	12.7
D. sicilloides	3	0.3	<0.5	0.4	<0.5	0.1	11	0.3	0	0.0	59	0.4	40	0.3	21	0.1	10	0.2
Unidentified Calanoida	0	0.0	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyclopoida (copepodid)	11	1.0	4	3.1	37	5.2	168	4.0	99	0.8	136	1.0	264	2.2	344	2.0	116	2.4
Eucyclops speratus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyclops sp.	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
C. vernalis	0	0.0	0	0.0	<0.5	0.1	30	0.7	15	0.1	0	0.0	0	0.0	0	0.0	<0.5	<0.05
C. bicuspidatus thomasi	505	45.9	9	7.4	55	7.7	281	6.7	764	5.8	379	2.8	9	0.1	0	0.0	<0.5	<0.05
Mesocyclops edax	0	0.0	0	0.0	1	0.2	2	0.1	21	0.2	148	1.1	921	7.6	724	4.2	252	5.3
Harpacticoida	<0.5	<0.05	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Amphipoda																		
Hyalella azteca	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Gammarus sp.	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	10	0.1	0	0.0	0	0.0	9	0.0
Hydracarina	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05
Insecta																		
Ephemeroptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	1	<0.05
Trichoptera	0	0.0	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	3	0.1
Diptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	<0.05	0	0.0	0	0.0	<0.5	<0.05
Mollusca	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Amnicolidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	0.0
Planorbidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals																		
Cladocera	45	4.1	27	22.2	597	83.4	3,544	84.9	11,888	90.4	11,207	82.4	4,782	39.2	9,523	55.8	3,702	77.7
Calanoida	540	49.1	81	67.3	22	3.0	141	3.4	365	2.8	1,697	12.5	6,193	50.8	6,436	37.7	668	14.0
Cyclopoida	516	46.8	13	10.5	94	13.1	483	11.6	898	6.8	664	4.9	1,194	9.8	1,088	6.3	388	7.7
Other	<0.5	<0.05	0	0.0	3	0.5	8	0.2	3	<0.05	26	0.2	19	0.2	26	0.1	24	0.5
Total	1,101		120		716		4,176		13,153		13,593		12,187		17,052		4,762	

TABLE 2-22

POMFRET ZOOPLANKTON (333-μ NET) MEAN DENSITIES BASED ON TWO SAMPLES PER DATE COLLECTED FROM VAN BUREN BAY, APRIL-SEPTEMBER 1975

Taxon	Apr 16 No./m³	Apr 16 R.A.	May 16 No./m³	May 16 R.A.	May 30 No./m³	May 30 R.A.	Jun 17 No./m³	Jun 17 R.A.	Jun 30 No./m³	Jun 30 R.A.	Jul 17 No./m³	Jul 17 R.A.	Aug 12 No./m³	Aug 12 R.A.	Sep 3 No./m³	Sep 3 R.A.
Coelenterata																
Hydra spp.	<0.5	0.1	1	0.4	8	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Nematoda	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.7	0	0.0
Annelida																
Naididae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	68	1.5	<0.5	1.2	0	0.0
Cladocera																
Leptodora kindtii	0	0.0	1	0.4	11	0.3	131	1.9	504	62.2	2,869	63.0	21	52.8	0	0.0
Diaphanosoma spp.	0	0.0	0	0.0	0	0.0	0	0.0	16	2.0	85	1.9	1	3.0	0	0.0
Holopedium gibberum	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	18	0.8
Alona quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	15	0.3	0	0.0	0	0.0
Daphnia spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	103	4.7
D. longiremis	0	0.0	10	6.7	46	1.4	925	13.7	1	0.1	0	0.0	0	0.0	0	0.0
D. ambigua	0	0.0	0	0.0	13	0.4	13	0.2	0	0.0	0	0.0	0	0.0	0	0.0
D. galeata mendotae	5	3.8	<0.5	0.1	8	0.2	243	3.6	59	7.2	650	14.3	8	20.3	2,010	91.0
D. parvula	0	0.0	0	0.0	0	0.0	19	0.3	0	0.0	0	0.0	0	0.0	<0.5	<0.05
D. retrocurva	0	0.0	2	1.0	54	1.6	4,159	61.6	211	26.1	162	3.6	1	2.2	17	0.8
Bosminidae	5	3.8	115	76.3	2,601	77.2	600	8.9	5	0.6	29	0.6	2	4.6	34	1.5
Ostracoda	0	0.0	0	0.0	0	0.0	4	0.1	<0.5	<0.05	75	1.6	2	4.0	0	0.0
Copepoda																
Calanoida (copepodid)	0	0.0	3	2.2	11	0.3	55	0.8	0	0.0	196	4.3	<0.5	0.1	0	0.0
Eurytemora affinis	0	0.0	0	0.0	24	0.7	0	0.0	0	0.0	0	0.0	1	1.8	0	0.0
Diaptomus spp.	0	0.0	0	0.0	5	0.2	0	0.0	0	0.0	0	0.0	<0.5	0.7	0	0.0
D. minutus	1	0.6	0	0.0	0	0.0	0	0.0	<0.5	<0.5	0	0.0	0	0.0	<0.5	<0.05
D. sicilis	61	48.9	0	0.0	3	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. ashlandi	2	1.8	0	0.0	16	0.5	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0
D. oregonensis	0	0.0	1	0.8	0	0.0	130	1.9	<0.5	<0.05	264	5.8	1	3.6	26	1.2
D. siciloides	2	1.7	0	0.0	16	0.5	0	0.0	3	0.4	19	0.4	<0.5	0.4	0	0.0
Cyclopoida (copepodid)	3	2.3	15	9.8	247	7.3	9	0.1	3	0.4	51	1.1	<0.5	0.9	<0.5	<0.05
Cyclops vernalis	0	0.0	0	0.0	186	5.5	0	0.0	3	0.4	0	0.0	0	0.0	0	0.0
C. bicuspidatus thomasi	46	36.7	3	2.3	118	3.5	456	6.8	<0.5	<0.05	0	0.0	<0.5	0.4	0	0.0
Mesocyclops edax	0	0.0	0	0.0	0	0.0	4	0.1	3	0.4	75	1.6	<0.5	0.4	<0.5	<0.05
Amphipoda																
Gammarus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	1.8	0	0.0
Hydracarina	<0.5	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	0.4	0	0.0
Insecta																
Ephemeroptera	<0.5	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chironomidae	<0.5	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals																
Cladocera	9	7.6	128	84.5	2,733	81.1	6,090	90.2	796	98.3	3,809	83.6	33	82.8	2,183	98.8
Calanoida	66	53.0	4	2.0	75	2.2	185	2.7	4	0.5	479	10.5	3	6.6	26	1.2
Cyclopoida	49	39.0	18	12.1	551	16.4	469	6.9	10	1.3	126	2.8	1	1.6	<0.5	<0.05
Other	1	0.4	1	0.4	8	0.2	4	0.1	0	0.0	142	3.1	4	9.0	0	0.0
Total	125		151		3,367		6,748		810		4,555		40		2,209	

the degradation and recycling of allochthonous organic material (organic matter settling from the water column) which would otherwise accumulate as bottom sediment. Benthic macroinvertebrates constitute a major food source for a number of fish species, thus transferring a considerable amount of energy derived from the sediment to higher trophic levels.

2.122
During the twelve-month sampling period, 96 taxa were identified at the Pomfret site, consisting of 25 dipterans, 13 trichopterans, 7 ephemeropterans, 12 mollusks, 9 annelids, and 5 bryozoans. The remaining 25 taxa were not representative of any one particular group.

2.123
Maximum invertebrate densities occurred during the months of May and August 1975. Data collected during the May sampling period indicate that the coelenterates were most abundant, while bryozoan densities were found to be relatively low. However, in the month of August bryozoans were present in the greatest numbers followed by coelenterates, cladocerans, and dipterans. Mean densities for Pomfret site macroinvertebrates colonizing natural substrates are presented in Table 2-23.

2.124
To complement the data obtained from natural sources and to determine rates of colonization by macroinvertebrates in the vicinity of the Pomfret site, artificial substrate samplers were employed. During the twelve-month sampling period maximum macroinvertebrate densities were recorded in early December 1974 and early July 1975. The coelenterates were found to be most abundant in both instances with amphipods and dipterans present in lesser but significant amounts. Mean densities for Pomfret site macroinvertebrates colonizing artificial substrate samplers are presented in Table 2-24. The following sections summarize the benthic biomass data and spatial distribution results at Pomfret:

- The yearly mean density from natural substrates was highest along the 10-foot contour. All of the more numerous organisms followed this trend except *Hydra* which was evenly distributed between the ten and thirty feet depth contours.
- Results from artificial substrates, as well, indicated that the highest benthic invertebrate yearly mean density was along the 10-foot contour. Three of the four most abundant taxa collected were most numerous at row 2, the 10-foot contour.
- The most evident spatial distribution difference was the higher abundance of benthic invertebrates along the 10-foot contour. This difference was primarily in density and not in numbers of taxa.

- In results of artificial substrate data, all stations followed the trends described for rows (with row 2 being highest). Yearly mean densities for stations along the 10-foot contour - 243 and 251 organisms per sample - were very similar but yearly mean densities along the 30-foot contour showed a trend in which densities increased from the western station (111) to the eastern station (113), primarily because of the abundance of Hydra.

Biomass distribution was influenced by the density of organisms at either extreme on the biomass "scale." As in the density distribution, biomass was highest along row 2. A review of the habitat preferences of some of the abundant taxa indicates the 10-foot depth contour to be a more suitable habitat; along it were 99 percent of the Cheumatopsyche (caddis fly) and 89 percent of Tanytarsus (midge) found. These organisms normally occur where current or wave action is appreciable (Ross, 1944; Peterson, 191; Hart and Fuller, 1974). Bryozoans are usually found in quiet waters but are sometimes found on rocky shoals with considerable wave action (Rogick, 1935; Pennak, 1953). The distribution of the bryozoans Cristatella and Paludicella indicated that the highest abundance (mean of all dates) was along the 10-foot depth contour where there are few silt accumulations, many rocks for suitable substrate, and much wave action. Substrate samples influenced the results of invertebrate distribution. Along the 10-foot contour, there were many rocks like the ones used for natural substrate samplers, whereas the 30-foot contour had fewer rocks and a thin layer of sediment (observed by divers). Since substrate samples resemble rocks, the rocky areas may have been sampled more effectively than areas with few rocks and little silt. The average biomass determined for offshore Lake Erie by Alley and Powers (1970) is 4.63 g/m^2, which is considerably higher than the average biomass (0.67 g/m^2) at Pomfret site. Cook and Johnston (1974) estimated Lake Erie's annual production to be 5 g/m^2/year, which is approximately equal to the mean standing crop (4.63 g/m^2).

Ichthyoplankton

2.125
Quantitative data on ichthyoplankton were collected in the vicinity of the Pomfret site from mid-April until August 1975. Fish eggs, yolk sac larvae, and postlarval ichthyoplankton were collected in shallow water up to six feet deep using a 0.5 meter epibenthic sled equipped with a 333 u net. Sampling at the 10- and 30-foot contour was accomplished using a 1.0 meter epibenthic sled and a 333 u net. For oblique and subsurface sampling of the water column at both the 10-foot and 30-foot contours, a 1.0 meter Tucker Trawl with a 333 u net was used. The species composition of ichthyoplankton in Lake

TABLE 2-23

POMFRET BENTHIC INVERTEBRATE SITE MEAN DENSITIES (NO./M^2) AND STANDARD ERROR (SE) FOR NATURAL SUBSTRATES, OCTOBER 1974-SEPTEMBER 1975

Taxa	Oct 28* No./m^2	Oct 28* SE	Dec 6 No./m^2	Dec 6 SE	Jan 8 No./m^2	Jan 8 SE	Apr 28,29* No./m^2	Apr 28,29* SE	May 30** No./m^2	May 30** SE	Jul 1 No./m^2	Jul 1 SE	Aug 1 No./m^2	Aug 1 SE	Aug 26 No./m^2	Aug 26 SE	Sep 26 No./m^2	Sep 26 SE
Coelenterata (hydroids, jellyfish)																		
Hydra spp.	3,127	1,468	87	128	2	2	117	60	19,813	12,142	15,700	9,611	1,222	309	95	45	2,406	1,441
Turbellaria (flatworms)	447	85	0	0	0	0	43	23	2	2	34	23	131	65	109	64	133	85
Nematoda (roundworms)	0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0	0	0
Bryozoa (moss animalcules)																		
Plumatellidae	0	0	0	0	0	0	0	0	25	16	0	0	13	9	0	0	0	0
Cristatella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,177	1,191	1,950	794
Cristatellidae	0	0	0	0	0	0	0	0	0	0	0	0	13,104	4,853	0	0	0	0
Paludicella articulata	0	0	0	0	0	0	0	0	543	362	547	475	334	200	683	459	445	245
Paludicellidae	0	0	0	0	0	0	0	0	134	134	0	0	0	0	0	0	0	0
Oligochaeta (aquatic earthworms)																		
Chaetogaster spp.	0	0	0	0	0	0	0	0	140	116	22	22	0	0	0	0	1	1
Pristina spp.	3	3	0	0	0	0	0	0	0	0	0	0	6	6	0	0	0	0
Stylaria spp.	0	0	0	0	0	0	0	0	0	0	5	4	4	4	7	4	7	4
Nais spp.	0	0	0	0	0	0	3	2	16	11	13	6	13	7	3	3	16	9
Naididae	3	3	0	0	0	0	4	4	0	0	2	2	0	0	0	0	0	0
Cladocera (water fleas)																		
Leptodora kindtii	0	0	0	0	0	0	0	0	0	0	13	8	8	8	0	0	0	0
Sididae spp.	0	0	0	0	0	0	0	0	0	0	0	0	155	46	2,027	1,736	865	504
Daphnia spp.	14	14	0	0	2	2	0	0	31	14	109	61	703	217	107	47	2	2
Bosminidae	0	0	0	0	8	8	0	0	14	10	0	0	327	183	2	2	0	0
Cladocera	0	0	0	0	32	19	0	0	1	1	0	0	0	0	0	0	0	0
Ostracoda (seed shrimps)	15	15	0	0	0	0	0	0	19	19	68	47	0	0	7	7	0	0
Copepoda (copepods)																		
Diaptomus spp.	7	7	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calanoida	0	0	0	0	13	13	0	0	12	6	4	2	162	59	5	5	0	0
Cyclops spp.	6	6	0	0	0	0	0	0	47	26	10	5	530	245	9	0	0	0
Cyclopoida	0	0	0	0	39	37	0	0	0	0	0	0	0	0	0	0	0	0
Harpacticoda	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Amphipoda (scuds)																		
Hyalella azteca	84	30	8	8	0	0	24	22	5	4	27	12	70	42	39	17	76	20
Gammarus spp.	391	170	8	8	0	0	17	9	10	4	77	28	369	268	120	61	37	15
Hydracarina (water mites)	61	51	0	0	0	0	1	1	3	3	0	0	4	2	2	2	3	2
Ephemeroptera (mayflies)																		
Stenonema spp.	150	48	0	0	0	0	8	4	3	3	45	31	23	6	34	27	9	4
Caenis spp.	13	6	0	0	0	0	2	2	4	3	2	2	18	8	2	2	0	0
Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2	0	0
Trichoptera (caddis flies)																		
Cheumatopsyche spp. (larvae)	125	61	0	0	0	0	17	12	7	3	103	93	326	176	190	94	139	58
Cheumatopsyche spp. (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0
Hydropsychidae (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Polycentropus spp.	65	38	0	0	0	0	10	5	1	1	14	14	0	0	0	0	0	0
Neureclipsis spp. (larvae)	27	14	0	0	0	0	4	3	1	1	0	0	152	66	237	154	294	162
Neureclipsis spp. (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	8	5	6	5	0	0
Hydroptilidae (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Oecetis spp.	0	0	0	0	0	0	0	0	86	38	2	2	13	11	23	13	16	10
Athripsodes spp.	128	46	0	0	0	0	22	10	15	4	44	28	58	25	30	7	10	5
Trichoptera (larvae)	4	4	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Trichoptera (pupae)	0	0	0	0	0	0	0	0	0	0	3	3	0	0	2	2	0	0

* During these months, substrates (flat stones) were collected from the lake bottom and washed; therefore, these samples represent total colonization over many years rather than colonization for 1 month.

** Includes data from samplers retrieved later than May 30. Refer to Table P74.2(v)-7 for exact invertebrate densities for each station.

TABLE 2-23 (cont.)

Taxa	Oct 20* No./m²	Oct 20* SE	Dec 6 No./m²	Dec 6 SE	Jan 8 No./m²	Jan 8 SE	Apr 28,29* No./m²	Apr 28,29* SE	May 30** No./m²	May 30** SE	Jul 1 No./m²	Jul 1 SE	Aug 1 No./m²	Aug 1 SE	Aug 26 No./m²	Aug 26 SE	Sep 26 No./m²	Sep 26 SE
Diptera (flies, mosquitoes, midges)							2	2	13	8	11	11	46	25	11	9	20	12
Ablabesmyia spp.	9	9	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Procladius spp.	0	0	0	0	0	0	4	4	51	26	103	87	6	4	0	0	2	2
Cricotopus spp.	0	0	0	0	0	0	4	3	128	95	344	175	77	17	61	22	63	20
Psectrocladius spp.	0	0	0	0	0	0	0	0	9	6	41	27	198	66	19	13	34	17
[illegible]fferiella spp.	7	7	0	0	0	0	0	0	26	26	0	0	0	0	0	0	0	0
Trichocladius spp.	0	0	0	0	0	0	5	5	0	0	4	4	0	0	0	0	0	0
Brillia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
Thienemanniella spp.	0	0	0	0	0	0	0	0	0	0	0	0	23	23	0	0	12	12
Cryptochironomus spp.	0	0	0	0	0	0	0	0	18	8	2	2	4	2	5	2	0	0
Dicrotendipes spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Microtendipes spp.	4	4	0	0	0	0	0	0	141	89	172	68	20	13	0	0	0	0
Parachironomus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudochironomus spp.	11	11	0	0	0	0	0	0	0	0	0	0	5	4	0	0	0	0
Glyptotendipes spp.	0	0	0	0	0	0	0	0	0	0	0	0	2	2	3	2	0	0
Polypedilum spp.	0	0	0	0	0	0	77	33	65	45	196	120	733	392	790	297	119	47
Tanytarsus spp.	288	120	12	12	0	0	0	0	4	4	0	0	0	0	0	0	0	0
Chironomidae (larvae)	0	0	0	0	0	0	0	0	0	0	4	2	0	0	0	0	0	0
Chironomidae (adult)	0	0	0	0	0	0	0	0	100	59	58	21	88	35	20	8	31	11
Chironomidae (pupae)	0	0	0	0	0	0												
Mollusca (snails, clams)							0	0	0	0	0	0	10	10	0	0	0	0
Viviparidae	8	5	0	0	0	0	5	2	0	0	0	0	4	2	5	4	2	2
Pleuroceridae	0	0	0	0	0	0	46	33	1	1	0	0	3	3	9	5	8	4
Amnicolidae	608	309	0	0	0	0	10	6	2	2	0	0	31	16	20	17	2	2
Physa spp.	59	15	0	0	0	0	0	0	0	0	0	0	4	2	0	0	2	2
Gyraulus spp.	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Ferrissia spp.	0	0	0	0	0	0	0	0	4	4	4	4	10	6	28	15	2	2
Gastropoda	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Unidentified invertebrate I	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0
Unidentified invertebrate II	6	6	0	0	0	0												
Total density	5,683		123		95		432		21,510		17,779		19,023		6,883		6,712	
No. of samples	18		8		12		16		16		19				18		18	

* During these months, substrates (flat stones) were collected from the lake bottom and washed; therefore, these samples represent total colonization over many years rather than colonization for 1 month.

** Includes data from samplers retrieved later than May 30. Refer to Table F74.2(v)-7 for exact invertebrate densities for each station.

TABLE 2-24

POMFRET BENTHIC INVERTEBRATE SITE MEAN NUMBERS PER ARTIFICIAL SUBSTRATE SAMPLE AND STANDARD ERROR (SE), SEPTEMBER 1974-SEPTEMBER 1975

Taxa	Sep 27 No./s	Sep 27 SE	Oct 28 No./s	Oct 28 SE	Dec 6 No./s	Dec 6 SE	Jan 8 No./s	Jan 8 SE	Apr 28,29 No./s	Apr 28,29 SE	May 30 No./s	May 30 SE	Jul 1 No./s	Jul 1 SE	Aug 1 No./s	Aug 1 SE	Aug 26 No./s	Aug 26 SE	Sep 26 No./s	Sep 26 SE
Coelenterata (hydroids, jellyfish)																				
Hydra spp.	18	17	ND		267	105	10	8	1	1	58	22	144	43	16	9	3	1	16	9
Hydrozoa	0	0	ND		0	0	0	0	0	0	0	0	10	10	0	0	0	0	0	0
Turbellaria (flatworms)																				
Dugesia spp.	0	0	ND		0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	3	1	ND		1	<0.5	0	0	0	0	1	1	9	4	5	1	3	2	2	1
Bryozoa (moss animalcules)																				
Paludicella articulata	0	0	ND		0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Cristatella spp.	0	0	ND		0	0	0	0	0	0	0	0	0	0	0	0	10	7	0	0
Cristatellidae	0	0	ND		0	0	0	0	0	0	0	0	0	0	7	4	0	0	0	0
Oligochaeta (aquatic earthworms)																				
Chaetogaster spp.	0	0	ND		0	0	0	0	0	0	6	4	3	3	0	0	<0.5	<0.5	0	0
Pristina spp.	1	1	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Stylaria spp.	0	0	ND		0	0	0	0	0	0	0	0	<0.5	<0.5	4	4	3	2	2	1
Nais spp.	0	0	ND		<0.5	<0.5	0	0	0	0	2	2	3	2	<0.5	<0.5	<0.5	<0.5	1	<0.5
Naididae	15	6	ND		1	<0.5	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Tubificidae	20	18	ND		<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Polychaeta (polychaetes)																				
Manayunkia speciosa	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	0	0	ND		0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Hirudinea (leeches)			ND																	
Piscicola spp.	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Piscicolidae	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocera (water fleas)																				
Leptodora kindti	0	0	ND		0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	<0.5	<0.5	0	0
Sididae	0	0	ND		0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	3	3	0	0
Daphnidae	2	2	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daphnia spp.	3	2	ND		4	4	0	0	0	0	2	1	6	2	44	14	5	2	6	5
Bosminidae	0	0	ND		4	3	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	0	0
Cladocera	0	0	ND		0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0
Ostracoda (seed shrimps)	14	11	ND		1	1	<0.5	<0.5	0	0	<0.5	<0.5	7	5	6	4	1	1	0	0
Copepoda (copepods)																				
Calanoida	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	2	1	<0.5	<0.5	1	1
Diaptomus spp.	<0.5	<0.5	ND		1	1	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0
Cyclops spp.	2	2	ND		<0.5	<0.5	0	0	0	0	<0.5	<0.5	<0.5	<0.5	1	0.5	<0.5	<0.5	0	0
Cyclopoida	0	0	ND		0	0	<0.5	<0.5	2	2	0	0	0	0	0	0	0	0	0	0
Harpacticoida	1	1	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Isopoda (aquatic sow bugs)																				
Asellus spp.	0	0	ND		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	0	1	1	4	4	<0.5	<0.5	0	0
Amphipoda (scuds)																				
Hyalella azteca	71	67	ND		55	14	5	4	7	2	9	3	5	3	10	2	17	5	57	13
Pontoporeia affinis	1	<0.5	ND		0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0
Gammarus spp.	79	50	ND		32	9	2	1	15	7	68	24	96	34	91	29	37	13	55	10
Amphipoda	0	0	ND		0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0
Hydracarina (water mites)	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0.5	0.5	<0.5	<0.5	0	0
Ephemeroptera (mayflies)																				
Heptageniidae	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Stenonema spp.	0	0	ND		0	0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	1	2	1	0	0	1	1
Caenis spp.	1	1	ND		<0.5	<0.5	<0.5	<0.5	0	0	7	4	6	4	6	4	1	<0.5	5	3
Leptohyphes spp.	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ephemeroptera (pupae)	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0

TABLE 2-24

TABLE 2-24 (cont.)

Taxa	Sep 27 No./m²	Sep 27 SE	Oct 28 No./m²	Oct 28 SE	Dec 6 No./m²	Dec 6 SE	Jan 8 No./m²	Jan 8 SE	Apr 28,29 No./m²	Apr 28,29 SE	May 30 No./m²	May 30 SE	Jul 1 No./m²	Jul 1 SE	Aug 1 No./m²	Aug 1 SE	Aug 26 No./m²	Aug 26 SE	Sep 26 No./m²	Sep 26 SE
Trichoptera (caddis flies)																				
Hydropsyche spp.	1	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheumatopsyche spp. (larvae)	0	0	ND		1	1	<0.5	<0.5	1	1	1	1	7	7	7	4	9	4	5	3
Cheumatopsyche spp. (pupae)	0	0	ND		0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0
Polycentropus spp.	0	0	ND		1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0	0	0	0	<0.5	<0.5
Neureclipsis spp.	1	<0.5	ND		0	0	0	0	0	0	0	0	0	0	1	1	<0.5	<0.5	1	<0.5
Hydroptila spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Oecetis spp.	0	0	ND		0	0	0	0	0	0	1	1	0	0	<0.5	<0.5	<0.5	<0.5	0	0
Athripsodes spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	0	0	0	0	<0.5	<0.5
Diptera (flies, mosquitoes, midges)																				
Ablabesmyia spp.	1	1	ND		1	1	0	0	0	0	1	<0.5	2	1	8	3	3	1	4	2
Coelotanypus spp.	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanypodinae spp.	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus spp.	<0.5	<0.5	ND		0	0	<0.5	<0.5	0	0	2	2	3	1	<0.5	<0.5	2	1	0	0
Psectrocladius spp.	0	0	ND		0	0	0	0	0	0	2	1	4	1	4	1	1	1	1	1
Eukiefferiella spp.	0	0	ND		0	0	0	0	0	0	1	1	0	0	<0.5	<0.5	0	0	0	0
Trichocladius spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Corynoneura spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Thienemanniella spp.	0	0	ND		0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0
Chironomus spp.	3	2	ND		0	0	0	0	0	0	<0.5	<0.5	2	1	<0.5	<0.5	<0.5	<0.5	5	5
Cryptochironomus spp.	0	0	ND		0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0
Dicrotendipes spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	3	2	<0.5	<0.5	<0.5	<0.5	0	0
Microtendipes spp.	8	8	ND		0	0	0	0	0	0	1	<0.5	14	6	1	<0.5	0	0	15	6
Parachironomus spp.	0	0	ND		0	0	0	0	0	0	1	<0.5	1	1	1	1	0	0	0	0
Micropsectra spp.	0	0	ND		0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Polypedilum spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	1	<0.5	1	<0.5	2	1	0	0
Tanytarsus spp.	1	1	ND		51	40	2	1	1	<0.5	6	4	18	10	38	26	75	17	6	2
Chironomidae (larvae)	0	0	ND		0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0
Chironomidae (adult)	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	3	3	0	0	0	0
Chironomidae (pupae)	<0.5	<0.5	ND		0	0	0	0	0	0	1	1	2	1	6	4	2	1	3	2
Chaoborus spp.	0	0	ND		0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Empididae	0	0	ND		0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0
Mollusca (snails, clams)																				
Pleuroceridae	0	0	ND		0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0
Amnicola spp.	0	0	ND		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Amnicolidae	1	<0.5	ND		1	<0.5	0	0	<0.5	<0.5	1	1	1	<0.5	2	2	1	1	2	1
Physa spp.	1	<0.5	ND		0	0	0	0	<0.5	<0.5	5	5	2	2	1	<0.5	<0.5	<0.5	2	1
Physidae	0	0	ND		0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Gyraulus spp.	0	0	ND		0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0
Gastropoda	0	0	ND		0	0	0	0	0	0	0	0	10	6	0	0	<0.5	<0.5	1	<0.5
Sphaerium spp.	<0.5	<0.5	ND		0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5
Unidentified invertebrate	1	<0.5	ND		1	1	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Total density	248				422		21		28		180		363		273		201		189	
No. of samples	6				8		12		12		12		12		10		12		8	

Erie adjacent to the Pomfret site is reported by gear type in Table 2-25.

2.126
Fish eggs were present in ichthyoplankton samples from mid-April through July when water temperatures in Lake Erie were steadily increasing. Only rainbow smelt and burbot eggs were collected during April and May, while white bass eggs appeared in early June. Freshwater drum and minnow eggs were consistently present throughout June and July.

2.127
From the data presented in Table 2-25 it is apparent that eggs are poorly represented although this situation may be due to overall size of the sampling equipment used as well as the inaccessibility of the eggs of certain Lake Erie fish species. Despite the paucity of the egg catch, data on yolk-sac and post-larvae indicate that spawning in or near the study area may have indeed occurred. For example, the yolk sac larvae of the yellow perch were present in considerable numbers at the Pomfret site. The abundance of yellow perch larvae and the presence of many ripe, running, and spent adults in the area at the same time indicate that spawning was underway. Similarly, very few walleye larvae were collected during this survey, but large numbers of walleye eggs were collected from the stomachs of adult yellow perch. These data suggest that walleye spawning had occurred in the area although there is no further information to substantiate this observation. In general, the egg and larvae catch data, along with supplemental information from adult fish studies, indicate that the Pomfret site is an important nursery area for young-of-the-year fish species. These same data also indicate that Lake Erie in the vicinity of the Pomfret site may be a spawning area for certain fish species.

2.128
Catches from the three primary gear types indicate that yolk sac larval abundance peaked twice during 1975. The first and largest peak occurred in late May and early June and was composed primarily of yellow perch, log perch, and rainbow smelt. The second peak occurred in early July and consisted of freshwater drum and minnows. Yellow perch clearly dominated catches during the first peak in densities (23 May through 2 June), usually accounting for 55-98 percent of the daily catches regardless of gear. Catches during the second peak were more evenly divided between the two dominant species, but minnows were generally more abundant relative to drum in the surface than in bottom samples. A closer examination of yolk-sac larval densities during late May and early June indicated that peak numbers of yellow perch preceded peak numbers of smelt and logperch just slightly. This corresponds to the natural spawning sequence of these three species.

TABLE 2-25

POMFRET SPECIES COMPOSITION (PERCENT OF TOTAL CATCH) OF EGGS, YOLK-SAC LARVAE AND POST LARVAE BY GEAR TYPE, POMFRET SITE, MID-APRIL THROUGH AUGUST 1975

		1-m Epibenthic Sled		1-m Tucker Trawl			0.5-m Epibenthic Sled
		Bottom Tow		Surface Tow	Oblique Tow		Bottom Tow
		Day	Day/Night	Day/Night	Day	Day	Day
	Species†††	10-,30-Ft Contours	30-Ft Contour	30-Ft Contour	10-,30-Ft Contours	50-Ft Contour	Van Buren Bay
Eggs	Rainbow smelt	0	0.6	0	<0.1	0	81.5
	Minnows-Shiners	0.2	0.8	0	97.8	0	0
	Burbot	0	0	0	0.1	0	0
	White bass	0	0	<0.1	0	0	0
	Freshwater drum	95.1	95.1	99.9	0.2	98.3	18.5
	Unidentified	4.7	3.5	0.1	1.9	1.7	0
	Mean density	1.9	0.81	16.2	14.8	1.8	6.5
	No. of samples	198	84	84	118	30	18
Yolk-Sac Larvae	Gizzard shad	<0.1	0	0	0	0	0
	Rainbow smelt	3.8	6.3	6.7	4.2	13.0	0.6
	Carp	1.5	0.7	1.7	1.5	9.5	3.8
	Goldfish-Carp*	<0.1	0.1	0.4	0.6	0	0.6
	Minnows-Shiners**	8.5	38.3	29.8	1.7	18.5	5.1
	Suckers***	<0.1	0.1	0	0	0	0
	Trout perch	0.2	1.0	0.4	0.1	2.3	0.1
	Burbot	<0.1	0.1	0	0.1	0.4	0
	White bass	0.4	0.2	0.9	0.3	0	0
	Rock bass	0.1	0	0	<0.1	0	0
	Sunfishes†	0	0	0	<0.1	0	0
	Yellow perch	60.8	29.2	40.1	71.3	38.7	80.9
	Log perch	17.2	5.0	1.9	19.8	10.4	8.4
	Walleye	0.4	0.1	0	0.1	0	0.4
	Perches††	<0.1	2.3	15.6	<0.1	1.5	0
	Freshwater drum	7.0	16.5	2.3	0.1	5.4	0.1
	Slimy sculpin	0	0	0	<0.1	0.2	0
	Unidentified	0.1	0.1	0.1	<0.1	0	0
	Mean density	38.3	11.4	5.7	30.1	5.2	106.2
	No. of samples	198	84	84	118	30	18
Post-Larvae	Alewife	1.4	4.6	1.3	0.7	0	0
	Gizzard shad	0.3	0.1	0.5	0.1	0	0
	Herrings	<0.1	0	0	0	0	0
	Rainbow smelt	62.5	81.8	22.9	12.8	32.3	15.9
	Carp	0.4	0.4	5.9	0.4	15.6	0
	Goldfish-Carp	0	0.1	1.0	0.1	0	0
	Spottail shiner	0.6	0.1	0	0	0	0
	Minnows-Shiners	4.4	3.8	48.0	1.5	23.1	0.5
	Trout perch	0	0.7	0	<0.1	2.2	0.5
	Brook silversides	<0.1	<0.1	0	0	0	0
	White bass	0.1	0	0.1	<0.1	0	0
	Rock bass	0.1	0.1	0	0.1	0	0
	Bluegill	0	0	0.1	0	0	0
	Sunfishes	<0.1	0	0	0	0	0
	Yellow perch	21.0	4.8	13.2	78.6	20.2	44.4
	Log perch	8.7	2.7	3.5	5.2	3.7	38.6
	Walleye	0.1	0	0	0	0	0
	Perches	<0.1	0.2	3.3	0.1	0	0
	Freshwater drum	0.2	0.2	0	0.1	0.4	0
	Slimy sculpin	<0.1	0.3	0	0.1	2.4	0
	Unidentified	<0.1	0.1	0.2	<0.1	0	0
	Mean density	31.4	27.0	9.8	31.8	4.7	17.7
	No. of samples	198	84	84	118	30	18

*Goldfish and goldfish-carp hybrids.
**Unidentified species of Cyprinidae; many are probably emerald and spottail shiners.
***Unidentified species of Catostomidae.
†Unidentified species of Centrarchidae.
††Unidentified species of Percidae; many are darters of the genus *Etheostoma*.
†††Common names recognized by American Fisheries Society (Baily et al, 1970). See Table P74.2(vii)-1 for scientific names.

2.129
Yolk-sac larvae (all species combined) were usually more abundant in bottom than in surface samples. The most obvious differences between the two depth strata occurred during late May-early June when yellow perch were abundant and in early July when minnows and freshwater drum were abundant. During late May-early June, the number of yellow perch in the bottom (sled) tows was significantly higher than that in the surface tows. Although the difference between the derived mean surface density (2.9 larvae/100 m^3) was not large, yellow perch were more abundant at the bottom during both day and night sampling on both dates.

2.130
Considering all species found at Pomfret, yolk-sac larvae densities exhibited two consistent patterns with respect to spatial distribution. First, densities were always higher along the 10-foot contour than along the 30-foot contour when directly comparable epibenthic sled or oblique Tucker-trawl samples were considered. Oblique tow samples were not taken at the 50-foot contour on the same dates on which the 10-foot and 30-foot contours were sampled and thus are not directly comparable. Apparently, yolk-sac larvae densities continued to decrease with increasing water depth. Regarding the second pattern, the highest density along both the 10-foot and 30-foot contours was frequently found at the station on the east end of the contour. When bottom catches at the three stations along each contour were combined to describe yolk-sac larva abundance at each contour, densities at the 10-foot contour were always significantly higher than were those at 30-foot. Densities at the 10-foot contour were not highest on every sampling date, producing a significant interaction between time and contours, but the exceptions were rare and the derived mean density for 10-foot contour (16.82 larvae/100m^3) was clearly much higher than the mean for 30-foot contour (7.50 larvae/100m^3).

2.131
The literature indicates that many of the species captured at Pomfret exhibit a preference for shallow water during the postlarval (and in some cases, juvenile) life stage. Fish (1932), for example, found that young yellow perch and trout-perch in Lake Erie were usually more abundant in shallow water. Eddy and Underhill (1974) indicate that young rainbow smelt, alewives, and emerald shiners exhibit a preference for shallow water, at least for the first month. Furthermore, according to Wells and House (1974), spottail shiners prefer the shallowest waters in the Great Lakes. Mansueti and Hardy (1967) state that carp and goldfish yolk-sac larvae are frequently found in very shallow water. Therefore, intentional movements by late yolk-sac larvae may account, in part, for the higher catches at the 10-foot contour.

2.132
Postlarvae were first identified in samples taken during mid-May. Seven taxa were represented in May samples and an additional six during the first half of June. Many taxa were present at the study site for two or three months, but only one species, rainbow smelt, was present for more than three months. Samples collected during the latter half of August yielded only three taxa - alewife, rainbow smelt, and minnows (excluding the relatively rare brook silverside). During late May-early June, postlarval catches (all species combined) increased rapidly and peaked coinciding basically with the first peak in densities of yolk-sac larvae. In weekly bottom tows, postlarval densities (all species combined) were high from late May through most of June and again during late July. Large catches continued through June because three different species (yellow perch, rainbow smelt, and logperch) exhibited abundance peaks in sequence.

2.133
Although freshwater drum postlarvae were uncommon at Pomfret, they did comprise about 15 percent of the total bottom catch along the 10-foot contour on July 22. Cyprinids (carp, goldfish, minnows, and shiners) increased in numerical importance in the bottom tows through July and early August. Alewives, the postlarvae of which were collected at the Pomfret site from early June through August, probably spawn more frequently in tributaries than in shoal areas of Lake Erie (Eddy and Underhill, 1974). Since neither alewife eggs nor yolk-sac larvae were found in Pomfret samples, alewives probably had not spawned in the near vicinity of the Pomfret site. Rainbow smelt postlarvae dominated day/night sled catches at the 30-foot contour in late May and early June when yellow perch were abundant. Day/night surface tows indicated that postlarvae of darters (including logperch) were more abundant in night catches. Bottom tows during the day, however, caught about the same amount of darters as those at night. Since these day/night differences were observed in surface but not bottom catches, some daytime gear avoidance by postlarvae may exist in the upper depth strata.

2.134
Overall there were no significant differences between ichthyoplankton tows at the surface and bottom. However, some species did exhibit very distinct vertical distribution patterns. Of the four numerically important taxa of postlarvae, the perches (including yellow perch, logperch, and some darters) were equally represented in surface and bottom tows. Rainbow smelt and certain minnows demonstrated obvious surface-to-bottom differences. The former were most abundant in bottom samples and the latter dominated surface catches. Rainbow smelt usually accounted for three-fourths or more of the postlarvae in bottom catches from late June through August. During the same period, minnows usually accounted for three-fifths or

more of the postlarvae in surface catches. The opposing distributions apparently produced the statistical similarity between depths when total catches (all species combined) were considered. With respect to abundance along rows and columns, the spatial distribution of postlarvae exhibited the same consistent patterns as those observed for yolk-sac larvae. Postlarval densities were always higher along the 10-foot contour than along the 30-foot contour when either bottom or oblique tows are compared. As with yolk-sac larvae, oblique catches suggest that postlarval densities decreased with increasing water depth.

2.135
Spatial distribution of postlarval ichthyoplankton at the Pomfret site during late May through late July is quite similar to the yolk-sac larva distribution. Yolk-sac larvae are generally poor swimmers, so the spatial distribution of this life stage is expected to be governed more by physical phenomena (currents, prevailing winds, etc.) than by intentional movements of the larvae. The similarity between the yolk-sac larva and postlarval spatial distribution at Pomfret suggests that physical factors may also have been the principal agents regulating the distribution of postlarvae, at least the younger phases. However, as the postlarvae grow and become stronger swimmers, behavioral preferences as well as physical phenomena govern distribution. The apparent off-shore movement of rainbow smelt postlarvae in July may have been an example of this. Relatively high concentrations of postlarvae along the 10-foot contour at Pomfret would be expected to continue, because many species caught at Pomfret exhibit a preference for shallow nearshore water. For example, catches of young-of-the-year or older fish in beach seines, fyke nets, and trawls indicated that spottail and emerald shiners as well as gizzard shad were most abundant in shallow (10 feet) nearshore waters. Other studies also have found that species frequently caught at Pomfret exhibit a preference for nearshore water, e.g. young-of-the-year yellow perch (Fish, 1932), gizzard shad (Miller, 1960), carp and goldfish (Mansueti and Hardy, 1967), and darters and sunfishes (Scott and Crossman, 1973).

2.136
Maximum ichthyoplankton densities for Lake Erie in the vicinity of the proposed Pomfret site are presented in Table 2-26. Detailed data on ichthyoplankton densities and diurnal behavior can be found in Section 74.2 of the applicant's New York State Article VIII Application.

Fisheries

2.137
From September 1974 through September 1975 adult and young-of-the-year fish species were collected from Lake Erie in the vicinity of

the Pomfret site. The sampling program was designed to determine species composition and relative abundance of Lake Erie fishes and to compare spatial and temporal variations. Sampling gear employed during this survey included beach seines, fyke nets, electroshockers, gill nets, and trawls. Fish collected were sorted by species and life stage then weighed and measured. Age and growth determinations were made to obtain data on abundance of year classes, growth rates, and life span of populations. Stomach analyses were also performed to identify food web interrelationships among fish and forage components of the aquatic ecosystem.

2.138
During the twelve-month sampling period 41 species of fish representing young-of-the-year, yearlings, and adults were collected from Lake Erie in the vicinity of the Pomfret site. The occurrence of these species varied throughout the year with the highest number (23 species) recorded during the months of June and August. A complete list of fish species taken from Lake Erie in the vicinity of the Pomfret site is presented in Table 2-27.

Shore Zone

2.139
The shore zone in the vicinity of the Pomfret site is generally characterized by water depths less than 1.5 meters. In this area sampling was performed using 50-foot and 100-foot beach seines. Of the 41 fish species captured in the Pomfret study area, 33 were taken in beach seines. Spottail shiner and emerald shiner generally dominated the catch throughout the year although yearling gizzard shad were taken in significant numbers in early May and September 1975.

Shoal Zone

2.140
The shoal zone generally consists of that portion of the Pomfret study area exhibiting water depths from 1.5-2.0 meters and is considered to be a transition area between the shore zone and the deep water zone. Sampling in this area was accomplished using fyke nets. During the survey of this area the most abundant species was the spottail shiner. Young-of-the-year emerald shiners were taken in this zone during November along with gizzard shad. Rock bass were common in the shoal zone throughout most of the year.

Deep Water Zone

2.141
The deep water zone includes the aquatic habitat at the 10-foot and 30-foot Lake Erie contours. Sampling was conducted at the surface and bottom to detect variations in species composition in the water

TABLE 2-26

MAXIMUM ICHTHYOPLANKTON DENSITIES

LAKE ERIE IN THE VICINITY OF THE POMFRET SITE
MID-APRIL 1975 - SEPTEMBER 1975

	Species	Maximum Densities (No./100 m^3) 1.0 Meter Epibenthic Sled Daytime Bottom Tows 10 Ft. and 30 Ft. Contour. Total of 204 Samples April-August.		Maximum Densities (No./100 m^3) 1.0 Meter Tucker Trawl Daytime Oblique Tows 10 Ft. and 30 Ft. Contours. Total 120 Samples April-August.		Maximum Densities (No./100 m^3) 1.0 Meter Tucker Trawl Oblique Daytime Tows 50 Ft. Contour. May-July.	
		Maximum	Date	Maximum	Date	Maximum	Date
EGGS	Minnows-Shiners	0.05	22 June	144.36	30 June	ND	ND
EGGS	Rainbow Smelt	ND	ND	0.06	19 May	ND	ND
EGGS	Burbot	ND	ND	0.03	30 April	ND	ND
EGGS	Freshwater Drum	28.00	7 July	0.21	15 July	8.68	7 July
EGGS	White Bass	ND	ND	ND	ND	ND	ND
EGGS	Unidentified	0.43	22 June	1.69	2 June	0.15	22 July
YOLK-SAC LARVAE	Gizzard Shad	0.09	2 June	ND	ND	ND	ND
YOLK-SAC LARVAE	Rainbow Smelt	13.92	2 June	8.11	2 June	2.90	9 June
YOLK-SAC LARVAE	Carp	7.85	2 June	3.47	2 June	2.48	9 June
YOLK-SAC LARVAE	Goldfish-Carp*	0.13	14-15 July	0.50	2 June	ND	ND
YOLK-SAC LARVAE	Minnows-Shiners	22.56	7 July	3.02	2 June	2.99	7 July
YOLK-SAC LARVAE	Suckers**	0.07	22 June	ND	ND	ND	ND
YOLK-SAC LARVAE	Trout Perch	0.52	2 June	0.14	2, 17 June	0.59	9 June
YOLK-SAC LARVAE	Burbot	0.02	23 May	0.39	19 May	0.10	29 May
YOLK-SAC LARVAE	White Bass	1.72	2 June	0.60	2 June	ND	ND
YOLK-SAC LARVAE	Rock Bass	0.42	14-15 July	0.10	15 July	ND	ND
YOLK-SAC LARVAE	Yellow Perch	215.64	29 May	212.17	2 June	6.86	29 May
YOLK-SAC LARVAE	Log Perch	55.85	2 June	57.76	2 June	2.03	9 June
YOLK-SAC LARVAE	Walleye	1.29	23 May	0.43	19 May	ND	ND
YOLK-SAC LARVAE	Perches***	0.08	29 May	0.09	2 June	ND	ND
YOLK-SAC LARVAE	Freshwater Drum	34.33	7 July	0.27	15 July	1.26	7 July
YOLK-SAC LARVAE	*Slimy Sculpin*	ND	ND	0.09	2 June	.05	9 June
YOLK-SAC LARVAE	Sunfishes	ND	ND	0.02	2 June	ND	ND
YOLK-SAC LARVAE	Unidentified	0.24	29 May	0.09	2 June	ND	ND
POSTLARVAE	Alewife	5.39	28-29 July	1.06	15 July	ND	ND
POSTLARVAE	Gizzard Shad	0.84	22 June	0.16	15 July	ND	ND
POSTLARVAE	Herring+	0.08	28-29 July	ND	ND	ND	ND
POSTLARVAE	Rainbow Smelt	130.07	28-29 July	21.70	17 June	3.55	22 June
POSTLARVAE	Carp	0.74	7 July	0.68	15 July	2.72	9 June
POSTLARVAE	Spottail Shiner	3.36	28-29 July	ND	ND	ND	ND
POSTLARVAE	Minnows-Shiners	18.09	28-29 July	2.28	15 July	4.00	22 June
POSTLARVAE	Brook Silver-Sides	0.08	27 August*	ND	ND	ND	ND
POSTLARVAE	White Bass	0.52	9 June	0.08	15 July	ND	ND
POSTLARVAE	Rock Bass	0.31	14-15 July	0.27	15 July	ND	ND
POSTLARVAE	Sunfishes++	0.21	28-29 July	ND	ND	ND	ND
POSTLARVAE	Yellow Perch	62.96	2 June	246.41	2 June	4.48	9 June
POSTLARVAE	Log Perch	18.89	22 June	7.31	2 June	0.73	9 June
POSTLARVAE	Walleye	0.72	29 May	ND	ND	ND	ND
POSTLARVAE	Perches	0.03	9 June	0.18	2 June	ND	ND
POSTLARVAE	Freshwater Drum	0.83	22 July	0.33	15 July	0.10	22 July
POSTLARVAE	Slimy Sculpin	0.15	9 June	0.40	17 June	0.56	9 June
POSTLARVAE	Goldfish-Carp	ND	ND	0.24	30 June	ND	ND
POSTLARVAE	Trout Perch	ND	ND	0.07	15 July	0.52	9 June
POSTLARVAE	Bluegill	ND	ND	ND	ND	ND	ND
POSTLARVAE	Unidentified	0.05	22 June	0.11	30 June	ND	ND

ND - No Data
*Goldfish and Goldfish-Carp Hybrids
**Unidentified Species of Catostomidae
***Unidentified Species of Percidae
+Unidentified Species Clupeidae (Probably Alewife and Gizzard Shad)
++Unidentified Species of Centrachidae

TABLE 2-26 (Continued)

MAXIMUM ICHTHYOPLANKTON DENSITIES
LAKE ERIE IN THE VICINITY OF THE POMFRET SITE

MID-APRIL 1975 - SEPTEMBER 1975

	Species	Maximum Densities (No./100 m^3) Six Day and Six Night Samples 1.0 Meter Epibenthic Sled Bottom Tows 30 Ft. Contour. Total 84 Samples May-August.		Maximum Densities (No./100 m^3) Six Day and Six Night Samples 1.0 Meter Tucker Trawl Surface Tows 30 Ft. Contour May-August 1975. Total Samples 84.		Maximum Densities (No./100 m^3) 0.5 Meter Epibenthic Sled Day Time Bottom Tows Van Buren Bay. Total 18 Samples April-September.	
		Maximum	Date	Maximum	Date	Maximum	Date
EGGS	Minnows-Shiners	0.09 (Day)	22 June	ND	ND	2.5	7 July
	Rainbow Smelt	0.07 (Night)	12-13 May	ND	ND	41.4	14 April
	Burbot	ND	ND	ND	ND	ND	ND
	Freshwater Drum	5.89 (Night)	7 July	182.92 (Day)	7 July	10.8	7 July
	White Bass	ND	ND	0.05 (Day)	9 June	ND	ND
	Unidentified	0.21 (Day)	22 June	0.18 (Night)	7 July	ND	ND
YOLK-SAC LARVAE	Gizzard Shad	ND	ND	ND	ND	ND	ND
	Rainbow Smelt	7.91 (Night)	9 June	2.64 (Day)	9 June	3.00	30 May
	Carp	0.80 (Night)	29 May	0.51 (Night)	9 June	35.90	30 May
	Goldfish-Carp*	0.11 (Day)	9 June	0.32 (Night)	9 June	6.00	30 May
	Minnows-Shiners	38.41 (Day)	7 July	9.25 (Day)	7 July	47.90	7 July
	Suckers**	0.15	22 June	ND	ND	ND	ND
	Trout Perch	0.70 (Night)	9 June	0.31 (Night)	29 May	0.8	17 June
	Burbot	0.15 (Night)	29 May	ND	ND	ND	ND
	White Bass	0.32 (Night)	7 July	0.34 (Night)	7 July	ND	ND
	Rock Bass	ND	ND	ND	ND	ND	ND
	Yellow Perch	39.68 (Day)	29 May	28.62 (Day)	29 May	765.7	30 May
	Log Perch	3.86 (Day)	29 May	0.62 (Night)	29 May	77.0	30 May
	Walleye	0.10 (Day)	29 May	ND	ND	3.7	30 May
	Perches***	2.44 (Night)	29 May	6.15 (Night)	29 May	ND	ND
	Freshwater Drum	14.19 (Night)	7 July	1.42 (Night)	7 July	0.8	7 July
	Slimy Sculpin	ND	ND	ND	ND	ND	ND
	Sunfishes	ND	ND	ND	ND	ND	ND
	Unidentified	0.13	22 July	0.04 (Day)	9 June	ND	ND
POSTLARVAE	Alewife	10.57 (Night)	27 August	1.37 (Night)	22 July	ND	ND
	Gizzard Shad	0.19 (Day)	7 July	0.34 (Night)	22 June	ND	ND
	Herring+	ND	ND	ND	ND	ND	ND
	Rainbow Smelt	160.05 (Day)	22 July	16.11 (Day)	9 June	25.3	17 June
	Carp	0.95 (Day)	7 July	5.51 (Day)	7 July	ND	ND
	Spottail Shiner	0.29 (Night)	22 July	ND	ND	ND	ND
	Minnows-Shiners	11.94 (Night)	22 July	17.07 (Day)	7 July	0.8	7 July
	Brook Silver-Sides	0.08 (Day)	27 August	ND	ND	ND	ND
	White Bass	ND	ND	0.05(Day/Night)	9 June	ND	ND
	Rock Bass	0.41 (Night)	7 July	ND	ND	ND	ND
	Sunfishes++	ND	ND	ND	ND	ND	ND
	Yellow Perch	11.26 (Day)	9 June	9.29 (Day)	29 May	63.5	30 May
	Log Perch	2.48 (Day)	9 June	3.76 (Night)	9 June	32.8	30 May
	Walleye	ND	ND				
	Perches	0.32 (Night)	7 July	4.58 (Night)	29 May	ND	ND
	Freshwater Drum	0.72 (Night)	22 July	ND	ND	ND	ND
	Slimy Sculpin	0.55 (Night)	22 June	ND	ND	ND	ND
	Goldfish-Carp	0.17 (Night)	29 May	1.41 (Day)	7 July	ND	ND
	Trout Perch	2.28 (Night)	7 July	ND	ND	0.9	30 June
	Bluegill	ND	ND	0.12 (Night)	22 June	ND	ND
	Unidentified	0.12 (Night)	22 June	0.31 (Night)	7 July	ND	ND

TABLE 2-27

FISH SPECIES CAPTURED IN LAKE ERIE AT POMFRET, SEPTEMBER 1974-SEPTEMBER 1975

Scientific Name	Common Name
Acipenseridae	* Sturgeons
Acipenser fulvescens	Lake sturgeon
Lepisosteidae	Gars
Lepisosteus osseus	Longnose gar
Clupeidae	Herrings
Alosa pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Salmonidae	Salmons
Oncorhynchus kisutch	Coho salmon
O. tshawytscha	Chinook salmon
Salmo gairdneri	Rainbow trout
S. namaycush	Lake trout
Osmeridae	Smelts
Osmerus mordax	Rainbow smelt
Esocidae	Pikes
Esox masquinongy	Muskellunge
Cyprinidae	Minnows & carps
Carrassius auratus	Goldfish
Clinostomus elongatus	Redside dace
Rhinichthys cataractae	Longnose dace
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
N. cornutus	Common shiner
N. hudsonius	Spottail shiner
** ~~*N. simus*~~	Bluntnose minnow
Cyprinus carpio	Carp
Semotilus atromaculatus	Creek chub
Catostomidae	Suckers
Carpiodes cyprinus	Quillback
Catostomus commersoni	White sucker
Hypentelium nigricans	Northern hog sucker
Moxostoma macrolepidotum	Shorthead redhorse
Ictaluridae	Freshwater catfish
Ictalurus nebulosus	Brown bullhead
I. punctatus	Channel catfish
Noturus flavus	Stonecat
Percopsidae	Trout perches
Percopsis omiscomaycus	Trout perch
Gadidae	Codfishes
Lota lota	Burbot
Atherinidae	Silversides
Labidesthes sicculus	Brook silverside
Percichthyidae	Temperate basses
Morone chrysops	White bass
Centrarchidae	Sunfishes
Ambloplites rupestris	Rock bass
Lepomis macrochirus	Bluegill
Micropterus dolomieui	Smallmouth bass
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappie
Percidae	Perches
Perca flavescens	Yellow perch
Percina caprodes	Log perch
Stizostedion vitreum vitreum	Walleye
Sciaenidae	Drums
Aplodinotus grunniens	Freshwater drum
Cottidae	Sculpins
Cottus cognatus	Slimy sculpin

* only one specimen caught; immediately released

** PIMEPHALES NOTATUS

column. Surface sampling was accomplished using surface gill nets and surface trawls while subsurface sampling was effected using bottom trawls and gill nets. Yellow perch were generally abundant in gill net samples throughout the study period although peaks were recorded from late April to the end of June. Yearling and spottail shiners were also most abundant in gill net catches from late April through June, while spottail shiners were captured by bottom gill net in every month sampled. From September through November and April through August 1975, walleye were collected in gill nets with peak abundance periods occurring in early June. No young-of-the-year walleye or yellow perch were taken in gill nets during any sampling month. Gizzard shad were abundant in this area in September 1974 but in December 1974 and January 1975 rainbow smelt were most numerous. Carp, white sucker, shorthead redhorse, stonecat, and freshwater drum were taken regularly in gill nets although their relative abundance varied with season.

2.142
Bottom trawls were used for daytime sampling in the deep water zone from April through September. During this period 161 individuals representing six species were collected. Rainbow smelt and emerald shiner were abundant in all bottom trawl samples while alewife, gizzard shad, and spottail shiner were present in lesser but significant numbers.

2.143
Surface gill nets were set at night to develop an index of the relative night-time activity of various fish species frequenting the study area. During this segment of the survey, alewife was found to be most abundant in gill net samples. Walleye, yellow perch, and spottail shiners were captured in surface gill nets in June and July 1975 while gizzard shad were only taken in August.

2.144
A generalized listing of the occurrence of fish species at the Pomfret study site is presented in Table 2-28. Table 2-29 shows yearly catch totals for the most abundant and important fish species caught in Lake Erie at the Pomfret site. Detailed data on the results of the Pomfret fishery study can be found in Section 74.2 of the applicant's New York State Article VIII Application.

Lake Erie Tributaries
2.145
Sampling of Lake Erie tributaries in the vicinity of the Pomfret site was accomplished between September 1974 and September 1975. During this survey, a total of six sampling stations was established on three separate streams (Little Canadaway Creek, Van Buren Bay Creek, and Canadaway Creek). A generalized map showing the location of these

TABLE 2-28

OCCURRENCE OF FISH SPECIES* AT POMFRET, SEPTEMBER 1974-SEPTEMBER 1975

Species	1974 Sep	Oct	Nov	Dec	1975 Jan	Apr	May	Jun	Jul	Aug	Sep
Lake sturgeon								A			
Longnose gar								A			
Alewife						A	A	A	Y,A	Y	Y
Gizzard shad	Y,A	Y	Y,A			A	A	A	A	Y,A	Y
Coho salmon	A					A	A				
Chinook salmon	A					A					
Rainbow trout			A			A		A			
Lake trout							A			A	
Rainbow smelt	Y	A	A	Y,A	A	A	A	Y,A	Y	Y,A	
Muskellunge	A								A	A	
Goldfish	A			A			A	A	A		
Redside dace								A			
Carp	A	A	A			A	A	A	A	A	
Golden shiner											A
Emerald shiner	Y,A		Y	Y	A	A	A	A	A	Y,A	Y,A
Common shiner											Y,A
Spottail shiner	Y,A	A	A	A	A	A	A	A	A	Y,A	Y,A
Bluntnose minnow										A	
Longnose dace					A	A	A	A	A	A	A
Creek chub										A	
Quillback		A					A	A	A		
White sucker	A	A	A	A		A	A	A	A	A	
Northern hog sucker	A						A	A		A	
Shorthead redhorse	A	A	A	A	A	A	A	A	A	A	
Brown bullhead								A			
Channel catfish		A							A	Y	
Stonecat	A	A	A			A	A	A	A	A	
Trout-perch			A		A	A	A		A	A	
Burbot				A							
Brook silverside											A
White bass	A	A				A	A	A	A	Y,A	Y
Rock bass	A	A	A			A	A	A	A	A	
Bluegill	A										
Smallmouth bass							A	A	Y,A	A	
White crappie									A		
Black crappie										A	
Yellow perch	A	A	A	A	A	A	A	Y,A	Y,A	Y,A	
Logperch	A		A			A	A	A		A	
Walleye	A	A	A			A	A	A	A	Y,A	
Freshwater drum	A	A				A	A	A	A	A	
Slimy sculpin			A			A					
Goldfish-carp hybrid							A	A			
Total species	20	14	15	8	5	21	24	25	22	25	10

*Y = young-of-the year, A = yearling and/or older, blank = no catch

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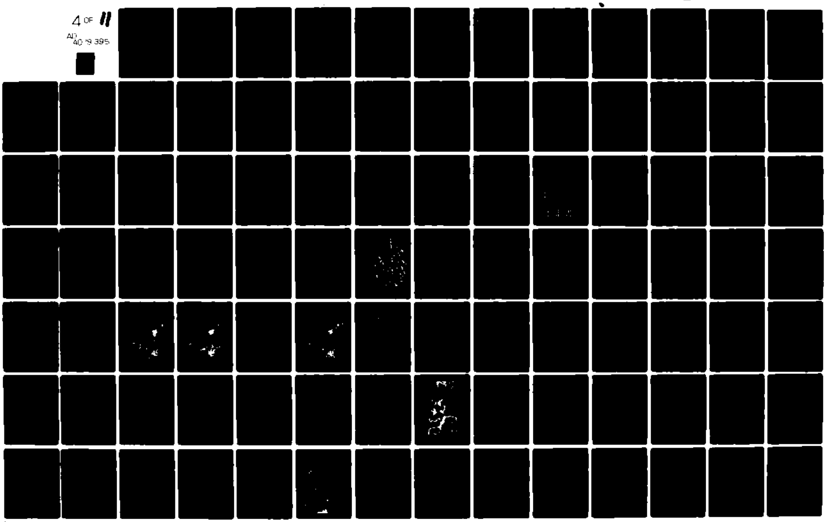

TABLE 2-29

YEARLY CATCH TOTALS FOR MOST ABUNDANT OR IMPORTANT FISH SPECIES IN LAKE ERIE AT THE POMFRET SITE

	Bottom Trawl (57 Samples)	Bottom Gill Nets (101 Samples)	Surface Gill Nets (8 Samples)	Surface Trawl (69 Samples)	Fyke Nets (37 Samples)	50' Beach Seines (28 Samples)	100' Beach Seines (18 Samples)
Alewife	5	663	159	13	0	5	100
Rainbow Smelt	77	353	3	61	15	4	2
Emerald Shiner	69	3	1	991	84	58	381
Spottail Shiner	1	410	16	1	296	331	315
Trout-Perch	0	97	0	0	35	4	142
Log Perch	0	21	0	0	0	0	16
Yellow Perch	8	1,292	2	3	16	0	6
Rock Bass	0	29	0	0	74	0	1
White Bass	0	18	1	0	2	5	49
Smallmouth Bass	0	26	0	0	0	0	6
Walleye	0	279	8	0	2	0	1
Freshwater Drum	0	225	6	0	0	2	16
Gizzard Shad	1	141	6	11	9	5	340

watercourses in reference to the Pomfret site and the site of each sampling station is presented in Figure 2-16.

Phytoplankton

2.146
Collectively 55 phytoplankton taxa were identified from samples of all three creeks with Bacillariophyta (diatoms) representing 21 taxa, Chlorophyta 20 taxa, Cyanophyta 6 taxa, Chrysophyta 4 taxa, Cryptophyta 3 taxa, and Euglenophyta one taxon. Little Canadaway Creek contained 35 taxa, Van Buren Bay Creek contained 44 taxa, and Canadaway Creek contained 17 taxa.

2.147
Stream mean phytoplankton densities (both stations averaged together) in Little Canadaway Creek decreased from April to June, were lowest in mid-June, increased 25-fold from June to July, then decreased threefold in August. April-June dominance was by the Chlorophyta and Bacillariophyta. In July and August, the Cyanophyta became important but never were the dominant group. Stream mean phytoplankton densities in Van Buren Bay Creek fluctuated only slightly through the sampling period; the high was in May and the low in June. Chlorophyta and Bacillariophyta dominated during April-July; in August, Cyanophyta were observed as the second dominant group but comprised only about 21 percent of total density. Densities during April were low in Canadaway Creek with the Bacillariophyta being the dominant group; by July, density had increased 17-fold and the Cyanophyta had become dominant, comprising 80 percent of total stream mean densities.

Periphyton

2.148
In stream survey samples collected during April-September, 34 taxa were identified. The majority were representative of the divisions Cyanophyta, Chlorophyta, and Bacillariophyta. Results from the stream surveys indicated that the composition of the periphyton communities was generally filamentous, unicellular, and colonial algae associated with the substrate. Characteristically, steam algae populations are composed of filamentous blue-greens and greens or encrusting (consisting of a thin greenish-brown coating on the rocks) blue-greens, greens, and diatoms, or a combination of the two conditions (Round, 1965).

Aquatic Macrophytes

2.149
Visual macrophyte surveys were conducted in all three streams during April and May with negative results. However, plant growth consisting of small tufts of green algae and mats of diatoms were

observed at most sampling stations. In June algal mats began to appear in Canadaway Creek and a small stand of Scirpus sp. was observed downstream of Station 143. Plant growth in these streams is generally confined to the saturated soils along the banks. The stream channels themselves rest on bedrock, a substrate which is not conducive to the growth and proliferation of rooted aquatic plants.

Zooplankton

2.150
Organisms collected and enumerated in the stream zooplankton samples include planktonic crustaceans as well as insects commonly considered benthic drift organisms. Zooplankton samples from area creeks represented 59 taxa including 18 cladocerans, 19 copepods, 13 insects, and 9 from other groups. Of the 59 taxa collected, seven insect taxa, three cyclopoid copepod taxa, and six cladoceran taxa were identified which were absent from Lake Erie samples collected at the same time. Apparently these organisms were not present in the lake since they are common only to the lotic environment.

2.151
In April 1975, zooplankton densities were fairly uniform from one station to another. However, during May, June, and July the downstream station (Station 142) on Van Buren Bay Creek had higher zooplankton densities than did Station 152 upstream. During August, high densities of immature copepods and dipteran larvae caused zooplankton densities to increase at the upstream station. The high densities are probably due to the low flow at the downstream station which is near the stream's confluence with Lake Erie. In Little Canadaway, zooplankton density was generally highest upstream where several small pools occur. In Canadaway, zooplankton densities were highest downstream, as indicated by samples collected in April and July. In all three creeks, the most abundant organisms were immature copepods (nauplii and copepodids). Temporal (monthly) occurrences of zooplankton in streams were similar to that observed for Lake Erie stations except for the increased abundance of copepods during July and August. Organisms not generally considered zooplankton such as worms and insects were most evident in July and August; of these, fly larvae (Diptera) were the most abundant, followed by oligocheate worms (Naididae). Highest total densities of organisms in creeks occurred during August when there were high numbers of worms, insects, and copepods (nauplii and cyclopoid copepodids).

Benthic Macroinvertebrates

2.152
In the onsite streams, Little Canadaway and Van Buren Bay Creeks, 128 invertebrate taxa were identified. They were primarily true flies (35 percent), mayflies (14 percent), beetles (10 percent), and

caddis flies (9 percent). While identification of 128 taxa indicated high diversity, each taxon's density was usually low. The most numerous organisms were midge larvae (Diptera). Fewer taxa (51) were found in Canadaway Creek than in the onsite streams. They were primarily true fly (45 percent); beetle (12 percent), mayfly (8 percent), and caddis fly (6 percent) taxa. The most numerous organisms in Canadaway Creek were oligochaetes (primarily Nais spp.). Several dipteran taxa present in the streams at Pomfret are considered indicators of trophic condition (or tolerance to decomposable organic material). The most frequently encountered and most abundant dipterans were Ablabesmyia, Cricotopus, Corynoneura, Micropsectra, and Tanytarus. All of these are usually considered intolerant to organic enrichment (Brinkhurst et al, 1968; Weber, 1973). Dipterans such as Coelotanypus, Procladius, and Cryptochironomus, considered by Brinkhurst to survive under extreme eutrophic conditions, were found in low numbers.

2.153
In Little Canadaway Creek 65 taxa were collected at the downstream station while 77 were identified at the upstream sampling site. Taxonomic distributions at both stations were quite dissimilar. In Van Buren Bay Creek, the upstream station had a higher number of taxa and a higher density than did the downstream station. For example, 56 invertebrate taxa were collected at the downstream station and 101 taxa at the upstream station. Forty-eight taxa were collected at the downstream station and 36 at the upstream station of Canadaway Creek.

2.154
Invertebrate densities in the onsite streams of Little Canadaway and Van Buren Creeks were generally highest during May and June and lowest in April and July. Dipterans were the most numerous organisms on all sampling dates in the on-site streams. Canadaway (the off-site stream) invertebrate densities observed during July were higher than those in April. Oligochaete worms were the most numerous, followed by dipterans. Several species of aquatic insects (e.g., many stoneflies and mayflies) have univoltine life cycles (single generation per year) and are abundant during certain times of the year (Hynes, 1972). Stoneflies (Plecoptera) were encountered most frequently in April and May, which was expected since stonefly emergence is usually in early spring (Hynes, 1972). Although mayflies (Ephemeroptera) were present during all months sampled, most genera were abundant during May and June. Midge larvae (Diptera) were also the most numerous during May and June.

Fisheries

2.155
Fish sampling was conducted on a seasonal basis in Little Canadaway

Creek, Van Buren Bay Creek, and Canadaway Creek. Sampling during the Fall of 1974 was accomplished with seines while winter, spring, and summer samples were collected by electroshocking. A large proportion of the fish taken from these watercourses were not found in Lake Erie.

2.156
During this survey, 14 species were collected in Little Canadaway Creek, while in Van Buren Bay Creek, only 12 species were collected. In Canadaway Creek a short distance away from the Pomfret site, six fish species were collected. Electroshock and seining data for these watercourses are summarized in Tables 2-30 and 2-31, respectively.

2.157
The data in Table 2-31 indicate that the pugnose minnow (Notropis emiliae) was taken in Little Canadaway Creek and Van Buren Bay Creek. Limited numbers of this species are found in Ohio tributaries emptying into the western and central Lake Erie basins. The pugnose minnow is currently listed in Ohio but not in New York as a protected species since it is threatened with extirpation from State waters. In order to substantiate the applicant's findings relative to the collection of the pugnose minnow from Pomfret site streams, the staff reviewed the habitat-specific requirements of this species and compared them to the habitat of the streams in which it was collected, performed a literature search to determine known species range and distribution, and consulted with officials of New York State Department of Environmental Conservation. Corps staff found that pugnose minnow are not typically found in Eastern Lake Erie tributaries and, therefore, requested reaffirmation of the identification. The applicant's consultant, Texas Instruments, is not able to definitively reaffirm the presence of pugnose minnow. The specimens retained from the 1974-75 sampling efforts were immature, thus preventing reaffirmation to the species level of the previous identification. However, based on identification of the species at that time, the consultant believes it is possible, if not probable, that pugnose minnow were found in two Pomfret area streams for brief periods of time. Pugnose minnow were also collected at the alternative site at Sheridan (see 2.387 a.).

During the 1974-1975 sampling, six sampling stations were established on the Pomfret site, two stations being situate on Canadaway Creek, Little Canadaway Creek and Van Buren Bay Creek. Each sampling station was sampled six times over a six-month period, with the exception of the sampling stations on Canadaway Creek which stations were sampled on three occasions each. Stream sampling methods consists of electroshocking and stream-seine sampling.

With respect to the December 1974-August 1975 stream electroshocking

TABLE 2-30

CATCH/EFFORT SUMMARY FOR ELECTROSHOCK SAMPLES FROM TRIBUTARY STREAMS IN VICINITY OF POMFRET SITE, DECEMBER 1974-AUGUST 1975

A = yearling and older; Y = young-of-the-year

		Little Canadaway Creek							Total	Van Buren Creek							Total	Canadaway Creek (Off-site)				Total
Species	Stage	Dec 23	Apr 15	May 9	Jul 2	Jul 11	Aug 14	C/f	No.	Dec 23	Apr 15	May 9	Jul 2	Jul 11	Aug 14	C/f	No.	Dec 23	Apr 15	Aug 14	C/f	No.
Northern brook lamprey (*Ichthyomyzon fossor*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	1.4	0.0	0.0	0.0	0.24	2	0.0	0.0	0.0	0.00	0
Stoneroller (*Campostoma anomalum*)	A	0.0	1.4	0.7	0.0	0.0	3.0	1.10	9	0.0	0.7	0.0	0.0	0.0	0.0	0.12	1	0.0	2.1	0.0	0.62	3
	Y	0.0	0.0	0.0	0.0	0.0	1.0	0.24	2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Redside dace (*Clinostomus elongatus*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.7	4.3	0.0	15.0	16.0	5.5	5.98	49	0.0	0.0	0.0	0.00	0
Common shiner (*Notropis cornutus*)	A	4.3	0.0	0.0	1.0	84.0	6.0	12.56	103	1.4	0.0	4.3	0.0	1.0	0.0	1.10	9	0.0	25.0	0.5	5.42	36
	Y	7.9	0.0	0.0	0.0	0.0	3.5	2.20	18	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	2.9	0.0	0.0	0.83	4
Pugnose minnow (*N. emiliae*)	A	3.6	0.0	0.0	91.0	0.0	0.0	11.71	96	0.0	0.0	0.0	13.0	0.0	0.0	1.59	13	0.0	0.0	0.0	0.00	0
	Y	5.7	0.0	0.0	0.0	0.0	0.0	0.98	8	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Spottail shiner (*N. hudsonius*)	A	0.0	5.0	0.0	0.0	0.0	0.0	0.85	7	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Bluntnose minnow (*Pimephales notatus*)	A	0.0	0.0	0.7	0.0	4.0	0.5	0.73	6	0.0	3.6	0.7	5.0	6.0	1.5	2.44	20	0.0	14.3	0.5	4.38	21
	Y	8.6	0.0	0.0	0.0	0.0	0.0	1.46	12	5.7	0.0	0.0	0.0	0.0	0.0	0.98	8	0.0	0.0	0.0	0.00	0
Western blacknose dace (*Rhinichthys atratulus*)	A	0.0	1.4	3.6	9.0	28.0	7.0	7.07	58	0.0	5.0	0.0	2.0	3.0	0.0	1.46	12	0.0	0.0	1.0	0.42	2
	Y	0.0	0.0	0.0	0.0	0.0	0.5	0.12	1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Longnose dace (*R. cataractae*)	A	2.9	0.0	0.0	2.0	6.0	0.5	1.59	13	0.0	3.6	0.0	1.0	1.0	0.0	0.85	7	0.0	13.6	2.5	5.00	24
	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	2.0	0.83	4
Creek chub (*Semotilus atromaculatus*)	A	0.0	0.0	4.3	21.0	29.0	7.5	8.66	71	0.0	2.1	8.6	1.0	6.0	0.5	2.80	23	0.0	2.9	1.5	1.46	7
	Y	5.7	0.0	0.0	0.0	0.0	1.5	1.34	11	0.0	0.0	0.0	0.0	0.0	15.0	3.66	30	0.0	0.0	1.5	0.62	3
White sucker (*Catostomus commersoni*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.7	1.4	0.0	2.0	0.5	0.73	6	0.0	2.9	0.5	1.04	5
	Y	0.7	0.0	0.0	0.0	0.0	0.5	0.24	2	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Northern hog sucker (*Hypentelium nigricans*)	A	0.0	0.7	1.4	0.0	3.0	0.0	0.73	6	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Black bullhead (*Ictalurus melas*)	A	0.0	0.0	0.0	0.0	1.0	0.0	0.12	1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Rock bass (*Ambloplites rupestris*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.0	1.0	0.0	0.12	1	0.0	0.0	0.0	0.00	0
Pumpkinseed (*Lepomis gibbosus*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.0	1.0	0.0	0.12	1	0.0	0.0	0.0	0.00	0
Bluegill (*L. macrochirus*)	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.0	0.0	0.5	0.12	1	0.0	4.0	0.0	0.00	0
Rainbow darter (*Etheostoma caeruleum*)	A	0.0	0.0	1.4	12.0	11.0	2.5	3.66	30	0.0	2.9	0.0	2.0	1.0	0.0	0.85	7	0.0	0.0	0.0	0.00	0
	Y	0.0	0.0	0.0	0.0	0.0	0.5	0.12	1	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Fantail darter (*E. flabellare*)	A	0.0	0.0	0.7	0.0	0.0	0.0	0.12	1	0.0	0.7	0.0	0.0	0.0	0.0	0.12	1	0.0	0.0	0.0	0.00	0
Log perch (*Percina caprodes*)	A	0.0	0.0	25.7	0.0	2.0	0.0	4.63	38	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Total species		6	4	8	6	9	8	16		3	9	5	7	10	5	12		1	6	6	7	
Total effort (10 min)		1.4	1.4	1.4	1.0	1.0	2.0	8.2		1.4	1.4	1.4	1.0	1.0	2.0	8.2		1.4	1.4	2.0	4.8	
Total specimens		55	12	54	136	168	69	494		11	33	23	39	38	47	191		4	85	20	109	
Total C/f (per 10 min)		39.3	8.6	38.6	136.0	168.0	34.5	60.2		7.9	23.6	16.4	39.0	38.0	23.5	23.3		2.9	60.7	10.0	20.62	

TABLE 2-31

CATCH/EFFORT FOR STREAM-SEINE SAMPLES FROM TRIBUTARIES IN VICINITY OF POMFRET, FALL 1975

Species	Life* Stage	Little Canadaway Creek 114	Little Canadaway Creek 115	Van Buren Creek 124	Van Buren Creek 125	Canadaway Creek (off site) 134	Canadaway Creek (off site) 135
Common shiner	A	12.5	0.0	0.0	0.0	0.0	0.0
Notropis cornutus	Y	0.0	0.0	0.0	0.0	12.5	0.0
Pugnose minnow	A	0.0	0.0	0.0	2.5	5.0	0.0
N. emiliae	Y	0.0	0.0	0.0	3.5	0.0	0.0
Bluntnose minnow *Pimephales notatus*	A	1.5	0.0	0.0	0.0	0.5	0.0
Creek chub	A	2.0	0.0	0.0	0.0	0.0	0.0
Semotilus atromaculatus	Y	0.0	0.0	0.0	0.0	5.0	0.0
White sucker *Catostomus commersoni*	Y	0.0	0.0	0.0	0.0	2.0	0.0
Northern hog sucker *Hypentelium nigricans*	A	11.5	0.0	0.5	0.0	0.0	0.0
Rainbow darter *Etheostoma caeruleum*	Y	0.0	1.5	0.0	0.0	0.0	0.0
Fantail darter *E. flabellare*	Y	0.0	0.5	0.0	0.0	1.0	0.0
Total species		4	2	1	1	6	0
Total specimens		55	4	1	12	52	0
Number of tows (total effort)		2	2	2	2	2	2
Total C/f		27.5	2.0	0.5	6.0	26.0	0.0

*Y = young of the year
A = yearling and older

efforts at the three Pomfret area streams, the following results were obtained from electroshocking efforts on six separate days:

- Little Canadaway Creek: 13 specimens identified as the pugnose minnow were counted on 23 December 1974 and 91 specimens, so identified, were counted on 2 July 1975.
- Van Buren Creek: 13 specimens were counted on 2 July 1975.
- Canadaway Creek: No observations of the pugnose minnow.

Stream seine samples in the fall of 1975 indicated the following with respect to the presence of the specimens identified as the pugnose minnow:

- Little Canadaway Creek - none observed
- Van Buren Creek - 12 specimens were counted
- Canadaway Creek - 5 specimens were counted

Given the divergent stream locations of the pugnose minnow (including Sheridan area), as identified at the time of the 1974-1975 sampling effort, it appears that the stream which would be affected by power plant construction (Van Buren Creek) is not "unique" to the Lake Erie ecosystem. Moreover, the Pomfret area streams are not typical of good pugnose minnow habitat. This species prefers clear, slow-moving streams with abundant vegetation, a condition not typical for the streams studied.

Onsite Water Bodies

2.158
As a corollary to those studies conducted in Lake Erie and the tributaries of Lake Erie, representative onsite water bodies were also surveyed. During this program a total of 18 onsite water bodies were surveyed at the Pomfret site. A map showing the location of these water bodies is contained in Figure 1-13 (Chapter One).

Phytoplankton

2.159
Approximately 104 phytoplankton taxa were identified from 18 onsite water bodies found on the Pomfret site. The taxa found represented 45 Chlorophyta, 21 Bacillariophyta, nine Cyanophyta, eight Chrysophyta, seven Euglenophyta, four Xanthophyta, and three Pyrrhophyta. The total number of species collected in each pond ranged from 4 to 28. Phytoplankton cell density was variable among water bodies as it was between sampling periods. Total cell density in the 18 water bodies ranged from zero to 246,104 x 10^6 cells/m^3. No total cell density trends were established, since the density of each water body fluctuated independently during the spring and fall collection periods. Lane (1969) observed similar

cell density fluctuations in two New York State ponds, and indicated that the possible cause for the fluctuations was a combination of physical and chemical factors.

2.160
Phytoplankton dominance varied from one water body to the next depending on nutrient availability and water temperature fluctuations. In water bodies 10 and 12 blue-green algae were found to be dominant during the spring and fall, while in water bodies 1 and 20, they were abundant only in the spring. Phytoplankton belonging to the phylum Chlorophyta were found to be dominant only in the spring at water body 15. During the fall, Cryptophyta was dominant in water bodies 3, 4, 7, and 16 indicating higher levels of nitrogen and organic matter during this period. The green algae (Chlorophyta) were generally dominant throughout the year in water bodies 2, 8, 17, 24, and 25.

Periphyton

2.161
A general survey of the periphyton community from the onsite water bodies at the Pomfret Lake Erie Generating site revealed 62 taxa. Forty-seven taxa were identified during spring while 45 taxa were collected during fall. Twenty-nine taxa were identified from both collection periods. Taxa represented members from Cyanophyta, Chlorophyta, Eugleno hyta, Cryptophyta, Chrysophyta, and Bacillariophyta. One taxon from Pyrrhophyta was found during fall sampling.

Aquatic Macrophytes

2.162
During the survey of onsite water bodies at the Pomfret site, 11 species of aquatic macrophytes were recorded. Generally, cattail (*Typha latifolia* and *T. angustifolia*) was encountered most frequently with stands identified at 15 of the 18 water bodies studied. The genus *Potamogeton* was represented in several onsite water bodies including water body No. 8 which supported a dense growth of *Potamogeton crispus* in the Fall of 1975. Several onsite ponds were found to contain *Myriophyllum spicatum*. Horsetail (*Equisetum arvense*), although present on the banks of many of the ponds surveyed, was found to be directly associated with aquatic macrophytes at only four sites. The relative abundance of aquatic macrophytes from water body to water body varied only slightly from spring to fall. Submerged forms (i.e., *Potamogeton*) appeared somewhat less abundant during fall, while emerged or floating forms (i.e., *Lemna minor*, *Typha*

agustifolia) appeared slightly more common. Spring-fed water bodies contained higher numbers of aquatic macrophyte species than did water bodies dependent upon other sources for water supply.

Zooplankton

2.163
Zooplankton samples were taken from onsite water bodies during May and October at the Pomfret Lake Erie Generating site. During this survey, fifty-nine taxa were identified, including 23 cladocerans, 21 copepods, and 6 insects. The number of taxa found in onsite water bodies ranged from 4 to 20 with a median of 18. Water bodies that contained the higher numbers of taxa generally exhibited intermediate total densities. Such conditions were evident in water bodies 5, 6, and 7. The seasonal total densities in the 18 ponds examined varied from 501 organisms/m^3 in water body 7 to 2,113,095 organisms/m^3 in water body 4. The lowest zooplankton densities found on the site occurred in fly ash ponds 7 and 25. Low pH values in these ponds were probably responsible for this condition. Zooplankton densities in individual water bodies varied from spring to fall. For example, water bodies 1, 3, 4, 15, 16, and 17 exhibited high zooplankton densities in May and had even higher density values in October. Those water bodies with intermediate to low densities during May seemed to reflect a general decrease in total density during the month of October. Taxa found in the onsite water bodies were typical of small pond environments (Ward and Whipple, 1959). During this survey, the most abundant zooplankters were found to be Chydorus, Bosminidae, copepod nauplii, and cyclopoid copepodids.

Benthic Macroinvertebrates

2.164
Grab samples were collected at each of the 18 water bodies on the Pomfret site to identify benthic macroinvertebrate populations. During this survey 102 taxa were identified including 62 insect taxa, 16 crustacean taxa, 13 annelid taxa, and 6 mollusk taxa. The Tubificidae, Naididae, Chironomidae, and Nematoda were the major contributors to biovolume in the macroinvertebrate communities studied.

2.165
The number of taxa collected varied from 9 at water bodies 7 and 25 to 42 at water body 16. Water bodies 7 and 25 are fly ash ponds with pH values low enough to inhibit the growth of all macroinvertebrates except the tolerant tubificids and chironomids (Weber, 1973). On the other hand, water body 16 had well-established aquatic flora with relatively higher amounts of nutrient-rich bottom substrate. This condition, and the availability of two water sources (spring water

and surface runoff) is generally responsible for the higher quality benthic habitat at Pond No. 16.

2.166
Total macroinvertebrate density varies from one pond to the next. The total density in one season ranged from 57 organisms/m^2 to 103,360 organisms/m^2. The lowest macroinvertebrate densities were found in fly ash ponds 7, 9, and 25. Water body No. 8 is also located near an existing fly ash dump and although larger than other fly ash ponds, it exhibited a higher density of plant and animal life. High densities encountered in water bodies 16 and 24 were due primarily to the abundance of aquatic earthworms (i.e., Napas sp. and Tubificidae).

Fisheries

2.167
During this investigation, 21 fish species were identified in the water bodies on the Pomfret site. Of the 21 species recorded, 18 were taken by seining while the remainder were documented through sightings or stocking information. The fish species and number of individuals collected during three separate seine hauls in each water body are summarized in Table 2-32.

2.168
Sunfish, primarily pumpkinseed (Lepomis gibbosus) and bluegill (L. macrochirus) were the most frequent and abundant fishes captured at the Pomfret site. The pumpkinseed is normally the most common and widely distributed of the sunfishes in the Great Lakes region (Scott, 1972). The majority of water bodies averaged three or less fish species. Bluegill sunfish (Lepomis microchirus) and largemouth bass (Micropterus salmoides) are primary warm-water species stocked in ponds in New York, thus accounting for their frequent occurrence in many of the onsite water bodies during spring 1975. The bluntnose minnow (Pimephales notatus) and fathead minnow P. promelas were fairly abundant in water bodies 5 and 6.

2.169
Changes in species composition were not as pronounced from spring to fall as were the changes in total number of individuals. Many of the same species were captured during both seasons, while the number of individuals per species was markedly lower during fall. The change in catch size probably can be attributed to the fact that a high number of yearlings was present in spring catches. By fall, natural mortality and predation had caused a reduction in the population.

2.170
Generally, the recreational usage of onsite water bodies from a

TABLE 2-32

COMPOSITE CATCH OF FISH FROM BEACH SEINES FROM POMFRET ON-SITE WATER BODIES DURING MAY [SPRING (SP)] AND OCTOBER [FALL (F)] 1975

Pomfret

On-Site Water Bodies

Common Name	1 SP	1 F	2 SP	2 F	3 SP	3 F	4 SP	4 F	5 SP	5 F	6 SP	6 F	7 SP	7 F	8 SP	8 F
Goldfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden shiner	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Common shiner	0	0	0	0	0	0	1	0	0	0	21	0	0	0	0	0
Spottail shiner	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Bluntnose minnow	0	0	17	1	0	0	2	3	40	0	35	16	0	0	0	0
Fathead minnow	0	0	0	0	0	0	0	0	11	0	67	11	0	0	0	0
Blacknose dace	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0
Creek chub	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
White sucker	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Brown bullhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brook stickleback	0	0	0	0	0	0	0	0	2	7	0	36	0	0	0	0
Pumpkinseed	2	3	3	0	0	0	52	32	0	0	0	0	0	0	0	0
Bluegill	2	5	17	11	1	0	0	0	0	0	0	0	0	0	0	0
Smallmouth bass	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Largemouth bass	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Black crappie	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Yellow perch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0

Common Name	9 SP	9 F	10 SP	10 F	12 SP	12 F	14 SP	14 F	15 SP	15 F	16 SP	16 F	17 SP	17 F	20 SP	20 F	24 SP	24 F	25 SP	25 F
Goldfish	Not Sampled	0	0	2	0	0	0	Not Sampled	0	0	0	0	0	0	0	0	0	0	0	0
Carp		0	4	20	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Golden shiner		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Common shiner		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Spottail shiner		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Bluntnose minnow		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Fathead minnow		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Blacknose dace		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Creek chub		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
White sucker		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Brown bullhead		0	0	0	0	0	0		0	0	0	0	1	0	0	0	0	0	0	0
Brook stickleback		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Pumpkinseed		0	0	0	0	1	16		91	55	0	6	43	4	23	68	109	162	0	0
Bluegill		0	0	0	1.	0	0		23	15	63	34	0	0	0	0	0	0	0	0
Smallmouth bass		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Largemouth bass		0	0	0	0	0	0		3	1	0	0	0	0	0	0	0	0	0	0
Black crappie		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0
Yellow perch		0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0

Note: Rainbow trout stocked in Pond 8; Brown trout stocked in Pond 8: Rock bass stocked in Pond 19.

fishing standpoint was light. Very few water bodies surveyed (with the possible exception of water bodies 2, 8, 15, and 20) contained sufficient size or quality of habitat to host catchable (from a sport fishing standpoint) size fish. In addition, none of the fish species reported from onsite water bodies are among those listed as endangered.

TERRESTRIAL ECOLOGY

Terrestrial Vegetation

2.171
Field studies were initiated in the vicinity of the Pomfret site to identify vegetation cover types and define the importance of various plant communities in relation to the overall terrestrial ecosystem. For the purpose of this discussion, the study area is defined as the area within the Pomfret site boundary, while the area within one mile of the site perimeter is referred to as the extended area.

Cover Types

2.172
During this survey, similarities in various stands of vegetation were noted. Through the use of aerial photography such similarities stand out and with field checks can be accurately mapped as cover types. Principal cover types for the Pomfret study are as follows:

Cover Type	Onsite Acreage*	(Percent)
Open Field	186	21
Shrub	161	18
Northern Hardwoods Forest	110	12
Pine Plantation	14	2
Black Locust Forest	1	0.1
Willow	5	0.5
Vineyard	90	10
Cropland	332	37
TOTAL	899	

*These percentages are based on "natural vegetation" and not on the total study acreage.

Open Field Cover Type

2.173
The open field community covered 186 acres, which is 21 percent of the natural vegetation in study area. In fall, the herbs in the open field community are dominated by wild carrot (Daucus carota), path

rush (Juncus tenuis), bent grass or red-top and Canada bluegrass (Agrostis alba and Poa compressa), velvet grass (Holcus lanatus), goldenrod (Solidago spp.), timothy (Phleum pratense), Kentucky bluegrass (Poa pratensis), and several unidentified grasses (Gramineae). The open field areas are commonly invaded by woody seedlings of shrub species including: silky dogwood (Cornus amomum), red-osier dogwood (Cornus stolonifera), hawthorn (Crataegus spp.), and southern arrowwood (Viburnum dentatum). Generally, open fields in the Pomfret site study area are former agricultural lands that may have been left fallow for a year or more. Open fields are in various stages of succession with some consisting of grasses and perennial weeds while others contain many shrubs less than one meter in height.

Shrub Cover Type

2.174
The shrub community covers 161 acres and includes areas that were either farmed or cleared at one time but which had been left undisturbed for many years. This cover type comprises 18 percent of the total study area. The shrubs that have invaded and subsequently dominate the area include: Silky dogwood, southern arrowwood, brambles (Rubus spp.), panicled dogwood (Cornus racemosa), European buckthorn (Rhamnus frangula), and red-osier dogwood (Cornus stolonifera). Two tree species, red maple (Acer rubrum) and black cherry (Prunus serotina), were also recorded. The typical shrub areas are composed of aggregations of shrubs interspersed with open spaces dominated by cinquefoil (Potentilla canadensis) and P. simplex), bentgrass and Canada bluegrass, goldenrod, seedlings of southern arrowwood, wild oat grass (Canthonia compressa and D. specata), and sweet vernal grass (Anthoxanthum odoratum).

Northern Hardwood Forest Cover Type

2.175
The heterogeneous forest community occupies 110 acres or 12 percent of the natural vegetation on the Pomfret study area. The overstory of the forest is dominated by red maple. Other common species are white and green ash (Fraxinus americana and F. pennsylvanica), American beech (Fagus grandifolia), American linden or basswood (Tilia americana), hemlock (Tsuga canadensis), Tulip polar (Liriodendron tulipifera), hop hornbeam (Ostrya viriginiana), and sugar maple (Acer saccharum), and shagbark hickory (Carya ovata). In the understory, hornbeam (Carpinus caroliniana) and red maple had relatively high importance values. Sugar maple, beech, shagbark hickory, hop hornbeam, and yellow birch (Betula alleghaniensis) are commonly encountered. Spicebush (Lindera benzoin) and southern arrowwood dominated the shrub layer. Transgressives of Carpinus, beech, white ash, and sugar maple also formed an important segment of the shrub layer. The herbaceous layer of the hardwoods forest is dominated primarily by two common ground vines, trailing euonymus

(Euonymus obovatus) and Virginia creeper (Parthenocissus quinquefolia). Poison ivy (Rhus radicans) was common in the fall. Of the true herbaceous species, sensitive fern (Onoclea sensibilis), spotted touch-me-not (Impatiens capensis), partridgeberry (Mitchella repens), enchanter's nightshade (Circaea quadrisulcata), yellow adder's tongue (Erythronium americanum), Jack-in-the-pulpit (Arisaema triphyllum) and cut-leaved toothwort (Dentaria laciniata) were among the dominants. Woody seedlings of tree shrub species are also common in the herbaceous layer; of these, spicebush, white ash, and southern arrowwood are dominant.

Pine Plantation Cover Type

2.176
The pine plantation community totals approximately 14 acres and occupies about two percent of the total study area natural vegetation. The pine plantations on the Pomfret study area are the result of commercial plantings approximately 25 years ago. They are even-aged, pure stands of either red pine (Pinus resinosa), Scotch pine (Pinus sylvestris), or a combination of these two, with mixtures of European larch (Larix decidua). Angiosperm trees of understory size are infrequent, and of these red maple and trembling aspen (Populus tremuloides) dominate. The shrub layer is fairly well developed in certain areas. It is dominated by southern arrowwood, with red maple, green ash, and poison ivy also occurring, but in much lower importance values. The herbaceous layer consisted mostly of woody seedlings of southern arrowwood and vines of poison ivy. Hawkweed (Hieracium spp.) and common speedwell (Veronica officinalis) are the most common herbaceous plants.

Black Locust Cover Type

2.177
The black locust woodland occupies approximately one acre, or less than 0.1 percent of the natural vegetation on the Pomfret study area. The overstory in the black locust forest is dominated by black locust (Robinia pseudoacacia). Black cherry is the most common associate of black locust. Black cherry is highly important in the understory layer, being followed in importance value by black locust and fire cherry. Black cherry is also the most common species in the shrub layer. Other species commonly found in the shrub layer are brambles, American elm (Ulmus americana) and white ash. In fall, black cherry seedlings dominated in the herbaceous layer with goldenrod and white avens (Geum canadense) having somewhat lower importance values. In spring, yellow adder's-tongue dominated the herbaceous layer while spotted touch-me-not, white avens, aster (Aster spp.), goldenrod, and black cherry had lower importance value. Other spring-flowering plants that commonly occurred were marsh blue violet (Viola cucullata), early meadow rue (Thalictrum dioicum), and jack-in-the-pulpit. During summer, white avens, asters and goldenrods dominate

the herbaceous layer, although violets (Viola spp.) and seedlings of black cherry are common.

Willow Cover Type

2.178
The willow stand occupies 0.5 percent of the Pomfret study area natural vegetation, or five acres. This community consists of almost pure stands of willows growing in long, narrow tracts along some of the streams and drainage ditches at the Pomfret study area. Crack willow (Salix ragilis) is the most common species in the overstory. The understory is almost nonexistent in this community, although there were some willows that had not yet reached canopy size and a few shrubs, such as silky dogwood, that are large enough to be considered in the understory category. Large patches of silky dogwood, interspersed with poison ivy and and red-osier dogwood, are common in the shrub layer. The well-developed herbaceous layer is dominated by three plants; ground ivy (Gleochoma hederacea), spotted touch-me-not, and poison ivy. Grasses (Gramineae) in general and two specific grasses, panic grass (Panicum spp.) and wood reed grass (Cinna arundinacea), had high importance values. This is the only community in the study area where moneywort (Lysimachia nummularia) is common. No woody seedlings of tree species were encountered.

Vineyards

2.179
About 90 acres of the Pomfret site consists of vineyards in which Concord grapes are the most common variety grown. The weed flora of the vineyards varies considerably according to the management practices utilized. The most common weeds include narrow-leaved plantain (Plantago lanceolata), broad-leaved plantain (P. major), bindweed (Convolvulus spp.), horsetail (Equisetum arvense), ragweed, dandeline (Taraxacum officinale) and quackgrass. Shrubs, such as poison ivy, brambles and staghorn sumac (Rhus typhina) will invade vineyards which are not properly maintained.

Croplands

2.180
The croplands in the Pomfret study area can be subdivided into three major groups: truck cropping, hay production, and general pasture. Major truck crops in the area are corn and tomatoes, although fields of beans, grain (oats and wheat), and potatoes were frequently encountered. The cropland cover type occupies 332 acres, approximately 37 percent of the natural vegetation on the study area.

2.181
Additional information on vegetation cover types can be found in Section 79.2 of the applicant's New York State Article VIII application.

Successional Patterns

2.182
Open Field - In the time span since abandonment, previous crops, adjacent communities, and location influence the rate of succession and structure of progressive seral stages (Daubenmire, 1968). The floral composition of the different fields that comprised the open field community varies mainly as a result of two factors: the amount of time that had passed since abandonment, and its prior use. In the fields that were first cut for hay, cut in alternate years, or had low livestock density, the vegetation is very similar to the open field community and hayfields. Most of the vegetation of the heavily pastured fields is grazed very close to the ground, although certain species are never eaten. Species that were not grazed by livestock, mostly because of their unpalatable nature, included buttercup (Ranunculus spp.), sunflower (Helianthus annuse), goldenrod, agrimony (Agrimonia spp.), milkweed (Ascelepias spp.), sensitive fern, water horehound (Lycopus americanus), and dock (Rumex spp.). A few species are avoided by livestock because they are armed with prickles or thorns. Of these, thistle (Cirsium spp.), knotweed (Polygonum spp.), brambles, rose (Rosa spp.), and hawthorn (Crataegus spp.) were the most common. Shrubs of hawthorn and rose were sometimes present in the pasture fields.

2.183
Shrub Areas - The shrub community is composed of areas that were either farmed or cleared at one time, but have been left undisturbed for many years and have, therefore, been invaded with shrubs. The shrubs that dominate the community vary in height and density depending on many factors. A few dense, even-age shrub areas are present in the study area. Areas such as this form a prolonged shrub stage because the shrub density prohibits the invasion of successional tree species. Niering and Egler (1955) studied a small aggregation of nannyberry (Viburnum lentago) that had remained stable for 25 years. These relatively stable shrub areas are of interest because shrubs seldom occupy an area to the exclusion of all other types of plants (Beckwith, 1954). In the Pomfret study area, the largest stable shrub area is along Van Buren Road between the drive-in theater and the airport. Approximately 15 acres of this entire shrub block is densely covered by southern arrowwood and silky dogwood. In the dense portion of this shrub area, these two species have an average density of 20 stems per square meter. Within these dense stable shrub areas, very little ground vegetation is present. Trees eventually do invade the shrub community. Red maple and ash appear to be the common tree invaders.

2.184
Northern Hardwood Forest - The forest on the study area was found to be very heterogenous, with few areas covered with distinct forest associations. This heterogeneity has probably resulted from different types of past disturbances, the geographical location of the lake plain, and the moderating influence of Lake Erie. Most of the forest tracts are also quite young and may, therefore, still be in developmental stages. As indicated by Stout (1958), the forest on the study area is usually restricted to the poorly drained regions or the slopes of streams because the better drained areas have been cleared for farming. In a very general sense, the older forests and those occasionally found on the better drained soils are closest to a beech/maple or beech/maple/birch association. Red maple, ash, and hemlock are the most common codominants, although basswood, tulip popular, and shagbark hickory are sometimes encountered. The poorer drained areas, regions with a high seasonal water table, and the younger forests are dominated by red maple, which usually formed pure stands, although ash and other tree species are associated in some areas.

2.185
Pine Plantation - The pine plantation community is an artificially induced monoculture. It is dominated by pines that do not naturally occur in the area, do not do well on poorly drained soil (Stone et al., 1954), and cannot reproduce in their own shade. Within the pine plantations, broad-leaved plants are infrequent in every plant size category, especially in the herbaceous layer. They occur in patches only where there is available light. This community will persist as long as it can restrict broad-leaved plants from invading; but extensive wind throws, disease, and death as the conifers mature will naturally lead to the elimination of this community in time.

2.186
Black Locust Stand - The location of the largest stand of black locust on the Pomfret study area is in the southeast end of the study area on the moderately well-drained Williamson soil association found along the slopes of Little Canadaway Creek. The study area is north of the original natural range of black locust but this species has become naturalized over a wide area of the northeast. There are trees of various ages within the black locust forest stand. In the more mature black locust stands, the herbaceous layer is not as well developed as in the younger areas, where perennial weeds and grasses characteristic of open fields commonly occur. White avens is common in both the young and mature areas. Occurrences of this species and large patches of spotted touch-me-not are found only in the black locust forest and willow community. The understory of the black locust forest is dominated by black locust and black cherry. Due to the absence of black locust seedlings and the prevalence of black

cherry in the understory, shrub, and herbaceous layer, there is a high probability that the black locust forest, if left undisturbed, will not remain dominated by black locust, but will eventually succeed to a forest dominated by black cherry and other successional hardwoods.

2.187
Willow Stand - The willow community consists of an almost pure stand growing in long narrow tracts along some of the streams and drainage ditches at the Pomfret study area. Willows grow rapidly in moist areas of full sunlight and easily dominate an area (Rawson, 1973). Willows are not of commercial value in the area. However, willow is important because its occurrence along waterways lessens erosion and holds soil. The future of the willow community is questionable. Since there is no indication that other tree species were invading the community, there is a high probability that the community will remain stable for some time. The community is, of course, subject to the uncertainties of a community dominated by a single species. One would eventually expect the invasions of tree species that can withstand periods of flooding, such as black ash, green ash, and red maple.

Productivity

2.188
Productivity can be investigated using several approaches. The site index approach used for selected forest species on the Pomfret study area is defined as the average height the dominant canopy trees will attain at 50 years. In the northern hardwoods forest, the site indices for red maple range from 20.2 to 22.7 meters (mean 21.2 m) of Collamer soils and from 19.0 to 20.8 m (mean 20.1 m) on Canandaigua soils. On the basis of the published curves for the New York region (Hampf, 1965), the area can be rated 3 on a scale of 1 to 5 with 5 denoting the most productive area. The site indices of sugar maple ranged from 16.9 to 18.0 (mean 20.3) on Canaddaigua soils. On the basis of the published curves from the Vermont region (Hampf, 1965), the Collamer series would probably be classified as 2 and the Canandaigua as 3 on a scale of 1 to 5. In the pine plantation, the site index value for red pine was 16.7 meters. This represents a moderately productive value on the basis of published curves for the Great Lakes states (Hampf, 1965). A site index of 20.6 m was calculated for black locust. This value is within the range of site indices of 10 to 27 meters for black locust (Hampf, 1965) in the central United States. By comparison, the Pomfret study area could be considered of fair quality for black locust production.

2.189
Corn and tomatoes are two of the major agricultural crops found on the Pomfret site. Fields of beans, grain (oat and wheat), cucumbers, and potatoes were observed within the study area. These truck crops (corn, tomatoes, etc.) occupied approximately 16 percent (433 acres) of the study area. Corn yields are between 75 and 100 bushels of dry shelled corn per acre, and tomato yields usually are 15 to 20 tons on the better-drained soil. However, differences in yields are as much a result of difference in soil (Pearce, 1975), as they are of management practices.

Terrestrial Fauna

2.190
During the twelve-month sampling period from August 1974 to September 1975, regional and site-specific data were collected on terrestrial fauna. Included in this survey are data on arthropods, amphibians, reptiles, avifauna, and mammals. Discussions relative to terrestrial fauna are presented below.

Arthropods

2.191
More than 15,400 species of arthropods have been reported for New York State (Leonard, 1928). Many arthropods were identified, with species from a majority of major insect families being represented in each of the plant communities studied. Although no major outbreaks of insect pests occurred during the study period, numerous pest species do inhabitat the region. None of these appear to have a significant impact in the existing vegetation. The most important pests from an economic point of view are those associated with agricultural crops. Major pests occurring in the vineyards are the grape leafhopper (Erythroneura comes), the red-banded leaf roller (Argyrotaenia velutinana), and the grape berry moth (Paralobesia viteana). The European corn borer (Ostrinia nubilalis), and corn leaf aphid (Rhopalosiphum maidis) are common on corn while aphids are typically associated with tomatoes. Reports indicate that none of these species were present in large enough numbers to cause appreciable damage.

Amphibians

2.192
Six species of salamander (spotted, northern dusky, redbacked, two-line, Jefferson, and red-spotted newt) were found on the Pomfret study area. All six species of salamanders were found in the northern hardwoods community, while none were found in the open fields and one was found in the shrub community. The black locust community was the only other community in which salamanders were

observed. Of the salamanders species found in the study area, only one, the northern dusky salamander, was common; however, its preferred habitat is restricted to streams, of which there are few on the study area. Five species of anurans (American toad, spring peeper, green frog, wood frog, and northern leopard frog) were found. Only three species (American toad, spring peeper, and green frog) appear to be common and wide-spread within the constraints of habitat preference. The wood frog and leopard frog are uncommon and local in distribution on the study area. One bullfrog observed may have been introduced. The western chorus frog, pickerel frog, and Fowler's toad have been identified in the area but were not observed during the study period. Several conditions present on the study area may tend to limit amphibian populations. Among those are the scarcity of forested communities and the patchwork arrangement of the small woodlots present. Second, within the woodlots there are few natural ponds for breeding areas. Third, most of the ponds that are present are farm ponds, which are frequently disturbed and which contain introduced fish. Fish populations limit reproductive success of many pond-breeding species by eating the amphibian eggs. Finally, the use of pesticides on croplands and vineyards may adversely affect amphibian populations and their prey species.

Reptiles

2.193
The turtle fauna on the Pomfret study area is rather limited as only two species, the snapping turtle and the painted turtle, were observed during the sampling period. The limited number of turtles encountered during this survey may be due to the paucity of undisturbed habitat. Snakes varied in abundance, with the most prolific being the garter snakes. Other snakes collected in the vicinity of the Pomfret site include the northern water snake, northern brown snake, northern red-bellied snake, and the milk snake. Black rat snakes may occur in the vicinity of the site but are generally uncommon.

Avifauna

2.194
Based on cumulative calculation approximately 30 percent of the 372 bird species (Beardslee, C.S. and H.D. Mitchell, 1965 Birds of the Niagara Frontier Region) known to occur in the Niagara Frontier region were observed in the study area during the fall migration period while 31 percent were observed by the end of the winter sampling period, 46 percent by the end of the spring sampling period and 47 percent by the end of the summer. A list of the important and relatively common bird species encountered at the Pomfret site is presented in Table 2-33. In general, the breeding species of the Pomfret study area are typical of the Lake Erie flood plain in New

TABLE 2-33

IMPORTANT AND RELATIVELY COMMON BIRD SPECIES OBSERVED POMFRET SITE

Species*	
Black Duck	-
Scaup sp.	-
Common Goldeneye	I, C
Red-tailed Hawk	I
Marsh Hawk	I
American Kestrel	I
Ring-necked Pheasant	I
Killdeer	C
Herring Gull	C
Ring-billed Gull	C
Common Tern	-
Mourning Dove	I, C
Downy Woodpecker	-
Eastern Wood Peewee	C
Horned Lark	C
Barn Swallow	C
Blue Jay	C
Common Crow	C
Black-capped Chickadee	C
Gray Catbird	C
American Robin	C
Woodthrush	C
Golden-crowned Kinglet	C
Cedar Waxwing	C
Northern Shrike	-
Starling	C
Red-eyed Vireo	C
Yellow Warbler	C
Common Yellowthroat	C
American Redstart	C
Bobolink	C
Eastern Meadowlark	C
Red-winged Blackbird	C
Common Grackle	C
Cardinal	C
American Goldfinch	C
Rufous-sided Towhee	-
Savannah Sparrow	C
Grasshopper Sparrow	I
Henslow's Sparrow	I

TABLE 2-33 (Cont'd)

IMPORTANT AND RELATIVELY COMMON BIRD
SPECIES OBSERVED POMFRET SITE

Species*	
Dark-eyed Junco	C
Tree Sparrow	C
Field Sparrow	C
White-throated Sparrow	C
Song Sparrow	C
Snow Bunting	C

C = Species included on list due to their abundance

I = Species included on list for reasons other than their abundance (gamebirds, etc.)

* Derived from winter and summer lists

York, Pennsylvania, and Ohio. A total of 55 species were encountered in the open field areas, 98 in the shrub zone, 119 in the northern hardwood forest, 61 in the pine plantation, 66 in the black locust stand, 39 in the vineyards, and 54 in the cropland areas. The estimated number of breeding bird pairs per 100 acres was 136 in the open field, 308 in the shrub, 252 in the northern hardwood forests, 51 in the pine plantations, 62 in the vineyard and 8 in the croplands. Due to the small size and irregular narrow width of the black locust forest on the Pomfret site, censusing breeding pairs was impractical.

2.195
The diversity of the seasonal avian populations of the open field community was generally lower than for the other communities except for vineyard and cropland communities. This general trend for a low number of species and low population diversity in open field areas can be attributed to: (1) a lack of diversity of foliage growth forms providing fewer niches than in communities with greater foliage height and growth from diversity; (2) a lack of protection from harsh weather during the winter season; and (3) a low diversity of forms of food items since weed seeds, grass seeds, and insects would comprise most of the avian food available in this community.

2.196
Species such as the Henslow's sparrow, grasshopper sparrow, savannah sparrow, and eastern meadowlark are associated as breeding more in open field areas than in any other plant community. Species such as the upland sandpiper, red-winged blackbird, bobolink, and dickcissel are also associated with open fields, but occur in other open communities such as pastures and cropland in comparable numbers.

2.197
Seasonal diversity of the avian populations in the shrub community is higher than that of the open field community for all seasons. The number of species seen in the shrub community shows high peaks during the migration seasons, with 59 species noted in fall and 64 species in spring. Nine species occurred in the winter in this community, and 40 species were noted during summer. Eighteen species of birds were recorded as breeding in the three shrub census areas. The shrub community supported a breeding population (pairs per 100 acres) that was significantly higher than all other communities except for the northern hardwoods forest.

2.198
The shrub community would be expected to have a more diverse avian population than the open field because of a greater foliage height diversity, which provides more niches for avian species utilization. In addition, the variation in plant species and distribution that occurs between and within shrub areas provides for an even greater diversity of habitat available for avian species. During winter, the

shrub community provides more protection from harsh weather than more open areas. The food supply in the shrub is also more diverse than that found in grasslands. In addition to weed seeds and insects, many fruits and berries are available and these are particularly important during the winter season. Species such as the yellow warbler, willow flycatcher, and common yellowthroat were far more abundant in this plant community than in any other. During the breeding season, many species that nested in shrub areas also nested in other plant communities. High numbers of song sparrows, red-winged blackbirds, gray catbirds, American robins, wood thrushes, field sparrows, and others nested in shrub areas, although many of these nested at higher densities in open fields, northern hardwoods forest, or vineyards.

2.199
The northern hardwoods forest overall has the most diverse avian population (119 species). This is not unexpected since the foliage height diversity is usually greater for this plant community. This community provided suitable habitat for a larger number of species during the winter and the breeding seasons. Protection from harsh weather offered by the northern hardwoods during winter and a variety of niches due to greater foliage height diversity in all seasons strongly contribute to the utilization of the community by a greater number of species. In addition, there is considerable variety in the food sources (weed seeds, berries, fruits, buds, mast, insects, etc.) available to birds in this community. Several species of birds are associated almost entirely with the forested communities (including black locust forest and pine plantation) on the study area. These species are of course most abundant in the northern hardwoods since that community comprises most of the forests on the study area. Such species (e.g., the red-winged vireo, American redstart, eastern wood pewee, great crested flycatcher, scarlet tanager, and hooded warbler) reach their peak densities in northern hardwoods forest. Species such as the wood thrush, song sparrow, gray catbird, American robin, and cardinal are found as common breeders in other communities but are also common breeders in the northern hardwoods forest. Many species that typically breed in shrub communities often utilize the woodland ecotones and understory. Therefore, in addition to the above-mentioned species, common yellowthroats, yellow warblers, red-winged blackbirds, and indigo buntings were found nesting in the northern hardwoods community.

2.200
Sixty-one species were observed in the pine plantation during the one-year study. Only five species were noted during winter observations, and only seven species were recorded nesting in the pine plantation census area. Thus, a large proportion of the species were visitors or transients in the pine plantation. The diversity of avian

species in this community shows high peaks during the migration periods and extremely low diversity during the winter period. The diversity index for the breeding population was significantly lower than for shrub and northern hardwoods, yet significantly higher than the remaining communities.

2.201
Stands of pines along the Lake Erie Plain do not represent natural communities. The larger pine plantations on the Pomfret study area were planted around 1950. Avian species of the northeastern United States that are associated with pine areas (e.g. dark-eyed junco, blackburnian warbler, and others) do not breed at this altitude in western New York. Therefore, the breeding population is less diverse than for similar areas on the Alleghany plateau. The small size of these pine plantations and a low diversity of plant species reduce the numbers of birds that can be supported by them during the winter season. The pine plantations are utilized heavily as a feeding and resting area by migrating species such as ruby-crowned kinglet, black-throated green warbler, yellow-rumped warbler, black-throated blue warbler, Cape May warbler, and red-breasted nuthatch. During the spring migration period, the pine plantations were used as roosting sites for long-eared owls, sharp-shinned hawks, and Copper's hawks. During both migratory periods, ruby-crowned kinglets, golden-crowned kinglets, and black-capped chickadees were particularly evident while feeding in the pine plantation. The golden-crowned kinglet and black-capped chickadee utilize the area heavily during winter.

2.202
During the one-year study, 66 species of birds were noted in the black locust community. The community was characterized by index of diversity values slightly lower than the hardwoods forest for fall, spring, and summer and a much lower diversity than the hardwoods forest in the winter population. Due to the relatively small width and irregular boundaries of the major black locust area along Little Canadaway Creek, no breeding bird census could be performed. Surveys of the breeding species composition indicated that the least flycatcher was the only breeding species in the black locust forest that was not recorded in the northern hardwoods forest.

2.203
The most important factors influencing avian populations in the black locust forest are the presence of Little Canadaway Creek and the lack of plant diversity in the overstory and understory. In addition to providing a source of water, the stream creates openings and edges in the forest that provide areas for species such as yellow warbler, which was very common in this community. The bank of the creek

provides nesting habitat for belted kingfishers, rough-winged swallows, and eastern phoebes, while the stream provides feeding sites for green herons and possibly other wading species.

2.204
The vineyard community had the lowest number of species (39) of any plant community on the Pomfret study area during the one-year study. The seasonal diversity of the avian populations in the vineyard was consistently lower than all other communities. The highest diversity of the avian population in vineyards was recorded during all sampling. This may be due to the presence of waste grapes in many vineyards being used as a food source by many migrant birds.

2.205
There are several factors that contribute to the low level of utilization of the vineyards by avian species. Of course, there is a reduced diversity of plant species and growth forms as vineyards represent a monoculture. This would directly affect the diveristy of avian species in the community. Human activity due to cultivation practices must have a great effect on the bird populations. The presence of humans during seasons when vines are being pruned and retied, the use of machinery to cultivate between rows and during the harvest, the use of gas-cannons to repel birds during late summer, and the spraying of insecticides, fungicides, and herbicides, would discourage the use of this community by birds. In addition, the lack of foliage on the vines during winter and the presence of open rows provide little protection from weather conditions.

2.206
During the one-year study, 54 species of birds were seen in the cropland community. As was seen with vineyards, the avian diversity in the cropland community generally was low. During fall and winter, the number of birds encountered per man-hour was low, but these values were very high during spring and summer. The total number of breeding pairs of birds based upon the censused area was far lower than in other communities; however, other types of cropland areas contained populations similar to open field areas. In many respects, the cropland avian community is quite similar to the open field avian community. In all seasons, many of the same species occurred in both communities and all of the species recorded as breeding in the open field were either confirmed or suspected breeders in the hayfields and pastures.

2.207
The low density recorded for cropland breeding birds probably represents the minimum as an actively used cropland was censused. During the spring, it was these same fields that contained large numbers of

birds, accounting for the high number of birds per man-hour. This high value was due to flocks of birds feeding primarily in freshly plowed fields as ground insects, insect larvae, earthworms, and other food items were exposed by plowing. High summer values for the birds per man-hour are due to flocking in red-winged blackbirds and starlings and the presence of adults and offspring of species such as the bobolink, meadowlark, savannah sparrow, and killdeer, which nest in cropland (especially hayfields and pasture) and cropland borders.

Mammals

2.208
Forty-six species of mammals were reported by Burt (1957) to be native to the region that includes the eastern shore of Lake Erie. Table 2-34 lists these mammals and denotes those which were found on the Pomfret study area.

2.209
Five species of mammals were found to be permanent residents of the open fields community on the Pomfret site, including woodchuck, shorttail shrews, white-footed mice, meadow voles, and meadow-jumping mice. Shorttail shrews were the most common species observed. Woodchucks were also noted in open fields, but seemed to prefer pastured fields and shrub areas along railroad tracks. Cottontails were observed in open fields during the summer but retreated to areas providing more food and cover such as shrub and northern hardwood forest communities during the winter. Other species noted either feeding or simply traversing the open fields were white-tailed deer, red fox, gray fox, shorttail weasel and oppossum.

2.210
The shrub community displayed abundant animal diversity with 21 mammalian species identified. The variation is probably due to the presence of a variety of herbaceous and woody plants which provide suitable habitat for species typical of open fields and forested areas. The shrub areas, which are very dense and relatively stable, support a unique mammalian species composition. The presence of red squirrel, prairie deer mice, and white-footed mice was noted within this community. To find these three species together is unusual since red squirrels and white-footed mice are typically found in forested communities and prairie deer mice are normally associated with sparsely vegetated open fields (Burt, 1957). It appears that the tall dense shrub layer and limited ground cover provided a unique habitat suitable to all three species. The two different types of shrub areas found on the Pomfret study area are an important habitat component of many mammals native to this region. Of these two, the typical open shrub communities are used by a greater variety and number of mammals than the dense, more stable shrub communities.

TABLE 2-34

Mammalian Species Reported by Burt (1957) to be Native to Western New York[a]

Opossum (*Didelphis marsupialis*)[b]
Hairytail mole (*Parascalops breweri*)
Starnose mole (*Condylura cristata*)[b]
Masked shrew (*Sorex cinereus*)[b]
Smoky shrew (*Sorex fumeus*)
Longtail shrew (*Sorex dispar*)
Least shrew (*Cryptotis parva*)
Shorttail shrew (*Blarina brevicauda*)[b]
Bats (Chiroptera)--9 species
Raccoon (*Procyon lotor*)[b]
Shorttail weasel (*Mustela erminea*)[b]
Longtail weasel (*Mustela frenata*)
Least weasel (*Mustela rixosa*)[c]
Mink (*Mustela vison*)[b]
Striped skunk (*Mephitis mephitis*)[b]
Red fox (*Vulpes fulva*)[b]
Gray fox (*Urocyon cinereoargenteus*)[b]
Coyote (*Canis latrans*)
Woodchuck (*Marmota monax*)[b]
Eastern chipmunk (*Tamias striatus*)[b]
Red squirrel (*Tamiasciurus hudsonicus*)[b]
Eastern gray squirrel (*Sciurus carolinensis*)
Eastern fox squirrel (*Sciurus niger*)[b]
Southern flying squirrel (*Glaucomys volans*)[b]
Beaver (*Castor canadensis*)
Deer mouse (*Peromyscus maniculatus*)[b]
White-footed mouse (*Peromyscus leucopus*)[b]
Southern bog lemming (*Synaptomys cooperi*)
Boreal red-backed vole (*Clethrionomys gapperi*)[c]
Meadow vole (*Microtus pennsylvanicus*)[b]
Pine vole (*Pitymys pinetorum*)
Muskrat (*Ondatra zibethicus*)[b]
House mouse (*Mus musculus*)[b]
Norway rat (*Rattus norvegicus*)[b]
Meadow jumping mouse (*Zapus hudsonius*)[b]
Woodland jumping mouse (*Napaeozapus insignis*)[c]
Eastern cottontail (*Sylvilagus floridanus*)[b]
White-tailed deer (*Odocoileus virginianus*)[b]

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a. Scientific names and the order of species are taken from Burt (1957).
b. Native species found on the Pomfret study area.
c. Native species for which hypothetical sightings were reported on the Pomfret study area.

2.211
The northern hardwood forest also had a diverse mammalian population with more than 22 species identified. The species composition of this community is clearly similar to the shrub and pine plantation community.

2.212
In general, hardwoods forests offer a wide variety of food and shelter and thus are usually occupied by a diverse assortment of mammals ranging from fossorial species such as moles, which find plentiful quantities of food in the soil and leaf litter, to arboreal types such as squirrels, whose feeding and cover requirements are met by the canopy-forming trees. Not only does each forest provide a multitude of habitat components, but each is to some extent different from all others and thus more suitable for particular species.

2.213
Thirteen species of mammals were noted in pine plantations with the white-footed mouse being the only species considered common. Most species noted were either passing through or using the area for shelter. Deer and foxes are good examples of transient species, particularly during winter when track surveys indicated that they were using pine plantations for travel routes and shelter. Of the species reported in the pine plantation, the red squirrel is the only species whose life history information indicates a strong preference for it. All other species seemed to use pine plantations in an incidental fashion.

2.214
Six species of mammals were recorded in the black locust community. Trapping efforts revealed the presence of three species (shorttail shrews, eastern chipmunks, and white-footed mice) with white-footed mice by far the most abundant.

2.215
The composition of mammalian species found in the black locust forest was not very similar to the composition of mammal species found in any other particular plant community. It is interesting, however, that this community was most similar to vineyards, pine plantations, and cropland, all of which are monocultures. Thus, the low variety of mammals reported in the black locust community may be due to the major plant species composition of this community.

2.216
Oppossum, red fox, cottontail, and deer were observed in vineyards. These species were seen traveling through the community and did not appear to depend on vineyards for more than a route from one community to another. Only four species (cottontails, raccoons, gray

fox, and deer) were recorded in croplands. Of these, the deer and raccoon are probably most important from an economic standpoint, since they both feed on agricultural crops, especially corn, when available. In addition, the locations of the cornfields appeared to influence the distribution of deer during fall.

2.217
The following discussions separate the mammals of the Pomfret site and vicinity by family. Included are their relative abundances and distributions.

2.218
Burt (1957), reports five species of shrews to be native to this region; two of these, the masked shrew and shorttail shrew, were noted on the Pomfret study area. The smoky and longtail shrew both prefer coniferous habitats, particularly hemlock (Doutt et al., 1967); lack of this type of habitat on the Pomfret study area may explain the absence of these shrews. On the other hand, the least shrew is reported to frequent open fields (Doutt et al., 1967) and was trapped on the Sheridan study area. Benton (personal communication, 1975) also reported this species to be present in the Pomfret area.

2.219
The hairytail and starnose mole are reported to be native to western New York (Burt, 1957). A starnose mole was found on the Pomfret study area in a poorly drained hardwoods forest. The distribution of starnose moles on the study area is unknown but their preference for very wet soils may be the major factor determining where they are located. The hairytail mole commonly inhabits drier soils with a higher sand and lower clay content than was found on the lake plain. Therefore, the seasonally high water table and poor drainage found on most of the Pomfret study area may make this area unsuitable for hairytail moles.

2.220
The only member of the family Leporidae found on the lake plain is the eastern cottontail. At the Pomfret site, the eastern cottontail was reported in every plant community and was found to be very common, particularly in shrub communities. As a result of their value as a game animal and as prey for a variety of predators, cottontails are one of the most important mammalian species in this region.

2.221
The woodchuck is the largest member of the family Sciuridae native to this region (Burt, 1957). Due to the poor soil drainage, high water table, and flat topography in this area, the number of locations

suitable for the construction of burrows is limited. Thus, the majority of burrows were found along the railroad tracks where the elevated track bed provided better burrowing conditions. In addition to providing shelter for woodchucks, the burrows are frequently used by other mammals, especially cottontail rabbits (Trippensee, 1948). Woodchucks did not appear to be very common, and it is suspected that the poorly drained soil conditions make this area, with local exceptions, unsuitable for large populations of woodchucks.

2.222
The forested portion of the study area supported populations of four other sciurid species: eastern chipmunk, eastern fox squirrel, red squirrel, and southern flying squirrel. Of these, the eastern chipmunk is probably the most abundant and widely distributed on the study area. Although the most suitable community for chipmunks was the northern hardwoods forests, a few were also reported in the shrub community and black locust forest. Red squirrels were abundant in pine plantations and a few were observed in shrub, northern hardwood and residential communities. Only five fox squirrels were observed, all in the northern hardwood forest. Their low numbers have been attributed to the fact that the study areas considered lie on the edge of the range for fox squirrels in New York. Gray squirrels were unexpectedly absent from the study area. No explanation can be given for their absence except that their fluctuating population levels could possibly have been at an extreme low. The southern flying squirrel was also reported to occur in the northern hardwood forest. However, their numbers were considerably lower than those of the Sheridan site. This is due primarily to the lack of suitable habitat such as dead and dying trees, which provide cavities necessary for nesting.

2.223
Burt (1957), reported that seven members of the family Cricetidae inhabit the eastern shore of Lake Erie. Of these, four were definitely identified on the Pomfret study area, one was listed as hypothetical, and two were not found. The white-footed mouse, Pomfret site's most abundant mammalian species, was caught in all plant communities. Meadow voles were also captured but in lower numbers than expected. Ecologically, the white-footed mouse is one of the most important mammals in this region. Their abundant numbers and high population turnover rate result in this species being very important in the energy flow through many plant communities. They consume large quantitites of seeds and insects and are in turn the major food source for a diverse group of predators. It is logical to assume that in the absence of high numbers of meadow voles, such as was demonstrated during this survey, white-footed mice and rabbits become the major mammalian prey species. This species is thus important as a baseline food source for local predators, and pressure on

these animals probably varies from year to year partially in response to the availability of alternate prey species.

2.224
Another member of the family Cricetidae native to this region is the muskrat. Muskrats were noted in many ponds, streams, and ditches on the Pomfret study area. No quantitative measure is available to indicate the population levels present, but enough evidence was found to indicate that they were fairly common.

2.225
Although both the meadow jumping mouse and woodland jumping mouse are native to this region (Burt, 1957), only the meadow jumping mouse was noted. One hypothetical observation of a woodland jumping mouse was noted. It was suspected that woodland jumping mice are more common in the forests to the east of the lake plain; this was confirmed by Benton (personal communication, 1975), who stated that he had frequently trapped them east of the escarpment. Meadow jumping mice were captured in open fields, shrub and northern hardwood forests communities. This species is common to grassy meadows and fields, and thus their presence in the open field was expected; however, they appeared to be more numerous in those typical shrub areas where a great deal of herbaceous ground cover was present.

2.226
Two native canids (red fox and gray fox) were observed in the study area. They were recorded in most of the plant communities and appeared to be utilizing most portions of the study area.

2.227
Local residents and conservation officers of the New York State Department of Environmental Conservation (NYSDEC) reported that the fox population was still recovering from a rabies epidemic that occurred in the 1960's. During this period, DEC personnel conducted a fox control project in nearby Erie County (Tuller, personal communication, 1975).

2.228
The raccoon is one of the most common medium-sized mammals on the Pomfret study area. Evidence of raccoon activity was noted in the following plant communities: shrub, northern hardwoods forest, pine plantation, and cropland. The raccoon, with its highly omnivorous food habits, is one of the most important mammals in this region. During spring and summer, almost every stream or pond that was visited was found to have raccoon tracks in the surrounding mud, thus indicating that aquatic food was being intensively sought. During late summer, evidence of raccoons feeding on corn was discovered, again illustrating the diverse food items available to this species on the Pomfret study area.

2.229
The shorttail weasel, mink, and striped skunk were identified during this survey while one visual sighting was made of what appeared to be a least weasel. The least weasel is the rarest weasel found in this region, even under ideal conditions, it never occurs in appreciable numbers (Doutt, et al., 1967). Another species reported to be native to this area, but which was not definitely recorded during the mammal survey is the longtail weasel (Burt, 1957). Since many weasel tracks were found in the snow and it is very difficult to distinguish the tracks of longtail from shorttail weasels, it is possible that longtail weasels were present on the study area, especially when one considers a report by Richmond and Rosland (1949), which claimed that longtail weasels were much more common than shorttail weasels in northwestern Pennsylvania.

2.230
As did the red and gray foxes, the small weasels appeared to be concentrating their winter hunting effort in the shrub and hardwoods forest communities. It is assumed that white-footed mice were the major prey item of these species during this study. One mink was seen during the study and a small number of skunks was observed, indicating that striped skunks are not currently very common on the Pomfret site.

2.231
The white-tailed deer is the largest and one of the most interesting mammals native to the Pomfret study area. Not only are deer ecologically important due to their consumption of large quantities of plant material, but their excellence as a game animal makes them very important from a recreational standpoint.

2.232
The reported deer kill by hunters for 1973 in the town of Pomfet was 42, of which 38 were adult bucks, one was a buck fawn, two were adult does, and one was a female fawn (DEC, 1974). During 1973, a total of 2,418 deer were killed in Chautauqua County; the Pomfret kill represents 1.7 percent of these. During 1974, 3,801 represents an increase of 36.4 percent. Severinghaus and Sauer (1969), reported that from 1940 to 1959, the amount of suitable deer habitat in Chautauqua County had increased 12.9 percent, from 597.4 to 674.6 square miles. Deer were reported in every plant community except residential areas. Some community types such as shrub and northern hardwoods forest were used to a much greater extent than others. These communities are the most important factor influencing the deer population in the region since they provide both food and shelter.

Protected, Threatened, and Endangered Status

Flora

2.233
Many of the plant species collected at the Pomfret site can be found on the New York State Department of Environmental Conservation list of Protected Native Plants. A list of these species, the habitat in which they were most commonly found, and comments regarding abundance is presented for both the Sheridan and Pomfret plant sites in Table 2-35. It should be noted that collection of the plants on this list without the express permission of the land owner is a violation of Section 193.3 of the New York Penal Code and those doing so are subject to fine. The New York State Protected Native Plants List does not offer the same kinds of protection afforded under the Federal Endangered Species Act.

2.234
None of the species included in the Smithsonian Institute 1975 report on Endangered and Threatened Plant Species of the United States were encountered at the Pomfret site or the extended area surrounding it.

2.235
Plant species that are new to an area, or on the periphery of their range, are also noteworthy. Stiff yellow flax (Linum medium), which was found on the Pomfret study area, is a native species that is quite rare in the Erie Plain region (Smith, 1975). This species was not mentioned by Zenkert (1934) in his Flora of the Niagara Frontier Region, which is a very thorough account of the species present in the areas.

Herpetofauna

2.236
No amphibian or reptile species listed as endangered by the U.S. Department of the Interior (USDI) (United States List of Endangered Fauna, 1974) were found on the Pomfret study area. In addition, the study area is not within the range of any such species.

Avifauna

2.237
During the one-year study, two birds of two species that are listed as endangered species were observed at the Pomfret study area. Both of these, an adult bald eagle and a peregrine falcon of unknown age, were seen during spring migration. Only the southern race, the

TABLE 2-35

Protected Plants Found Within the Extended Area, Pomfret and Sheridan Study Areas

Species	Typical Habitat: Open Fields	Shrub Community	Northern Hardwoods Forest	Black Locust Forest	Willow Community	Marsh	Comments[(a)]: Pomfret	Sheridan
Celastrus scandens American bittersweet		x	x				Sparse, along bluffs of Lake Erie and Little Canadaway Creek	Sparse, along bluffs of Lake Erie
Cornus florida Flowering dogwood			x				Solitary	Solitary
Euonymus atropurpureus Burning bush			x				Sparse, only at mouth of Little Canadaway Creek	--(b)
E. obovatus Strawberry bush			x	x			Abundant	Abundant
Botrychium dissectum Cutleaf grapefern			x				Sparse	Sparse
B. virginianum Rattlesnake fern			x				Rather abundant	Rather abundant
Osmunda regalis Royal fern		x	x				Common	Common
O. cinnamomea Cinnamon fern			x				Sparse	Sparse
O. claytoniana Interrupted fern			x				Sparse	Sparse
Athyrium asplenoides Southern lady's fern			x				Abundant	Abundant
Cystopteris bulbifera Bulbiferous bladder fern			x				--	Sparse only on moist limestone bluffs
Thelypteris palustris Marsh fern						x	Not seen, but probably present	Abundant, cattail marsh

a. Plants are rated on the abundance of individuals of a species by the categories: abundant, rather abundant, sparse, solitary.
b. Not seen on this study area.

southern bald eagle (Haliaeetus l. leucocephalus), is listed in the United States List of Endangered Fauna (USDI), 1974). Both races of this species occur in spring in the Lake Erie region (Beardslee and Mitchell, 1965), and field identification to subspecific level is impossible. The peregrine falcon was observed while migrating northeastward over the study area with a number of other dirunal raptors. Only two subspecies of the peregrine falcon are known to occur in the eastern United States, and both are included on the United States List of Endangered Fauna (USDI, 1974). Since the American peregrine falcon (Falco peregrinus anatum) is considered extirpated in the eastern United States (Hickey, 1969), the bird seen was most likely of the northern race, the Arctic peregrine falcon (F. p. tundrius). Both of these birds were transient on the study area. Neither was observed landing on the area or using it in any way; that is, they were observed flying over the area only. The study area lies outside of the breeding range of both the southern bald eagle and the arctic peregrine falcon.

Mammals

2.238
Three mammalian species that might possibly be found in western New York have been designated by the USDI (1974) as endangered. These include the Indiana bat (Myotis sodalis), eastern timber wolf (Canis lupus lycaon) and eastern cougar (Felis concolor cougar). The Indiana bat is native to most of the eastern United States, particularly the Appalachian mountain region (Burt, 1957). Barbour and Davis (1969) indicate that western New York is on the periphery of the currently known range of this species. The use of limestone caves for winter hibernation seems to be the critical factor in the survival of this species. During the warm months, they apparently disperse from the wintering caves, and little is known about their habits or distribution at this time. Since the lake plain area is basically devoid of limestone deposits (Mueller, 1960), it is reasonable to assume that no appropriate wintering areas are available for Indiana bats. The actual occurrence of the Indiana bat on the study area is unknown since bats were seen but not collected and identification in flight is very difficult. This is especially true in the case of the Indiana bat, which is almost identical to the little brown bat (Motis lucifugus), a common species in this region (Barbour and Davis, 1969). Western New York is currently not in the range of the eastern timber wolf, and because this species requires wilderness conditions, it probably never will be. The U. S. Fish and Wildlife Service (Threatened Wildlife of the United States, 1973) reported that one specimen was shot in Fulton County (eastern NY) in 1968. The distribution of the eastern cougar is currently unknown, but

there does appear to be a recent range extension from both the Maritime Provinces in Canada and the New England States. The only datum bearing any importance to the Pomfret and Sheridan study areas is of a cougar that was killed in 1967 in Crawford County, Pennsylvania, approximately 60 miles southwest of the study areas (Doutt, et al., 1967). As in the case of the wolf, this species requires wilderness conditions, which the Pomfret and Sheridan areas do not provide.

Arthropods

2.239
In the Federal Register (March 20, 1975), the U.S. Department of the Interior gave notice that a review of the status of a number of butterfly species was necessary to determine if these species should be proposed for listing as either endangered or threatened. One species, Hessel's hairstreak (Callophrys hesseli), and one subspecies, Karner blue (Lycaeides melissa samuelis), listed are reported to occur in New York. Neither was found in the Pomfret study area, although no special effort was made to locate them.

Fauna Specifically Protected by New York State

2.240
Part 182.1, Section 11:0535 of the New York State Environmental Conservation Law notes five endangered wildlife species not included on the Federal listing: northern bald eagle, osprey, Karner blue butterfly, bog turtle, and the Cittenango ovate amber snail. The latter two do not occur at either site or vicinity. The range of the Karner blue butterfly includes New York State, but the species was not observed at either site. Both the northern bald eagle and osprey were observed flying over one of both sites during spring migration. Neither of these species, however, was observed nesting in the site study areas.

Fish

2.240 a. Several sources were consulted to derive a list of the threatened or endangered species to be found in New York and Lake Erie, and Eastern Basin tributary streams. These include Van Meter and Trautman (1970), Miller (1972), Hubbs and Lagler (1974), Scott and Crossman (1973), U. S. Department of Interior (1977), and the New York State Department of Environmental Conservation's list of fishes (1974). The species listed on the Federal Endangered and Threatened list include longjaw cisco, blue pike, and shortnose sturgeon. These species are also on the New York State list. The lake sturgeon is described as found in greatly reduced numbers in the Great Lakes and throughout almost its entire range by Hubbs and Lagler (Fishes of the Great Lakes Region, 1974), but is not on the Federal or New York State lists. Statewide angling regulations (1978-79) indicate that lake sturgeon and shortnose sturgeon may not be possessed at any time. Shortnose sturgeon are listed as endangered (Federal and State lists), but would not generally be found in Lake Erie. Shortnose sturgeon are restricted to the eastern seaboard of North America from the St. John River in New Brunswick to the St. Johns River in eastern Florida. They are most often seen in large tidal rivers, but also in salt and brackish waters. The pugnose minnow (Notropis emiliae) was listed as rare in the Lake Erie watershed (Van Meter & Trautman, 1976), but is not on the Federal or New York State threatened or endangered species list.

2.240 b.
No shortnose sturgeon, cisco, or blue pike were caught in the Pomfret Lake Erie Generating Station study areas. One lake sturgeon was caught in the 1974-75 season and was released immediately. A few fish identified as pugnose minnows were caught in the tributaries near the sites, especially in Little Canadaway Creek. The identity of this species was questioned by Corps staff since the pugnose minnow is not typically found in the Eastern Basin tributaries of Lake Erie. Texas Instruments is not able to definitively reaffirm the presence of the pugnose minnow (Notropis emiliae) on the streams of either site (Pomfret and Sheridan). The reference specimens retained from the 1974-1975 sampling efforts were immature, thus preventing reaffirmation to the species level of the previous identification. Based on the identification of this species at the time of the sampling, Texas Instruments believes it is possible, if not probable, that pugnose minnows were found in the two Pomfret area streams for brief periods of time (see para. 2.157). This species was also collected at Sheridan vicinity streams (para. 2.387a.)

2.240 c.
The applicant's fishery consultant, Texas Instrument (TI), believes there are very few of the three endangered species in the New York nearshore area of Lake Erie. TI's sampling effort in the Dunkirk area was intense, covering parts of three years and utilized a variety of fisheries sampling gears.

The following are some general habitat and life cycle requirements of the three endangered species and the pugnose minnows and lake sturgeon.

Species	Life History	Distribution	Preferred Habitat
Pugnose Minnows *Notropis emiliae*	No information available.	Primarily Gulf States and Mississippi Valley including western Lake Erie.	Clear, slow-moving streams and sloughs where bottom is sand or fine mud.
Shortnose sturgeon *Acipenser brevirostrum*	Spawn in April to early June in middle reaches of large tidal rivers; sexual maturity reached by males at approximately 20 inches total length and 24 inches for females. Maximum age between 27 and 30 years.	Restricted to the eastern seaboard of North America from St. John River in New Brunswick to St. Johns River in eastern Florida, in large tidal rivers, brackish and salt water.	Large tidal rivers.
Lake sturgeon *Acipenser fulvescens*	Spawns May to late June at water temperature of 13-18°C in larger rivers, typically in swift waters 2-15 feet deep, eggs adhere to rocks, number from 50 to 667 thousand per female. Age of maturity is from 15 to 22 years.	Large river systems and lakes, including St. Lawrence, Mississippi, and Tennessee river basins, and the Great Lakes.	Shoal areas of lakes and large rivers, feed on bottom on small organisms in mud and debris.

Species	Life History	Distribution	Preferred Habitat
Longjaw cisco *Coregonus alpenae*	Spawn in October through November in deep areas (60 to 150 feet). Females mature at 3-4 years, very little known about eggs hatching and larval fish.	Indigenous to Great Lakes Basin.	Deep waters of Great Lakes, feeds on invertebrates such as clams and insect larvae.
Blue pike *Stizostedion vitreum glaucum*	The blue pike is a variation of the yellow walleye. A complete discussion on this species is found in Section 574.2-36 of the Article VIII application.		

Habitat of Endangered Fish Species (or others listed above) in the Dunkirk Area

Pugnose minnow - This species is not on the U. S. Department of the Interior's or the New York State DEC's species list of threatened or endangered species. Authors Van Meter and Trautman (1970) regard the western basin of Lake Erie as the northern extreme range of the pugnose minnow in the United States. The species is relatively common in its primary range which extends from Florida to Texas and includes the Mississippi Valley and its tributaries. The preferred habitat is clear, slow-moving streams with abundant aquatic vegetation, and these conditions are not typical for the streams studied at Sheridan and Pomfret.

Lake sturgeon - The Dunkirk nearshore area, including the Pomfret and Sheridan sites, is not a preferred habitat for Lake Sturgeon since there are no large shoal areas or river mouths in the area. Also, the bottom is composed primarily of shale and would not provide suitable food materials for the bottom-feeding sturgeon. Although lake sturgeon typically run up large rivers, where they spawn near the first major obstructions such as falls and dams, lake spawning has been reported along rocky, shallow, wave-washed shores.

Long jaw cisco - nearshore area of southern Lake Erie near the study sites is not preferred Long jaw cisco habitat since this species inhabits deep waters, generally deeper than 60 feet.

Blue pike - The blue pike has habitat preferences similar to the yellow walleye. Walleye are common in the Dunkirk area during the spring and fall when these fish are caught in some numbers by both sport and commercial fishermen. In almost three years of study in the area, Texas Instruments has not collected a confirmed specimen of the blue pike subspecies. However, Texas Instruments did cooperate with the Lake Erie U. S. Fish and Wildlife unit which is trying to capture, spawn and grow a viable population of blue pike. Unit personnel checked several slate grey specimens that TI field crews caught and kept alive but none of these fish were confirmed as blue pike.

Shortnose sturgeon - According to Hubbs and Lagler, shortnose sturgeon do not inhabit the Great Lakes. Additionally, the shale bottom in the Dunkirk area would not provide suitable foods for the shortnose sturgeon, which is a bottom feeder.

SHERIDAN SITE

LOCATION

2.241
The proposed power facility will be situated on a 986 acre site near Fletcher Point in the town of Sheridan, Chautauqua County, New York. Specifically, the site lies within the central lowlands physiographic province bordering Lake Erie and is approximately one-quarter mile from the lake at its nearest point. Fuel handling facilities and the water intake and discharge structures for the proposed plant will be constructed offshore at points where water depths of 25 to 30 feet are available (approximately 0.75-mile offshore). They will be connected to the site by means of an underground tunnel. The anticipated latitude and longitude of the main plant buildings on the site will be 42°31'24"N and 79°24'35"W.

2.242a
Sheridan is one of the several communities which comprise the Dunkirk-Fredonia region. The city of Dunkirk and the applicant's Dunkirk Steam Station are located west-southwest of the proposed site, at a distance of six and eight miles, respectively. Within a five-mile radius of the proposed site are located the villages of Silver Creek and Forestville. Land use within the five-mile radius is predominantly agricultural and open space (woodlands). In general, the lowlands bordering Lake Erie near the site are known for their grape production.

2.242b
Primary and secondary impacts of facility construction and operation would be expected to pervade an area approximately 15 miles in any

direction from the proposed project site. Included in this impact area are three distinct community types:

- Highly urbanized areas, consisting of the city of Dunkirk and the village of Fredonia.
- Moderately urbanized areas to the east such as the villages of Silver Creek and Forestville, and the town of Hanover.
- Rural-suburban fringe communities surrounding the more urbanized areas, represented by the towns of Sheridan and Dunkirk.

Figure 1-4 shows the corporate boundaries of the municipalities and towns in the immediate vicinity of the site, and their location with respect to New York State.

2.242c
Since the propsed site boundaries do not coincide with property lines, the residential inventory includes all dwelling units situated on any land parcel which is either wholly or partially located with the site boundaries. Based upon this assumption, there are 30 houses and two mobile homes on the Sheridan site. All of these dwellings are year-round and are predominantly of wood frame construction with between one and two floors. According to tax records, the average assessed valuation of a site house is $11,918 (as of 1 May 1974). It has been reported that the market value of residential homes in this area is approximately 1.8 times the assessed value.

DEMOGRAPHY

Regional Population
2.243a
Refer to Pomfret paragraph 2.003a.

Local Population
2.243b
Areas of high population concentration such as Dunkirk (3,500 people per square mile), and the village of Fredonia (2,000 people per square mile) are relatively small in size. The town of Sheridan is sparsely populated and essentially rural. The total 1975 residential population within 15 miles of the proposed site is estimated to be more than 76,000 persons with a density of 185 persons per square mile. The largest city in the vicinity of the proposed site is Dunkirk, with a population of 16,855 people in 1970.

2.243c
A rough index of family size is the average number of persons per household. For the County and Sheridan, the number of persons per

household is around 3.2. Hanover Town has 3.12 persons per household, according to the 1970 Census of Population. The effect of the outmigration on this average is evidenced by the 1960-70 figures for Sheridan and Chautauqua County, with Sheridan's figure going from 3.4 to 3.2 and Chautauqua County going from 3.1 to 2.7. The non-white households represent a very small percentage of the population households (1.6%). However, for the region, the non-white category nearly doubled in percent; the town of Sheridan fell by over 50 percent, and the County experienced a 40 percent increase.

2.243d
Population fluctuation within the study area is apparent with certain communities declining in population (e.g. the city of Dunkirk, which experienced a 7.4 percent population decline from 1960 to 1970), others experiencing incremental increases, and a few demonstrating significant growth. The town of Sheridan has experienced a net decrease of 25 individuals from 1960 to 1970. Population losses have been attributed primarily to economic problems centered in the highly urbanized areas as unemployment forces people to emigrate to the other more industrialized and diversified market areas. A notable exception to the population decline is the town of Pomfret, which has experienced an increase in population primarily due to the State University College of New York at Fredona. Current population trends and projected growth for the municipalities and towns in the immediate vicinity of the site are presented in Table 2-1.

Site Specific Population
2.243e
The proposed site consists of an estimated 108 residents who are located primarily along Aldrich and Chapin Roads.

COMMUNITY DEVELOPMENT

2.244
Refer to Pomfret paragraphs 2.004a and 2.004b.

COMMUNITY COHESION

2.245
Sheridan is a farm community with an agrarian style of life. Rural as opposed to urban interests characterize the town. Industry is of minor importance, but the town is still dependent on the Dunkirk industrial complex. The people value highly their neighbors and the land. Religion plays an important part in the community and local churches have a persuasive influence on local citizens. Since there is a deep concern for maintaining the community life style, abrupt change is viewed negatively.

PUBLIC SERVICES AND FACILITIES

2.246
The adequacy of services and facilites, combined with land availability and economic climate, can often be used as an indicator of an areas's population capacity. The 1975 population of institutions, such as schools and hospitals, within a 15-mile radius of the site is estimated to be 26,842, and by 1985 estimated to rise to only 26,890. In addition to the general population trends discussed earlier, a future decline in school age population is one of the most noticeable causal factors. This nearly constant institutional population and the low population growth expected for the area as a whole, indicates that these institutions should have sufficient future capacity.

Law Enforcement and Fire Prevention

2.247
Refer to Pomfret paragraph 2.007.

Water Supply

2.248
Refer to Pomfret paragraph 2.008.

Waste Disposal

2.249
The town of Sheridan has no sanitary sewers or public water service.

2.250
During the plant's operation, sewer and water services will be provided by the plant itself and should have no effect on the public. During construction, water will probably be drawn from a water line which will extend from Dunkirk to the intersection of Newell and Middle Roads and was planned for completion in 1977. Capacity is expected to be adequate to supply this incremental need. The construction and operation of sanitary facilities will be accomplished in accordance with applicable Federal, State, and local standards.

2.251
The capacity of the local area to provide other services is also adequate. Local and regional planning projections indicate that the prevailing vacancy rate and present supply of residential structures and mobile homes are sufficient to meet existing and future demands. There are enough schools and educational facilities to provide services for both the existing and projected population. Assuming a normal diffusion of residency within the area, and the average family with two school age persons per relocated household, the increases in

school enrollment caused by the proposed project are anticipated to be quite small. The present extent of health services, recreational sites, and other public and semi-public services in the local area is ample to meet the existing needs and those that might prevail in the future.

Other Services
2.252
Refer to Pomfret paragraph 2.010

LAND USE

Regional
2.253
Refer to Pomfret paragraph 2.012.

Local
2.254
Local land use in the area of the Sheridan site is characterized by a predominance of forestland in the Fc and Fn LUNR classification, brush cover and forests over 30 feet. The next major land uses within about five miles of the site are vineyard (Av) and cropland/cropland pasture (Ac) which together account for about 40 percent of the local land use. The remaining local land use is primarily comprised of other kinds of agricultural uses, such as intensive agriculture, permanent pasture, and residential land. Figure 2-19 illustrates current land use patterns both onsite and within a one-mile radius of the proposed plant. A summary of the acreage utilization per land use type for the area defined in Figure 2-19 is presented in Table 2-36. Table 2-3 defines the land use classification symbols used in Figure 2-19 and Table 2-36.

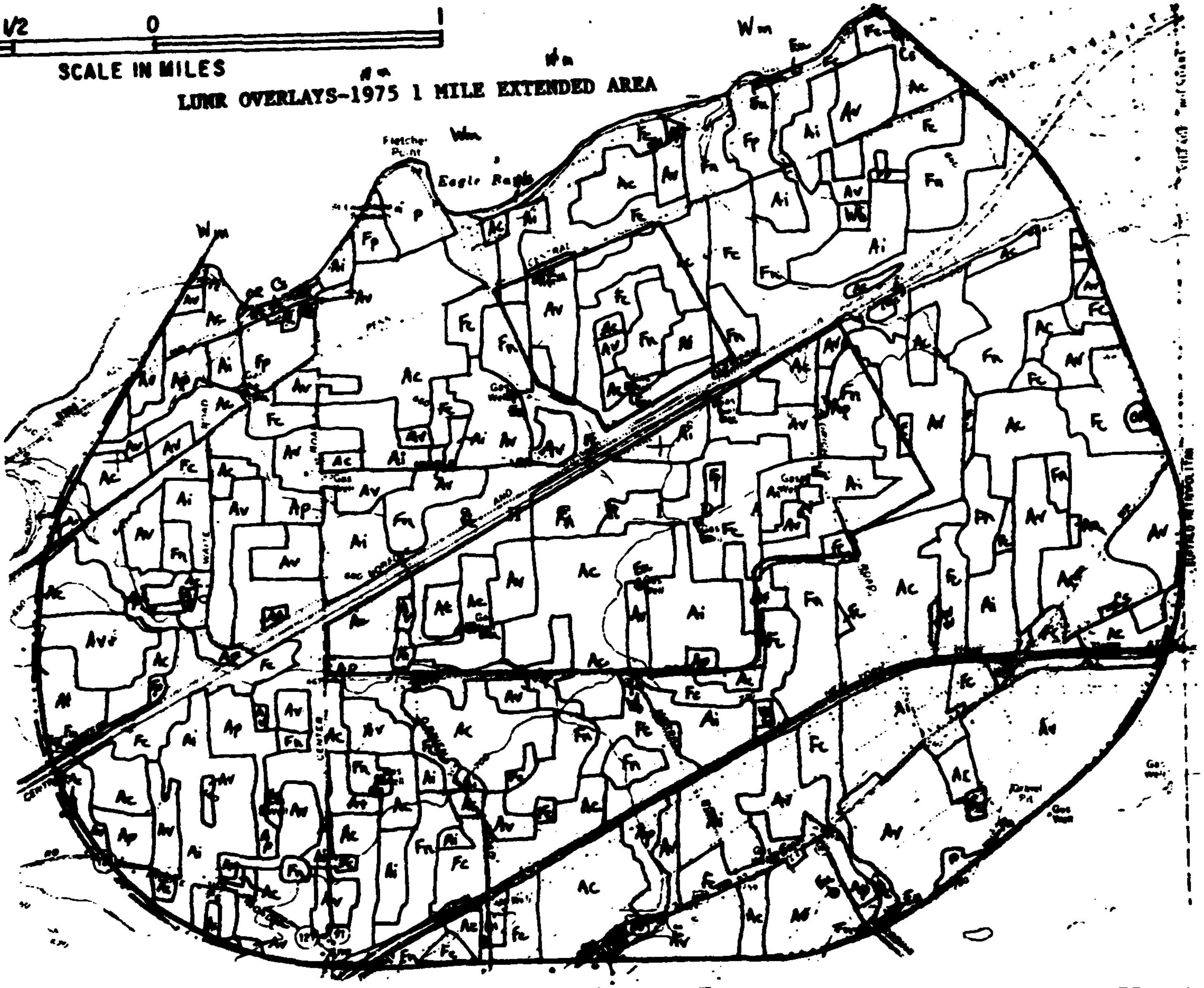
High Intensity Land Use
2.255
According to the land use data presented in Table 2-36, about 0.1 percent of the site and 0.4 percent of the area within one mile of the site is classified as high intensity land use. The high intensity classification includes industrial, commercial, mining, residential, and urban land use.

2.256
It should be noted that the LUNR area classification system does not delineate farm residences nor does it map rural nonfarm residential activities unless there are more than four residences per 1,000 feet of road frontage (Hardy, et al., 1971). Thus, the absence of residential acreage figures ($\overline{Rs}$, $\overline{Rl}$, Rk) in Table 2-36 should not be interpreted as meaning that such uses do not exist on the site.

1 — 1/2 — 0 — 1

SCALE IN MILES

LUNR OVERLAYS-1975 1 MILE EXTENDED AREA



SHERIDAN SITE

FIGURE 2-19

TABLE 2-36

SITE SPECIFIC LAND-USE ACREAGE SUMMARY

LUNR Category	Sheridan Site Acreage	Sheridan Site Percent Distribution	Adjacent One-Mile Area Acreage	Adjacent One-Mile Area Percent Distribution
High Intensity				
Rl	0.0	0.0	5.0	0.1
Rk	0.0	0.0	8.0	0.1
Cs	0.0	0.0	9.2	0.2
Eu	1.0	0.1	2.2	0.0
Sub Total	1.0	0.1	24.4	0.4
Low Intensity				
Ao	0.0	0.0	4.0	0.1
Av	191.3	19.4	1,258.0	22.3
Ac	248.5	25.2	1,388.0	24.6
At	31.6	3.2	55.5	1.0
Ap	43.4	4.4	198.5	3.5
Ai	148.9	15.1	764.0	13.6
Fc	187.4	19.0	1,151.7	20.4
Fn	128.2	13.0	491.7	8.7
Fp	5.9	0.6	132.7	2.3
Wc	0.0	0.0	3.0	0.1
Wb	0.0	0.0	10.0	0.2
Ww	0.0	0.0	3.0	0.1
Ns	0.0	0.0	4.0	0.1
Or	0.0	0.0	8.0	0.1
P	0.0	0.0	60.5	1.1
Sub Total	985.2	99.9	5,532.6	98.2
Corridors and Services				
Th	0.0	0.0	77.0	1.4
Sub Total	0.0	0.0	77.0	1.4
Grand Total	986.2	100.0	5,634.0	100.0

Source: Field survey program undertaken jointly by ERT and Cornell University.

Since the site boundaries do not coincide with property lines, the residential inventory includes all dwelling units situated on any land parcel which is either wholly or partially located within the site boundaries. Based upon this conservative assumption, there are 30 houses and two mobile homes on the site. Utilizing these data and the occupation factor for the Sheridan site (3.39) the total number of residents occupying the dwellings was calculated to be about 108.

2.257
Natural gas production is the only commercial/industrial land use taking place on the site. There are 12 gas wells located within the site boundaries. A review of the LUNR inventory and assessors' maps indicate that there are no other commercial or industrial land uses taking place on the site.

Low Intensity Land Use
2.258
Ninety-nine percent of the acreage within the site boundaries, and 98 percent of the area within one mile of the site is classified as low intensity land use. According to this land use acreage summary (Table 2-36), 52 percent of the site's 986 acres is active agricultural land (Ac, Av, Ao, At, Ap) while an additional 15 percent is considered to be inactive agricultural land (Ai). The predominant nonagricultural land use on the site is forest land (Fc, Fn, Fp) a land use designation which applies to nearly 33 percent of the site. The relative distribution of land uses in the adjacent one mile area generally reflects those patterns which exist on the site, particularly with regard to the predominance of agricultural and forest land activities.

2.259
Three land uses have been identified as having a special value or character: vineyards, forest land, and wetlands. With the exception of wetlands, all three activities are found on the site as well as in the adjacent one mile area. Wetlands have been identified in the adjacent area only. Vineyards (Av) constitute approximately 19 percent of the acreage found on the site and 22 percent of that contained in the adjacent area. According to Carl Pearce, Chautauqua County Agricultural Extension agent, the soils and micro-climatic conditions found generally in the Chautauqua Grape Belt region make vineyards a unique and irreplaceable agricultural resource (Pearce, 1950).

2.260
Forest lands (Fc, Fn, Fp) compose nearly 33 percent of the site and 32 percent of the adjacent area. The value of this land use lies not with its uniqueness in terms of relative scarcity, but rather with

its ecological importance with respect to "providing a natural habitat for many species of animals and plants" (New York State Office of Planning Coordination, 1971). Although there are no wetlands on the site, there are approximately 13 acres of wetlands in the adjacent one mile area or less than 0.3 percent of the total land contained within this area. The acreage of wetlands (Wb) specified above results from a general categorization for the planning purposes of the LUNR survey. There are no commercial forests or publicly owned land on the site.

Prime and Unique Farmlands
2.260a
An analysis of prime and unique farmland at the Sheridan site was performed using soils maps and prime farmland mapping units supplied by the U. S. Department of Agriculture, Soil Conservation Service. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has a special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Prime farmlands are those whose value derives from their general advantage as cropland due to soil and water conditions. In areas where farmlands qualify for prime, as well as unique, the prime farmland classification takes precedence. Table 2-36a shows prime farmland mapping units for the Sheridan area. Approximately 41 acres of the proposed power plant site at Sheridan consists of unique farmland. Prime farmland occupies about 492 acres of the 986 acre site. These prime farmland mapping units encountered on the site are as follows:

39A, 40A, 41 - Canandaigua silt loam, 0-2 percent slopes.
48A - Willimson silt loam, 0-2 percent slopes.
50 - Niagara silt loam, 0-2 percent slopes.
56A - Minoa fine sandy loam, 0-2 percent slopes.

A soil survey for Chautauqua County is currently in progress, thus information is not presently available for a comparison of the acreage of prime and unique farmland onsite versus the acreage within the County or region. The single most important agricultural product of the Sheridan site is grapes. However, according to an analysis performed by Mr. Wallace Washbon of the New York State Department of Agriculture and Markets, "...the site has almost no acreage of the moderately well and well drained soils best suited to grape production. The site has a large portion so poorly drained that it is not being used for crop production." The Washbon report was dated 4 January 1975. The impact of power plant construction on prime and unique farmland is discussed in Chapter Four.

TABLE 2-36a

TOWN OF SHERIDAN, CHAUTAUQUA COUNTY, NEW YORK
PRIME FARMLAND MAPPING UNITS FOR SOIL CONSERVATION SURVEYS
COMPLETED BEFORE 1974

2, 3, 4, 9	- Hamlin silt loam
5, 10, 11, 13	- Teel silt loam
16A, 17A, 18A	- Chenango gravelly loam, 0 to 3 percent slopes
16B, 17B, 18B	- Chenango gravelly loam, 3 to 12 percent slopes
19A	- Allard silt loam, 0 to 3 percent slopes
19B, 20B	- Allard silt loam, 3 to 8 percent slopes
20A	- Scio silt loam, 0 to 3 percent slopes
21A, 22A	- Canandaigua silt loam, 0 to 2 percent slopes
21B	- Braceville gravelly silt loam, 3 to 12 percent slopes
26A	- Hamlin silt loam
26B	- Chenango gravelly loam, 3 to 12 percent slopes
27A	- Chenango gravelly loam, 0 to 3 percent slopes
27B	- Chanango gravelly loam, 3 to 12 percent slopes
28A	- Braceville gravelly silt loam, 0 to 3 percent slopes
28B, 29B	- Braceville gravelly silt loam, 3 to 12 percent slopes
29A, 30A	- Canandaigua silt loam, 0 to 2 percent slopes
31A, 32A	- Williamson silt loam, 0 to 2 percent slopes
31B, 32B	- Williamson silt loam, 2 to 6 percent slopes
33A	- Canaseraga silt loam, 0 to 2 percent slopes
33B	- Canaseraga silt loam, 2 to 6 percent slopes
36A	- Minoa fine sandy loam, 0 to 2 percent slopes
36B	- Galen fine sandy loam, 2 to 6 percent slopes
39A, 40A, 41	- Canandaigua silt loam, 0 to 2 percent slopes
39B, 40B	- Collamer silt loam, 2 to 6 percent slopes
46A, 47A	- Allard silt loam, 0 to 3 percent slopes
46B, 47B	- Allard silt loam, 3 to 8 percent slopes
48A	- Williamson silt loam, 0 to 2 percent slopes
48B	- Williamson silt loam, 2 to 6 percent slopes
50	- Niagara silt loam, 0 to 2 percent slopes
55A	- Allard silt loam, 0 to 3 percent slopes
55B	- Allard silt loam, 3 to 8 percent slopes
56A	- Minoa fine sandy loam, 0 to 2 percent slopes
56B	- Galen fine sandy loam, 2 to 6 percent slopes
60A	- Mardin-Chenango gravelly silt loam, 0 to 3 percent slopes
60B	- Mardin-Chenango gravelly silt loam, 3 to 12 percent slopes
65A, 65X A	- Langford gravelly silt loam, 0 to 3 percent slopes

TABLE 2-36a (Cont'd)

TOWN OF SHERIDAN, CHAUTAUQUA COUNTY, NEW YORK
PRIME FARMLAND MAPPING UNITS FOR SOIL CONSERVATION SURVEYS
COMPLETED BEFORE 1974

65B, 65Y B	- Langford gravelly silt loam, 3 to 12 percent slopes
75A	- Darien silt loam, 0 to 3 percent slopes
75B	- Darien silt loam, 3 to 8 percent slopes
81A, B	- Danley gravelly silt loam, 0 to 8 percent slopes
82A, B	- Darien gravelly silt loam, 0 to 8 percent slopes
86A, B; 87A, B	- Minoa fine sandy loam, 0 to 6 percent slopes
90	- Carlisle muck
111	- Palms muck
491A, B	- Canaseraga silt loam, 0 to 6 percent slopes

Corridors and Service Land Use
2.261
None of the site and only 1.4 percent of the surrounding one mile area is classified as corridor and service land (Table 2-36). The only major interstate highway is the N.Y. State Thruway (I-90) which provides the major connection to destinations east and west of the site area. Interchange 58, east of the village of Silver Creek, is the primary Thruway exit for traffic coming from the Buffalo metropolitan area. This interchange leads directly to combined U.S. 20 and S.R. 5, which separate outside of Silver Creek. S.R. 5 continues west on the north side of the Sheridan site; U.S. 20 passes south of the site parallel to I-90. These roadways are defined in the Dunkirk-Fredonia Master Plan category as "Arterials," which connect major population concentrations by a reasonably direct route.

2.262
Two railroads, the Norfolk & Western and the Conrail, traverse the site. The Conrail (formerly Penn Central) lines provide a direct connection between Buffalo and Cleveland. There are also two Conrail branch lines in the region. One runs south from Dunkirk through Fredonia and beyond. Another runs south to Pennsylvania from the village of Brocton. The Norfolk & Western's main line runs alongside of Conrail. The Dunkirk Steam Station is 7.9 miles southwest of the proposed site area.

WATER USE

Groundwater
2.263
A groundwater survey of the Sheridan site revealed a total of 40 wells, either drilled or dug, with a total of 19 owners. At the time of the survey, five wells were known not to be in use. The wells have been used as the sources of potable water for domestic use by landowners, including the watering of livestock. Virtually all the surface water bodies on the site are man-made, with most of them built by vineyard owners as a source of irrigation for grapes and other food crops such as tomatoes. Generally, the recreational usage of onsite water bodies from a fishing standpoint is light. Very few contain sufficient size or quality of habitat to host catchable (from a sport fishing stand point) size fish.

Natural Water Bodies
2.264
Refer to Pomfret section paragraphs 2.021 and 2.022.

AIR USE

2.265
Two airports are located in the general area of the Sheridan site: the Dunkirk Municipal Airport and the Van Buren (Fredonia) Airport.

The Dunkirk Airport is equipped with two paved runways, one 4,000 feet long and the other 5,000 feet in length. There is no scheduled airline service at this airport because of its close proximity to the Greater Buffalo International Airport. The Van Buren Airport is a privately owned facility which currently houses 12 private aircraft.

CULTURAL RESOURCES

2.266
The National Register of Historic Places and the National Register of Natural Landmarks have not identified any architectural or historical resources on the Sheridan site. A study completed by ARMS using the "criteria for eligibility for inclusion" for the National Register of Historic Places has revealed no archeological sites of significance within the Sheridan site.

2.267
Two structures, the former Daniel Reed House and the former Sheridan School District No. 3 Schoolhouse at the Sheridan site were recommended by Cultural Resources Management Services for consideration for eligibility to the National Register of Historic Places. The Reed House is a two-story gable front house, erected before 1857, with one-story "L" addition. The house has cultural and historical interest because of the activities of its former owners. The property was owned from 1876 to 1929 by Melvin Knox who invented an oscillating car brake, a potato digger and a portable power saw. The parents of Melvin Knox's wife, Ella, were Merrick and Fannie Alden. The Aldens raised Daniel A. Reed from infancy. Daniel A. Reed was a prominent local and national political figure who served in Congress from 1919 until his death in 1959. Mr. Reed inherited the house from Ella Knox in 1929. The Reed House may be considered eligible for the National Register of Historic Places, under criterion (2) as a building "associated with the lives of persons significant in our past." The Schoolhouse is a one-story Greek Revival institutional building erected in 1849. It is distinctive of type and period for rural 19th Century School houses. It may be considered eligible for the National Register of Historic Places under criterion (3), since it embodies "the distinctive characteristics of a type or period." On 23 June 1978, the Buffalo District submitted a request for a determination of eligibility for inclusion in the National Register to the Keeper of the National Register. This request included documentation on the Sheridan School District, No. 3 Schoolhouse and the Daniel Reed house. The Keeper of the National Register, by letter dated 20 September 1978, determined that both of these properties are eligible for inclusion in the National Register. In making his determinations, the Keeper of the National Register provided the following comments:

Knox-Reed Farm - "The property is locally significant, despite alterations, for its associations with both Melvin Knox, a nineteenth century inventor, and his cousin Daniel Reed, prominent local politician and leader who served in the U. S. House of Representatives for fifty years."

Knox-Reed Farm - Applicable criteria: B

Sheridan Schoolhouse - "This structure is significant at the local level for its associations as a rural schoolhouse."

Sheridan Schoolhouse - Applicable criteria: A

Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council on Historic Preservation procedures (36 CFR 800) are completed.

2.268
During the months of July and August 1975, systematic sampling of the Sheridan site was conducted by the Archeological Resource Management Service of the New York Archeological Council. Prehistoric archeological data from the site indicate transitory, temporary utilization of the area by small groups of people. No sign of extensive or prolonged habitation was found. The lack of a dependable water source, the general slope of the land, and the occurrence of cliffs along the lakeshore all contributed to make the area less desirable for prolonged occupation.

ECONOMY

Regional

2.269
Refer to Pomfret section paragraphs 2.031 through 2.035.

Local

2.270
The median family income for the town of Sheridan was $5,380 in 1960 with agriculture and manufacturing the chief sources of employment. Approximately 30 percent of the employed are involved in manufacturing. There are at least 200 farms with an average of about 80 acres. The Sheridan working population employed in agriculture greatly exceeds the population associated with agriculture in other towns of the region.

2.271
Within the Sheridan site boundary, natural gas and agricultural crops

are produced. The total annual value of agricultural products produced on the site is estimated to be $271,417. No estimates are available on the value of natural gas production from onsite gas wells.

AESTHETICS

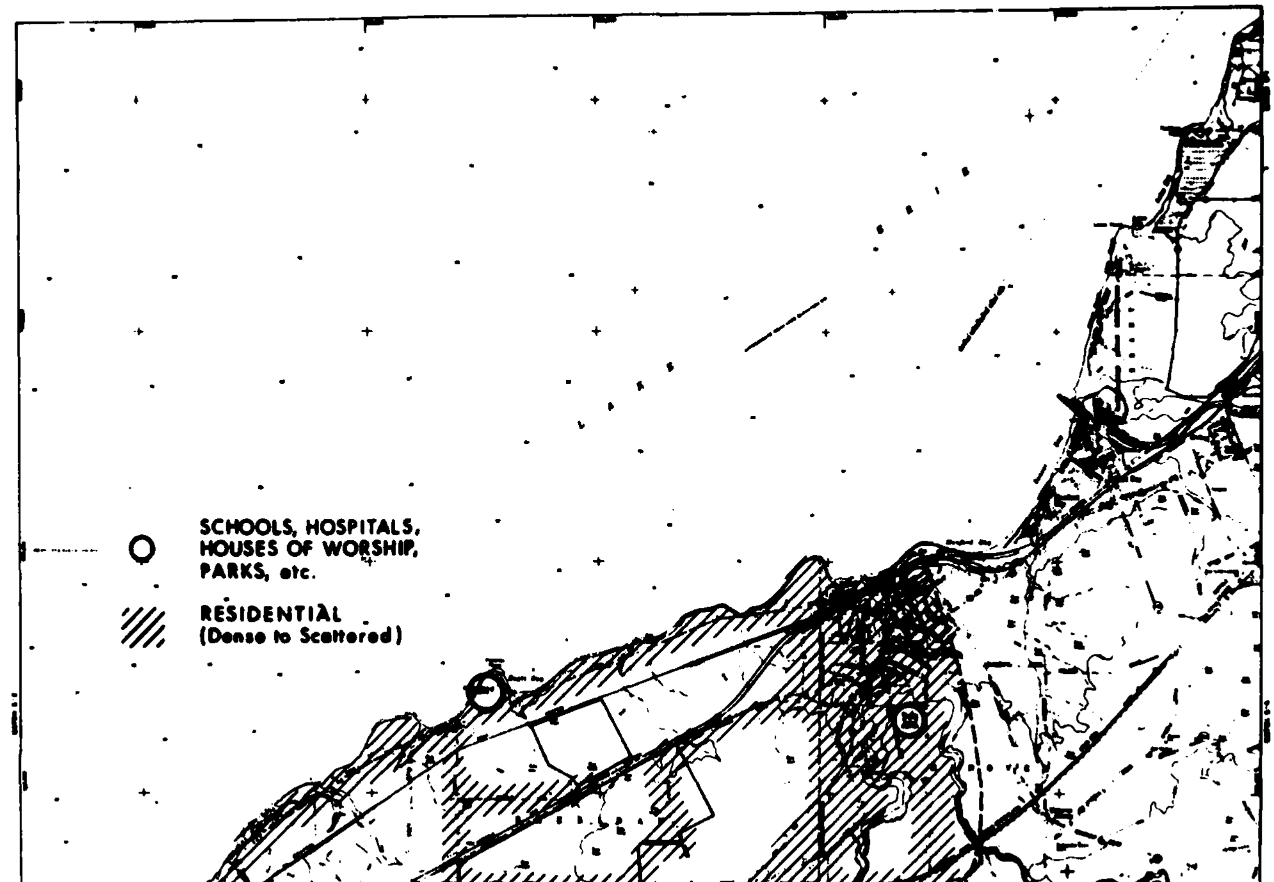
2.272
Refer to Pomfret section paragraphs 2.038 and 2.039.

NOISE

2.273
The Sheridan site lies on a gently-rolling plain which, since pioneer times, has been a natural land transportation corridor, skirting the lake to the north and avoiding the rugged hills to the south. Although the region is agricultural, principally a vineland area, it is dominated by heavy transportation noise. State Route 5 and the New York State Thurway (I-90) are located adjacent or in close proximity to the proposed site. The rail lines of Conrail and Norfolk & Western traverse the site and the instrument approach to the Dunkirk Airport passes overhead.

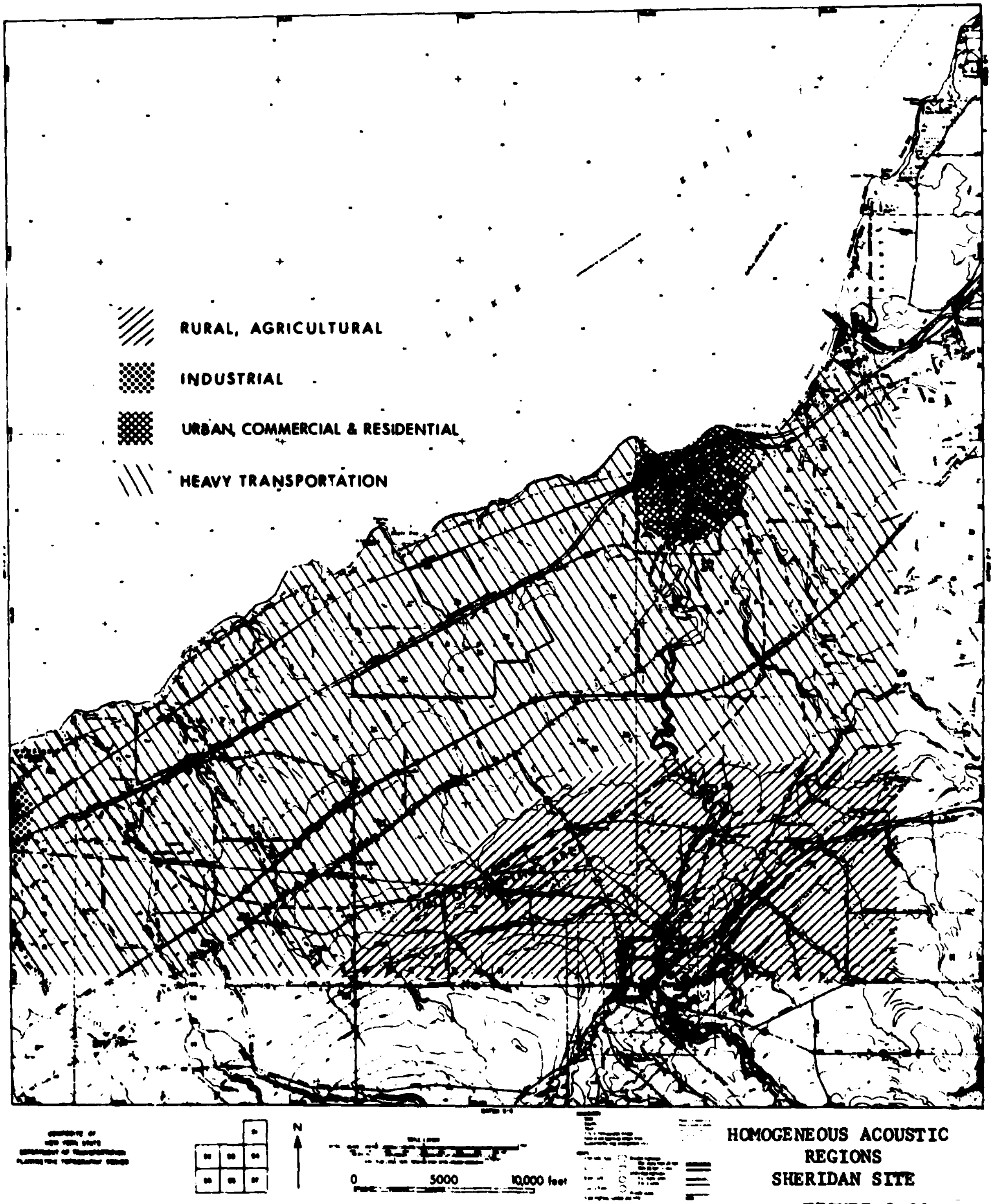
2.274
Noise-sensitive receptors located in the vicinity of the Sheridan site include residential zones, schools, parks, hospitals, and churches (Figure 2-20). To establish a baseline for ambient sound, the applicant first identified the various noise-sensitive land use and homogeneous acoustical regions in the vicinity of the Sheridan site (Figure 2-21). From this analysis, three separate regions were identified where ambient noise sampling would provide useful information. These areas were designated by the applicant as: "heavy transportation," "urban, commercial, and residential," and "rural, agricultural."

2.275
The "Heavy Transportation Region," identifying most of the sampling area, is part of a continuing transportation corridor along the shoreline east and west of the Sheridan site. Surface transportation noise predominates this region. Members of the applicant's study team also noted the use of carbide cannons in the grape fields during the summer measurement program. Each cannon was fired periodically (every 4 to 6 minutes) to frighten the grape-eating birds. Together with these guns, which operated from sunrise to sundown during August and at the beginning of September, mechanical bird tweeters were used as acoustic scarecrows.



NOISE SENSITIVE LAND USES
SHERIDAN SITE

FIGURE 2-20



HOMOGENEOUS ACOUSTIC REGIONS
SHERIDAN SITE

FIGURE 2-21

2.276
The "Urban, Commercial, and Residential Region" is essentially the community of Silver Creek northeast of the Sheridan site. Typical of nearby Dunkirk, Fredonia, or Brocton, community sounds of Silver Creek include stop-and-go traffic, children playing, air conditioners, yard appliances, and entertainment activities.

2.277
The "Rural, Agricultural Region" southeast of the sampling area has an acoustical pattern typical of open farmland; natural sounds of field and woodland, with occasional man-made intrusions, noise from work, sports, or other activities.

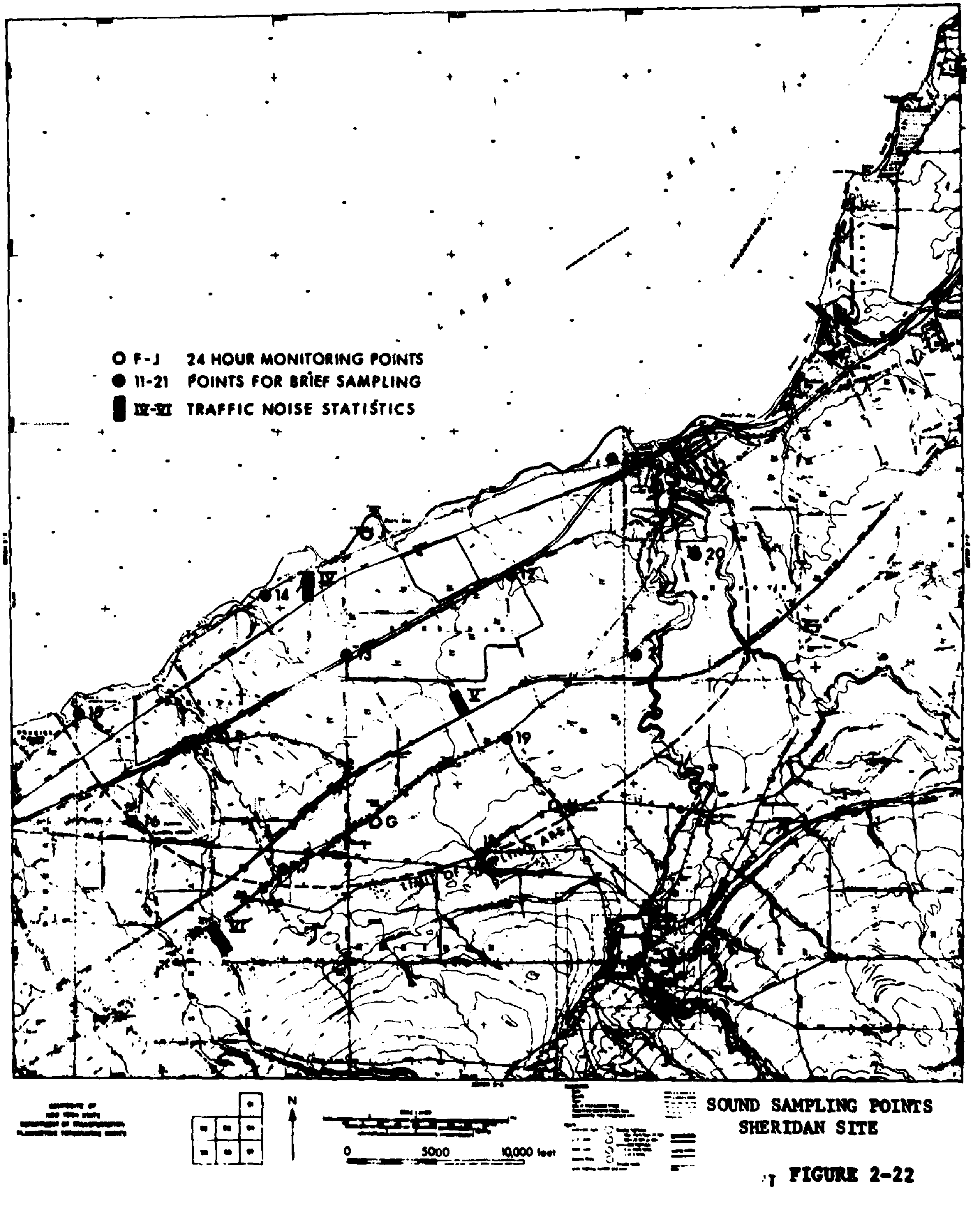
2.278
Figure 2-22 shows the location of sound measurement stations installed by the applicant to determine ambient noise levels in the vicinity of the Sheridan site. Five primary stations were installed where 24-hour monitoring was carried out. The location of each monitoring point is presented below:

Monitoring Point	Location
F	Middle Road south of Conrail tracks
G	U.S. Route 20 and Center Road
H	Cook and Stebbins Road
I	U.S. Route 20 and Rt 5
J	Fletcher Point

Traffic noise data were also collected at three separate locations: Waite Road south of Route 5, Merrill Road north of I-90, and Newell Road south of U.S. Route 20. Brief observations were also taken at points 11-20 (Figure 2-22) to further refine homogenous region definitions and to gain information on prominent sound sources.

2.279
A summary of the data collected at the five primary stations is presented in Table 2-37. The quantities L_{90}, L_{50}, and L_{10} are the A-weighted decibel levels (refer to glossary) that were exceeded 90 percent, 50 percent and 10 percent of the time, respectively. The quantity L_{eq} is the energy equivalent level, i.e., is the level of an unvarying A-weighted sound which would contain the same energy as that observed for all the actual sounds.

2.280
During summer, sound levels in the Sheridan sampling area are seen to be generally lower during the weekend day than weekday time period. This is attributed to the lower truck traffic observed on the weekend day passing through the Sheridan site. Railway traffic noise is



SOUND SAMPLING POINTS
SHERIDAN SITE

FIGURE 2-22

TABLE 2-37

SUMMARY OF AUTOMATIC MONITOR SOUND LEVEL

OBSERVATIONS AT THE SHERIDAN SITE - WINTER

	Weekday Day				Weekend Day				Weekday Evening				Weekend Evening				Weekday Night				Weekend Night			
	dBA Fri. 12/13				dBA Sat. 12/14				dBA Fri. 12/13				dBA Sat. 12/14				dBA Thur.-Fri. 12/12-12/13				dBA Fri.-Sat. 12/13-12/14			
Sheridan	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}
F	57	42	49	57	61	33	44	60	53	39	45	53	50	35	42	49	53	37	43	51	52	33	39	50
G	65	44	56	68	63	45	54	67	63	47	55	67	59	39	48	64	62	43	51	64	60	39	49	61
H	51	34	39	50	50	35	40	51	47	36	40	46	46	30	33	43	45	34	38	44	46	32	38	43
I	52	40	44	55	64	43	49	66	50	40	42	53	48	37	39	49	45	37	40	46	62	40	46	54
J	61	42	53	66	55	38	46	57	59	38	48	60	54	35	44	56	57	30	41	60	57	42	46	58

TABLE 2-37 (cont.)

SUMMARY OF AUTOMATIC MONITOR SOUND LEVEL OBSERVATIONS AT THE SHERIDAN SITE - SUMMER

	Weekday Day				Weekend Day				Weekday Evening				Weekend Evening				Weekday Night				Weekend Night			
	dBA Fri. 8/23				dBA Sun. 8/25				dBA Thur. 8/22				dBA Sat. 8/24				dBA Thur.-Fri. 8/22-8/23				dBA Fri.-Sat. 8/23-8/24			
Sheridan	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}	L_{eq}	L_{90}	L_{50}	L_{10}
F	55	48	52	56	57	45	51	57	53	48	50	54	53	43	48	53	52	47	49	51	52	46	50	52
G	66	48	55	67	60	41	51	65	62	45	52	64	61	47	54	65	63	43	48	61	62	43	49	61
H	52	42	47	54	50	42	45	51	(50	45	48	51)*	50	43	45	48	49	46	48	50	50	47	49	51
I	53	43	48	56	50	39	44	54	49	43	46	52	48	40	45	50	48	45	47	49	49	44	46	49
J	58	45	51	61	52	40	45	53	59	43	51	61	54	43	49	56	61	44	49	64	56	43	46	57

*Friday 8/23

included in the sound level data. The sound level at Position F is shown higher for the weekend day than weekday. This can be partly attributed to the normal weekend increase of small aircraft activity near the Dunkirk Airport. In addition, the wind changed direction between the two days, shifting the aircraft traffic pattern over the measurement position on the weekend days. Weekday and weekend nighttime sound levels were similar to each other, except near Route 5, where truck traffic was reduced on weekends. Insect activity during the nighttime hours also affected ambient sound levels.

2.281
The winter sound levels in the Sheridan area were similar in magnitude to the summer sound levels, having been highest during the daytime and lowest during the nighttime. The absence of insect noise during the winter measurement program contributed to this pattern. Sheridan sound levels near Route 5 were in winter also higher for weekdays than for the weekend time periods.

2.282
In agreement with the summer data, the winter sound levels at Position F near the Dunkirk Airport were again higher during the weekend than weekday time periods. Since sound in the "Rural, Agricultural Region" was primarily of natural origin, no weekday-weekend contrast was expected there or observed. Finally, the Urban, Commercial, and Residential Region in Silver Creek exhibited higher sound levels for the weekend periods. This is attributed to increased neighborhood activity, including local traffic during the weekend hours.

PHYSIOGRAPHY

2.283
Discussion in the Pomfret section is applicable with the exception of the number of streams. Drainage in the region of the Sheridan site is limited to four perennial streams that flow roughly at right angles to the Lake Erie shoreline.

GEOLOGY

Regional Geology

2.284
Refer to Pomfret section 2.052.

Bedrock Stratigraphy

2.285
The bedrock stratigraphy at the Sheridan site is similar to that of the Pomfret site as described previously. Borings at the Sheridan site penetrated deeper into the stratigraphic section and in addition

to the units described in the Pomfret section, encountered the Pipe Creek and Angola Shale members of the Seneca Group.

Surficial Geology

2.286

The surficial geology at the Sheridan site is similar to that of the Pomfret site, except that the total thickness of unconsolidated deposits observed in the borings drilled at the site varies up to about 21 feet in contrast to 32 feet for the Pomfret site. Most of the surface soils at the Sheridan site are fine-grained. Silts and clay of low to moderate plasticity are the most predominant soil types. Occasional small areas of more granular (sand and/or gravelly) soil occur sporadically; however, the major area of the granular soils occur inland (south and east) of the site proper.

Groundwater

2.287

The groundwater conditions at the Sheridan site are similar to those of the Pomfret site as described previously. The impact of the construction, operations, and maintenance of the proposed facility on groundwater use and contamination will be minimal.

Economic Resources

2.288

The leading producing horizon of commercial quantities of natural gas in Chautauqua County is the Lower Silurian (Medina) Group, consisting mostly of sandstones with some shale. The producing formation is encountered at a depth of approximately 1,500 to 1,800 feet in the site area and averages 150 feet thick. A total of 13 gas wells have been drilled within the proposed Sheridan site. It is anticipated that construction, operation, and maintenance of the proposed facility should neither affect nor be affected by gas production in the region (Fakundiny, 1975).

2.289

There are no major quarrying operations in the immediate site region, although glacial and alluvial deposits may be used locally as a source of sand and gravel. These sand and gravel operations would not be affected by the construction, operation, and maintenance of the proposed facility. There are no underground mining operations in the vicinity of the proposed site.

Seismology

2.290

The seismology of the Sheridan site is similar to that of the Pomfret site as described previously. No recorded seismic events have resulted in damage to the area within 25 miles of the site.

Aseismic Geologic Hazards

2.291
Aseismic geologic hazards present at the Sheridan site are similar to those at the Pomfret site as described previously. The historical rate of shore-line erosion was calculated at 0.43 ft/year (1938-1971) adjacent to the site area, and the maximum estimated water elevations caused by hypothetical 50- and 100-year storms are less than the lowest elevation on the site. Thus, lake flooding and erosion are not expected to cause damage to the Sheridan site.

Lake Erie Bottom Sediments

2.292
Construction of the coal handling facility would require dredging in the near shore waters of Lake Erie. Lake bottom sediments in the proposed dredge areas consists of a layer of fine sediment (0.25 inch to 6.0 inches thick) overlaying shale bedrock. The scarcity of sediment and prevalence of rock fragments and bedrock prevented collection of sediment samples by conventional methods, so divers were used to perform this function. Sediment samples taken from the proposed dredging site were analyzed to determine chemical quality and physical characteristics. A general description of the sediment collected as well as data on percent composition of sediment types and particle size distribution is presented in Table 2-38 and 2-39. The result of the chemical analysis can be found in Table 2-40. Location of sampling stations is presented in Figure 2-23.

Soils

2.293
The Sheridan study area was dominated by the Caneadea-Canadice-Canandaigua soil association, although there was some Canandaigua-Collamer-Caneadea and a very small amount of Manlius (Feuer et al., 1955). The Collamer soil was composed of 22, 52, and 26 percent sand, silt, and clay, respectively. The highest clay content (8 percent) was found in the Canadice soil, which also had sand and silt contents of 12 and 49 percent, respectively. Based on these results, the Collamer, Canandaigua, and Canadice soils can be classified as silt loam, loam, and silty clay loam, repectively. This concurs with published results, since the U. S. Department of Agriculture (1972) classifies the Collamer and Canandaigua series as silt loam or fine sandy loams, and the Canadice series as silty clay loam.

2.294
The mean percent organic matter was 14.0, 20.5, and 8.9 for the Collamer, Canandaigua, and Canadice soils, respectively. These percentages are rather high compared to Buckman and Brady (1969), who report that a range of 0.4 to 10 percent is characteristic in mineral soils. Mean pH values of 4.2, 4.3, and 4.9 were determined for the

TABLE 2-38

SHERIDAN SEDIMENT OBSERVATIONS

Row	Station		% Bedrock	% Boulder	% Small Rocks and Shale	% Fine Sediment
1	211	Transverse cracks in bedrocks; much fine sediment cover over bedrock; some gravel; no macrophytes.	3	0	2	25
	212	Fine sediment cover; deep transverse cracks in bedrock; several mussels; no macrophytes.	59	1	10	30
	213	Transverse cracks in bedrock; fine sediment cover; boulders present along with gravel and loose shale; no macrophytes.	38	10	12	40
	214	Less fine sediment cover; very smooth, scattered boulders and gravel; transverse cracks in bedrock; no macrophytes.	73	10	10	7
2	221	Shale bedrock with transverse cracks; gravel present; sediment in cracks only; some boulders; macrophytes present.	86	5	6	3
	222	Shale bedrock with transverse cracks; clean; little sediment; some gravel; cracks full of gravel and shells of mollusks; no macrophytes.	95	0	4	1
	223	Shale bedrock with transverse cracks; gravel only in cracks; very level and smooth; macrophytes present.	94	0	5	1
	224	Shale bedrock with transverse cracks; large boulders; much rubble and cracking of bedrock; much gravel and some fine sediment; macrophytes present.	73	10	12	5

TABLE 2-39

PERCENT COMPOSITION OF SEDIMENT COLLECTED AT SHERIDAN SITE

Wentworth Scale	Sediment Size (mm)	211 (0%)* Oct 24	211 (0%)* May 2	212 (10%)* Oct 24	212 (10%)* May 2	213 (10%)* Oct 24	213 (10%)* May 2	214 (5%)* Oct 24	214 (5%)* May 2	221 (0%)* Oct 24	221 (0%)* May 1	222 (1%)* Oct 24	222 (1%)* May 1	223 (0%)* Oct 24	223 (0%)* May 1	224 (1%)* Oct 24	224 (1%)* May 1
Pebble	>4	No Sediment	No Sediment	78	78	25	3	37	No Sediment	No Sediment	No Sediment	No Sediment	50	No Sediment	No Sediment	49	79
Granule	>2			6	6	5	<1	19					7			12	2
Very coarse sand	>1			4	3	5	<1	13					7			10	1
Coarse sand	>0.500			3	2	29	1	8					10			7	3
Medium sand	>0.250			3	2	20	1	18					10			11	3
Fine sand	>0.125			2	9	15	2	5					15			9	7
Very fine sand	>0.062			4	<1	2	3**	<1					3			3	4

*Percent of total sediment comprised of pebble and smaller sediment determined by observation during October 1974.
**90% passed through this sieve.

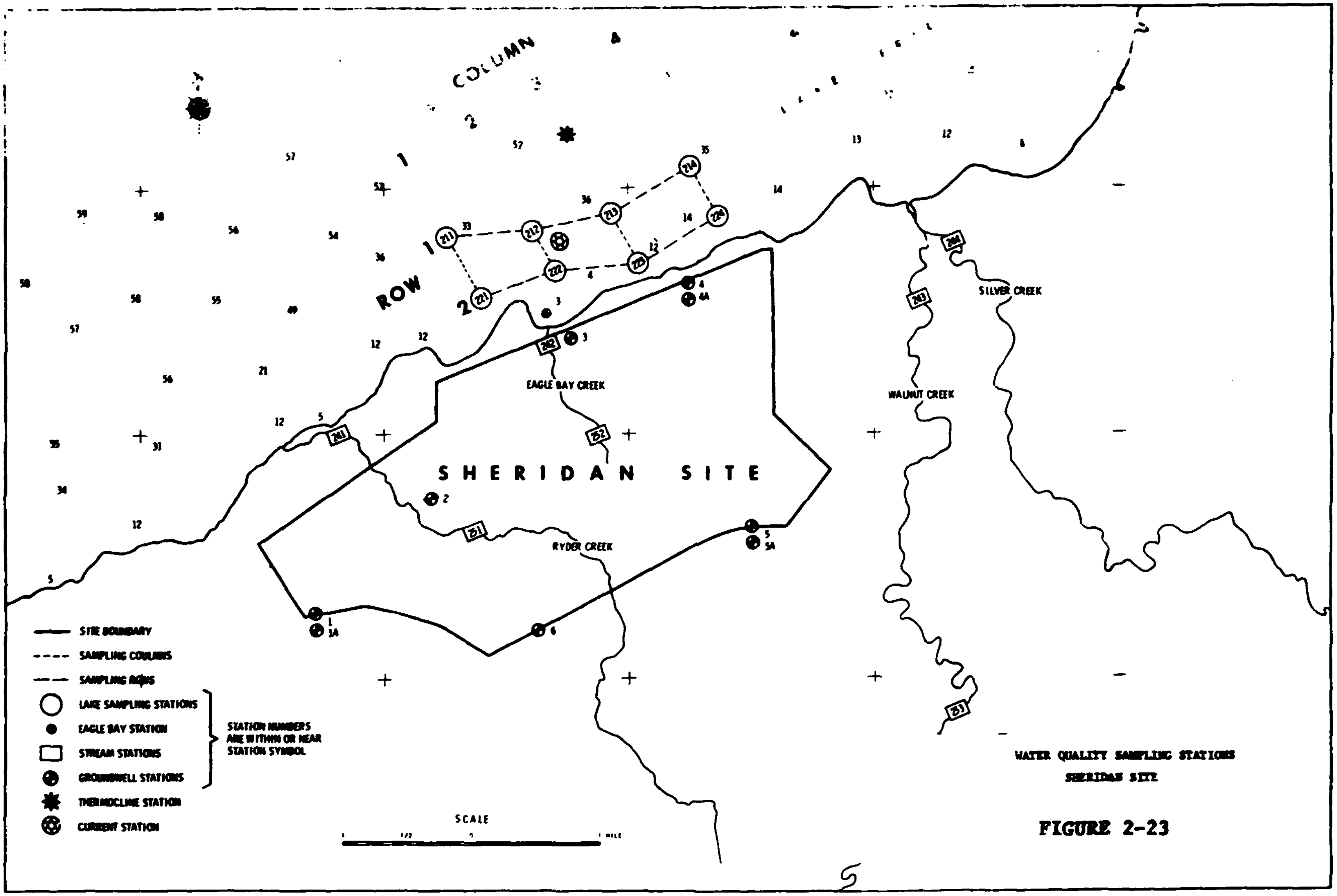
TABLE 2-40

SHERIDAN CHEMICAL SEDIMENT ANALYSIS, JULY 31, 1975

		Row 1							
	Station:	211		212		213		214	
Chemical Parameter	Unit of Measurement	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Total organic carbon	mg/kg	75.6	72.8	80.0	88.6	32.4	46.2	36.2	83.2
Chemical oxygen demand	mg/kg	101.2	110.0	30.0	100.0	10.0	101.2	59.2	65.2
Immediate dissolved oxygen demand	mg/kg	32.5	30.5	35.0	45.0	15.0	52.5	23.5	30.0
Volatile solids	% loss	5.98	6.55	3.26	4.10	4.66	5.89	5.30	6.39
Total Kjedahl nitrogen	mg/kg	19.00	16.92	6.92	15.32	3.92	20.92	10.04	18.84
Nitrogen-nitrate	mg/kg	<0.16	<0.16	0.40	<0.16	<0.16	<0.16	<0.16	<0.16
Orthophosphate	mg/kg	0.036	0.072	0.268	0.032	<0.008	0.140	0.048	<0.008
Oil and Grease	mg/kg	7.3	7.8	16.5	20.7	4.9	4.5	7.1	3.2
Cyanide	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/kg	0.0232	0.0076	0.0064	0.0056	<0.0004	0.0068	0.0016	0.0004
Cadmium	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium	mg/kg	0.024	<0.004	<0.004	<0.004	<0.004	0.012	<0.004	<0.004
Copper	mg/kg	0.008	<0.004	<0.004	0.004	<0.004	0.004	<0.004	0.016
Lead	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Mercury	mg/kg	0.0012	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Nickel	mg/kg	0.004	0.052	0.020	0.196	<0.004	0.040	0.008	0.168
Zinc	mg/kg	0.140	0.096	0.060	0.156	0.020	0.118	0.176	0.076

TABLE 2-40 (cont.)

		Row 2							
	Station:	221		222		223		224	
Chemical Parameter	Unit of Measurement	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2	Rep 1	Rep 2
Total organic carbon	mg/kg	30.0	28.2	45.8	45.6	44.0	30.4	52.4	41.0
Chemical oxygen demand	mg/kg	25.2	12.0	54.0	64.0	90.0	12.0	24.0	30.0
Immediate dissolved oxygen demand	mg/kg	1.0	7.5	15.0	12.5	5.0	5.0	7.0	0.5
Volatile solids	% loss	4.08	4.52	2.40	4.54	3.76	3.52	4.08	3.44
Total Kjedahl nitrogen	mg/kg	5.44	4.76	5.56	4.76	5.68	3.96	1.48	1.40
Nitrogen-nitrate	mg/kg	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Orthophosphate	mg/kg	0.012	0.008	0.012	0.008	0.016	0.012	0.008	0.008
Oil and Grease	mg/kg	8.9	6.2	15.4	16.2	15.2	4.9	1.8	2.0
Cyanide	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Arsenic	mg/kg	0.0028	<0.0004	0.0008	0.0008	0.0044	<0.0004	<0.0004	<0.0004
Cadmium	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chromium	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Copper	mg/kg	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004	<0.004
Lead	mg/kg	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Mercury	mg/kg	0.0044	0.0020	<0.0004	<0.0004	<0.0004	0.0040	<0.0004	<0.0004
Nickel	mg/kg	<0.004	0.004	0.056	0.028	0.080	0.048	0.004	0.004
Zinc	mg/kg	0.024	0.152	0.076	0.088	0.108	0.072	<0.004	<0.004



WATER QUALITY SAMPLING STATIONS
SHERIDAN SITE

FIGURE 2-23

Collamer, Canandaigua, and Canadice series, respectively. These pH values are low. However, the soils of the Sheridan site are reported to be acidic (USDA, 1972; Feuer et al., 1955).

2.295
Regarding the natural productivity of the soil for grape growing, a team of agricultural experts surveyed the study area and concluded that almost no areas exist which are best suited for grape production.

CLIMATE

Regional
2.296
Refer to Pomfret paragraphs 2.072 through 2.074.

Onsite Meteorology
2.297
Refer to Pomfret paragraphs 2.075 through 2.078.

AIR QUALITY

Applicable Standards
2.298
Refer to Pomfret paragraph 2.079.

Regional Air Quality
2.299
Refer to Pomfret paragraph 2.080

Onsite Air Quality Monitoring
2.300
Refer to Pomfret paragraphs 2.081 and 2.082.

Existing Air Quality
2.301
Refer to Pomfret paragraph 2.083.

Air Pollution Potential
2.302
Refer to Pomfret paragraph 2.084.

HYDROLOGY

Regional Hydrology
2.303
The Sheridan site is situated on the shore of Lake Erie which is the smallest and shallowest of the Great Lakes. Lake Erie is 241 miles

long and 57 miles wide, its drainage basin area is 32,490 square miles and its total water surface area is 9,930 square miles. The average depth for this water body is 58 feet and low water surface elevation 568.6 feet IGLD (International Great Lakes Datum, 1955). Lake Erie is topographically divided into three basins: east, west, and central, the deepest being the Eastern Basin (maximum, 216 ft; mean, 80 ft) in which the Sheridan study area lies. The Eastern Basin's water surface area is 2,400 miles^2 See Figure 2-13).

2.304
The New York State portion of the Lake Erie drainage basin is very narrow, lying between the 200- and 300-foot-high Portage escarpment on the south and the shoreline. Most of the small tributary streams in the Sheridan area originate in or near this escarpment. Ryder and Eagle Bay Creeks run through the site proper, and Silver and Walnut Creeks lie approximately 1.5 miles to the northeast of the site boundary. These streams constitute the only major flowing water sources on or near the site. Other onsite streams were strictly intermittent, and held water only for a short period after local rains.

2.305
Surface current and circulation patterns in the Eastern Basin of Lake Erie have been considered to be highly erratic and predominantly wind-driven (Hamblin, 1971). Results of current surveys at the Sheridan site during the 1974-1975 study revealed three basic patterns of surface currents. One of these patterns occurred during December 1974 and September 1975 when winds were prevailing from the south. Results indicated that during periods of 10 to 15 mph wind speeds, currents were predominantly moving northwest to westerly. A second current pattern appeared during two surveys in May and one during August 1975 when winds were predominantly from the west. Results revealed that surface currents were also entirely eastward during these periods. A third pattern in which current speeds and directions were highly erratic and variable occurred during late May and July 1975. Wind speeds recorded during these surveys were extremely light, generally less than five knots. Results appeared to agree with previous findings (Hamblin, 1971) demonstrating that surface currents are predominantly wind-driven. No direct correlation between variations in wind speed and recorded fluctuations in current speeds was observed during this survey.

Local Hydrology
2.306
The Lake Erie shoreline along the Sheridan site is approximately 2.5 miles long and runs on a NE-SW axis (Figure 2-2). The site's elevation varies from 620 to 720 feet above sea level. Except for the sand and cobble beach at Eagle Bay, the shore is a rocky cliff approximately 30 feet high. Water depths below the cliff average

four to eight feet. In Eagle Bay, a small shallow bay open to the north and protected from the southwest by Fletcher Point, depths range from three to six feet. The beach area at Eagle Bay slopes gradually into the lake.

2.307
The Sheridan plant site, including the area within 1.0-mile of the site boundary, is drained by several streams which generally flow northward into Lake Erie. The largest stream within the site area is Ryder Creek, which drains an area of approximately 6.8 square miles. Other streams in the general area vary in drainage area from 0.17 square miles to 2.3 square miles. A brief discussion of each of the principal streams traversing the Sheridan site area is presented below:

Ryder Creek - Ryder Creek originates approximately five miles from shore and flows northwesterly across the proposed site into Lake Erie and drains an area of 6.8 square miles. Within the site boundaries, Ryder Creek is 2-3 m wide and varies from 0.3 m to 1.0 m in depth. The stream bottom is largely mud, with detritus in deeper areas and sand in the shallows. The banks are low and muddy and bordered by willow, sumac, hawthorn, and viburnum as well as low herbaceous vegetation except where the stream makes an S-curve through the well-manicured lawn of a country home; here, the stream has been lined with stones and the bank cleared of low shrub vegetation, leaving only sugar maple, honey locust, and horsechestnut. Downstream, to the north of the sity boundary, Ryder Creek is narrow (2 meters or less) and shallow (0.3-0.5 meters). Dense, low vegetation grows along its borders. The stream bottom in this area varies from shale bedrock to sand. The steep west bank is bordered by dense willow and cottonwood; and understory of red-osier dogwood overhangs the water. On the gently sloping east bank, dense willow and dogwood give way to pine and spruce.

Eagle Bay Creek - Eagle Bay Creek originates within the boundaries of the proposed site, only 1.25 miles from Lake Erie, and flows north-northwesterly through the site, emptying into the lake at Eagle Bay just east of Fletcher Point. Eagle Bay Creek drains a 2.3 square mile area. At approximately the center of the proposed site, Eagle Bay Creek is two meters wide and 0.2-0.4 meters deep. The bottom varies from sand to gravel. High, steep banks are heavily forested, with sugar maple, ash, sycamore, basswood, yellow poplar, cherry and hemlock high on the slopes and an understory of hawthorn, maple saplings, hop hornbeam, and witch hazel. The forest floor on the banks is fairly open and littered with sticks, twigs, and leaves covering dark soil. There has been limited cutting of vegetation where the creek runs under a transmission line. On the boundary of the proposed site, approximately 100 m from the mouth of Eagle Bay

Creek at Lake Erie, the creeks forms a large (4-5 m wide and 1-1.5 m deep) quiet pool, usually backed up by a barrier beach along the lakeshore. At this point, flow is negligible and the bottom is mud and detritus. The pool is littered with old tires, rotten logs, and metal scraps. Vegetation on the low, gently sloping banks is primarily honey locust, willow, sycamore, and cherry, with a thick understory of red-osier dogwood, sumac, viburnum, tangled grapevines and blackberry.

Walnut Creek - Walnut Creek originates approximately 12 miles from Lake Erie and meanders northerly through the village of Silver Creek where it joins Silver Creek approximately 1,000 feet from Lake Erie. It lies approximately a mile or more to the east of the proposed site and at no point crosses site boundaries. At approximately four miles from its confluence with Silver Creek, the creek is 7-8 m wide and 0.2-0.4 m deep and flow is constant over a shale bedrock to gravel bottom. Grasses and milkweeds line the low, gently sloping east bank, and a few willow, walnut and sycamore trees grow between the creek and Route 248 which runs parallel to it about 10 m to the east. The high, rocky west bank rises 3 m directly from the water and then levels off to an oak-maple woods with an understory of small cherry, hop hornbeam and witch hazel. Approximately 0.25 miles from its confluence with Silver Creek, the stream is about 25-30 m wide and 0.3-0.5 m deep. It flows steadily over a 0.7 m high rock falls into a shallow pool and then continues downstream over a gravel to sandy bottom and becomes shallower. Banks are low and littered in places with pipe, wood and pieces of cement. A business district and golf course lie to the east. On the east bank, vegetation, primarily cottonwood and willow mixed with some walnut and basswood, is sparse. A trailer park and town road lie to the west of the creek, and growth on the west bank is thicker, being dominated by walnut, sugar maple and honey locust with an understory of sumac, low herbaceous vegetation and tangled grapevines.

Silver Creek - Silver Creek originates approximately 11 miles from the lake shore and flows northwesterly to the village of Silver Creek where it is joined by Walnut Creek; it then flows 1,000 feet to Lake Erie. The stream lies approximately 1-2 miles to the east of the proposed site and at no point crosses site boundaries. At a point about 0.25-mile from its confluence with Walnut Creek, the stream is narrow (2-5 m) and shallow (0.2-0.4 m). Flow is steady over a shale bedrock to gravel bottom. The banks are shale and vertical to a height of 5-8 m. The tops of the banks support sparse growth of cottonwood, sycamore, honey locust and chestnut with an undergrowth of box elder, sumac, maple and grapevines. Village business and residential areas lie on both sides of the stream. The location of all watercourses on the site and the areas affected by the 100-year flood are shown in Figure 2-24. The site is not subject to general inundation, however, certain low areas upstream of small culverts would experience water considerably beyond the normal stream banks.

2.308
A survey completed in 1975 identified 29 onsite water bodies (Table 2-41). Of this figure, eleven were chosen for sampling based on their proximity to the center of the proposed site. All of these onsite water bodies surveyed were considered to be permanent ponds (contain water year-round). The majority of the ponds are maintained by springs or a combination of springs and surface runoff. Only four of the ponds are fed by streams or creeks. Most of these water bodies were built by vineyard owners to serve as a source of irrigation water. In summary, the onsite ponds can be described as small, shallow bodies of water predominated by plant growth. They have an average size of 0.2 acres and a mean depth of approximately two feet. Substrate consists of clay bottoms with overlying gravel and silt.

WATER QUALITY

Lake Erie
2.309
Eight sampling locations (Figure 2-23) were established in Lake Erie on a systematic grid system defined by "rows" parallel to shore and "columns" perpendicular to shore. In addition to the above station, three additional sites were established: one in Eagle Bay and one at the 50-foot depth contour to monitor the thermocline and a current monitoring station off Fletcher Point. The baseline study was conducted during the period from September 1974 through September 1975.

2.310
Temperatures at the 30-foot contour and the 10-foot contour increased to maximum levels in early August, declined through the winter months, and began increasing again in April. Fluctuation in lake temperatures followed a seasonal pattern, the result of variations in the degree of solar radiation typical of temperate zone lakes (refer to Table 2-42). During regular weekly sampling throughout the study, surface to bottom temperature differentials greater than 1°F (0.5°C) occurred 29 percent of the time at the 30-foot contour and 14 percent of the time at the 10-foot contour. Spatial temperature variations between the surface, mid-depth and bottom were generally less than 0.5°C with only 14 percent of the fluctuations greater than 0.5°C at the 30-foot contour and 19 percent at the 10-foot contour. Results of diel measurements in July and September 1975 revealed that 53 percent of the samples collected at station 213 displayed a surface-to-bottom temperature differential of 0.5°C. However, measured variation within the vertical column never exceeded

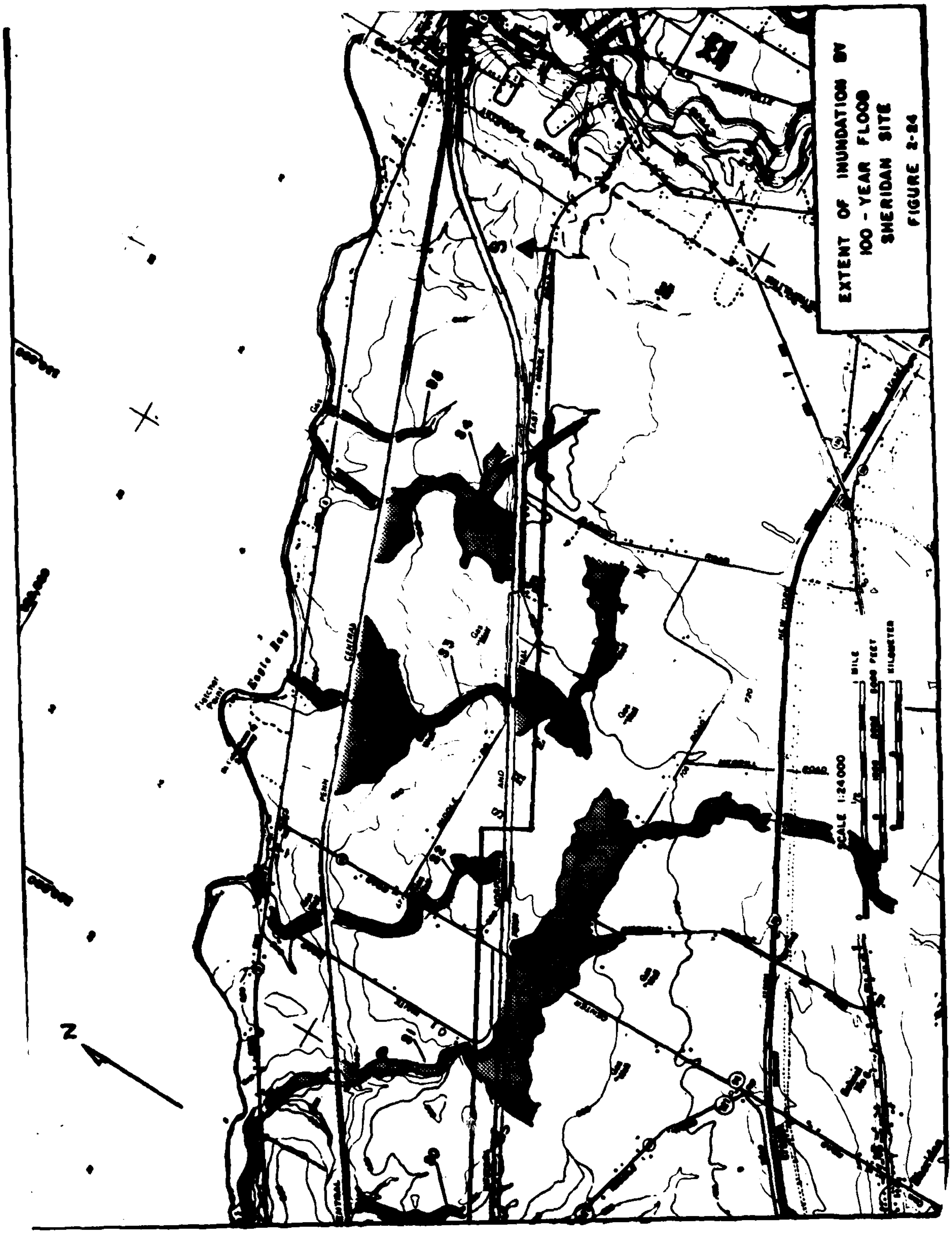

EXTENT OF INUNDATION BY
100 - YEAR FLOOD
SHERIDAN SITE
FIGURE 2-24
SCALE 1:24000
Eagle Bay

TABLE 2-41

PHYSICAL MEASUREMENTS AND OTHER IMPORTANT INFORMATION FOR SHERIDAN ON-SITE WATER BODIES, JUNE AND OCTOBER 1975

Water Body	Length (ft)	Width (ft)	Mean Depth (ft)	Area ($ft^2 x10^3$)	Volume ($ft^3 x10^3$)	Origin	Clarity	Bottom Type	Comments
1	825	121	3.3	107.7	360.3	Spring; drainage	Clear	Silt/bedrock*	Recreational and agricultural use
2	105	27	1.8	3.1	5.6	Runoff	Murky	Clay	None
3	158	41	1.7	7.6	12.7	Spring	Clear	Gravel/clay	Agricultural use
4	203	84	1.3	16.2	21.4	Drainage	Murky	Silt/clay	None
5	125	32	2.2	3.7	8.1	Spring	Clear	Detritus/clay	Agricultural use; 25% less volume in fall
6	Combined with - 5					Part of - 5			
7	207	198	2.0	39.4	77.6	Spring; drainage	Murky	Clay	Recreational use; 50% less volume in fall
8	56	35	1.9	1.7	3.2	Stream	Murky	Clay	Agricultural use
9	280	30	1.7	7.8	13.4	Runoff	Clear	Pebble/bedrock	Almost dry during fall
10	258	72	0.2	19.9	3.4	Runoff	Clear	Pebble/bedrock	Dry during fall
11	88	50	1.7	4.0	7.0	Runoff	Clear	Pebble/bedrock	Dry during fall
12	62	36	2.1	1.8	3.7	Spring	Murky	Silt/clay	None
13	62	20	1.2	0.8	0.9	Creek	Clear	Sand/clay	50% less volume in fall
14	Dry low spot in field					Runoff	-	-	No water during spring and fall
15	350	68	1.6	25.0	38.9	Spring; drainage	Clear	Silt/clay	Recreational use
16	379	143	2.6	54.2	139.6	Spring	Clear	Silt/bedrock	Recreational and agricultural use
17	428	148	3.4	61.5	211.9	Spring	Clear	Silt/bedrock	Recreational use
18	112	91	1.7	10.3	17.7	Spring; drainage	Clear	Detritus	Used as a lagoon
19	261	54	5.6	14.2	79.4	Spring	Clear	Gravel/bedrock	Recreational and agricultural use
20	93	73	2.1	6.6	13.9	Spring	Muddy	Clay	Duck pond
21	68	53	2.9	3.4	9.8	Spring	Muddy	Clay	Watering hole for livestock
22	Filled								
23	30	30	1.7	0.8	1.3	Runoff	Muddy	Silt	None
24	118	104	4.1	12.0	48.7	Spring	Clear	Gravel/clay	Recreational and agricultural use
25	102	69	2.8	7.0	19.5	Spring	Clear	Silt/clay	Recreational use
26	75	75	2.3	5.5	12.4	Creek	Muddy	Silt/clay	50% less volume during fall
27	123	71	2.5	9.1	23.2	Creek	Muddy	Silt/clay	50% less volume during fall
28	188	46	2.4	8.5	20.4	Drainage	Clear	Silt/clay	50% less volume during fall
29	Dry hole								Dried depression in field

* Silt/clay - clay bottom covered with silt.

TABLE 2-42

[illegible]

[illegible]

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	[illegible]	16.7	22.5	19.5	64	16.0	21.0	19.0
Dissolved oxygen	mg/l	[illegible]	7.0	10.3	9.3	64	8.0	10.0	9.5
% saturation	%	[illegible]	[illegible]	117	109	64	90	121	102
pH	units	[illegible]	8.3	8.6	8.5	64	8.4	9.0	8.5
Specific conductance	µmhos	[illegible]	300	340	313	62	300	330	313
Biochemical oxygen demand	mg/l	[illegible]	0.6	1.6	0.8	56	0.1	1.1	0.8
Solids									
Total dissolved	mg/l	36	[illegible]	202	171	56	160	238	182
Total suspended	mg/l	Not Scheduled							
Nitrogen									
Ammonia	mg/l-N	36	<0.010	0.015	0.011	16	<0.010	0.020	<0.010*
Nitrate	mg/l-N	36	0.08	0.23	0.10	16	0.08	0.11	0.08
Nitrite	mg/l-N	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	36	0.10	0.32	0.21	16	0.18	0.34	0.24
Orthophosphate	mg/l-P	36	<0.002	<0.002	<0.002*	16	<0.002	<0.002	0.002*
Total phosphorus	mg/l-P	36	<0.005	<0.005	0.005*	16	0.005	0.005	0.005*
Bacteria									
Fecal coliform	No./100 ml	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total coliform	No./100 ml	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	72	14.0	16.7	15.1	64	10.0	16.4	14.0
Dissolved oxygen	mg/l	72	8.7	10.9	9.5	64	8.0	11.6	9.7
% saturation	%	72	[illegible]	100	96	64	86	100	95
pH	units	72	8.0	8.6	8.3	64	7.9	8.8	8.4
Specific conductance	µmhos	72	300	315	307	64	300	340	310
Biochemical oxygen demand	mg/l	72	0.0	1.6	0.5	60	0.1	1.1	0.5
Solids									
Total dissolved	mg/l	36	120	200	197	[illegible]	160	200	[illegible]
Total suspended	mg/l	Not Scheduled							
Nitrogen									
Ammonia	mg/l-N	36	0.013	0.027	0.016	15	0.005	0.075	0.043
Nitrate	mg/l-N	36	0.06	0.30	0.08	15	0.04	[illegible]	0.06
Nitrite	mg/l-N	4	0.005	0.006	0.005	4	0.005	0.006	0.005
Organic	mg/l-N	36	0.11	0.30	0.26	15	0.17	0.32	0.22
Orthophosphate	mg/l-P	36	<0.002	0.008	0.002**	15	<0.002	0.005	0.002**
Total phosphorus	mg/l-P	36	<0.005	0.025	0.006*	15	<0.005	[illegible]	0.008*
Bacteria									
Fecal coliform	No./100 ml	36	0†	6†	1†	16	0†	16†	3†
Total coliform	No./100 ml	17	3†	1,760†	100†	16	8†	110†	51†

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	96	5.7	11.3	9.0	64	2.9	11.3	9.2
Dissolved oxygen	mg/l	96	8.0	12.4	10.0	64	9.0	13.0	10.7
% saturation	%	96	[illegible]	111	[illegible]	64	[illegible]	[illegible]	92
pH	units	96	8.1	8.8	8.4	64	8.0	8.8	8.4
Specific conductance	µmhos	96	[illegible]	[illegible]	[illegible]	64	[illegible]	[illegible]	[illegible]
Biochemical oxygen demand	mg/l	96	0.0	1.9	0.8	64	0.0	4.6	0.8
Solids									
Total dissolved	mg/l	72	110	220	173	48	[illegible]	271	176
Total suspended	mg/l	72	0.6	26.0	4.6	48	0.2	40.2	8.3
Nitrogen									
Ammonia	mg/l-N	36	[illegible]	0.125	[illegible]	16	[illegible]	0.100	0.077
Nitrate	mg/l-N	36	[illegible]	0.10	[illegible]	16	0.05	0.10	0.08
Nitrite	mg/l-N	4	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]
Organic	mg/l-N	36	0.15	0.30	0.26	16	0.14	0.40	0.26
Orthophosphate	mg/l-P	36	<0.002	<0.002	<0.002*	16	<0.002	<0.002	0.002*
Total phosphorus	mg/l-P	36	<0.005	<0.005	<0.005*	16	<0.005	<0.005	<0.005*
Bacteria									
Fecal coliform	No./100 ml	36	<3	9	3*	16	<3	9	<3*
Total coliform	No./100 ml	24	43	1,100	110	16	23	90	4

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	96	1.9	5.0	3.6	64	1.0	4.0	2.3
Dissolved oxygen	mg/l	96	10.5	13.6	11.8	64	11.0	14.9	12.5
% saturation	%	96	88	99	89	64	82	100	91
pH	units	96	7.9	8.4	8.1	[illegible]	7.9	8.3	8.1
Specific conductance	µmhos	96	240	360	300	64	240	[illegible]	286
Biochemical oxygen demand	mg/l	96	0.3	1.1	0.7	64	0.1	1.2	0.7
Solids									
Total dissolved	mg/l	96	120	234	174	72	124	264	158
Total suspended	mg/l	96	0.1	100.6	5.6	64	0.3	21.0	3.5
Nitrogen									
Ammonia	mg/l-N	24	0.008	0.056	0.031	6	0.017	0.080	0.031
Nitrate	mg/l-N	24	0.13	0.16	0.15	16	0.14	0.16	0.15
Nitrite	mg/l-N	4	0.002	0.007	0.005	4	0.003	0.010	0.006
Organic	mg/l-N	24	0.08	0.19	0.14	16	0.09	0.20	0.16
Orthophosphate	mg/l-P	24	<0.002	<0.002	<0.002*	16	<0.002	<0.002	<0.002*
Total phosphorus	mg/l-P	24	<0.005	<0.005	<0.005*	16	<0.005	<0.005	<0.005*
Bacteria									
Fecal coliform	No./100 ml	24	<3	43	12*	16	9	75	20
Total coliform	No./100 ml	24	7	22,400	646	16	240	22,400	1,019

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	84	0.0	2.0	1.1	70	0.3	2.0	1.2
Dissolved oxygen	mg/l	10	11.0	13.4	11.0	10	12.0	13.2	12.4
% saturation	%	10	83	95	89	10	88	99	[illegible]
pH	units	10	8.0	8.4	8.2	10	8.0	8.5	8.2
Specific conductance	µmhos	10	300	333	320	10	330	337	[illegible]
Biochemical oxygen demand	mg/l	10	0.5	4.6	2.7	10	[illegible]	4.3	2.4
Solids									
Total dissolved	mg/l	10	82	241	154	10	130	264	[illegible]
Total suspended	mg/l	10	4.0	63.5	20.5	10	6.3	50.5	23.0
Nitrogen									
Ammonia	mg/l-N	6	0.015	0.080	0.032	4	0.013	0.080	0.046
Nitrate	mg/l-N	6	0.21	0.35	0.30	4	[illegible]	[illegible]	[illegible]
Nitrite	mg/l-N	Not Scheduled							
Organic	mg/l-N	6	0.19	0.36	0.21	4	0.16	0.36	0.30
Orthophosphate	mg/l-P	6	<0.002	0.003	<0.002*	4	0.002	0.003	[illegible]
Total phosphorus	mg/l-P	6	<0.005	0.012	0.008*	4	[illegible]	0.010	0.014
Bacteria									
Fecal coliform	No./100 ml	6	<3	9	4*	4	<3	4	4*
Total coliform	No./100 ml	6	23	93	47	4	39	240	90

Parameter	Units of Measurement	[illegible] Bay 1 No. of Samples	Bay 1 Min	Bay 1 Max	Bay 1 Mean	Bay 2 No. of Samples	Bay 2 Min	Bay 2 Max	Bay 2 Mean
Temperature	°C	40	0.1	0.5	0.3	[illegible]	0.0	0.5	0.3
Dissolved oxygen	mg/l	4	13.1	13.0	13.1	2	13.4	13.4	13.4
% saturation	%	4	90	91	91	2	[illegible]	[illegible]	[illegible]
pH	units	4	8.4	8.5	8.4	2	8.6	8.6	8.6
Specific conductance	µmhos	[illegible]	240	300	275	4	[illegible]	[illegible]	270
Biochemical oxygen demand	mg/l	[illegible]	0.1	6.1	4.5	4	0.3	5.6	4.4
Solids									
Total dissolved	mg/l	8	113	[illegible]	166	4	147	[illegible]	173
Total suspended	mg/l	8	7.3	[illegible]	37.6	4	11.0	63.6	30.8
Nitrogen									
Ammonia	mg/l-N	4	[illegible]	[illegible]	0.013	2	[illegible]	0.012	[illegible]
Nitrate	mg/l-N	4	0.26	0.25	0.26	2	[illegible]	0.30	[illegible]
Nitrite	mg/l-N	Not Scheduled							
Organic	mg/l-N	4	0.19	0.23	0.21	2	0.21	0.21	0.21
Orthophosphate	mg/l-P	4	0.007	[illegible]	0.007	2	[illegible]	[illegible]	[illegible]
Total phosphorus	mg/l-P	4	[illegible]	0.023	0.018	2	[illegible]	[illegible]	[illegible]
Bacteria									
Fecal coliform	No./100 ml	4	23	39	31	2	23	23	23
Total coliform	No./100 ml	4	130	22,400	[illegible]	2	130	22,400	1,275

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the minimum detection limit concentrations with other higher values to produce a maximum yearly mean.

†Values recorded during October using membrane-filter procedures cannot be directly compared to results of remainder of study.

TABLE 2-42 (cont.)

Parameter	Units of Measurement	[illegible] Stns 1 and 2 No. of Samples	Min	Max	Mean	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean
Temperature	°C	0	ND	ND	ND	96	1.0	7.0	3.2	70	1.3	7.5	3.0
Dissolved oxygen	mg/l	0	ND	ND	ND	32	13.1	16.0	13.3	32	10.3	16.6	13.5
% saturation	%	0	ND	ND	ND	32	86	105	96	32	86	107	97
pH	units	0	ND	ND	ND	16	8.2	8.6	8.4	8	7.0	8.6	8.3
Specific conductance	umhos	0	ND	ND	ND	28	270	300	300	8	275	300	304
Biochemical oxygen demand	mg/l	0	ND	ND	ND	16	0.1	3.1	1.3	8	0.3	2.0	1.1
Solids													
Total dissolved	mg/l	0	ND	ND	ND	16	90	218	156	8	140	190	167
Total suspended	mg/l	0	ND	ND	ND	16	12.4	148.6	43.6	8	11.2	68.6	38.7
Nitrogen													
Ammonia	mg/l-N	0	ND	ND	ND	4	0.016	0.080	0.082	2	0.042	0.053	0.047
Nitrate	mg/l-N	0	ND	ND	ND	4	0.26	0.27	0.27	2	0.27	0.27	0.27
Nitrite	mg/l-N	0	ND	ND	ND	2	0.007	0.007	0.007	2	0.007	0.007	0.007
Organic	mg/l-N	0	ND	ND	ND	4	0.08	0.36	0.31	2	0.12	0.25	0.24
Orthophosphate	mg/l-P	0	ND	ND	ND	4	0.008	0.008	0.008	2	0.007	0.008	0.008
Total phosphorus	mg/l-P	0	ND	ND	ND	4	0.004	0.003	0.004	2	0.004	0.037	0.006
Bacteria													
Total coliform	MPN/100 ml	0	ND	ND	ND	26	<3	23	3*	20	<3	23	3*
Fecal coliform	MPN/100 ml	0	ND	ND	ND	26	9	460	140	20	4	460	171

Parameter	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean
Temperature	96	6.0	17.0	11.9	72	6.8	16.0	13.6	119	16.5	28.0	17.6	80	15.0	22.9	18.2
Dissolved oxygen	96	9.0	16.5	11.4	68	6.8	13.2	10.9	71	8.4	13.4	11.0	80	8.6	11.9	10.2
% saturation	96	86	140	100	68	71	132	100	70	67	120	114	38	80	127	100
pH	30	7.3	8.5	8.1	9	7.4	8.6	8.0	38	8.0	8.7	8.4	30	8.0	8.9	8.3
Specific conductance	33	280	300	315	11	260	320	300	38	280	316	316	30	280	300	311
Biochemical oxygen demand	16	0.3	2.9	1.8	8	0.6	2.6	1.8	30	0.4	2.3	1.4	30	0.4	3.3	1.3
Solids																
Total dissolved	16	130	220	171	8	140	280	172	16	167	275	[illegible]	8	180	275	[illegible]
Total suspended	16	1.8	38.4	13.8	8	6.4	38.6	16.0	16	2.0	30.0	28.1	8	2.6	38.6	38.2
Nitrogen																
Ammonia	4	0.008	0.013	0.009	2	0.007	0.016	0.012	4	0.010	[illegible]	[illegible]	2	0.004	0.007	0.008
Nitrate	4	0.44	0.48	0.46	2	0.42	0.44	0.43	4	0.16	0.31	0.26	2	0.30	0.30	0.30
Nitrite	2	0.008	0.008	0.008	2	0.008	0.008	0.008	2	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]
Organic	4	0.22	0.26	0.24	2	0.22	0.25	0.24	4	0.13	0.18	0.15	2	0.16	0.18	0.17
Orthophosphate	4	0.002	0.008	0.002	2	<0.002	<0.002	<0.002*	4	0.005	0.011	0.007	2	0.005	0.011	0.008
Total phosphorus	4	<0.005	0.013	0.009*	2	0.007	0.016	0.013	4	0.008	0.011	0.007	2	0.008	0.041	0.008
Bacteria																
Total coliform	26	<3	460	70	15	9	460	120	26	<3	23	6*	26	<3	23	3*
Fecal coliform	26	43	12,400	463	15	43	21,400	1,094	26	4	93	35	26	43	460	150

Parameter	Units of Measurement	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean
Temperature	°C	96	22.0	26.2	23.4	72	22.0	26.0	23.6	96	22.0	25.7	23.3	72	21.6	25.4	23.5
Dissolved oxygen	mg/l	30	8.0	12.0	9.7	40	8.0	10.3	8.5	57	8.2	9.8	9.3	40	8.8	9.7	9.3
% saturation	%	30	98	140	112	41	98	121	106	57	93	112	107	40	100	113	108
pH	units	30	8.4	8.5	8.5	8	8.3	8.6	8.4	30	8.1	8.5	8.3	6	8.0	8.5	8.2
Specific conductance	umhos	30	280	320	300	8	300	330	312	30	298	325	307	8	293	315	304
Biochemical oxygen demand	mg/l	12	1.0	1.6	1.3	6	1.2	3.3	1.7	16	0.6	1.6	0.8	8	0.6	1.4	0.9
Solids																	
Total dissolved	mg/l	16	116	221	177	8	146	283	170	16	108	176	150	8	130	177	180
Total suspended	mg/l	16	1.8	40.2	25.3	8	2.4	108.8	41.7	16	1.4	30.6	22.1	8	1.0	46.8	25.6
Nitrogen																	
Ammonia	mg/l-N	4	0.010	0.017	0.012	2	0.003	0.006	0.004	4	0.006	0.013	0.009	2	0.006	0.009	0.007
Nitrate	mg/l-N	4	0.13	0.13	0.13	2	0.12	0.12	0.12	4	<0.04	0.35	0.12*	2	<0.04	<0.04	<0.04*
Nitrite	mg/l-N	2	0.003	0.003	0.003	2	0.003	0.003	0.003	2	0.002	0.002	0.002	2	0.008	0.009	0.008
Organic	mg/l-N	4	0.17	0.23	0.18	2	0.17	0.20	0.18	4	0.12	0.15	0.13	2	0.14	0.17	0.16
Orthophosphate	mg/l-P	4	<0.002	<0.002	<0.002*	2	0.002	0.008	0.005	4	<0.002	<0.002	<0.002*	2	<0.002	<0.002	<0.002*
Total phosphorus	mg/l-P	4	0.005	0.014	0.010	2	0.012	0.025	0.019	4	0.009	0.016	0.012	2	0.014	0.029	0.017
Bacteria																	
Total coliform	MPN/100 ml	26	<3	43	<3*	20	<3	43	<3*	26	<3	43	<3*	16	<3	43	<3*
Fecal coliform	MPN/100 ml	26	4	150	46	15	43	460	206	16	3	43	18	16	4	240	46

Parameter	[illegible] Stn 1 No. of Samples	Min	Max	Mean	Stn 2 No. of Samples	Min	Max	Mean
Temperature	96	17.0	20.0	19.0	66	16.9	22.2	20.0
Dissolved oxygen	96	9.0	10.2	9.5	66	8.8	10.5	9.6
% saturation	96	95	107	101	66	98	140	102
pH	96	8.1	8.7	8.5	66	8.1	8.8	8.5
Specific conductance	96	280	320	300	66	280	318	311
Biochemical oxygen demand	72	0.3	1.5	0.8	60	0.4	1.3	0.9
Solids								
Total dissolved	72	143	237	181	60	121	230	178
Total suspended	72	0.8	36.6	9.6	60	0.2	108.2	13.7
Nitrogen								
Ammonia	Not Scheduled							
Nitrate	Not Scheduled							
Nitrite	4	0.004	0.005	0.005	4	0.004	0.004	0.004
Organic	Not Scheduled							
Orthophosphate	Not Scheduled							
Total phosphorus	Not Scheduled							
Bacteria								
Total coliform	26	<3	43	7*	16	<3	460	60*
Fecal coliform	26	15	460	164	16	93	1,100	202

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the minimum detection limit concentrations with other higher values to produce a maximum yearly mean.

3.7°C. Mean temperature values generally indicated the same temperatures at the 30-foot and 10-foot contour during October through December 1974, and again in May and June 1975. Results during these periods revealed that variations at the 10-foot contour coincided more directly with changes in ambient air temperature (i.e., decreased more rapidly as the result of declining air temperature increased) than did those at the 30-foot contour, possibly explaining the maximum variations between depth contours in mean temperature during these periods. No true thermocline (a temperature change of 1°C per meter of depth) was found during measurement periods. This is consistent with the finding of Murthy (1971), who implies that the nearshore area is well mixed and thermoclines are temporary in these areas.

2.311
Seasonal fluctuations in dissolved oxygen concentrations generally varied inversely with temperature fluctuations. This can be partially attributed to the variation in the solubility of gases in water at different temperatures. Dissolved oxygen concentrations were never less than 68 percent saturation over the year's study. These results are characteristic of lake waters of high environmental quality with regard to oxygen saturation, showing no effects of oxygen-demanding contamination such as industrial or municipal pollutants. Data from all eight Sheridan sampling stations revealed that dissolved oxygen levels varied little from station to station or from one column to the next, with fluctuations usually less than 0.5 mg/l with only 5.8 percent of the values indicating larger variations. Mean DO values generally indicated that variations between the 10-foot and 30-foot contour were chiefly the result of temperature fluctuations and not in the DO saturation level. Higher DO levels were observed at all depths during May, June, and July at the 30-foot contour with mean values reported as six percent, six percent, and eight percent higher, respectively, in DO saturation than at the 10-foot contour. These higher values appeared to correspond with higher phytoplankton densities at the 30-foot contour during these months. In diel oxygen surveys conducted during July and September at the 30-foot and 50-foot contours, variations in dissolved oxygen concentration during a diurnal period was generally small. Maximum fluctuations recorded during the three 24-hour diurnal periods (two in July and one in September) were 2.4 and 2.1 mg/l, respectively for the 30-foot and 50-foot contours occurring at the surface and first three meters. There was no apparent pattern in these diurnal variations. While most researchers indicate that minimal concentrations of dissolved oxygen are to be expected just before dawn (i.e., 0600 hrs) because of phytoplankton respiration (Hutchinson, 1975), results of the Sheridan site diel oxygen surveys showed the lowest oxygen concentration to be at 1440 hour in early July and 2330 hour later that month. However, these minimum concentrations represented 100 percent and 80 percent saturation, repectively. Vertical

dissolved oxygen variations during the diel surveys ranged from zero to 3.0 mg/l with a mean difference of 0.7 mg/l. Similar vertical fluctuation patterns were observed at both the 30-foot and 50-foot contours. DO concentrations were slightly higher at the surface during late July, indicating the influence of possible wind and surface current aeration. However, results revealed high DO concentrations at mid-depth and off-bottom during the early July observations. Patterns of low oxygen concentrations have been observed in the central basin when phytoplankton densities are high in the transition zone or metalimnion, causing a shading effect on the lower layers and consequent oxygen depletion of the lower layers (Kleveno et al., 1971).

2.312
In addition to temperature and dissolved oxygen, the following parameters were also measured during the 1974-1975 survey: pH, specific conductance, biological oxygen demand, total dissolved and suspended solids, nitrogen, phosphorus, coliform bacteria, alkalinity, turbidity, color, salinity, bromide, fluoride, silica, sulfate, metals including heavy metals, pesticides, and herbicides. These data are summarized for the twelve month sampling period in Appendix Table B-11. Additional information on water quality and the data collected can be found in Section 80.2 of the applicant's New York State Article VIII Application.

Lake Erie Tributaries
2.313
Field investigations conducted at the Sheridan site included the monitoring of water quality in two onsite streams, Ryder Creek and Eagle Bay Creek, and two offsite streams, Walnut Creek and Silver Creek (Refer to Table 2-43). Two sampling stations were established on each stream (one in the upper watershed and a second near Lake Erie) to monitor changes and variations within each watercourse (refer to Figure 2-23). A summary of the water quality conditions encountered in each stream is presented below:

Ryder Creek

2.314

- Temperapure measurements ranged from 3.0°C in December 1974 to 23.0°C in July 1975.
- Dissolved oxygen concentrations were near saturation throughout the survey with values ranging from 65 percent to 112 percent saturation with a mean of 91 percent.
- pH values ranged from 7.0 to 11.6. The higher values are in excess of the New York State Water Quality Standards for Class B streams.

- Specific conductance ranged from 310 to 710 umhos, with a mean level of 452 umhos.
- Total dissolved solids (TDS) concentrations displayed large seasonal variations throughout the survey. Levels ranged from 70 to 425 mg/l, with a mean of 258 mg/l. Suspended solids levels displayed similar seasonal variation. Concentrations ranged from 0.4 to 208.4 mg/l, with a mean of 24.0 mg/l.
- Alkalinity varied from less than 10 to 123 mg/l, with a mean of 100 mg/l.
- The levels of nitrate, nitrogen, orthophoshate and total phosphate remained low throughout the study period.
- High fecal coliform levels indicated additions of organic wastes to the creek. All samples contained fecal coliform in excess of the New York State Department of Environmental Conservation level for Class B waters.

Eagle Bay Creek

2.315

- Temperature measurements ranged from 4.9°C in November 1974 to 23.5°C in June 1975.
- Dissolved oxygen levels were near saturation at one station with a mean of 98 percent. The second station which was located in a deep pool exhibited concentrations ranging from 17 to 104 percent with a mean of 66 percent. Of the total number of dissolved oxygen measurements conducted on the stream, 14 percent were below the New York State Department of Environmental Conservation Standard of 5.0 mg/l.
- pH values ranged from 5.8 to 8.2.
- Specific conductance values varied from 390 to 975 umhos with a mean level of 586 umhos.
- TDS concentrations displayed large seasonal variances. Levels ranged from 145 to 618 mg/l with a mean of 326 mg/l. Suspended solids levels displayed erratic seasonal variations as did TDS. Concentrations ranged from 0.5 to 98.2 mg/l with a mean value of 19.6 mg/l.
- Alkalinity ranged from 26 to 162 mg/l with a mean value of 103 mg/l.
- Levels of nitrate, nitrogen, orthophosphate, and total phosphate remained low throughout the sampling period.
- Fecal coliform levels exceeded the New York State Department of Environmental Conservation level on 55 percent of the sampling occasions.

Walnut and Silver Creeks

2.316

- Walnut and Silver Creeks exhibited water quality levels

TABLE 2-43

[illegible] ANALYSIS OF TEMPERATURE (°C) AND [illegible] WATER QUALITY [illegible],
[illegible] ON-SITE STREAMS, [illegible] 1974–AUGUST 1975

Parameter	Unit of Measurement	Station Replicate	Nov 20				Dec 23				Apr 17				Apr 21			
			241		251		241		251		241		251		241		251	
			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	°C		4.2	4.2	3.9	3.9	3.0	[illegible]	3.2	[illegible]	6.0	6.0	6.0	6.0	9.8	9.8	8.5	8.5
pH	units		[illegible]	[illegible]	[illegible]	[illegible]	7.8	[illegible]	7.6	[illegible]	7.0	7.0	7.3	7.3	8.1	8.1	8.2	8.2
Dissolved oxygen	mg/l		11.6	11.6	11.2	11.3	11.0	[illegible]	9.6	[illegible]	12.6	12.6	13.0	13.0	11.8	11.8	13.2	13.2
% saturation	%		89	88	86	86	83	[illegible]	71	[illegible]	101	101	106	106	106	106	112	112
Total dissolved solids	mg/l		209	185	204	183	[illegible]	[illegible]	[illegible]	[illegible]	257	236	363	240	201	202	150	154
Total suspended solids	mg/l		60.7	90.6	115.8	65.3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.2	3.0	4.6	3.2	9.2	1.2	7.2
Total alkalinity	mg/l-$CaCO_3$		15	17	18	23	[illegible]	[illegible]	[illegible]	[illegible]	81	81	82	82	[illegible]	[illegible]	[illegible]	[illegible]
Conductivity	µmhos/cm^2		335	335	310	310	300	[illegible]	[illegible]	[illegible]	385	385	400	400	420	420	420	420

Parameter	May 3				May 8				May 14			
	241		251		241		251		241		251	
	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	10.5	10.5	10.0	10.0	13.0	13.0	11.5	11.5	6.6	6.6	6.6	6.6
pH	7.5	7.5	7.6	7.6	7.5	7.5	7.9	7.9	8.4	8.4	8.0	8.0
Dissolved oxygen	9.6	9.6	9.9	9.9	11.4	11.4	10.7	10.7	12.2	12.4	11.9	12.1
% saturation	102	102	104	104	[illegible]	[illegible]	[illegible]	[illegible]	99	[illegible]	97	[illegible]
Total dissolved solids	263	267	272	[illegible]	251	[illegible]	[illegible]	[illegible]	106	104	[illegible]	105
Total suspended solids	17.8	17.8	21.2	24.2	8.2	8.2	17.8	21.0	2.8	2.2	4.4	2.8
Total alkalinity	[illegible]	[illegible]	[illegible]	[illegible]	60	50	64	60	104	104	[illegible]	[illegible]
Conductivity	440	440	440	440	380	380	380	380	400	400	415	415

Parameter	Unit of Measurement	Nov 21				Dec 23				Apr 17				Apr 21			
		242		252		242		252		242		252		242		252	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	°C	4.9	4.9	3.9	3.9	[illegible]	[illegible]	3.0	[illegible]	7.0	7.0	5.5	5.5	6.8	6.8	9.5	9.5
pH	units	6.4	6.4	6.2	6.2	[illegible]	[illegible]	7.9	[illegible]	7.6	7.6	7.3	7.3	6.0	6.0	5.8	5.8
Dissolved oxygen	mg/l	10.6	10.5	11.9	11.1	[illegible]	[illegible]	11.0	[illegible]	10.7	10.7	13.0	13.0	10.6	10.6	10.8	10.8
% saturation	%	83	82	[illegible]	[illegible]	[illegible]	[illegible]	71	[illegible]	88	88	103	103	[illegible]	87	95	95
Total dissolved solids	mg/l	145	167	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	295	[illegible]	[illegible]	273	286	281
Total suspended solids	mg/l	46.0	64.7	31.2	52.9	[illegible]	[illegible]	[illegible]	[illegible]	5.8	7.0	2.4	2.0	4.4	2.6	8.2	7.2
Total alkalinity	mg/l-$CaCO_3$	27	26	30	31	[illegible]	[illegible]	[illegible]	[illegible]	73	73	62	65	[illegible]	[illegible]	[illegible]	[illegible]
Conductivity	µmhos/cm^2	395	395	400	400	[illegible]	[illegible]	390	[illegible]	440	440	450	450	500	500	515	515

Parameter	May 3				May 8				May 14			
	242		252		242		252		242		252	
	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	16.5	16.5	16.5	16.5	11.0	11.0	14.5	14.5	7.0	7.0	5.5	5.5
pH	7.0	7.0	7.0	7.0	8.0	8.0	8.1	8.1	7.9	7.9	7.9	7.0
Dissolved oxygen	8.2	8.2	8.0	8.0	11.5	11.5	10.2	10.2	9.9	10.0	11.5	11.3
% saturation	83	83	81	81	106	106	99	99	83	84	91	90
Total dissolved solids	297	290	291	295	275	282	260	255	163	180	196	222
Total suspended solids	18.0	16.4	23.6	18.8	12.6	14.4	4.4	5.6	6.6	7.2	2.3	2.8
Total alkalinity	[illegible]	[illegible]	[illegible]	[illegible]	60	67	60	62	96	96	83	83
Conductivity	520	520	540	540	430	430	425	425	500	500	500	500

Parameter	Unit of Measurement	Station Replicate	May 19				May 22				May 29				Jun 4			
			241		251		241		251		241		251		241		251	
			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	°C		18.0	18.0	18.0	18.0	19.5	19.5	19.0	19.0	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5
pH	units		8.5	8.5	8.7	8.7	[illegible]	[illegible]	[illegible]	[illegible]	7.8	7.7	7.8	7.8	8.2	8.2	7.9	7.9
Dissolved oxygen	mg/l		9.1	9.1	9.2	9.2	7.6	7.6	7.6	7.6	10.1	10.0	10.1	10.0	9.0	9.0	9.1	9.1
% saturation	%		96	96	97	97	82	82	79	79	100	99	100	99	89	89	90	90
Total dissolved solids	mg/l		[illegible]	[illegible]	[illegible]	[illegible]	269	276	291	311	273	274	290	281	285	330	295	353
Total suspended solids	mg/l		[illegible]	[illegible]	[illegible]	[illegible]	23.6	18.4	13.6	107.0	36.4	40.6	44.0	288.4	13.2	10.4	11.0	9.8
Total alkalinity	mg/l-$CaCO_3$		[illegible]	[illegible]	[illegible]	[illegible]	114	114	[illegible]	[illegible]	116	116	115	116	100	100	115	115
Conductivity	µmhos/cm^2		445	445	470	470	470	470	400	400	470	465	475	470	700	700	600	600

Parameter	Jun 11				Jun 18				Jun 22			
	241		251		241		251		241		251	
	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	16.0	16.0	15.0	15.0	21.0	21.0	20.0	20.0	21.5	21.5	22.5	22.5
pH	7.7	7.7	7.7	7.7	7.9	7.9	7.6	7.6	11.6	11.5	8.7	8.8
Dissolved oxygen	8.2	8.2	8.2	8.2	8.0	8.0	7.8	7.8	8.3	8.2	9.6	9.6
% saturation	82	82	80	80	90	90	85	85	93	92	120	120
Total dissolved solids	200	227	265	243	230	265	225	224	273	279	286	280
Total suspended solids	7.0	6.5	14.5	26.5	23.6	33.4	32.6	28.6	27.8	37.6	42.8	30.2
Total alkalinity	103	103	105	105	90	96	105	97	111	111	120	119
Conductivity	500	500	400	400	410	420	420	420	400	470	380	380

Parameter	Unit of Measurement	May 19				May 22				May 29				Jun 4			
		242		252		242		252		242		252		242		252	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	°C	16.5	16.5	16.5	16.5	19.0	19.0	16.5	16.5	16.5	16.5	12.0	12.0	16.0	16.0	15.5	15.5
pH	units	8.2	8.2	7.1	7.1	[illegible]	[illegible]	[illegible]	[illegible]	7.6	7.7	7.6	7.6	8.0	8.0	7.9	7.9
Dissolved oxygen	mg/l	7.6	7.6	9.0	9.0	5.7	5.7	8.6	8.4	6.5	6.7	11.0	10.6	7.6	7.6	9.1	9.1
% saturation	%	77	77	87	87	61	61	82	82	66	68	102	90	76	76	90	90
Total dissolved solids	mg/l	[illegible]	[illegible]	[illegible]	[illegible]	336	335	327	292	360	367	330	302	362	373	425	459
Total suspended solids	mg/l	[illegible]	[illegible]	[illegible]	[illegible]	20.6	23.0	26.2	26.4	59.2	58.2	62.8	45.2	7.8	12.6	11.0	[illegible]
Total alkalinity	mg/l-$CaCO_3$	[illegible]	[illegible]	[illegible]	[illegible]	123	123	84	86	125	150	83	80	92	92	119	119
Conductivity	µmhos/cm^2	350	350	520	520	590	590	560	560	600	605	620	500	625	625	975	975

Parameter	Jun 11				Jun 18				Jun 22			
	242		252		242		252		242		252	
	1	2	1	2	1	2	1	2	1	2	1	2
Water temperature	15.0	15.0	14.5	14.5	20.0	20.0	10.0	10.0	23.5	23.5	19.5	19.5
pH	7.7	7.7	7.7	7.7	7.7	7.7	7.8	7.8	7.6	7.6	8.6	8.6
Dissolved oxygen	7.0	7.0	10.0	10.0	6.4	6.4	8.8	8.8	3.1	3.1	9.4	9.4
% saturation	69	69	97	97	70	70	96	86	36	36	101	108
Total dissolved solids	351	342	375	390	312	326	343	356	360	356	300	307
Total suspended solids	8.5	9.4	0.5	2.5	10.0	11.6	12.0	9.2	40.8	26.0	18.6	30.0
Total alkalinity	109	109	94	93	107	100	96	90	130	130	90	90
Conductivity	620	620	700	700	560	560	580	580	430	430	540	540

TABLE 2-43 (cont.)

[illegible]

Parameter	Unit of Measurement	Jul 2 241 1	Jul 2 241 2	Jul 2 251 1	Jul 2 251 2	Jul 10 241 1	Jul 10 241 2	Jul 10 251 1	Jul 10 251 2	Jul 16 241 1	Jul 16 241 2	Jul 16 251 1	Jul 16 251 2	Jul 21 241 1	Jul 21 241 2	Jul 21 251 1	Jul 21 251 2
Water temperature	°C	23.0	23.0	22.0	[illegible]	19.0	19.0	18.5	18.5	18.5	18.5	18.0	18.0	20.0	20.0	20.0	20.0
pH	units	7.9	7.9	7.7	7.7	7.0	7.0	7.0	7.0	7.8	7.8	7.5	7.5	7.4	7.4	7.5	7.5
Dissolved oxygen	mg/l	8.0	8.0	7.6	7.6	9.3	9.3	8.2	8.2	7.5	7.5	7.0	7.0	7.1	7.1	6.0	6.0
% saturation	%	92	92	86	[illegible]	99	99	87	87	79	79	74	74	77	77	65	65
Biological oxygen demand	mg/l	1.2	0.8	1.0	2.0	0.9	0.6	0.7	0.7	2.4	1.0	2.2	1.6	1.6	1.3	2.2	2.2
Total dissolved solids	mg/l	261	235	334	[illegible]	236	230	249	286	250	236	308	335	280	276	364	425
Total suspended solids	mg/l	16.4	16.4	0.0	2.4	11.0	22.2	13.0	29.6	1.4	3.0	0.4	2.6	27.6	36.4	26.4	53.4
Total alkalinity	mg/l-$CaCO_3$	113	113	113	113	109	109	116	116	113	113	111	111	103	103	99	99
Conductivity	µmhos/cm	425	425	450	450	445	445	475	475	425	425	440	440	420	420	650	650

Parameter	Unit of Measurement	Aug 6 241 1	Aug 6 241 2	Aug 6 251 1	Aug 6 251 2	Aug 14 241 1	Aug 14 241 2	Aug 14 251 1	Aug 14 251 2	Aug 21 241 1	Aug 21 241 2	Aug 21 251 1	Aug 21 251 2	Aug 28 241 1	Aug 28 241 2	Aug 28 251 1	Aug 28 251 2
Water temperature	°C	19.0	19.0	18.5	18.5	20.0	20.0	20.0	20.0	17.0	17.0	17.0	17.0	19.0	19.0	19.0	19.0
pH	units	7.0	7.0	7.4	7.4	7.6	7.6	7.7	7.7	7.4	7.4	7.7	7.7	7.3	7.3	7.4	7.4
Dissolved oxygen	mg/l	10.3	10.3	6.9	6.9	9.0	9.0	7.1	7.1	9.0	9.0	8.5	8.5	8.2	9.2	8.0	8.0
% saturation	%	110	110	73	73	[illegible]	[illegible]	77	77	93	93	[illegible]	[illegible]	87	87	85	85
Biological oxygen demand	mg/l	[illegible]	[illegible]	[illegible]	[illegible]	0.9	1.0	1.2	1.0	2.2	1.1	1.1	0.9	0.9	0.8	1.2	1.3
Total dissolved solids	mg/l	110	135	[illegible]	240	275	270	262	[illegible]	[illegible]	314	293	294	317	316	[illegible]	[illegible]
Total suspended solids	mg/l	5.2	9.0	14.0	15.2	11.4	20.4	1.6	20.4	18.0	52.4	67.2	31.2	13.0	15.8	22.2	18.6
Total alkalinity	mg/l-$CaCO_3$	89	89	92	91	116	116	122	122	115	115	123	123	107	107	116	116
Conductivity	µmhos/cm	410	410	400	400	505	505	515	515	430	430	500	500	500	500	525	525

[illegible]

Parameter	Unit of Measurement	Jul 2 242 1	Jul 2 242 2	Jul 2 252 1	Jul 2 252 2	Jul 10 242 1	Jul 10 242 2	Jul 10 252 1	Jul 10 252 2	Jul 16 242 1	Jul 16 242 2	Jul 16 252 1	Jul 16 252 2	Jul 21 242 1	Jul 21 242 2	Jul 21 252 1	Jul 21 252 2
Water temperature	°C	22.0	22.0	18.5	18.5	20.0	20.0	15.5	15.5	18.0	18.0	15.5	15.5	20.0	20.0	20.0	20.0
pH	units	7.5	7.5	8.0	8.0	6.8	6.8	7.3	7.3	7.1	7.1	7.5	7.5	7.4	7.4	7.8	7.8
Dissolved oxygen	mg/l	4.3	4.3	9.5	9.5	3.2	3.2	10.5	10.5	2.6	2.6	7.8	7.8	[illegible]	[illegible]	8.2	8.2
% saturation	%	49	49	102	102	35	35	104	104	17	17	77	77	[illegible]	[illegible]	89	89
Biological oxygen demand	mg/l	3.0	3.2	1.3	0.7	3.3	2.9	0.1	0.1	3.2	2.7	1.9	2.2	0.0	0.0	2.0	1.0
Total dissolved solids	mg/l	306	306	337	326	360	361	426	424	347	326	236	230	317	335	305	396
Total suspended solids	mg/l	32.0	23.0	0.0	8.6	20.0	10.2	26.0	20.2	3.6	2.8	3.4	3.0	51.2	35.2	90.2	19.4
Total alkalinity	mg/l-$CaCO_3$	160	160	75	75	132	132	99	99	146	146	108	108	160	160	102	102
Conductivity	µmhos/cm	[illegible]	[illegible]	[illegible]	500	660	660	750	750	640	640	840	840	625	625	700	700

Parameter	Unit of Measurement	Aug 6 242 1	Aug 6 242 2	Aug 6 252 1	Aug 6 252 2	Aug 14 242 1	Aug 14 242 2	Aug 14 252 1	Aug 14 252 2	Aug 21 242 1	Aug 21 242 2	Aug 21 252 1	Aug 21 252 2	Aug 28 242 1	Aug 28 242 2	Aug 28 252 1	Aug 28 252 2
Water temperature	°C	19.5	19.5	18.0	18.0	21.0	21.0	19.0	19.0	17.0	17.0	15.0	15.0	20.0	20.0	19.0	19.0
pH	units	7.5	7.5	7.4	7.4	7.3	7.3	7.7	7.7	7.4	7.4	7.5	7.5	7.2	7.2	7.5	7.5
Dissolved oxygen	mg/l	6.8	6.8	8.5	8.5	4.1	4.1	10.0	10.0	4.0	4.0	8.8	8.8	6.2	6.2	9.5	9.5
% saturation	%	73	73	89	89	46	46	106	106	41	41	[illegible]	[illegible]	67	67	101	101
Biological oxygen demand	mg/l	0.2	0.1	[illegible]	[illegible]	1.8	1.7	0.3	0.4	1.6	1.0	0.7	0.6	1.9	1.4	0.9	0.9
Total dissolved solids	mg/l	158	149	259	255	[illegible]	633	475	476	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	404
Total suspended solids	mg/l	16.8	22.6	12.4	6.8	19.8	15.8	18.0	1.0	45.0	41.0	28.0	26.2	18.2	24.0	33.6	34.2
Total alkalinity	mg/l-$CaCO_3$	95	95	93	93	141	141	110	110	162	162	115	115	115	115	134	136
Conductivity	µmhos/cm	640	646	560	560	720	720	795	795	700	700	[illegible]	[illegible]	[illegible]	[illegible]	625	625

TABLE 2-43 (cont.)

MONTHLY ANALYSIS FOR SELECTED PARAMETERS AND STREAM FLOW, [illegible] STREAMS, APRIL 1975-AUGUST 1975

Parameter	Unit of Measure	Apr 16 Station 1 Rep 1	Apr 16 Station 1 Rep 2	Apr 16 Station 2 Rep 1	Apr 16 Station 2 Rep 2	May 14 Station 1 Rep 1	May 14 Station 1 Rep 2	May 14 Station 2 Rep 1	May 14 Station 2 Rep 2
[illegible]									
Nutrients									
Ammonia	mg/l-N	0.080	0.054	0.032	0.032	0.042	0.076	0.042	0.020
Nitrate	mg/l-N	2.90	2.75	3.07	3.00	2.08	2.08	2.19	2.30
Organic nitrogen	mg/l-N	0.12	0.07	0.10	0.10	0.15	0.15	0.14	0.27
Total nitrogen	mg/l-N	0.17	0.17	0.13	0.13	0.16	0.23	0.18	0.29
Orthophosphate	mg/l-P	0.014	0.015	0.003	0.004	0.003	0.027	0.003	0.003
Total phosphate	mg/l-P	0.049	0.065	0.062	0.040	0.065	0.084	0.015	0.011
Bacteria*									
Total coliform	MPN/100 ml	≥2,400	≥2,400	1,100	1,100	≥2,400	≥2,400	≥2,400	≥2,400
Fecal coliform	MPN/100 ml	1,100	1,100	1,100	240	≥2,400	460	1,100	1,100
Chemicals									
Potassium	mg/l	2.320	2.310	2.290	2.300	NS	NS	NS	NS
Calcium	mg/l	50.20	50.40	51.60	50.90	NS	NS	NS	NS
Magnesium	mg/l	12.55	12.50	12.85	12.75	NS	NS	NS	NS
Mercury	mg/l	0.0003	0.0003	0.0004	0.0011	NS	NS	NS	NS
Copper	mg/l	0.003	0.009	0.005	0.007	NS	NS	NS	NS
Barium	mg/l	0.006	0.010	0.009	0.012	NS	NS	NS	NS
Chloride	mg/l-Cl	6.1	6.1	5.9	6.0	NS	NS	NS	NS
Sulfate	mg/l-SO_4	65.6	65.6	65.6	66.8	NS	NS	NS	NS
Chemical oxygen demand	mg/l	7.0	7.0	7.2	7.1	NS	NS	NS	NS
Cadmium	mg/l	0.005	0.009	0.005	0.007	NS	NS	NS	NS
Chromium	mg/l	0.002	0.002	0.002	0.002	NS	NS	NS	NS
Iron	mg/l	0.207	0.206	0.292	0.292	NS	NS	NS	NS
Sodium	mg/l	10.67	10.01	9.99	10.02	NS	NS	NS	NS
Manganese	mg/l	0.052	0.050	0.055	0.053	NS	NS	NS	NS
Stream flow**	cfs	15	NS	1	NS	216	NS	5	NS
[illegible]									
Nutrients									
Ammonia	mg/l-N	0.086	0.033	0.123	0.116	0.030	0.024	0.014	0.009
Nitrate	mg/l-N	0.32	0.32	0.10	0.12	0.10	0.10	0.08	0.08
Organic nitrogen	mg/l-N	0.13	0.12	0.07	0.06	0.21	0.33	0.18	0.17
Total nitrogen	mg/l-N	0.16	0.15	0.19	0.18	0.25	0.35	0.19	0.18
Orthophosphate	mg/l-P	0.020	0.020	0.003	0.002	0.003	0.002	<0.002	<0.002
Total phosphate	mg/l-P	0.023	0.022	0.008	0.008	0.015	0.016	0.007	0.007
Bacteria*									
Total coliform	MPN/100 ml	460	460	460	460	1,100	≥2,400	≥2,400	1,100
Fecal coliform	MPN/100 ml	43	39	15	93	240	460	93	240
Chemicals									
Potassium	mg/l	4.460	4.480	3.660	3.610	NS	NS	NS	NS
Calcium	mg/l	49.20	50.10	46.90	46.70	NS	NS	NS	NS
Magnesium	mg/l	11.43	12.00	10.91	10.70	NS	NS	NS	NS
Mercury	mg/l	0.0005	0.0004	0.0004	<0.0002	NS	NS	NS	NS
Copper	mg/l	0.002	0.001	0.003	0.002	NS	NS	NS	NS
Barium	mg/l	0.086	0.070	0.004	0.006	NS	NS	NS	NS
Chloride	mg/l-Cl	41.0	40.5	53.0	52.0	NS	NS	NS	NS
Sulfate	mg/l-SO_4	71.2	71.2	65.6	65.6	NS	NS	NS	NS
Chemical oxygen demand	mg/l	9.1	9.1	10.0	10.0	NS	NS	NS	NS
Cadmium	mg/l	0.002	0.001	0.003	0.002	NS	NS	NS	NS
Chromium	mg/l	0.002	0.002	0.002	0.002	NS	NS	NS	NS
Iron	mg/l	0.280	0.286	0.244	0.290	NS	NS	NS	NS
Sodium	mg/l	15.40	15.72	17.30	17.30	NS	NS	NS	NS
Manganese	mg/l	0.006	0.007	0.004	0.001	NS	NS	NS	NS
Stream flow**	cfs	0	NS	15	NS	12	NS	4	NS

Parameter	Jun 11 Station 1 Rep 1	Jun 11 Station 1 Rep 2	Jun 11 Station 2 Rep 1	Jun 11 Station 2 Rep 2	Jul 16 Station 1 Rep 1	Jul 16 Station 1 Rep 2	Jul 16 Station 2 Rep 1	Jul 16 Station 2 Rep 2	Aug 6 Station 1 Rep 1	Aug 6 Station 1 Rep 2	Aug 6 Station 2 Rep 1	Aug 6 Station 2 Rep 2
[illegible]												
Nutrients												
Ammonia	0.016	0.020	0.040	0.060	0.041	0.036	0.053	0.059	0.046	0.030	0.051	0.089
Nitrate	0.30	0.30	1.10	1.12	1.20	1.20	1.36	1.36	1.07	1.09	1.32	1.32
Organic nitrogen	0.23	0.24	0.22	0.26	0.17	0.16	0.11	0.09	0.28	0.27	0.27	0.28
Total nitrogen	0.25	0.26	0.26	0.32	0.21	0.20	0.16	0.15	0.33	0.30	0.33	0.32
Orthophosphate	0.003	0.003	0.010	0.008	0.009	0.007	0.005	0.008	0.023	0.006	0.007	0.006
Total phosphate	0.010	0.009	0.019	0.030	0.016	0.013	0.016	0.015	0.050	0.060	0.049	0.080
Bacteria*												
Total coliform	≥2,400	290	≥2,400	≥2,400	4,600	1,200	11,000	11,000	≥24,000	4,600	≥24,000	≥24,000
Fecal coliform	≥2,400	290	≥2,400	≥2,400	1,300	930	4,600	4,600	11,000	2,400	≥24,000	11,000
Chemicals												
Potassium	2.020	1.700	1.910	1.870	NS	NS	NS	NS	4.990	4.930	5.050	5.080
Calcium	47.10	44.30	46.90	48.60	NS	NS	NS	NS	57.10	57.40	50.90	50.20
Magnesium	15.60	14.10	14.75	14.90	NS	NS	NS	NS	10.04	10.01	11.02	10.93
Mercury	<0.0002	0.0139	0.0014	0.0018	NS	NS	NS	NS	<0.0002	<0.0002	<0.0002	<0.0002
Copper	<0.001	0.001	0.001	0.001	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Barium	1.10	1.07	0.80	0.85	NS	NS	NS	NS	9.5	9.4	9.8	9.7
Chloride	22.4	22.4	21.6	21.6	NS	NS	NS	NS	32.8	32.8	37.4	37.4
Sulfate	67.0	64.5	71.0	71.5	NS	NS	NS	NS	69.4	70.4	71.6	71.6
Chemical oxygen demand	15.0	12.2	15.9	10.0	NS	NS	NS	NS	15.7	16.3	16.0	16.2
Cadmium	<0.001	<0.001	<0.001	<0.001	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Chromium	0.010	0.017	0.034	0.021	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Iron	0.203	0.205	0.216	0.219	NS	NS	NS	NS	0.217	0.223	0.220	0.219
Sodium	13.65	12.20	12.31	13.06	NS	NS	NS	NS	7.26	7.26	7.33	7.30
Manganese	0.008	0.006	0.012	0.010	NS	NS	NS	NS	0.027	0.024	0.046	0.045
Stream flow**	62	NS	34	NS	24	NS	0	NS	0	NS	0	NS
[illegible]												
Nutrients												
Ammonia	0.074	0.098	0.086	0.086	0.246	0.190	0.074	0.064	0.063	0.067	0.085	0.085
Nitrate	0.28	0.29	0.31	0.30	0.14	0.13	0.34	0.32	0.28	0.27	0.17	0.13
Organic nitrogen	0.24	0.07	0.23	0.21	0.15	0.22	0.07	0.08	0.31	0.28	0.30	0.30
Total nitrogen	0.31	0.32	0.24	0.22	0.40	0.30	0.14	0.12	0.37	0.35	0.31	0.31
Orthophosphate	0.008	0.003	0.013	0.012	0.006	0.007	<0.002	<0.002	0.011	0.013	0.008	0.008
Total phosphate	0.007	0.008	0.013	0.012	0.022	0.035	0.005	0.003	0.046	0.005	0.034	0.030
Bacteria*												
Total coliform	290	≥2,400	≥2,400	≥2,400	930	1,200	4,600	4,600	4,600	2,400	4,600	4,600
Fecal coliform	150	150	240	210	150	150	230	230	4,600	2,400	1,500	930
Chemicals												
Potassium	2.730	3.470	1.720	1.750	NS	NS	NS	NS	5.290	5.290	4.720	4.880
Calcium	60.80	48.30	44.70	44.10	NS	NS	NS	NS	42.40	35.90	36.10	33.20
Magnesium	14.51	14.63	14.00	13.96	NS	NS	NS	NS	9.21	9.07	10.19	9.97
Mercury	0.0004	0.0101	0.0030	0.0020	NS	NS	NS	NS	<0.0002	<0.0002	<0.0002	<0.0002
Copper	0.003	0.003	0.007	0.002	NS	NS	NS	NS	0.002	<0.001	0.002	<0.001
Barium	1.03	0.90	0.96	1.01	NS	NS	NS	NS	9.3	9.1	9.3	8.6
Chloride	29.2	29.2	80.0	80.0	NS	NS	NS	NS	55.5	55.5	72.5	72.5
Sulfate	75.0	77.5	71.5	71.0	NS	NS	NS	NS	72.5	73.0	74.0	76.0
Chemical oxygen demand	14.0	13.0	15.5	16.0	NS	NS	NS	NS	20.2	21.5	21.3	20.0
Cadmium	<0.001	<0.001	<0.001	<0.001	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Chromium	0.010	0.012	0.012	0.014	NS	NS	NS	NS	<0.001	<0.001	<0.001	<0.001
Iron	0.123	0.104	0.079	0.077	NS	NS	NS	NS	0.229	0.217	0.186	0.143
Sodium	25.20	25.10	20.40	20.40	NS	NS	NS	NS	9.31	9.32	10.12	9.97
Manganese	0.004	0.014	0.003	0.005	NS	NS	NS	NS	0.020	0.015	0.017	0.013
Stream flow**	50	NS	30	NS	0	NS	0	NS	0	NS	0	NS

*May samples were collected on the 8th, June samples on the 4th, July samples on the 10th, and August samples on the 14th.

**May samples were collected on the 9th, June samples on the 13th, July samples on the 2nd, and August samples on the 14th.

similar to the on-site streams.

- Results generally reflected lower specific conductance (289 umhos for both streams) and dissolved solids (191 mg/l for Walnut and 178 mg/l for Silver).
- Fecal coliform levels were extremely high. Values greater than 24,000/100 ml during July at Silver Creek should be considered to be a direct indicator of water discharge (McKee and Wolf, 1963) and a possible potential hazard to local residents (EPA, 1973).

2.317
Water quality data for Ryder Creek and Eagle Bay Creek are summarized in Table 2-43. Additional data on the chemical quality of Walnut and Silver Creek which lie outside the Sheridan site can be obtained from Section 80.2 of the applicant's New York State Article VIII application.

Groundwater

2.318
The quality of groundwater in the vicinity of the Sheridan site was determined by analyzing nine groundwater wells as shown in Figure 2-23. Parameters sampled include temperature, bacteria, and selected water quality variables including those specified in the Public Service Commission regulations.

2.319
Analyses revealed a wide range of pH values. Certain wells exhibited variations as great as 6.4 to 8.3 and 7.1 to 12.4 during monthly sampling in the 1974-1975 survey. Chemical concentrations generally varied from month to month but remained basically in the same proportions. Bicarbonates and chlorides as well as sulfates were the predominant anions present, with chloride concentrations often increasing from an annual mean level of 32 mg/l to as high as 250 to 1000 mg/l during the increased precipitation and runoff. Sulfates generally decreased slightly as chlorides increased. Aluminum and iron were the most concentrated heavy metals during this survey. Mean aluminum concentrations for the nine groundwater wells ranged from 0.306 to 0.536 mg/l, while iron ranged from 0.141 to 0.252 mg/l. These data indicated that metals in high concentrations in the soils leached into the groundwater in higher levels and were comparable with results of groundwater analyses in this area reported by Pritcher (1968). At no time during the study did results indicate a possibility of groundwater contamination by leaching of excess nutrients, metals, or industrial pollutants. Data did, however, indicate leaching suspended solids and total and fecal coliform bacteria.

AQUATIC ECOLOGY

2.320
A baseline survey of the aquatic biota of Lake Erie and tributaries in the vicinity of the proposed alternative site at Sheridan was conducted from September 1974 until September 1975. A generalized map showing the location of aquatic ecology sampling stations is presented in Figure 2-25. The results of this survey are presented below:

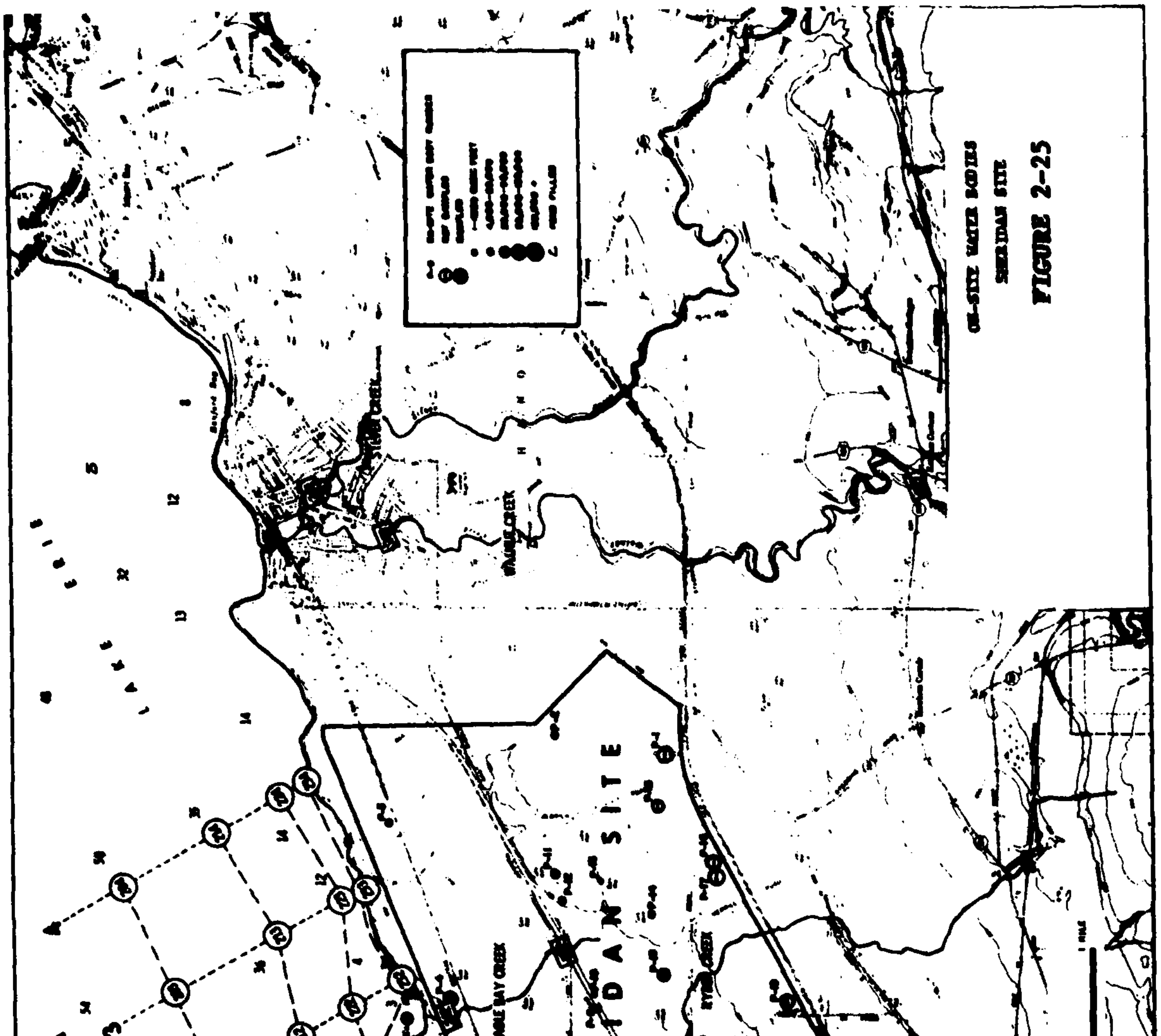
Lake Erie

Phytoplankton

2.321
Lake Erie adjoining the Sheridan site was sampled for phytoplankton, periphyton, and macrophyton during the 12-month period between September 1974 and September 1975. During this survey 163 phytoplankton taxa were identified representing more than eight phyla. The densities and relative abundance of phytoplankton taxa collected during the sampling period are summarized by phyla in Table 2-44. A more detailed discussion on phytoplankton data collected during the sampling period can be found in Section 74.2 of the applicant's New York State Article VIII Application.

2.322
For the 12-month period, the Chlorophyta (green algae) were represented by 77 taxa (47 percent of total taxa), the greatest number for any division. The Bacillariophyta (diatoms) were represented by 30 taxa (18 percent) followed by the Cyanophyta (blue-green algae) represented by 20 taxa (12 percent). Other representative taxa of the other divisions included 17 Chrysophyta (yellow-green algae), six Cryptophyta (cryptomonads, or phytoflagellates), six Pyrrhophyta (dinoflagellates), five Xanthophyta (golden-brown algae), and two Euglenophyta (euglenophytes). The greatest number of taxa recorded during any single sampling period (66) occurred in early August. Five taxa were present throughout the year, including four green algae and one cryptomonad. There were no significant differences in phytoplankton spatial distribution within sampling periods. It should be noted, as at Pomfret, that short-term variations in distributions in natural waters may occur as a result of turbulence, wind action on the surface, and other ephemeral (temporary) external conditions.

2.323
Total phytoplankton cell densities fluctuated throughout the year. There was a five-fold increase from September to early October, then a gradual decrease to early December when lowest density for the



ON-SITE WATER BODIES
SHERIDAN SITE
FIGURE 2-25

TABLE 2-44

PHYTOPLANKTON MEAN DENSITIES AND RELATIVE ABUNDANCE BASED ON 18 SAMPLES PER SAMPLING DATE
SEPTEMBER 1974 - AUGUST 1975 (SHERIDAN SITE)

Phyla	Sep 7 No.*	Sep 7 R.A.	Sep 19 No.*	Sep 19 R.A.	Oct 6 No.*	Oct 6 R.A.	Oct 16 No.*	Oct 16 R.A.	Nov 8 No.*	Nov 8 R.A.	Nov 20 No.*	Nov 20 R.A.	Dec 6 No.*	Dec 6 R.A.	Dec 31 No.*	Dec 31 R.A.	Jan 24 No.*	Jan 24 R.A.	Jan 28 No.*	Jan 28 R.A.	Feb 28 No.*	Feb 28 R.A.
Cyanophyta	388	45.6	271	31.5	3,165	66.2	1,279	45.1	1,190	61.4	417	43.0	97	21.6	82	13.4	24	2.2	110	5.3	32	3.1
Chlorophyta	291	34.2	289	33.6	659	13.8	1,133	40.0	376	19.4	258	26.5	89	19.8	264	43.3	320	29.7	382	18.2	170	16.3
Chrysophyta	6	0.7	18	2.1	4	0.1	26	0.9	37	1.9	15	1.5	15	3.3	1	0.1	20	1.8	7	0.3	4	0.4
Xanthophyta	0	0.0	3	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	7	0.3	0	0.0
Bacillariophyta	111	13.0	75	8.7	478	10.0	95	3.3	12	0.6	91	9.4	38	8.4	124	20.4	561	52.2	1,346	64.2	744	71.4
Euglenophyta	1	0.1	0	0.0	0	0.0	0	0.0	3	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pyrrhophyta	7	0.8	3	0.3	14	0.3	37	1.3	2	0.1	3	0.3	1	0.2	0	0.0	1	0.1	3	0.1	0	0.0
Cryptophyta	47	5.5	202	23.4	455	9.5	263	9.3	295	15.2	163	16.8	159	35.3	95	15.5	70	6.5	55	2.6	59	5.7
Unidentified alga	0	0.0	0	0.0	8	0.2	3	0.1	25	1.3	25	2.6	52	11.5	44	7.3	80	7.4	188	9.0	33	3.2
Total	851		860		4,783		2,836		1,939		969		451		609		1,075		2,098		1,042	

Phyla	Apr 10 No.*	Apr 10 R.A.	Apr 23 No.*	Apr 23 R.A.	May 6 No.*	May 6 R.A.	May 20 No.*	May 20 R.A.	Jun 4 No.*	Jun 4 R.A.	Jun 18 No.*	Jun 18 R.A.	Jul 1 No.*	Jul 1 R.A.	Jul 16 No.*	Jul 16 R.A.	Aug 8 No.*	Aug 8 R.A.	Aug 20 No.*	Aug 20 R.A.
Cyanophyta	120	7.8	73	10.1	26	3.9	50	3.9	15	5.2	0	0.0	15	2.1	91	10.7	1,406	42.3	2,688	45.8
Chlorophyta	307	20.0	216	30.0	385	57.2	267	20.7	42	14.1	186	17.7	114	16.1	512	60.5	930	28.0	3,071	48.7
Chrysophyta	51	3.3	21	2.9	38	5.6	12	0.9	27	9.1	5	0.5	1	0.2	2	0.3	651	19.6	221	3.5
Xanthophyta	0	0.0	0	0.0	0	0.0	0	0.0	1	0.5	3	0.3	2	0.3	12	1.4	0	0.0	0	0.0
Bacillariophyta	992	64.6	332	46.2	138	20.5	11	0.9	3	1.0	40	3.8	5	0.8	1	0.2	42	1.2	9	0.1
Euglenophyta	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pyrrhophyta	4	0.3	3	0.4	0	0.0	1	0.1	1	0.2	0	0.0	0	0.0	0	0.0	3	0.1	0.5	0.0
Cryptophyta	61	4.0	63	8.7	82	12.1	931	72.2	205	68.9	810	77.1	565	80.1	226	26.6	285	8.6	121	1.9
Unidentified alga	1	0.1	11	1.6	4	0.6	19	1.5	3	1.0	7	0.7	2	0.3	2	0.3	10	0.3	0	0.0
Total	1,537		719		673		1,289		297		1,051		705		847		3,328		6,309	

*Multiply values by 10^6.
R.A. = Relative Abundance.

first four months was observed. From late December to late May, cell densities fluctuated, the highest density occurring in late January. Early June was the time of lowest cell density during the study. Densities increased slightly into late July, then experienced a four-fold increase in August, doubling again in late August when phytoplankton density reached its peak. These phytoplankton cell density trends are similar to those of the Pomfret site.

2.324
Apparent changes in the living population from sampling period to sampling period can be expressed by means of biovolume of the phytoplankton populations. In this study, biovolume varied from period to period, peaking in early October, late November, and late January. Biovolume of stations was quite variable within each sampling period and generally exhibited no apparent spatial trends. The yearly range was 13-10,194 ul/m^3: the yearly mean, 807 ul/m^3. Yearly mean biovolume of depths revealed that the 30-foot contour off-bottom was higher (929 ul/m^3) than the biovolume at the 30-foot contour subsurface (676 ul/m^3). At the 10-foot contour, mid-depth biovolume (802 ul/m^3) was between the 30-foot contour subsurface and off-bottom estimates. Yearly mean biovolume for columns, from highest to lowest, was as follows:

983 ul/m^3, column 1: 819 ul/m^3, column 4; 746 ul/m^3, column 2; and 680 ul/m^3, column 3. Biovolume peaks were closely related to the specific organisms that occurred during those specific periods. Diatoms, due to the size of their silicon frustules, contribute greatly to biovolume.

2.325
In addition to phytoplankton biovolume at the regular Lake Erie sampling stations, Eagle Bay biovolume was observed. There were two peaks of interest: 2387 ul/m^3 in mid-April and 912 ul/m^3 in mid-June, both of which were higher than biovolume estimates observed in the lake during those times. The April peak was due to three diatoms: <u>Melosira binderana</u>, <u>Stephanodiscus astrae</u>, and <u>Asterionella formosa</u>. Together, they comprised 81 percent of total biovolume. During this time, the diatoms were also numerically dominant. Similarly, the peak in June was due to a group of unidentified cryptomonads, which comprises 96 percent of total biovolume and 55 percent of total density. It was noted that these two peaks were higher than the biovolume observed in the lake during those times because of the higher densities of the dominant organisms in Eagle Bay.

2.326
The biovolume estimate in this study was similar to that reported by Davis (1962) for 1950-1951; Davis' estimates for 1956-1957, however, were higher than those of the present study, although showing similar temporal variations.

Periphyton

2.327
In the cleared diatom specimens used during the study at the Sheridan site, 73 Bacillariophyta taxa were identified; of these, seven were from the order Centrales and 66 from the order Pennales. The largest number collected during any single period was 39 in the month of December. A quantitative list of all taxa, the month observed, and each taxon's relative occurrence is presented in Table 2-45. Analysis of the whole periphyton sample revealed 55 taxa present during the study from May to September. The major groups were Chlorophyta (29 taxa) and Bacillariophyta (two Centrales and 16 Pennales taxa). The largest number of taxa (8) was found in September 1975.

2.328
Some of the taxa found in the periphyton community are considered to be planktonic forms that evidently settled out of the water column into the periphyton community. Stephanodiscus astraea and certain species of Melosira were some of the planktonic diatoms found in both communities; Scenedesmus ecornis is an example of a planktonic green alga found in both communities during the summer.

2.329
There were no major spatial differences within time periods at the individual stations. Shifts in taxa dominance are similar to the Pomfret site. Results from the whole periphyton analysis are similar to the Pomfret site with a few exceptions. There are slight differences in the algal species which were considered as periphyton.

Aquatic Macrophytes

2.330
Four surveys were conducted along the Sheridan Lake Erie Generating Site shoreline to determine the distribution and abundance of Cladophora and the species observed in the macrophyte surveys. Samples revealed good growth of Cladophora at the 10-foot depth contour, while minimal growth was found in Eagle Bay.

2.331
During late July, several species of macrophytes other than Cladophora were observed floating on the surface southwest of Fletcher Point. The species observed were Lemna minor, Myriophyllum spp., Potamogeton, crispus, Spirodela polyrhiza, and Zannichellia palustris. These plants probably originated in or near Dunkirk harbor. Other than these additions, the results were the same as that of the Pomfret site.

TABLE 2-45

CLEARED DIATOMS QUANTITATIVE LIST WITH RELATIVE OCCURRENCE*, SHERIDAN SITE, SEPTEMBER 1974-AUGUST 1975

	Sep	Oct	Nov	Dec	Apr	May	Jun	Jul	Aug
Bacillariophyta									
Centrales									
Cyclotella spp.	7.5	3.6	>0.1	0.1	1.5	2.9	1.0	2.	0.1
Cyclotella ocellata	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.	0.0
Melosira spp.	0.0	1.70	0.0	<0.1	0.5	0.0	0.0	0.	0.0
Melosira binderana	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.	0.0
Melosira distans	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0	0.0
Stephanodiscus spp.	0.0	1.7	<0.1	0.1	5.2	1.0	0.3	0.	0.0
Stephanodiscus astraea	0.7	4.1	<0.1	0.3	2.9	3.1	0.8	0.	0.5
Pennales									
Achnanthes spp.	0.1	2.1	<0.1	0.4	0.5	2.3	1.0	1.3	2.1
Achnanthes lanceolata	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.1
Achnanthes linearis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Achnanthes minutissima	1.1	5.6	0.3	0.4	0.3	1.6	9.0	3.4	17.2
Amphora spp.	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.3	0.4
Amphora ovalis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Amphora ovalis var. *pediculus*	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.3	0.0
Anomoeoneis serians var. *brachysira*	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Anomoeoneis vitrea	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	<0.1
Asterionella formosa	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Caloneis spp.	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.6	0.0
Caloneis bacillum	0.4	0.0	0.4	0.0	0.0	0.0	0.2	1.0	2.5
Cocconeis spp.	0.0	1.1	0.2	0.6	0.1	0.0	0.1	0.0	0.1
Cocconeis pediculus	0.0	0.2	0.4	0.4	0.0	0.0	0.0	0.0	0.3
Cocconeis placentula	0.0	0.1	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Cymbella spp.	0.9	0.4	7.5	1.9	1.8	2.4	0.1	0.1	0.1
Cymbella affinis	0.0	0.1	2.7	1.0	0.0	0.0	0.1	0.0	0.7
Cymbella prostrata	0.0	0.0	0.0	2.8	0.0	1.6	0.2	0.0	0.1
Cymbella sinuata	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Cymbella tumida	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cymbella turgida	0.0	1.0	1.7	0.8	0.0	0.0	0.0	0.0	0.0
Cymbella ventricosa	0.0	5.9	8.7	1.7	0.0	2.9	0.3	0.0	0.0
Diatoma spp.	0.0	0.3	0.2	0.9	5.7	4.1	2.8	0.0	0.0
Diatoma tenue	0.0	0.0	0.0	0.3	6.3	11.1	7.8	1.0	0.0
Diatoma tenue var. *elongatum*	0.0	0.0	0.0	0.0	0.5	1.	0.0	0.0	0.0
Diatoma vulgare	0.0	0.1	0.9	4.6	0.0	0.0	0.0	0.0	0.1
Eunotia spp.	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilariaceae	0.4	0.4	0.4	0.6	0.0	0.0	0.0	0.0	0.0
Fragilaria spp.	0.4	0.4	0.9	<0.1	20.9	2.8	0.2	0.8	4.3
Fragilaria brevistriata	0.0	0.0	0.2	<0.1	0.0	0.0	0.0	0.0	0.0
Fragilaria capucina	0.0	1.5	1.1	1.3	0.0	0.0	0.3	0.0	0.0
Fragilaria crotonensis	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fragilaria vaucheriae	0.1	7.6	13.4	11.4	5.2	12.1	5.1	52.5	12.8
Gomphonema spp.	0.5	2.4	2.8	8.8	20.4	2.6	0.4	1.6	0.3
Gomphonema acuminatum var. *coronata*	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gomphonema intricatum var. *pumila*	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Gomphonema olivaceum	0.0	0.1	0.4	42.9	11.1	4.5	1.1	0.0	0.0
Gomphonema olivaceum var. *minutissima*	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0
Gomphonema parvulum	<0.1	0.6	1.5	<0.1	0.0	0.3	0.1	0.3	0.0
Gyrosigma spp.	0.0	0.3	0.0	<0.1	0.0	0.0	0.0	0.1	0.0
Meridion circulare	0.0	0.0	<0.1	0.4	0.9	0.2	0.0	0.0	0.0
Navicula spp.	1.2	4.5	2.1	2.2	1.9	0.3	6.5	0.4	1.0
Navicula [illegible]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3
Navicula [illegible]	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Navicula cryptocephala	0.0	0.0	<0.1	0.1	0.0	0.0	0.0	0.0	0.0
Navicula longirostris	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0
Navicula menisculus	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Navicula pseudoreinhardtii	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.0	0.0
Navicula radiosa	0.0	0.0	0.2	0.0	0.0	0.0	0.0	19.8	15.6
Navicula radiosa var. *tenella*	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.6	0.0
Navicula salinarum var. *intermedia*	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Navicula tripunctata	0.0	0.0	0.2	0.8	0.0	0.0	0.2	0.0	0.0
Navicula tripunctata var. *schizonemoides*	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0	0.0
Nitzschia spp.	8.9	27.3	34.5	2.6	7.4	14.8	7.6	2.6	7.5
Nitzschia acicularis	<0.1	0.0	0.0	0.0	0.3	0.5	0.0	0.0	0.0
Nitzschia dissipata	70.9	11.2	11.0	8.1	0.4	0.6	49.0	4.5	6.3
Nitzschia kutzingiana	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Nitzschia palea	0.0	2.2	2.3	0.0	0.0	0.3	0.0	2.7	0.0
Pinnularia spp.	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhoicosphenia curvata	0.3	0.7	3.0	1.6	0.2	0.8	1.3	0.9	0.4
Surirella spp.	0.0	0.0	0.0	0.0	0.2	0.0	0.6	0.5	0.0
Surirella angusta	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Synedra spp.	<0.1	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Synedra amphicephala	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Synedra ulna	0.0	0.0	0.0	<0.1	0.0	0.0	0.0	0.0	0.0
Tabellaria flocculosa	1.2	5.5	0.3	0.3	0.1	0.0	0.0	0.0	0.0

*Computed using following equation:

$$\left(\frac{\text{number counted per taxon}}{\text{total number counted for all taxa}}\right) 100$$

Zooplankton

2.332
A total of 84 taxa was identified and enumerated from zooplankton samples collected at the Sheridan site, consisting of rotifers (25 percent), crustaceans (57 percent), and protozoans (one percent). The remaining 17 percent did not fall into any of these categories and are not considered unique or numerically important since they comprise about two percent of the total population density throughout the majority of the study period.

2.333
Total zooplankton density at the Sheridan site indicated that the 30-foot contour had the highest density and the lowest density occurred at the 10-foot contour. At the 30-foot contour copepods were most abundant. Cladocerans were evenly distributed between contours. Histograms depicting zooplankton densities at the 30-foot and 10-foot contours have been derived from the 333 u and 73 u net data and are presented in Figures 2-26 and 2-27 respectively.

2.334
There were three peaks in crustacean zooplankton densities at the Sheridan site. The highest occurred in September followed by two of a similar size in November and late June. There was a fourth, although much lower, peak in early April due primarily to an abundance of cyclopoids soon after breakup of ice. Cladocerans were most dominant at other times of the year.

2.335
Rotifers densities followed a different pattern, although the highest density occurred concurrent with the crustacean peak in September. Rotifer densities exhibited a decrease from September to late December, which was the lowest observed during the year. From December through February, rotifer densities remained quite uniform, then in April exhibited a rapid increase, and remained at a high density level throughout the summer.

2.336
Zooplankton biomass correlated with zooplankton density quite uniformly. A small increase in biomass relative to density occurred in April, late July, and August due to the higher relative abundance of calanoids and cyclopoids (heavier organisms than cladocerans). The primary difference in abundance of rotifers and crustaceans was the extremely high density of rotifers in April and the relatively low densities of crustaceans.

2.337
Seasonal succession of species observed at the Sheridan site was similar to that noted at the Pomfret site.

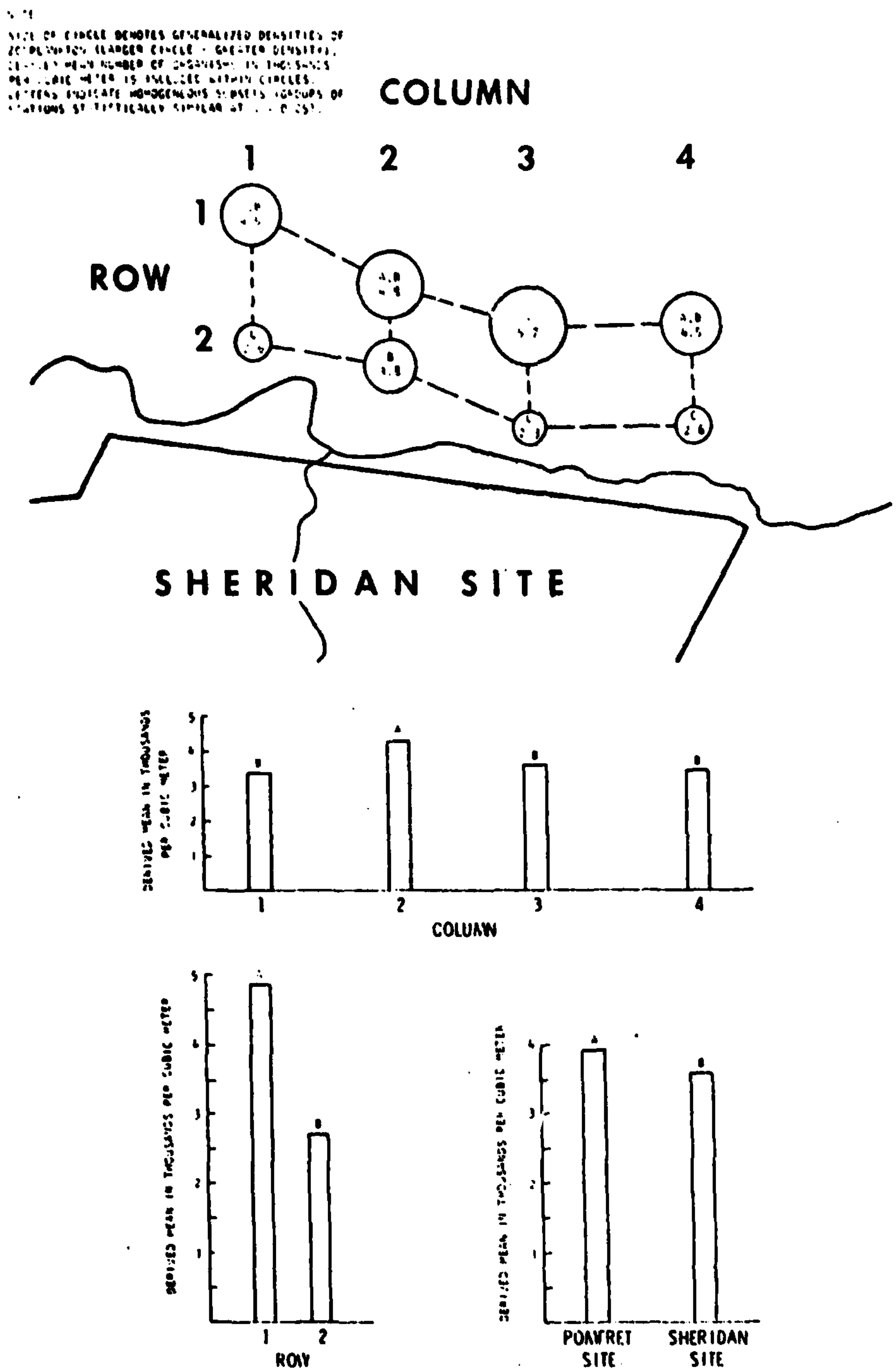


FIGURE 2-26

SPATIAL COMPARISONS OF ZOOPLANKTON DENSITIES (333 μ NET FROM ANOVA) SEPTEMBER 1974-AUGUST 1975 SHERIDAN SITE

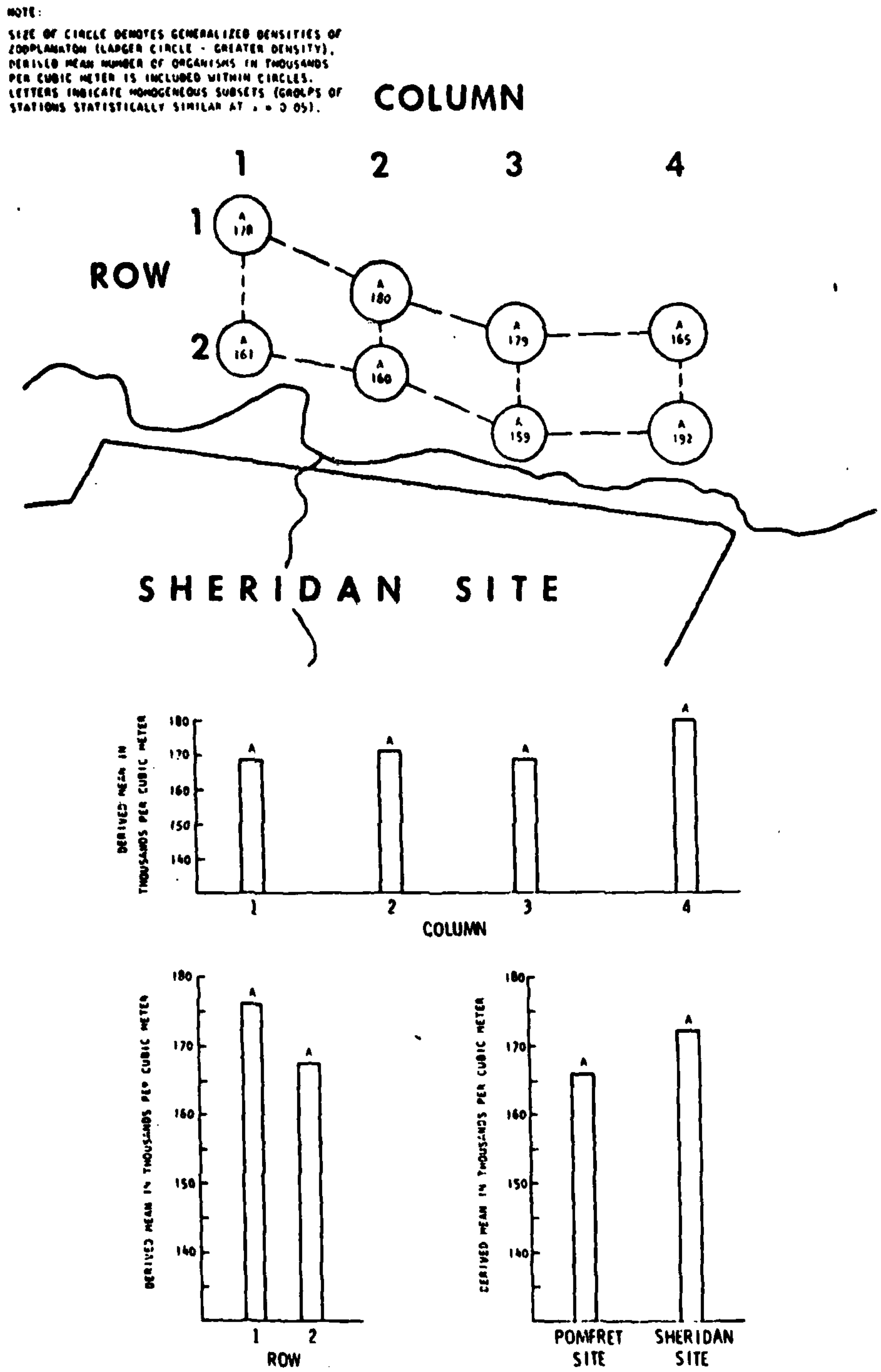


FIGURE 2-27

SPATIAL COMPARISON OF ZOOPLANKTON DENSITIES (73 µ NET FROM ANOVA) SEPTEMBER 1974-AUGUST 1975 SHERIDAN SITE

2.338
Lake Erie zooplankton densities and their relative abundance by month are summarized in Tables 2-46 (73 u net) and 2-47 (333 u mesh) for areas sampled at the Sheridan site. Total zooplankton densities were lower in Eagle Bay (see Table 2-48) than the regular lake sampling stations on all comparable sampling dates from April through August. Mean density for April through August on comparable dates was approximately four times higher at the regular stations than in Eagle Bay.

Benthic Macroinvertebrates

2.339
During the 12 month sampling period, 95 taxa were identified at the Sheridan site: 23 dipterans, 13 mollusca, 9 trichopterans, 6 oligochaetes, 5 bryozoans, 6 cladocera, 5 collembolans, and 4 copepods. The remaining 24 taxa were not representative of any single group.

2.340
Two peaks of total invertebrate density were noted in Lake Erie waters at the Sheridan site. The highest occurred during August when Cristatella (Bryozoan) was dominant and the second highest in June when Hydra (coelen-terata) was dominant. August was the most productive month in terms of overall invertebrate density. Bryozoans were present in greatest numbers followed by dipterans, cladocerans, and amphipods. Mean densities for Sheridan Site macroinvertebrates colonizing natural substrates are presented in Table 2-49.

2.341
To complement the data obtained from natural sources and to determine rates of colonization by macroinvertebrates in the vicinity of the Sheridan site, artificial samplers were employed. During the 12 month sampling period, maximum macroinvertebrate densities were recorded in June and August 1975. The coelenterates were found to be most abundant in June while Gammarus (Amphipoda) Tanytarsus (Diptera) and Cristatella (Bryozoa) dominated in August. Gammarus was also dominant in July. No other invertebrate was numerically dominant during any of the other sampling periods. Mean densities for Sheridan site macroinvertebrates colonizing artificial substrate samplers are presented in Table 2-50.

2.341a
The following sections summarize the Sheridan site benthic biomass and spatial distribution.

- The yearly mean density from natural substrates was highest along the 10-foot contour. All of the more numerous organisms followed this trend.

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TABLE 2-46

SHERIDAN ZOOPLANKTON (73-μ NET) SITE MEAN DENSITIES (NO./M³) AND RELATIVE ABUNDANCE (R.A.) BASED ON 16 SAMPLES PER SAMPLING DATE, SEPTEMBER 1974-AUGUST 1975

	1974							
	Sep 17		Oct 16		Nov 20		Dec 31	
Taxon	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Protozoa	909	0.2	606	0.3	260	0.2	0	0.0
Coelenterata								
Hydra spp.	0	0.0	0	0.0	0	0.0	1	<0.05
Turbellaria	0	0.0	0	0.0	0	0.0	1	<0.05
Rotifera	7,830	1.7	10,917	5.4	5,490	4.1	1.296	4.8
Brachionus spp.	632	0.1	0	0.0	0	0.0	0	0.0
Kellicottia spp.	1,300	0.3	1,178	0.6	1,163	0.9	1,751	6.5
Keratella spp.	45,706	9.9	66,668	32.8	23,282	25.8	11,777	43.8
Notholca spp.	198	<0.05	0	0.0	339	0.3	0	0.0
Lepadella spp.	1,622	0.4	0	0.0	622	0.5	0	0.0
Squatinella spp.	198	<0.05	0	0.0	0	0.0	0	0.0
Lecane spp.	331	0.1	0	0.0	0	0.0	0	0.0
Monostyla spp.	0	0.0	0	0.0	0	0.0	0	0.0
Pseudoploesoma spp.	0	0.0	0	0.0	0	0.0	0	0.0
Ascomorphella spp.	409	0.1	1,880	0.9	0	0.0	136	0.5
Trichocerca spp.	2,205	0.5	2,500	1.2	1,583	1.2	0	0.0
Ascomorpha spp.	267	0.1	738	0.4	0	0.0	0	0.0
Asplanchna spp.	6,534	1.4	480	0.2	0	0.0	0	0.0
Ploesoma spp.	0	0.0	207	0.1	0	0.0	0	0.0
Polyarthra spp.	187,266	40.5	82,647	40.7	8,190	6.2	4,100	15.3
Gastropus spp.	0	0.0	0	0.0	0	0.0	0	0.0
Filinia spp.	908	0.2	4,299	2.1	0	0.0	0	0.0
Conochilus spp.	136,357	29.4	2,406	1.2	320	0.2	0	0.0
Ptygura spp.	632	0.1	0	0.0	0	0.0	0	0.0
Collotheca spp.	593	0.1	0	0.0	15,422	11.6	766	2.8
Nematoda	0	0.0	0	0.0	0	0.0	0	0.0
Annelida								
Naididae	0	0.0	0	0.0	0	0.0	10	<0.05
Chaetogaster spp.	10	<0.05	0	0.0	0	0.0	0	0.0
Cladocera								
Leptodora kindtii	55	<0.05	12	<0.05	0	0.0	0	0.0
Diaphanosoma sp.	606	0.1	285	0.1	168	0.1	0	0.0
Holopedium gibberum	164	<0.05	44	<0.05	0	0.0	0	0.0
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	0	0.0
Alona spp.	0	0.0	0	0.0	0	0.0	0	0.0
A. rectangula	0	0.0	0	0.0	0	0.0	0	0.0
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0
A. costata	10	<0.05	17	<0.05	0	0.0	0	0.0
Leydigia quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0
Chydorus spp.	0	0.0	117	0.1	35	<0.05	0	0.0
Daphnia spp.	572	0.1	0	0.0	0	0.0	8	<0.05
D. longiremis	0	0.0	0	0.0	0	0.0	2	<0.05
D. ambigua	0	0.0	0	0.0	0	0.0	16	0.1
D. galeata mendotae	37,039	8.0	4,053	2.0	16,965	12.7	51	0.2
D. retrocurva	22	<0.05	454	0.2	177	0.1	0	0.0
Simocephalus spp.	38	<0.05	0	0.0	0	0.0	0	0.0
Ceriodaphnia spp.	0	0.0	98	<0.05	79	0.1	0	0.0
Bosminidae (*B. longirostris, E. coregoni, E. hagmanni*)	2,054	0.4	7,753	3.8	9,556	7.2	1,650	6.1

	1975											
	Jan 24		Feb 28		Apr 10		Jun 23		Jul 22		Aug 8	
Taxon	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Protozoa	370	1.1	105	0.3	700	0.2	404	0.1	0	0.0	0	0.0
Coelenterata												
Hydra spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Turbellaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Rotifera	5,001	14.8	8,189	22.4	161,564	46.9	1,918	0.5	1,086	0.3	17,361	9.4
Brachionus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Kellicottia spp.	2,182	6.4	1,837	5.0	6,946	2.3	58,744	15.9	82	<0.05	2,087	1.1
Keratella spp.	11,252	33.2	8,694	23.8	39,609	13.1	47,539	12.8	32,090	8.8	56,331	30.5
Notholca spp.	995	2.9	580	1.6	658	0.2	0	0.0	0	0.0	41	<0.05
Lepadella spp.	0	0.0	0	0.0	0	0.0	305	0.1	61	<0.05	0	0.0
Squatinella spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lecane spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Monostyla spp.	0	0.0	0	0.0	0	0.0	0	0.0	122	<0.05	0	0.0
Pseudoploesoma spp.	0	0.0	0	0.0	0	0.0	0	0.0	577	0.2	0	0.0
Ascomorphella spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Trichocerca spp.	0	0.0	0	0.0	0	0.0	153	<0.05	0	0.0	244	0.1
Ascomorpha spp.	0	0.0	306	0.8	2,505	0.9	0	0.0	0	0.0	0	0.0
Asplanchna spp.	117	0.3	0	0.0	3,165	1.0	1,121	0.3	0	0.0	736	0.4
Ploesoma spp.	0	0.0	0	0.0	0	0.0	0	0.0	494	0.1	5,513	3.0
Polyarthra spp.	2,233	6.6	4,439	12.2	91,816	30.4	87,838	23.7	34,550	9.2	20,149	10.9
Gastropus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	280	0.2
Filinia spp.	0	0.0	0	0.0	149	<0.05	0	0.0	0	0.0	0	0.0
Conochilus spp.	0	0.0	0	0.0	0	0.0	15,786	4.3	252,848	67.4	38,447	20.8
Ptygura spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Collotheca spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Nematoda	3	<0.05	15	<0.05	10	<0.05	0	0.0	14	<0.05	0	0.0
Annelida												
Naididae	0	0.0	2	<0.05	0	0.0	41	<0.05	0	0.0	0	0.0
Chaetogaster spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cladocera												
Leptodora kindtii	0	0.0	0	0.0	0	0.0	369	0.1	505	0.1	37	<0.05
Diaphanosoma sp.	0	0.0	0	0.0	0	0.0	73	<0.05	56	<0.05	105	0.1
Holopedium gibberum	0	0.0	0	0.0	0	0.0	0	0.0	4	<0.05	0	0.0
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	76	<0.05	9	<0.05	3	<0.05
Alona spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	<0.05
A. rectangula	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	13	<0.05
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0
A. costata	0	0.0	0	0.0	0	0.0	0	0.0	8	<0.05	0	0.0
Leydigia quadrangularis	3	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chydorus spp.	0	0.0	0	0.0	0	0.0	59	<0.05	0	0.0	0	0.0
Daphnia spp.	18	0.1	21	0.1	0	0.0	5,043	1.4	155	<0.05	0	0.0
D. longiremis	10	<0.05	4	<0.05	0	0.0	2,180	0.6	0	0.0	46	<0.05
D. ambigua	1	<0.05	3	<0.05	0	0.0	199	0.1	0	0.0	0	0.0
D. galeata mendotae	27	0.1	39	0.1	12	0.05	2,726	0.7	27,311	7.3	1,552	0.8
D. retrocurva	1	<0.05	<0.5	<0.05	0	0.0	9,303	2.6	1,084	0.3	779	0.4
Simocephalus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ceriodaphnia spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Bosminidae (*B. longirostris, E. coregoni, E. hagmanni*)	2,119	6.3	1,814	5.0	1,414	3.5	52,023	14.1	177	<0.05	433	0.2

TABLE 2-46 (cont.)

Taxon	1974 Sep 17 No./m³	Sep 17 R.A.	Oct 16 No./m³	Oct 16 R.A.	Nov 20 No./m³	Nov 20 R.A.	Dec 31 No./m³	Dec 31 R.A.	1975 Jan 24 No./m³	Jan 24 R.A.
Ostracoda	21	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
Copepoda (nauplii)	13,406	2.9	3,094	1.5	3,088	2.3	1,430	5.3	4,110	12.1
Calanoida (copepodid)	1,274	0.3	4,026	2.0	2,581	1.9	85	0.3	97	0.3
Eurytemora affinis	0	0.0	37	<0.05	67	0.1	0	0.0	39	0.1
Diaptomus spp.	3,195	0.4	0	0.0	0	0.0	0	0.0	14	<0.05
D. minutus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. sicilis	0	0.0	0	0.0	15	<0.05	0	0.0	0	0.0
D. ashlandi	0	0.0	0	0.0	0	0.0	0	0.0	4	<0.05
D. pallidus	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05
D. oregonensis	4,432	1.0	1,714	0.8	3,194	2.4	91	0.3	277	0.8
D. siciloides	0	0.0	64	<0.05	0	0.0	0	0.0	<0.5	<0.05
Unidentified Calanoida	0	0.0	0	0.0	0	0.0	0	0.0	4	<0.05
Cyclopoida (copepodid)	2,216	0.5	4,440	2.2	22,312	16.8	3,362	12.5	4,324	12.8
Tropocyclops prasinus	0	0.0	0	0.0	0	0.0	3	<0.05	41	0.1
Cyclops spp.	744	0.2	0	0.0	0	0.0	0	0.0	0	0.0
C. vernalis	0	0.0	0	0.0	0	0.0	0	0.0	8	<0.05
C. bicuspidatus thomasi	0	0.0	1,324	0.8	5,506	4.2	334	1.2	509	1.7
Mesocyclops edax	2,339	0.5	838	0.4	1,520	1.1	0	0.0	0	0.0
Unidentified Cyclopoida	33	0.1	0	0.0	0	0.0	0	0.0	4	<0.05
Harpacticoida	0	0.0	0	0.0	0	0.0	5	<0.05	0	0.0
Hydracarina	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0
Insecta										
Diptera	0	0.0	0	0.0	0	0.0	4	<0.05	0	0.0
Chironomidae	0	0.0	0	0.0	13	<0.05	0	0.0	0	0.0
Totals										
Protozoa	909	0.2	606	0.3	260	0.2	0	0.0	370	1.1
Rotifera	393,228	85.0	173,099	85.6	67,511	50.7	19,823	73.7	21,779	64.4
Cladocera	40,611	8.8	12,834	6.3	26,981	20.3	1,726	6.4	2,179	6.4
Copepoda (nauplii)	13,406	2.9	3,094	1.5	3,088	2.3	1,430	5.3	4,110	12.1
Calanoida	8,901	1.9	5,842	2.9	5,855	4.4	177	0.7	437	1.3
Cyclopoida	5,630	1.2	6,803	3.3	29,619	22.1	3,698	13.8	4,964	14.7
Other	31	<0.05	0	0.0	13	<0.05	23	0.1	3	<0.05
Total	462,709		203,071		133,126		26,885		33,843	

Taxon	1975 Feb 28 No./m³	Feb 28 R.A.	Apr 10 No./m³	Apr 10 R.A.	Jun 23 No./m³	Jun 23 R.A.	Jul 22 No./m³	Jul 22 R.A.	Aug 8 No./m³	Aug 8 R.A.
Ostracoda	0	0.0	2	<0.05	470	0.1	232	0.1	30	<0.05
Copepoda (nauplii)	4,402	12.1	9,147	3.0	22,400	6.1	4,115	1.1	19,004	10.3
Calanoida (copepodid)	39	0.1	0	0.0	2,793	0.8	1,724	0.5	1,473	0.8
Eurytemora affinis	2	<0.05	0	0.0	98	<0.05	1	<0.05	0	0.0
Diaptomus spp.	3	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
D. minutus	0	0.0	103	<0.05	0	0.0	232	0.1	0	0.0
D. sicilis	0	0.0	122	<0.05	27	<0.05	0	0.0	0	0.0
D. ashlandi	10	<0.05	29	<0.05	41	<0.05	24	<0.05	22	<0.05
D. pallidus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. oregonensis	125	0.3	5	<0.05	92	<0.05	361	0.1	1,084	0.5
D. siciloides	0	0.0	16	<0.05	0	0.0	403	0.1	30	<0.05
Unidentified Calanoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cyclopoida (copepodid)	4,999	13.7	2,204	0.7	56,290	15.2	13,362	3.6	16,880	9.1
Tropocyclops prasinus	43	0.1	0	0.0	99	<0.05	2,100	0.6	147	0.1
Cyclops spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
C. vernalis	11	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
C. bicuspidatus thomasi	806	2.2	1,530	0.5	1,478	0.4	94	<0.05	819	0.4
Mesocyclops edax	0	0.0	0	0.0	154	<0.05	603	0.2	1,152	0.6
Unidentified Cyclopoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Harpacticoida	0	0.0	4	<0.05	20	<0.05	5	<0.05	0	0.0
Hydracarina	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Insecta										
Diptera	1	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
Chironomidae	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0
Totals										
Protozoa	105	0.3	700	0.2	404	0.1	0	0.0	0	0.0
Rotifera	24,052	65.9	286,304	94.9	213,403	57.7	322,658	86.0	141,197	76.4
Cladocera	1,881	5.2	1,428	0.5	72,249	19.5	29,321	7.8	3,082	1.7
Copepoda (nauplii)	4,402	12.1	9,147	3.0	22,400	6.1	4,115	1.1	19,004	10.3
Calanoida	179	0.5	274	0.1	3,051	0.8	2,726	0.7	2,510	1.4
Cyclopoida	5,859	16.1	3,734	1.2	58,022	15.7	16,159	4.3	19,006	10.3
Other	18	<0.05	14	<0.05	531	0.1	272	0.1	30	<0.05
Total	36,496		301,876		370,080		375,202		184,980	

TABLE 2-47

ZOOPLANKTON (333-μ NET) MEAN DENSITIES (NO./M³) AND RELATIVE ABUNDANCE (R.A.) IN PERCENT BASED ON 16 SAMPLES PER SAMPLING DATE, SEPTEMBER 1974-AUGUST 1975

	1974																	
	Sep 7		Sep 17		Oct 6		Oct 16		Nov 8		Nov 20		Dec 6		Dec 31		Apr 10	
Taxon	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Coelenterata																		
Hydra spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Turbellaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.05	0.0	0	0.0
Annelida																		
Naididae	8	<0.05	0	0.0	0	0.0	8	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Stylaria spp.	4	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cladocera																		
Leptodora kindtii	59	0.3	113	0.2	58	0.4	67	0.4	31	0.1	13	0.1	0	0.0	0	0.0	0	0.0
Sida crystallina	0	0.0	0	0.0	20	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Latona setifera	3	<0.05	0	0.0	7	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Diaphanosoma spp.	326	1.7	253	0.5	558	3.6	473	3.1	208	1.0	265	1.1	<0.5	<0.05	0	0.0	0	0.0
Holopedium gibberum	9	<0.05	168	0.3	151	1.0	80	0.5	7	<0.05	0	0.0	0	0.0	0	0.0	0	0.0
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Alona quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
A. costata	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Leydigia quadrangularis	0	0.0	14	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Daphnia spp.	0	0.0	0	0.0	0	0.0	2	<0.05	4	<0.05	17	0.1	4	0.5	0	0.0	0	0.0
D. longiremis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	0.4	<0.5	<0.05
D. ambigua	7	<0.05	0	0.0	190	1.2	9	0.1	484	2.2	4	<0.05	5	0.6	0	0.0	0	0.0
D. galeata mendotae	8,212	42.3	38,838	71.9	8,349	54.4	6,094	40.6	8,065	36.0	12,492	52.6	209	24.0	30	5.9	21	1.3
D. parvula	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. retrocurva	160	0.8	291	0.5	272	1.8	926	6.2	1,693	7.5	619	2.6	2	0.2	3	0.5	<0.5	<0.05
Ceriodaphnia spp.	6	<0.05	0	0.0	65	0.4	71	0.5	200	0.9	47	0.2	0	0.0	0	0.0	0	0.0
Bosminidae	245	1.3	1,001	1.9	1,865	12.2	2,813	18.7	5,813	25.9	3,688	15.5	316	36.0	128	24.9	205	12.2
Ilyocryptus sordidus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Ostracoda	31	0.2	23	<0.05	0	0.0	3	<0.05	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	0.0
Copepoda (nauplii)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Calanoida (copepodid)	11	0.1	8	<0.05	723	4.7	1,592	10.6	852	3.8	142	0.6	27	3.1	25	5.0	2	0.1
Epischura lacustris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eurytemora affinis	0	0.0	0	0.0	0	0.0	30	0.2	164	0.7	120	0.5	3	0.3	<0.5	<0.05	<0.5	0.05
Diaptomus spp.	505	2.6	702	1.3	0	0.0	0	0.0	12	0.1	61	0.3	1	0.2	0.5	<0.05	0	0.0
D. minutus	0	0.0	0	0.0	27	0.2	7	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	47	2.8
D. sicilis	0	0.0	0	0.0	9	0.1	0	0.0	17	0.1	0	0.0	1	0.1	0.5	0.1	200	12.5
D. ashlandi	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	<0.05	1	0.1	5	1.0	25	1.5
D. reighardi	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. pallidus	0	0.0	0	0.0	17	0.1	236	1.6	170	0.8	0	0.0	<0.5	<0.05	1	0.1	0	0.0
D. oregonensis	7,780	40.1	9,971	18.5	2,236	14.6	1,562	10.4	3,659	16.3	3,517	14.8	194	22.2	94	18.1	1	0.1
D. siciloides	59	0.3	241	0.4	46	0.3	103	0.7	242	1.1	348	1.5	1	0.1	1	0.2	8	0.5
Cyclopoida (copepodid)	25	0.1	26	<0.05	149	0.9	98	0.7	89	0.4	130	0.5	9	1.0	43	8.3	121	7.2
Cyclops sp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0
C. vernalis	0	0.0	0	0.0	28	0.2	43	0.3	8	0.05	6	<0.05	<0.5	<0.05	3	0.5	0	0.0
C. bicuspidatus thomasi	352	1.8	142	0.3	188	1.2	380	2.5	412	1.8	1,455	6.1	101	11.5	178	34.6	1,031	61.7
Mesocyclops edax	1,595	8.2	2,187	4.1	411	2.7	423	2.8	300	1.3	818	3.4	0	0.0	0	0.0	0	0.0
Unidentified Cyclopoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.5	0.05	0	0.0	0	0.0
Amphipoda																		
Hyalella azteca	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.5	<0.05	0	0.0
Gammarus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	0.0
G. minus	4	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Hydracarina	3	<0.05	6	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Insecta																		
Ephemeroptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.5	0.05	0	0.0
Baetidae	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Plecoptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Trichoptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Corixidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Diptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.5	0.05	0	0.0
Chironomidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Totals																		
Cladocera	9,028	46.5	40,678	75.4	11,536	75.1	10,534	70.2	16,506	73.6	17,145	72.1	536	61.2	163	31.8	227	13.5
Calanoida	8,354	43.1	10,922	20.2	3,058	19.9	3,528	23.5	5,115	22.8	4,212	17.7	228	26.1	127	24.7	294	17.6
Cyclopoida	1,972	10.2	2,355	4.4	766	5.0	942	6.1	[illegible]	3.6	2,352	9.9	111	12.7	223	43.5	1,154	[illegible]
Other	50	0.3	29	0.1	6	0.0	11	0.1	0	0.0	0	0.0	0	0.0	0.5	0.1	0	0.0
Total	19,403		53,984		15,359		15,015		22,428		23,765		873		513		1,675	

TABLE 2-47 (cont.)

Taxon	1975 Apr 23 No./m³	R.A.	May 6 No./m³	R.A.	May 20 No./m³	R.A.	Jun 6 No./m³	R.A.	Jun 20 No./m³	R.A.	Jul 1 No./m³	R.A.	Jul 16 No./m³	R.A.	Aug 8 No./m³	R.A.	Aug 20 No./m³	R.A.
Coelenterata																		
Hydra spp.	0	0.0	2	1.9	<0.5	0.1	2	<0.05	12	<0.05	6	<0.05	0	0.0	0	0.0	0	0.0
Turbellaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	0	<0.0
Annelida																		
Naididae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	<0.5	<0.05
Stylaria spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cladocera																		
Leptodora kindtii	0	0.0	0	0.0	8	0.9	16	0.3	610	2.1	1,967	11.0	1,277	12.0	121	3.0	120	0.9
Sida crystallina	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Latona setifera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05
Diaphanosoma spp.	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0	69	0.4	60	0.6	110	2.7	321	6.1
Holopedium gibberum	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	18	0.4	61	0.5
Camptocercus rectirostris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	5	<0.05	0	0.0	<0.5	<0.05	0	0.0
Alona quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	<0.05	<0.5	<0.05	0.	0.0
A. affinis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05	<0.5	<0.05	0	0.0
A. costata	0	0.0	0	0.0	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Leydigia quadrangularis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Daphnia spp.	0	0.0	<0.5	0.4	0	0.0	1	<0.05	0	0.0	144	0.8	52	0.5	0	0.2	80	0.7
D. longiremis	2	0.7	3	2.6	137	15.4	225	4.5	6,497	21.8	658	2.6	66	0.6	0	0.0	0	0.0
D. ambigua	0	0.0	0	0.0	3	0.4	57	1.1	26	0.1	5	<0.05	0	0.0	0	0.0	0	0.0
D. galeata mendotae	17	6.8	5	4.7	14	1.5	265	5.3	5,605	18.8	4,805	27.2	4,380	42.3	1,385	36.2	7,006	55.2
D. parvula	0	0.0	0	0.0	0	0.0	0	0.0	76	0.3	2	<0.05	0	0.0	0	0.0	0	0.0
D. retrocurva	0	0.0	<0.5	0.1	10	1.2	314	6.2	9,937	33.4	6,179	35.0	1,201	11.3	276	6.8	823	6.6
Ceriodaphnia spp.	0	0.0	0	0.0	<0.5	<0.05	0	0.1	18	0.1	0	0.0	1	<0.05	3	0.1	53	0.4
Bosminidae	32	12.6	35	35.9	550	61.8	3,500	71.4	6,337	16.6	1,617	8.0	178	1.7	29	0.7	387	1.0
Ilyocryptus [illegible]	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05
Ostracoda	0	0.0	0	0.0	2	0.2	0	0.0	21	0.1	14	0.1	26	0.2	33	0.8	43	0.1
Copepoda (nauplii)	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Calanoida (copepodid)	1	0.4	2	2.0	26	2.7	60	1.3	651	2.2	257	1.5	589	5.8	210	5.2	280	2.0
Epischura lacustris	0	0.0	0	0.0	0	0.0	3	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Eurytemora affinis	0	0.0	<0.5	0.1	3	0.6	19	0.4	60	0.2	15	0.1	1	<0.05	0	0.0	<0.5	<0.05
Diaptomus spp.	0	0.0	1	0.5	1	0.1	4	0.1	3	<0.05	5	<0.05	1	<0.05	0	0.0	0	0.0
D. minutus	6	2.6	2	1.9	1	0.1	39	0.8	156	0.5	17	0.1	25	0.2	1	<0.05	0	0.0
D. sicilis	100	42.7	11	11.5	2	0.2	5	0.1	13	<0.05	0	0.0	8	0.1	0	0.0	0	0.0
D. ashlandi	3	1.3	2	2.5	1	0.2	12	0.2	26	0.1	630	2.5	11	0.1	14	0.3	6	<0.05
D. reighardi	0	0.0	<0.5	0.1	0	0.0	4	0.1	0	0.0	0	0.0	1	<0.05	0	0.0	<0.5	<0.05
D. pallidus	0.5	0.05	<0.5	<0.05	0	0.0	2	<0.05	0	0.0	0	0.0	8	0.1	0	0.0	9	0.0
D. oregonensis	2	0.9	4	4.2	6	0.7	16	0.3	300	1.0	[illegible]	1.9	1,210	11.6	1,176	29.1	2,705	21.1
D. siciloides	1	0.1	<0.5	0.1	<0.5	<0.05	5	0.1	0	0.0	[illegible]	[illegible]	70	0.7	9	0.2	40	0.3
Cyclopoida (copepodid)	1	1.1	11	11.1	73	8.2	167	2.9	311	1.1	311	1.9	636	4.1	245	6.1	151	1.2
Cyclops sp.	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
C. vernalis	0	0.0	<0.5	0.1	0	0.0	21	0.4	13	<0.05	27	0.2	1	<0.05	0	0.0	<0.5	<0.05
C. bicuspidatus thomasi	78	80.0	18	18.6	50	5.6	201	4.0	[illegible]	1.2	[illegible]	1.8	10	0.1	43	1.1	5	<0.05
Mesocyclops edax	0	0.0	0	0.0	1	0.1	2	<0.05	100	0.4	121	0.7	962	8.9	363	9.0	381	3.0
Unidentified Cyclopoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Amphipoda																		
Hyalella azteca	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0	0	0.0	0	0.0	<0.5	<0.05	5	<0.05
Gammarus spp.	0	0.0	0	0.0	0.5	<0.05	0	0.0	0	0.0	5	<0.05	1	<0.05	1	<0.05	<0.5	<0.05
G. [illegible]	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Hydracarina	0	0.0	0	0.0	0.5	<0.05	0	0.0	0	0.0	0	0.0	1	<0.05	<0.5	<0.05	<0.5	<0.05
Insecta																		
Ephemeroptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05	2	<0.05
Baetidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Plecoptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05	<0.5	<0.05	0	0.0
Trichoptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05	0	0.0	<0.5	<0.05
Corixidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	<0.05	<0.5	<0.05
Diptera	0	0.0	0	0.0	0	0.0	1	<0.05	0	0.0	0	0.0	1	<0.05	<0.5	<0.05	<0.5	<0.05
Chironomidae	0	0.0	0	0.0	0.5	0.1	0	0.0	0	0.	[illegible]	[illegible]	1	<0.05	<0.5	<0.05	0.5	<0.05
Totals																		
Cladocera	51	20.1	61	61.5	722	81.2	4,476	89.1	27,106	91.2	[illegible]	85.1	[illegible]	69.0	1,960	48.2	9,1[illegible]	[illegible]
Calanoida	122	48.0	26	26.9	40	4.5	175	3.5	1,203	4.0	1,455	8.2	1,800	17.7	1,410	36.0	3,112	26.2
Cyclopoida	81	[illegible]	29	29.7	123	13.0	372	7.6	1,300	6.7	1,160	6.5	1,107	13.0	651	16.1	510	6.2
Other	0	0.0	2	1.0	4	0.4	3	0.1	43	0.1	26	0.1	33	0.3	38	0.9	50	0.4
Total	255		98		889		5,026		29,760		17,662		10,660		4,060		12,086	

TABLE 2-48

SHERIDAN ZOOPLANKTON (333-μ NET) MEAN DENSITIES BASED ON TWO SAMPLES PER DATE COLLECTED FROM EAGLE BAY, APRIL-SEPTEMBER 1975

	1975															
	Apr 14		May 15		Jun 2		Jun 20		Jul 2		Jul 17		Aug 12		Sep 3	
Taxon	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.	No./m³	R.A.
Coelenterata																
Hydra spp.	0	0.0	0	0.0	0	0.0	0	0.0	10	2.5	0	0.0	0	0.0	0	0.0
Annelida																
Naididae	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	7.0	0	0.0
Cladocera																
Leptodora kindtii	0	0.0	<0.5	0.2	0	0.0	122	1.6	252	61.5	1,750	19.4	1	6.3	1	0.2
Diaphanosoma	0	0.0	0	0.0	0	0.0	0	0.0	<0.05	0.1	4	<0.05	0	0.0	1	0.4
Holopedium gibberum	0	0.0	0	0.0	0	0.0	32	0.4	0	0.0	0	0.0	0	0.0	2	0.6
Alona spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	1.3	0	0.0
Daphnia spp.	0	0.0	0	0.0	0	0.0	1,365	18.4	0	0.0	0	0.0	0	0.0	176	63.4
D. longiremis	<0.5	0.1	4	3.8	17	3.7	1,554	20.9	8	2.0	0	0.0	0	0.0	0	0.0
D. ambigua	0	0.0	0	0.0	2	0.4	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. galeata mendotae	5	2.9	0	0.0	0	0.0	886	11.9	34	8.3	6,841	75.9	4	20.6	77	27.9
C. parvula	0	0.0	0	0.0	0	0.0	44	0.6	0	0.0	0	0.0	0	0.0	0	0.0
D. retrocurva	0	0.0	3	2.8	5	1.1	1,544	20.8	37	8.9	30	0.3	0	0.0	2	0.6
Ceriodaphnia spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	1.3	2	0.6
Bosminidae	30	17.2	78	83.4	388	86.1	1,588	21.4	17	4.1	0	0.0	3	16.2	4	1.3
Ostracoda	0	0.0	0	0.0	0	0.0	0	0.0	4	1.0	70	0.8	5	28.3	2	0.6
Copepoda (nauplii)	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	0.6	0	0.0
Calanoida (copepodid)	0	0.0	<0.5	<0.05	3	0.6	16	0.2	<0.5	0.1	0	0.0	<0.5	0.6	4	1.5
Epischura lacustris	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	0.1
Eurytemora affinis	0	0.0	<0.5	0.2	8	1.7	32	0.4	5	1.3	0	0.0	0	0.0	0	0.0
Diaptomus spp.	<0.5	<0.05	1	0.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. minutus	0	0.0	0	0.0	0	0.0	0	0.0	4	0.9	0	0.0	0	0.0	0	0.0
D. sicilis	24	13.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. ashlandi	1	0.5	<0.5	0.3	0	0.0	0	0.0	4	1.1	0	0.0	0	0.0	0	0.0
D. reighardi	0	0.0	<0.5	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. pallidus	0	0.0	<0.5	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
D. oregonensis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	49	0.5	<0.5	1.2	5	1.6
Cyclopoida (copepodid)	2	0.9	3	3.0	19	4.3	30	0.4	6	1.4	0	0.0	1	3.1	0	0.0
Tropocyclops prasinus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	0.6	0	0.0
Cyclops vernalis	0	0.0	0	0.0	1	0.3	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
C. bicuspidatus thomasi	113	64.5	4	4.8	7	1.6	220	3.0	24	5.8	0	0.0	0	0.0	0	0.0
Mesocyclops edax	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	0.1	275	3.0	<0.5	1.2	3	1.2
Harpacticoida	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	1.2	0	0.0
Amphipoda																
Hyalella azteca	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
Gammarus spp.	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	2.3	0	0.0
Hydracarina	<0.5	<0.05	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Insecta																
Ephemeroptera	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.5	1.2	0	0.0
Trichoptera	<0.5	<0.05	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.5	0	0.0
Diptera	0	0.0	0	0.0	0	0.0	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
Chironomidae	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	3.5	0	0.0
Totals																
Cladocera	36	20.3	85	90.2	411	91.3	7,134	96.0	349	85.0	8,626	95.6	8	45.7	264	95.0
Calanoida	25	14.1	2	2.0	10	2.3	48	0.6	14	3.3	49	0.5	<0.5	1.8	9	3.2
Cyclopoida	115	65.5	7	7.7	28	6.2	250	3.4	31	7.6	275	3.0	1	4.9	3	1.2
Other	<0.5	0.1	0	0.0	1	0.3	0	0.0	17	4.1	70	0.8	8	47.6	2	0.6
Total	175		94		450		7,432		410		9,020		17		278	

TABLE 2-49

SHERIDAN BENTHIC INVERTEBRATE SITE MEAN DENSITIES (NO./M^2) FOR NATURAL SUBSTRATES, OCTOBER 1974-SEPTEMBER 1975

Taxon	Oct 24 No./m^2	Oct 24 SE	Nov 27 No./m^2	Nov 27 SE	Jan 10 No./m^2	Jan 10 SE	May 2 No./m^2	May 2 SE	May 23 No./m^2	May 23 SE	Jun 26 No./m^2	Jun 26 SE	Jul 31 No./m^2	Jul 31 SE	Aug 28 No./m^2	Aug 28 SE	Sept 23 No./m^2	Sept 23 SE
Coelenterata (hydroids)																		
Hydra spp.	201	84	21	10	11	7	47	16	594	212	50,175	12,521	1,161	421	136	55	1,263	793
Hydrozoa	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria (flatworms)	547	72	14	9	0	0	194	72	2	2	160	82	464	101	413	123	103	47
Nemertea (proboscis worms)	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Nematoda (roundworms)	2	2	0	0	1	1	0	0	4	3	7	3	0	0	0	0	0	0
Bryozoa (moss animalcules)																		
Plumatella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	68	0	0
Plumatellidae	0	0	0	0	0	0	0	0	0	0	29	19	40	40	0	0	0	0
Cristatella spp. (zooid)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60,696	46,302	22,144	14,052
Cristatella spp. (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	105	127	207	207
Cristatellidae	0	0	0	0	0	0	0	0	0	0	0	0	13	13	0	0	0	0
Paludicella articulata	0	0	0	0	0	0	0	0	145	140	1,648	767	1,009	515	202	85	540	200
Oligochaeta (aquatic earthworms)																		
Chaetogaster spp.	0	0	0	0	0	0	0	0	3	2	0	0	12	12	0	0	0	0
Stylaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	3	2
Pristina spp.	0	0	0	0	0	0	0	0	0	0	0	0	7	5	0	0	0	0
Nais spp.	0	0	0	0	0	0	7	3	5	3	5	3	5	3	2	2	2	2
Naididae	81	58	0	0	0	0	2	2	0	0	2	2	0	0	0	0	0	0
Tubificidae	8	4	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Polychaeta (polychaetes)																		
Manayunkia speciosa	7	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hirudinea (leeches)																		
Piscicola spp.	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erpobdellidae	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	0	0
Cladocera (water fleas)																		
Leptodora kindtii	0	0	0	0	0	0	0	0	0	0	9	7	13	11	49	49	0	0
Sididae	0	0	0	0	0	0	0	0	0	0	0	0	133	54	394	195	710	512
Daphnia spp.	2	2	41	41	12	8	0	0	34	11	393	305	1,093	324	243	178	26	10
Bosminidae	0	0	19	19	70	40	0	0	45	43	0	0	394	94	8	8	0	0
Chydoridae	0	0	0	0	4	3	0	0	0	0	2	2	0	0	0	0	0	0
Cladocera	0	0	0	0	312	116	0	0	2	2	0	0	0	0	0	0	0	0
Ostracoda (seed shrimps)	2	2	0	0	0	0	0	0	2	2	76	67	0	0	5	4	0	0
Copepoda (Copepods)																		
Calanoida	0	0	0	0	38	22	0	0	81	52	2	2	210	66	8	5	1	1
Cyclops spp.	0	0	0	0	0	0	1	1	55	52	37	20	324	92	5	5	0	0
Cyclopidae	0	0	0	0	44	8	0	0	0	0	0	0	0	0	0	0	0	0
Cyclopoida	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Harpacticoida	0	0	0	0	0	0	0	0	5	3	4	4	0	0	0	0	0	0
Isopoda (aquatic sowbugs)																	1	1
Asellus spp.	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda (scuds)																		
Hyalella azteca	60	30	7	7	2	2	13	8	0	0	80	64	24	19	100	51	18	11
Gammarus spp.	362	152	69	42	11	8	19	10	16	8	41	16	437	204	552	269	82	36
Hydracarina (water mites)	12	6	0	0	0	0	0	0	10	7	0	0	2	2	1	1	0	0
Collembola (springtails)	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
Ephemeroptera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenonema spp.	101	40	4	4	1	1	10	5	4	2	0	0	9	4	25	8	6	6
Caenis spp.	40	27	0	0	0	0	6	5	0	0	0	0	67	31	36	9	2	2
Ephemerella spp.	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Ephemeroptera	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0

TABLE 2-49 (cont.)

Taxon	Oct 24 No./m²	Oct 24 SE	Nov 27 No./m²	Nov 27 SE	Jan 10 No./m²	Jan 10 SE	Mar 2 No./m²	Mar 2 SE	May 23 No./m²	May 23 SE	Jun 26 No./m²	Jun 26 SE	Jul 31 No./m²	Jul 31 SE	Aug 28 No./m²	Aug 28 SE	Sept 23 No./m²	Sept 23 SE
Trichoptera (caddis flies)																		
Cheumatopsyche spp.	217	100	0	0	0	0	30	18	0	0	7	7	51	30	121	60	62	29
Polycentropus spp.	5	3	0	0	0	0	8	3	0	0	2	2	0	0	0	0	2	2
Neureclipsis spp. (larvae)	24	18	0	0	0	0	0	0	0	0	4	4	40	30	10	8	35	19
Neureclipsis (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	9	0	5	4	0	0
Agraylea spp.	2	2	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Hydroptilidae (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	0
Oecetis spp.	5	3	0	0	0	0	9	3	71	20	15	11	8	3	17	4	3	2
Athripsodes spp.	47	13	0	0	0	0	24	11	4	2	67	22	210	70	76	42	16	8
Trichoptera (larvae)	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
Trichoptera (pupae)	0	0	0	0	0	0	0	0	0	0	4	4	0	0	2	2	0	0
Lepidoptera (aquatic caterpillars)																		
Paragyractis spp.	2	2	0	0	0	0	0	0	0	0	9	9	0	0	0	0	5	5
Coleoptera (beetles)																		
Hydraenidae	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diptera (flies, mosquitoes, midges)																		
Ablabesmyia spp.	41	6	0	0	0	0	3	2	4	2	62	28	29	17	42	16	2	2
Tanypus spp.	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cricotopus spp.	0	0	0	0	0	0	30	17	122	61	148	140	36	17	2	2	2	2
Psectrocladius spp.	2	2	0	0	0	0	20	10	279	75	278	182	114	34	55	25	50	20
Eukiefferiella spp.	0	0	0	0	3	3	2	2	23	19	48	30	364	157	31	18	54	25
Hydrobaenus spp. (*Trissocladius*)	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Trichocladius spp.	0	0	0	0	0	0	3	2	0	0	29	13	2	2	0	0	0	0
Corynoneura spp.	0	0	0	0	0	0	0	0	8	2	0	0	0	0	0	0	0	0
Brillia spp.	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
Thienemanniella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Cryptochironomus spp.	5	3	0	0	0	0	0	0	0	0	0	0	7	7	0	0	3	2
Dicrotendipes spp.	9	9	0	0	0	0	4	3	14	10	0	0	13	7	14	7	45	40
Microtendipes spp.	42	14	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2
Parachironomus spp.	62	54	0	0	0	0	3	3	45	19	321	116	39	11	67	45	31	17
Pseudochironomus spp.	62	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polypedilum spp.	0	0	0	0	0	0	3	2	0	0	0	0	2	2	0	0	0	0
Tanytarsus spp.	987	312	29	14	7	3	257	72	120	50	648	268	1,096	503	732	352	154	74
Chironomidae (larvae)	0	0	0	0	0	0	0	0	8	6	0	0	0	0	0	0	0	0
Chironomidae (adult)	0	0	0	0	0	0	0	0	13	7	0	0	0	0	0	0	0	0
Chironomidae (pupae)	0	0	0	0	0	0	0	0	48	16	83	35	184	61	55	27	42	15
Ceratopogonidae	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Empididae	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Ephydridae	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0
Mollusca (clams, snails)																		
Viviparidae	2	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0
Pleuroceridae	0	0	0	0	0	0	1	1	0	0	0	0	2	2	6	4	2	2
Amnicola spp.	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Amnicolidae	232	47	12	5	0	0	46	12	4	2	54	41	71	34	97	72	3	2
Physa spp.	7	5	0	0	0	0	3	2	0	0	80	40	18	13	31	10	8	5
Helisoma spp.	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Gyraulus spp.	25	13	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Gastropoda	7	5	0	0	0	0	0	0	0	0	29	17	23	17	34	21	11	0
Pisidium spp.	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Invertebrate	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Density	3,258		215		518		763		1,775		54,352		7,777		72,492		25,697	
No. of Samples	24		17		16		24		18		18		17		21		24	

TABLE 2-50

SHERIDAN BENTHIC INVERTEBRATE SITE MEAN NUMBERS PER ARTIFICIAL SUBSTRATE SAMPLE AND STANDARD ERROR (SE), OCTOBER 1974-SEPTEMBER 1975

Taxa	Oct 24 No./s	Oct 24 SE	Nov 27 No./s	Nov 27 SE	Jan 10 No./s	Jan 10 SE	May 2 No./s	May 2 SE	May 23 No./s	May 23 SE	Jun 26 No./s	Jun 26 SE	Jul 31 No./s	Jul 31 SE	Aug 28 No./s	Aug 28 SE	Sep 23 No./s	Sep 23 SE
Coelenterata (hydroids)																		
Hydra spp.	16	12	71	22	9	6	<0.5	<0.5	6	3	244	122	8	3	4	2	21	4
Turbellaria (flatworms)																		
Dugesia spp.	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Turbellaria	1	<0.5	1	<0.5	0	0	<0.5	<0.5	1	<0.5	16	6	33	1	29	14	9	4
Bryozoa (moss animalcules)																		
Plumatellidae	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Cristatella spp. (zooid)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	127	86	4	2
Cristatella spp. (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Cristatellidae	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Paludicella articulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	<0.5	<0.5
Oligochaeta (aquatic earthworms)																		
Chaetogaster spp.	0	0	0	0	0	0	0	0	0	0	15	12	0	0	<0.5	<0.5	0	0
Pristina spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Stylaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	3	2
Nais spp.	0	0	0	0	0	0	0	0	0	0	1	<0.5	1	0	4	3	1	<0.5
Naididae	<0.5	<0.5	1	1	1	<0.5	0	0	1	1	0	0	0	0	0	0	<0.5	<0.5
Tubificidae	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polychaeta (polychaetes)																		
Manayunkia speciosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Hirudinea (leeches)																		
Helobdella spp.	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Glossiphoniidae	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	<0.5	<0.5	0	0
Cladocera (water fleas)																		
Sididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	1	<0.5
Daphnia spp.	0	0	2	1	0	0	0	0	0	0	4	1	1	1	2	1	2	1
Bosminidae	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Ostracoda (seed shrimps)	0	0	1	1	<0.5	<0.5	0	0	0	0	11	4	0	0	1	1	3	3
Copepoda (copepods)																		
Calanoida	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	<0.5	<0.5
Cyclops spp.	0	0	2	1	<0.5	<0.5	0	0	<0.5	<0.5	1	1	1	1	0	0	<0.5	<0.5
Cyclopoida	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Harpacticoida	0	0	1	1	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Isopoda (aquatic sow bugs)																		
Asellus spp.	<0.5	<0.5	3	2	1	1	0	0	0	0	2	1	1	<0.5	0	0	<0.5	<0.5
Lirceus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Amphipoda (scuds)																		
Hyalella azteca	2	1	22	7	7	2	5	1	8	5	6	2	2	1	8	2	16	6
Gammarus spp.	73	19	48	7	33	13	31	8	64	20	42	15	160	67	178	51	84	16
Hydracarina (water mites)	0	0	0	0	<0.5	<0.5	0	0	<0.5	<0.5	0	0	0	0	<0.5	<0.5	<0.5	<0.5
Collembola (springtails)	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Ephemeroptera (may flies)																		
Hexagenia spp.	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stenonema spp.	<0.5	<0.5	0	0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	1	<0.5	0	0
Caenis spp.	<0.5	<0.5	0	0	0	0	0	0	2	1	3	1	21	15	12	3	2	1
Leptophlebia spp.	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 2-50 (cont.)

Taxa	Oct 24 No./m²	Oct 24 SE	Nov 27 No./m²	Nov 27 SE	Jan 10 No./m²	Jan 10 SE	Mar 2 No./m²	Mar 2 SE	May 23 No./m²	May 23 SE	Jun 26 No./m²	Jun 26 SE	Jul 31 No./m²	Jul 31 SE	Aug 28 No./m²	Aug 28 SE	Sep 23 No./m²	Sep 23 SE
Trichoptera (caddis flies)																		
Cheumatopsyche spp. (larvae)	<0.5	<0.5	<0.5	<0.5	0	0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1	1	4	3	1	1
Cheumatopsyche spp. (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0
Polycentropus spp.	0	0	<0.5	<0.5	0	0	<0.5	<0.5	<0.5	<0.5	0	0	0	0	0	0	0	0
Neureclipsis spp.	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	0	0	0	0	<0.5	<0.5
Oecetis spp.	0	0	0	0	0	0	0	0	1	<0.5	0	0	0	0	<0.5	<0.5	<0.5	<0.5
Athripsodes spp.	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	0	0	<0.5	<0.5	0	0
Lepidoptera (aquatic caterpillars)																		
Paragyractis spp.	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0
Diptera (flies, mosquitoes, midges)																		
Ablabesmyia spp.	<0.5	<0.5	1	1	0	0	<0.5	<0.5	1	<0.5	5	2	10	5	3	1	2	1
Cricotopus spp.	0	0	0	0	<0.5	<0.5	0	0	1	1	3	1	0	0	2	1	<0.5	<0.5
Psectrocladius spp.	0	0	0	0	<0.5	<0.5	0	0	5	2	1	<0.5	2	1	11	4	4	2
Eukiefferiella spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0
Hydrobaenus spp. (Trissocladius)	0	0	0	0	<0.5	<0.5	0	0	0	0	1	<0.5	0	0	<0.5	<0.5	7	7
Chironomus spp.	0	0	0	0	0	0	0	0	0	0	0	0	1	<0.5	0	0	0	0
Dicrotendipes spp.	<0.5	<0.5	0	0	0	0	0	0	<0.5	<0.5	1	1	1	<0.5	1	<0.5	0	0
Microtendipes spp.	<0.5	<0.5	<0.5	<0.5	0	0	0	0	0	0	4	1	1	<0.5	1	<0.5	7	3
Parachironomus spp.	0	0	0	0	0	0	0	0	<0.5	<0.5	4	2	1	<0.5	1	1	<0.5	<0.5
Polypedilum spp.	0	0	0	0	<0.5	<0.5	0	0	<0.5	<0.5	1	<0.5	0	0	2	<0.5	<0.5	<0.5
Tanytarsus spp.	5	5	52	23	5	2	2	2	4	2	33	15	59	35	105	37	17	8
Chironomidae (larvae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Chironomidae (pupae)	0	0	0	0	0	0	0	0	0	0	2	1	10	6	3	2	7	4
Empididae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5
Diptera (pupae)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0
Mollusca (clams, snails)																		
Valvatidae	0	0	0	0	0	0	0	0	<0.5	<0.5	<0.5	<0.5	1	1	0	0	0	0
Viviparidae	0	0	0	0	0	0	0	0	0	0	0	0	2	2	<0.5	<0.5	0	0
Pleuroceridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5
Amnicola spp.	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Amnicolidae	1	<0.5	1	<0.5	<0.5	<0.5	<0.5	<0.5	1	<0.5	2	1	5	3	3	1	3	1
Gastropoda	0	0	0	0	0	0	0	0	0	0	7	4	2	1	1	<0.5	<0.5	<0.5
Physa spp.	<0.5	<0.5	0	0	0	0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2	1	0	0	1	1
Physidae	0	0	0	0	0	0	0	0	0	0	1	1	0	0	5	5	0	0
Lymnaeidae	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0
Sphaerium spp.	0	0	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	<0.5	<0.5	0	0
Pisidium spp.	0	0	<0.5	<0.5	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified invertebrate	0	0	2	2	<0.5	<0.5	0	0	0	0	0	0	0	0	0	0	0	0
Total density	99		211		59		40		95		408		331		512		198	
No. of samples	17		14		14		14		12		12		12		14		14	

- Results for artificial substrates, as well, indicate that the highest benthic invertebrate yearly mean density was along the 10-foot depth contour. All of the four most abundant taxa collected were most numerous at row 2, the 30-foot contour.

- The most evident spatial distribution difference was the higher abundance of benthic invertebrates along the 10-foot contour. This difference was primarily in density and not in numbers of taxa.

- Distribution trends among stations were primarily those discussed for row and column distribution. Station 223, with its high abundance of Cristatella (Bryozoa) as discussed for column comparisons, yielded the highest invertebrate density on natural substrates. Lowest density was observed at station 211, the 30-foot contour station with the least amount of sediment and rocks. Hydra and Cristatella exhibited the greatest influence of any taxa on the distribution of total invertebrate density.

- Density distribution on artificial substrates was similar to that on natural substrates. While dominant organisms on the two substrate types differed, the stations with the lowest density (211) and the highest density (223) were the same for both substrate types (see Figure 2-25).

Biomass distribution was influenced by the density of organisms at either extreme on the biomass "scale." Dry-weight biomass was the highest along row 2, the 30-foot contour. A review of the habitat preferences of some of the abundant taxa indicates the 10-foot depth contour to be a more suitable habitat; along it were 88 percent of the Cheumatopsyche (caddis fly) and 73 percent of the Tanytarsus. These organisms normally occur where current or wave action is appreciable (Ross, 1944; Peterson, 1951; Hart and Fuller, 1974). Bryozoans are usually found in quiet waters but are sometimes found on rocky shoals with considerable wave action (Rogick, 1935; Pennak, 1953). Distribution of bryozoans (Cristatella and Paludicella) indicated that the highest abundance (mean of all dates) was along the 10-foot depth contour where there are little silt accumulations, many rocks for suitable substrate, and much wave action. The average biomass determined for Lake Erie by Alley and Powers (1970) is 4.63 g/m^2, which is considerably higher than the average biomass (0.88 g/m^2) at Sheridan. Cook and Johnson (1974) estimated Lake Erie's annual production to be 5 $g/m^2/yr$, which is approximately equal to the mean standing crop (4.63 g/m^2).

Ichthyoplankton

2.342
Quantitative data on ichthyoplankton were collected in the vicinity

of the Sheridan site from mid-April until August 1975. Fish eggs, yolk-sac larvae and postlarval ichthyoplankton were collected using a 0.5 meter epibenthic sled equipped with a 333 u net. Sampling at the 10-foot contour and 30-foot contour was accomplished using a 1.0 meter epibenthic sled and a 333 u net. For mid-level and subsurface sampling of the water column at both the 10-foot and 30-foot contour lines a 1.0 meter tucker trawl with a 333 u net was used. The species composition of ichthyoplankton in Lake Erie adjacent to the Sheridan is reported by gear type in Table 2-51.

2.343
Fish eggs were present in ichthyoplankton samples from mid-April through July when water temperatures in Lake Erie were steadily increasing. Only rainbow smelt and burbot eggs were collected during April and early May, while yellow perch and a few unidentified perch eggs appeared in late May. Freshwater drum and minnow eggs were taken only during early June.

2.344
From the data presented in Table 2-51 it is apparent that eggs are poorly represented although this situation may be due to overall size of the sampling equipment used as well as the inaccessibility of the eggs of certain Lake Erie fish species. Despite the paucity of the egg catch, data on yolk-sac and postlarvae indicate that spawning in or near the study area may have indeed occurred. For example, the yolk-sac larvae of the yellow perch were present in considerable numbers at the Sheridan site. The presence of yellow perch larvae and the presence of many ripe, running, and spent adults in the area at the same time indicate that spawning was underway.

2.345
Although Sheridan egg and larval catch data indicate a similar species composition to the Pomfret site, the mean population densities were slightly less than at the Pomfret site. However, both Pomfret and Sheridan sites are considered about equal in terms of habitat suitability for spawning and larval development.

2.346
Yolk-sac larval catches with the three primary gear types (1-m epibenthic sled, 1-m Tucker trawl, and 0.5-m sled) increased abruptly during late May and early June. Catches then declined rapidly by late June.

2.347
The large catches of yolk-sac larvae during late May and early June were composed primarily of yellow perch, rainbow smelt, and logperch. Rainbow smelt accounted for about 92 percent of the catch in both bottom and oblique tows on May 20, with yellow perch comprising most of the remaining fraction.

TABLE 2-51

SHERIDAN SPECIES COMPOSITION (PERCENT OF TOTAL CATCH) OF EGGS, YOLK-SAC LARVAE AND POST LARVAE AND BY GEAR TYPE, SHERIDAN SITE, MID-APRIL THROUGH 1975

	Species	1-m Epibenthic Sled Bottom Tow Day 10-, 30-Ft Contours	1-m Epibenthic Sled Bottom Tow Day/Night 30-Ft Contour	Surface Tow Day/Night 30-Ft Contour	1-m Tucker Trawl Oblique Tow Day 10-, 30-Ft Contours	1-m Tucker Trawl Oblique Tow Day 50-Ft Contour	0.5-m Epibenthic Sled Bottom Tow Day Van Buren Bay
Eggs	Rainbow smelt	1.1	0.7	0.1	7.5	0.0	100
	Goldfish-Carp	0.6	0.0	0.0	0.0	0.0	0.0
	Minnows-Shiners	37.3	0.0	0.0	11.3	0.0	0.0
	Trout perch	0.6	0.0	0.0	9.4	0.0	0.0
	Burbot	0.0	0.0	0.0	0.2	0.0	0.0
	Yellow perch	0.0	0.0	0.0	1.0	0.0	0.0
	Perches	0.0	0.0	0.0	0.3	0.0	0.0
	Freshwater drum	57.8	53.9	99.6	47.0	94.6	0.0
	Unidentified	2.7	45.4	0.3	23.3	5.4	0.0
	Mean Density (No./100 m^3)	0.4	2.1	2.8	1.2	1.3	0.5
	No. of Samples	262	110	111	156	39	18
Yolk-Sac Larvae	Alewife	0.0	0.0	<0.1	0.0	0.0	1.6
	Gizzard shad	0.2	<0.1	<0.1	0.3	0.7	0.0
	Rainbow smelt	15.8	2.0	4.6	55.2	29.5	1.3
	Carp	2.8	5.7	19.3	2.6	15.4	16.1
	Goldfish-Carp	0.7	0.5	[illegible]	0.4	2.3	8.8
	Minnows-Shiners **	3.1	6.1	2.4	2.4	5.0	0.0
	Suckers***	<0.1	<0.1	<0.1	0.0	0.0	0.0
	Trout perch	0.3	2.6	1.6	0.4	0.5	0.0
	Burbot	0.3	0.2	0.4	0.6	0.5	1.0
	White bass	0.4	0.6	0.3	0.3	0.5	1.0
	Sunfishes†	<0.1	0.0	<0.1	<0.1	0.0	0.0
	Yellow perch	53.8	48.0	54.9	26.8	15.6	60.7
	Log perch	21.2	22.0	4.1	10.7	18.6	7.0
	Perches††	0.5	3.6	9.0	0.2	7.0	0.0
	Freshwater drum	1.0	8.5	0.6	0.1	4.4	2.4
	Slimy sculpin	0.0	0.0	0.0	<0.1	0.0	0.0
	Unidentified	<0.1	0.0	<0.1	<0.1	0.0	0.0
	Mean Density	30.0	8.3	15.0	20.3	3.5	6.3
	No. of Samples	262	110	111	156	39	18
Postlarvae	Alewife	1.0	4.1	0.3	<0.1	0.0	1.0
	Gizzard shad	0.3	<0.1	0.4	0.3	0.0	6.6
	Herrings	0.0	0.0	<0.1	0.0	0.0	0.0
	Rainbow smelt	29.7	54.2	7.1	24.4	32.8	0.0
	Carp	1.8	3.9	16.8	1.8	19.0	15.9
	Goldfish-Carp	<0.1	0.3	2.0	0.9	1.2	3.0
	Minnows-Shiners	2.6	10.4	50.9	11.2	31.8	0.0
	Trout perch	0.1	0.6	<0.1	0.4	0.0	0.0
	Burbot	<0.1	0.0	0.0	0.0	0.0	0.0
	Brook silversides	0.0	0.0	<0.1	0.0	0.0	0.0
	White bass	0.7	0.2	0.1	0.4	0.3	0.0
	Smallmouth bass	0.4	0.0	0.0	0.0	0.0	0.0
	Rock bass	0.0	0.1	0.1	0.0	0.0	0.0
	Sunfishes	<0.1	0.0	<0.1	0.2	0.0	0.9
	Yellow perch	42.7	18.4	20.2	46.4	6.6	62.0
	Log perch	19.5	5.1	1.1	11.7	5.4	10.6
	Perches	0.2	0.1	0.3	<0.1	1.7	0.0
	Freshwater drum	0.3	0.5	<0.1	0.3	0.0	0.0
	Slimy sculpin	<0.1	2.0	0.0	1.7	0.2	0.0
	Unidentified	0.3	0.1	0.2	0.3	1.1	0.0
	Mean Density	15.4	13.6	32.8	12.2	4.5	7.5
	No. of Samples	262	110	111	156	39	18

*Goldfish and goldfish-carp hybrids.
**Unidentified species of Cyprinidae; many are probably emerald and spottail shiners.
***Unidentified species of Catostomidae.
†Unidentified species of Centrarchidae.
††Unidentified species of Percidae; many are darters of the genus *Etheostoma*.

2.348
In early June, a relatively small peak in yolk-sac larva catches was observed in bottom and surface tows within the lake proper and in nearshore 0.5-m sled samples in Eagle Bay. At that time, most of the yolk-sac larvae in the lake were carp and freshwater drum and most in the nearshore catches were minnows with some drum. Total catches (all species combined) of yolk-sac larvae in bottom and surface tows were usually about the same. Night sampling on May 30 yielded noticeably higher surface catches (an average of 127 larvae/100 m^3) than bottom catches (about 32/100 m^3); otherwise, surface-to-bottom differences in total catches were very small.

2.349
When directly comparable bottom or oblique tows at the Sheridan site are considered, yolk-sac larval densities were consistently higher along the 10-foot contour than along the 30-foot contour. Oblique tows at row 0 (the 50-foot contour) were not taken on the same dates on which rows 1 and 2 were sampled and thus are not directly comparable; apparently, however, yolk-sac larval densities continued to decrease with water depth. Although there was a well-defined difference in densities of yolk-sac larvae perpendicular to shore, there were no consistent differences between catches parallel to shore (i.e., at stations or columns along the contours).

2.350
During the mid-April through August survey, 18 taxa of postlarvae (post yolk-sac larvae) were collected at Sheridan and only one of the ichthyo-plankton identified (suckers) was not represented as postlarvae. All of the very few suckers (identified only to family) caught were yolk-sac larvae. Many of the suckers in the area spawn in tributaries (Scott and Crossman, 1973; Eddy and Underhill, 1974) so the youngest life stages might be largely restricted to these streams.

2.351
Five taxa (rainbow smelt, carp, minnows, yellow perch, and logperch) accounted for about 90 percent or more of the postlarvae captured. Yellow perch ranked first in abundance in bottom and oblique tows along the 10-foot and 30-foot contours and in 0.5 m sled nearshore tows in Eagle Bay. Rainbow smelt were the most abundant postlarvae in oblique tows along the 50-foot contour and in the bottom samples taken during day/night sampling and ranked second in abundance in bottom and oblique tows (10- and 30-foot contours combined). During day/night surface sampling, minnows were most abundant (50 percent), while yellow perch ranked second during day/night sampling at both the surface and bottom depth strata.

2.352
Postlarvae were first identified in samples taken during mid-May.

Six taxa were represented in May samples and an additional eight during the first half of June. Many of them were present at the study site for two months, but only one species, rainbow smelt, was present for more than three months. Samples collected during the latter half of August yielded only three taxa - alewife, rainbow smelt, and minnows. Postlarval catches (all species combined) increased rapidly during late May and early June coinciding basically with the first peak in densities of yolk-sac larvae. In weekly bottom tows, postlarval densities (all species combined) were high from late May through most of June and again during late July. Total catches of postlarvae in oblique tows along the 10-foot and 30-foot contours increased rapidly from late May to a peak density of 64 larvae/100 m^3 in early June, then declined through August. Oblique tows captured very few postlarvae during August; in late August, alewives accounted for about two-thirds of the catch. Alewife postlarvae were also common in August bottom tows, especially along the 30-foot contour when day and night samples were taken in late August.

2.353
Day and night catches of postlarvae in surface and bottom samples counter-balanced one another so that total catches (all species and surface and bottom tows combined) exhibited no significant day/night differences. There was no evidence of any diel changes in the vertical distribution of postlarvae at the Sheridan site, and the densities of postlarval darters, unlike darter yolk-sac larvae, were no higher at night than during the day.

2.354
As previously mentioned, most of the postlarvae in both surface and bottom samples during late May and early June were yellow perch, logperch, and rainbow smelt; thereafter, however, distinct differences were observed between the two depth strata. Except for early July when relatively large numbers of carp postlarvae were caught in both surface and bottom tows, minnows accounted for 75-99 percent of the surface catches from mid-June through August while rainbow smelt accounted for 63-100 percent of the bottom catches from mid-June through July. In August, 88-100 percent of the postlarvae in bottom tows were alewives. In addition to the vertical differences in species composition, significant vertical differences in the abundance of postlarvae were observed at the Sheridan site. In late May and early June, yellow perch dominated postlarval catches, and surface catches of perch were significantly higher than bottom catches; the large surface catches of yellow perch in late May and minnows during mid-June and July also resulted in significantly higher surface than bottom postlarval densities when total catches were analyzed. The derived mean density of postlarvae in surface catches (16.9 larvae/100 m^3) was twice as high as the derived mean density for bottom catches (8.5 larvae/100 m^3).

2.355
With respect to abundance along rows and columns, the spatial distribution of postlarval densities was always higher along row 2 (the 10-foot contour) than along row 1 (the 30-foot contour) when either bottom or oblique tows were compared. Maximum ichthyoplankton densities for Lake Erie in the vicinity of the proposed Sheridan site are presented in Table 2-52. Detailed data on ichthyoplankton densities and diurnal behavior can be found in Section 74.2 of the applicant's New York State Article VIII Application.

Fisheries

2.356
From September 1974 through September 1975, adult and young-of-the-year fish species were collected from Lake Erie in the vicinity of the Sheridan site. The sampling program was conducted in the same manner as that for the Pomfret site (see paragraph 2.137).

2.357
During the 12-month sampling period, 35 species of fish representing young-of-the-year, yearlings, and adults were collected from Lake Erie in the vicinity of the Sheridan site. The occurrence of these species varied throughout the year with the highest numbers (26 species) recorded in May 1975. A complete list of fish species taken from Lake Erie in the vicinity of the Sheridan site is presented in Table 2-53.

2.358
The descriptions of the Lake Erie shore zone, shoal zone, and deep water zone for the Pomfret site are applicable for the Sheridan site as well.

Shore Zone

2.359
The shore zone in the vicinity of the Sheridan site produced 19 species of fish. A 50-foot and 100-foot beach seine were used to sample the area from September 1974 to September 1975. Catches were similar to those at the Pomfret site, yielding a predominance of adult spottail and emerald shiners. Spottails were most abundant throughout the year, peaking in July and August while emerald shiners dominated in mid-April. Significant numbers of white bass were caught from May to September and yellow perch were common in August. Logperch were caught sporadically throughout the year and peaked in June. Gizzard shad were abundant in May only.

TABLE 2-52

MAXIMUM ICHTHYOPLANKTON DENSITIES

LAKE ERIE IN THE VICINITY OF THE SHERIDAN SITE

MID-APRIL 1975 - SEPTEMBER 1975

	Species	Maximum Densities (No./100 m^3) 1.0 Meter Epibenthic Sled Daytime Bottom Tows 10 Ft. and 30 Ft. Contour. Total of 292 Samples April-August.		Maximum Densities (No./100 m^3) 1.0 Meter Tucker Trawl Daytime Oblique Tows 10 Ft. and 30 Ft. Contours. Total 160 Samples April-August.		Maximum Densities (No./100 m^3) 1.0 Meter Tucker Trawl Oblique Daytime Tows 50 Ft. Contour. May-July.	
		Maximum	Date	Maximum	Date	Maximum	Date
EGGS	Minnows-Shiners	2.47	28 July	1.30	1 July	ND	ND
	Rainbow Smelt	0.08	7 May	0.59	6 May	ND	ND
	Trout-Perch	0.04	4 June	1.08	4 June	ND	ND
	Freshwater Drum	3.58	9 July	4.47	16 July	5.82	7 July
	Goldfish-Carp	0.04	4 June	ND	ND	ND	ND
	Yellow Perch	ND	ND	0.12	20 May	ND	ND
	Burbot	ND	ND	0.02	6 May	ND	ND
	Perches	ND	ND	0.04	20 May	ND	ND
	Unidentified	0.10	23 June	2.29	1 July	0.35	7 July
YOLK-SAC LARVAE	Alewife	ND	ND	ND	ND	ND	ND
	Gizzard Shad	0.71	10 June	0.67	4 June	0.05	10 June
	Rainbow Smelt	64.67	20 May	102.51	20 May	4.79	10 June
	Carp	4.11	4 June	3.59	4 June	1.46	7 July
	Goldfish-Carp*	0.79	18 June	0.33	1 July	0.40	7 July
	Minnows-Shiners	5.59	18 June	2.23	4 June	0.64	10 June
	White Suckers	0.06	18 June	ND	ND	ND	ND
	Trout-Perch	0.59	4 June	0.43	4 June	0.08	30 May
	Burbot	0.91	20 May	1.11	20 May	0.09	30 May
	White Bass	1.00	10 June	0.67	4 June	0.06	10 June
	Rock Bass	ND	ND	ND	ND	ND	ND
	Yellow Perch	222.26	30 May	46.59	4 June	1.64	30 May
	Log Perch	62.51	30 May	19.32	4 June	2.62	10 June
	Walleye	ND	ND	ND	ND	ND	ND
	Crappies	ND	ND	0.08	4 June	ND	ND
	Perches**	1.06	4 June	0.23	4 June	1.00	10 June
	Freshwater Drum	2.37	16 July	0.25	16 July	0.77	7 July
	Slimy Sculpin	ND	ND	0.02	4 June	ND	ND
	Sunfishes	0.03	10 June	ND	ND	ND	ND
	Unidentified	0.05	23 June	0.04	4 June	ND	ND
POSTLARVAE	Alewife	2.50	28 July	0.07	20 Aug	ND	ND
	Gizzard Shad	0.39	23 June	0.24	20 June	ND	ND
	Herring+	ND	ND	ND	ND	ND	ND
	Rainbow Smelt	26.35	18 June	21.25	20 June	4.33	10 June
	Carp	3.19	9 July	1.39	4 June	4.24	7 July
	Minnows-Shiners	3.44	28 July	6.79	16 July	3.42	7 July
	Brook Silversides	ND	ND	ND	ND	ND	ND
	White Bass	0.94	10 June	0.29	20 June	0.07	10 June
	Rock Bass	ND	ND	ND	ND	ND	ND
	Sunfishes++	0.15	23 July	0.19	4 June	ND	ND
	Yellow Perch	54.67	4 June	55.34	4 June	0.86	10 June
	Log Perch	23.90	1 July	7.61	1 July	1.12	10 June
	Perches	0.46	18 June	0.04	1 July	0.38	7 July
	Freshwater Drum	0.40	16 July	0.37	16 July	ND	ND
	Slimy Sculpin	0.06	18 June	1.92	20 June	0.05	10 June
	Goldfish-Carp	0.20	9 July	0.88	1 July	0.26	7 July
	Trout-Perch	0.19	18 June	0.30	1 July	ND	ND
	Burbot	0.08	4 June	ND	ND	ND	ND
	Smallmouth Bass	1.16	1 July	ND	ND	ND	ND
	Unidentified	0.41	23 June	0.19	1 July	0.14	7 July

ND - No Data

* Goldfish and Goldfish-Carp hybrids

** Unidentified species of Percidae

\+ Unidentified species Clupeidae (probably Alewife and Gizzard Shad)

\++ Unidentified species of Centrachidae

TABLE 2-52 (Continued)

MAXIMUM ICHTHYOPLANKTON DENSITIES

LAKE ERIE IN THE VICINITY OF THE SHERIDAN SITE

MID-APRIL 1975 - SEPTEMBER 1975

		Maximum Densities (No./100 m^3) Six Day and Six Night Samples 1.0 Meter Epibenthic Sled Bottom Tows 30 Ft. Contour. Total 112 Samples May-August.		Maximum Densities (No./100 m^3) Six Day and Six Night Samples 1.0 Meter Tucker Trawl Surface Tows 30 Ft. Contour May-August 1975. Total Samples 112.		Maximum Densities (No./100 m^3) 0.5 Meter Epibenthic Sled Day Time Bottom Tows Eagle Bay. Total 18 Samples April-September.	
	Species	Maximum	Date	Maximum	Date	Maximum	Date
EGGS	Minnows-Shiners	ND	ND	ND	ND	ND	ND
	Rainbow Smelt	0.21	12-13 May	0.04	12-13 May	4.81	14 April
	Trout-Perch	ND	ND	ND	ND	ND	ND
	Freshwater Drum	12.74	9-10 July	15.09	23 June	ND	ND
	Goldfish-Carp	ND	ND	ND	ND	ND	ND
	Yellow Perch	ND	ND	ND	ND	ND	ND
	Burbot	ND	ND	ND	ND	ND	ND
	Perches	ND	ND	ND	ND	ND	ND
	Unidentified	9.98	10 June	0.10	23 June	ND	ND
YOLK-SAC LARVAE	Alewife	ND	ND	0.09	23 June	0.91	15 May
	Gizzard Shad	0.06	10 June	0.11	10 June	ND	ND
	Rainbow Smelt	1.01	30 May	5.58	30 May	0.75	15 May
	Carp	2.82	9-10 July	18.64	30 May	9.20	2 June
	Goldfish-Carp*	0.23	30 May	2.14	9-10 June	ND	ND
	Minnows-Shiners	3.31	23 June	1.44	23 June	4.17	7 July
	White Suckers	0.11	23 June	0.08	30 May	ND	ND
	Trout-Perch	0.69	10 June	3.70	30 May	ND	ND
	Burbot	0.25	30 May	0.87	30 May	0.59	2 June
	White Bass	0.34	10 June	0.55	10 June	0.59	2 June
	Rock Bass	ND	ND	ND	ND	ND	ND
	Yellow Perch	28.65	30 May	84.96	30 May	33.94	2 June
	Log Perch	12.98	30 May	3.96	30 May	2.51	2 June
	Walleye	ND	ND	ND	ND	ND	ND
	Crappies	ND	ND	ND	ND	ND	ND
	Perches**	1.68	10 June	15.25	30 May	ND	ND
	Freshwater Drum	5.78	9-10 July	0.88	9-10 July	1.38	7 July
	Slimy Sculpin	ND	ND	ND	ND	ND	ND
	Sunfishes	ND	ND	0.06	10 June	ND	ND
	Unidentified	ND	ND	0.06	10 June	ND	ND
POSTLARVAE	Alewife	5.16	20 Aug	0.29	20 Aug	0.67	7 July
	Gizzard Shad	0.09	23 June	0.94	23 June	4.46	20 June
	Herring+			0.11	23 July	ND	ND
	Rainbow Smelt	54.60	23 July	12.78	10 June	ND	ND
	Carp	4.11	9-10 July	27.74	30 May	10.03	2 June
	Minnows-Shiners	9.72	23 June	47.89	23 July	ND	ND
	Brook Silversides			0.11	9-10 July	ND	ND
	White Bass	0.19	23 June	0.36	10 June	ND	ND
	Rock Bass	0.26	9-10 July	0.43	9-10 July	ND	ND
	Sunfishes++	ND	ND	0.11	10 June	0.59	2 June
	Yellow Perch	25.34	30 May	49.26	30 May	37.92	2 June
	Log Perch	3.89	10 June	1.89	10 June	5.72	20 June
	Perches	0.10	23 June	0.12	10 June	ND	ND
	Freshwater Drum	0.94	23 July	0.10	9-10 July	ND	ND
	Slimy Sculpin	3.67	10 June	ND	ND	ND	ND
	Goldfish-Carp	0.24	9-10 July	4.22	9-10 July	2.02	2 June
	Trout-Perch	0.61	23 June	0.11	9-10 July	ND	ND
	Burbot	ND	ND	ND	ND	ND	ND
	Smallmouth Bass	ND	ND	ND	ND	ND	ND
	Unidentified	0.18	23 June	0.27	23 June	ND	ND

TABLE 2-53

FISH SPECIES CAPTURED IN LAKE ERIE AT SHERIDAN, SEPTEMBER 1974-SEPTEMBER 1975

Scientific Name	Common Name
Lepisosteidae	Gars
Lepisosteus osseus	Longnose gar
Clupeidae	Herrings
Alosa pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
Salmonidae	Salmons
Oncorhynchus kisutch	Coho salmon
O. tshawytscha	Chinook salmon
Salmo gairdneri	Rainbow trout
S. namaycush	Lake trout
S. trutta	Brown trout
Osmeridae	Smelts
Osmerus mordax	Rainbow smelt
Esocidae	Pikes
Esox lucius	Northern pike
Cyprinidae	Minnows & carps
Carassius auratus	Goldfish
Cyprinus carpio	Carp
Notropis atherinoides	Emerald shiner
N. hudsonius	Spottail shiner
Catostomidae	Suckers
Carpiodes cyprinus	Quillback
Catostomus commersoni	White sucker
Hypentelium nigricans	Northern hog sucker
Moxostoma macrolepidotum	Shorthead redhorse
Ictaluridae	Freshwater catfish
Ictalurus natalis	Yellow bullhead
I. nebulosus	Brown bullhead
I. punctatus	Channel catfish
Noturus flavus	Stonecat
Percopsidae	Trout perches
Percopsis omiscomaycus	Trout perch
Atherinidae	Silversides
Labidesthes sicculus	Brook silverside
Percichthyidae	Temperate basses
Morone chrysops	White bass
Centrarchidae	Sunfishes
Ambloplites rupestris	Rock bass
Lepomis gibbosus	Pumpkinseed
Pomoxis annularis	White crappie
P. nigromaculatus	Black crappie
Micropterus dolomieui	Smallmouth bass
Percidae	Perches
Perca flavescens	Yellow perch
Percina caprodes	Log perch
Stizostedion vitreum vitreum	Walleye
Sciaenidae	Drums
Aplodinotus grunniens	Freshwater drum
Cottidae	Sculpins
Cottus cognatus	Slimy sculpin

Shoal Zone

2.360
In the shoal zone fyke nets were used, collecting 24 species of fish. Spottail shiners dominated the catch. Adults were common from mid-April to mid-June, and in September. Young-of-the-year were common in September only. Adult rock bass were also caught in abundant numbers, occurring sporadically throughout the year. Adult yellow perch were common only in early May but were not caught after mid-June. No other species were caught in significant numbers.

Deep Water Zone

2.361
The deep water zone was sampled at surface, mid, and bottom levels to detect variations in species composition in the water column. Throughout the year 318 samples were taken, yielding 29 species of fish.

2.362
Surface sampling was accomplished using surface gill nets and surface trawlers. Adult alewife was the only species collected in significant numbers using surface gill nets, with over 90 percent caught in late May. Rainbow smelt and emerald shiners were the only two species caught in abundant numbers with the surface trawl. The majority of rainbow smelt were young-of-the-year caught primarily in June and July. Adults were caught sporadically from November 1974 to June 1975. Adult emerald shiners were caught throughout the year while young-of-the-year were caught in November, December, August, and September. Adult emerald shiners were over four times more numerous than young-of-the-year. Yellow perch and walleye were caught by both methods but in low numbers.

2.363
Bottom sampling was accomplished using bottom gill nets and bottom trawlers. Adult yellow perch were most abundant in bottom gill net catches followed by adult alewife. Yellow perch were caught in good numbers throughout the year except in November and December. Peak catches occurred in May. Alewife were caught almost entirely in April and May. Large numbers of adult rainbow smelt, white sucker, walleye, and spottail shiner were also caught. Each of these species except rainbow smelt was caught consistently throughout the year. Rainbow smelt were caught from October 1974 to June 1975.

2.364
Young-of-the-year alewife and rainbow smelt were most abundant in bottom trawler samples. Peak catches for alewife occurred in August while June and July were the most productive months for rainbow

smelt. Significant catches of adult emerald shiners occurred in the months of April and May.

2.365
Yearly catch totals for abundant and important fish species are presented in Table 2-54. Table 2-55 lists all fish species caught at Sheridan and the months they occurred. Detailed data on the results of the Sheridan fishery study can be found in Section 74.2 of the applicant's New York State Article VIII Application.

Lake Erie Tributaries
2.366
Sampling of Lake Erie tributaries in the vicinity of the Sheridan site was accomplished between September 1974 and September 1975. During this period both on-site streams (Ryder Creek and Eagle Bay Creek) and the two off-site streams (Walnut Creek and Silver Creek) were surveyed. Sampling stations were set up along the watercourses as shown on the generalized map in Figure 2-25.

Phytoplankton
2.367
In samples taken from all four creeks, 57 phytoplankton taxa were identified. The Bacillariophyta (diatoms) were represented by 20 taxa followed by 19 Chlorophyta. There were five Euglenophyta, four Cryptophyta, four Cyanophyta, three *Chrysophyta*, and two *Xanthophyta*. Each stream had taxa from all major phytoplankton groups except Walnut Creek from which no taxa of Chrysophyta or Xanthophyta were found.

2.368
Stream mean phytoplankton densities in Ryder Creek were lowest in mid-June and highest in mid-July when a five-fold increase occurred. The dominant group during all periods was Bacillariophyta; the subdominant group, Chlorophyta.

2.369
Stream mean phytoplankton densities in Eagle Bay Creek registered lowest in mid-April, doubled in May, then decreased 60 percent to June when lowest densities were observed. From June to July, there was a 23-fold increase; in August, a slight decrease. Bacillariophyta dominated during April and May; Chlorophyta in June and July. In August, Cryptophyta dominated, comprising about 37 percent of the total phytoplankton density, with Cyanophyta and Chlorophyta sharing the second numerically dominant population.

2.370
Densities in Walnut Creek were low during April but about two-fold greater than those of Ryder Creek or Eagle Bay Creek. There was a

TABLE 2-54

YEARLY CATCH TOTALS FOR MOST ABUNDANT OR IMPORTANT FISH SPECIES IN LAKE ERIE AT THE SHERIDAN SITE

	Bottom Trawl (80 Samples)	Bottom Gill Nets (129 Samples)	Surface Gill Nets (8 Samples)	Surface Trawl (101 Samples)	Fyke Nets (56 Samples)	50' Beach Seines (26 Samples)	100' Beach Seines (18 Samples)
Alewife	185	1,104	376	7	1	7	6
Rainbow Smelt	231	360	3	602	5	17	10
Emerald Shiner	51	0	0	660	4	141	435
Spottail Shiner	2	302	2	2	888	192	3,409
Trout-Perch	3	189	0	0	16	2	5
Rock Bass	0	68	0	0	144	1	3
White Bass	0	43	2	0	0	49	39
Yellow Perch	4	1,633	2	7	26	4	85
Walleye	0	298	9	1	0	0	0
Freshwater Drum	1	208	0	0	4	3	3
Log Perch	19	19	0	1	2	0	62
Gizzard Shad	2	147	0	14	0	78	10
Smallmouth Bass	0	100	0	0	0	0	0

TABLE 2-55

OCCURRENCE OF FISH SPECIES* AT SHERIDAN, SEPTEMBER 1974-SEPTEMBER 1975

Species	1974 Sep	1974 Oct	1974 Nov	1974 Dec	1975 Jan	1975 Apr	1975 May	1975 Jun	1975 Jul	1975 Aug	1975 Sep
Longnose gar									A		
Alewife	Y		Y			A	A	A	Y,A	Y	Y
Gizzard shad	Y,A	Y,A	Y,A			A	A		A	Y,A	A
Coho salmon	A					A	A				
Chinook salmon	A					A					
Rainbow trout		A					A	A			
Brown trout	A			A		A	A	A			
Lake trout		A									
Rainbow smelt	Y,A	A	Y,A	Y,A	A	A	A	Y,A	Y	Y	Y
Northern pike									Y		
Goldfish							A		A	A	
Carp	A	A	A	A		A	A	A	A		A
Emerald shiner	Y	Y,A	Y,A	Y,A	A	A	A	A	A	Y,A	Y,A
Spottail shiner	Y,A	A	A	A		A	A	A	Y,A	Y,A	Y,A
Quillback	A	A						A	A		
White sucker	A	A	A	A		A	A	A	A	A	A
Northern hog sucker		A		A			A	A	A	A	
Shorthead redhorse	A	A	A	A		A	A	A	A	A	A
Yellow bullhead							A	A			
Brown bullhead	A							A			
Channel catfish			A				A	A	A		
Stonecat	A	A	A			A	A	A	A		A
Trout perch		A	A			A	A	A			A
Brook silverside	Y										Y
White bass	A	Y,A	A			A	A	A	A	Y,A	Y,A
Rock bass	A	A	A			A	A	A	A	A	A
Pumpkinseed							A	A			A
Smallmouth bass	A	A	A				A	A	A	A	A
White crappie	A						A				
Black crappie	A										A
Yellow perch	A	A		A		A	A	Y,A	Y,A	Y,A	Y,A
Log perch							A	A	Y,A	Y,A	A
Walleye	A	A	A	A		A	A	A	Y,A	A	A
Freshwater drum	A		A			A	A	A	A	A	A
Slimy sculpin	A										
Total species	24	18	16	10	2	18	26	24	22	16	19

*Y = young-of-the-year, A = yearling and older, blank = no catch three-fold increase from April to July. The dominant group in both April and July was the Bacillariophyta, comprising 82 percent and 79 percent, respectively, of the total phytoplankton density observed.

2.371
There was only one sampling station on Silver Creek. There, densities doubled from April to July. Dominance was exhibited by the Bacillariophyta during April, with 52 percent of total density, but shifted in July to Cyanophyta, with 53 percent of total density.

Periphyton

2.372
In stream survey samples collected during April through September, 31 periphyton taxa were identified. All were of the divisions Cyanophyta, Chlorophyta, or Bacillariophyta. The results of samplings were the same as the Pomfret site with the addition of *Mougeotia spp*. as a filamentious alga.

Aquatic Macrophytes

2.373
Macrophyte surveys were conducted at the on-site (Ryder Creek and Eagle Bay Creek) and off-site streams (Walnut Creek and Silver Creek). Visual surveys were conducted at all stream sampling stations during April and only on-site streams during May. During these months, no aquatic macrophytes were present, only small tufts of green algae and mats of diatoms covering the bedrock bottom of the streams were observed. In June algal mats at on-site streams were observed to be abundant as well as *Eleocharis acicularis* and *Elodea canadensis*.

Zooplankton

2.374
Organisms collected and enumerated in the stream zooplankton samples included plasktonic crustaceans as well as insects commonly considered benthic drift organisms. Of the 63 taxa indentified and enumerated in zooplankton samples collected from Sheridan site creeks, 21 were cladocerans, 25 were copepods, and 17 were taxa from other groups including six insect orders. The creeks yielded 18 taxa (including four insect orders, eight cyclopoid copepods, and four cladocerans) not found in the zooplankton lake survey conducted concurrently.

2.375
Differences in zooplankton populations among the Sheridan site stream stations were probably related to the substrate and flow characteristics at each station. Except during June, station 242 on Eagle

Bay Creek exhibited the highest density of all stream stations. The next highest organism density was at upstream stations 251 and 252, which appeared to have had similar densities. Station 241 not only was lowest in zooplankton in Ryder and Eagle Bay creeks but also had the most shale and bedrock for substrate. Stations with the lowest zooplankton densities were on Walnut and Silver Creeks where bedrock, shale, and gravel are the predominant substrates. Although the downstream station on Eagle Bay Creek generally had the highest density, it also had the lowest number of taxa. The most taxa were usually found at the upstream station on Eagle Bay Creek.

2.376
Temporal (monthly) distribution of zooplankton in creeks was similar to that observed in Lake Erie except for an extremely high abundance of copepods during August. Organisms generally not considered zooplankton (worms and insects) were most abundant during May. Plecopterans (stone flies) were abundant only during May. Worms (nematodes and annelids) and fly larvae (dipterans) exhibited a small peak of abundance in May, but their numbers were similar from April through August. Similar distributions of stoneflies, worms, and fly larvae were found in the benthic studies of this survey.

Benthic Macroinvertebrates

2.377
In the on-site streams, Ryder and Eagle Bay Creeks, 139 invertebrate taxa were identified. They were primarily true flies (33 percent), mayflies (12 percent), beetles (nine percent), caddis flies (seven percent) and snails and clams (nine percent). While identification of 139 taxa indicated high diversity, each taxon's density was usually low. The most numerous organisms were midge larvae (Diptera). Fewer taxa (65) were found in the off-site streams (Walnut and Silver Creeks) than in the on-site streams due primarily to the lower sampling frequency in off-site streams. Primarily, they were true flies (40 percent), caddis flies (14 percent), beetles (nine percent), mayflies (nine percent), and aquatic earthworms (nine percent). In off-site streams, midge fly larvae (Diptera) were the most numerous organisms.

2.378
In the on-site stream Ryder Creek, the numbers of taxa identified at each station were similar: 89 taxa downstream; 91 taxa upstream. The stations did not yield the same taxa; 65 of the total 115 taxa were collected at both locations. A possible explanation is the difference in substrates: there was a greater abundance of fine sediments at the upstream station and more bedrock substrate at the downstream station. Mean (average of all dates) invertebrate density

was similar for the two stations although differences occurred during most months because of abundances of several dipteran taxa.

2.379
The two stations on Eagle Bay Creek, the second on-site stream, also exhibited similar numbers of taxa: 73 at the downstream station and 76 at the upstream station. Of the 103 total taxa collected in Eagle Bay Creek, 46 were identified at both stations. The substrates were different at the stations, so different taxa were expected. The presence of specific taxa (e.g., caddis flies: Chematipsyche and Rhyacophilia) at the upstream station was indicative of the rock substrate with moderate to fast flow, whereas the presence of dipterans only at the downstream station was more indicative of fine sediment and organic substrates. Total invertebrate densities at the stations differed on each sampling date, with the downstream station having the lowest density during three of the five months sampled. High densities of Nais (Oligochaeta) increased abundance at the downstream station during June, and oligochaetes and dipterans slightly increased the downstream station density during July.

2.380
Of the off-site streams, Walnut and Silver Creeks, the latter exhibited more taxa and higher densities - 47 of the 65 taxa identified from these streams. In Walnut Creek, there were 32 at the downstream station and 33 at the upstream station. There is no apparent explanation for the difference in number of taxa between Silver and Walnut Creeks (47 taxa versus 32 and 33 taxa); the substrates and flow characteristics were similar. Total densities were higher in Silver Creek primarily because of the abundance of aquatic earthworm.

2.381
Invertebrate densities in on-site streams, Ryder and Eagle Bay Creeks, were generally highest during June and lowest in April and August. The off-site streams followed, with high densities during the summer season (July).

2.382
Most invertebrates in running waters have one generation per year, which influences abundances during specific times (Hynes, 1972). Stoneflies were most abundant during May. Mayflies were abundant from May through August, with Caenis abundant throughout this period and other genera abundant only during one or two months. True flies (Diptera) showed for peak emergence in June and July as indicated by the abundance of chironomidae pupae. This was also the time when dipterans were most numerous.

Fisheries

2.383
Fish sampling was conducted on a seasonal basis in Ryder, Eagle Bay, Walnut, and Silver Creeks. Fall 1974 samples were collected by seining, while winter 1974 and spring-summer 1975 samples were collected by electroshocking. Electroshock and seining data for these watercourses are summarized in Tables 2-56 and 2-57.

2.384
In Ryder Creek, 14 species were collected by electroshocking. Seven were not collected in Lake Erie in the vicinity of the Sheridan study site; these included five species common in Ryder Creek: common shiner, bluntnose minnow, western blacknose dace, creek chub, and rainbow darter. White suckers also were common in stream shock samples, and stoneroller young-of-the-year were abundant in the August catch. Fall 1974 stream seine samples yielded only five individuals at Station 251, representing three species. No fish were captured in seine samples at Station 241.

2.385
In Eagle Bay Creek, 12 species were identified, with nine having been caught with the electroshock method and three from seine samples. The western blacknose dace and creek chub were the most abundant species in the electroshock samples while emerald shiners were dominant in seine catches. Adult alewife were caught in good numbers on 15 August only and young-of-the-year Cryprinidae (minnows or shiner) were abundant on 11 July only.

2.386
In Walnut Creek electrofishing was productive in all three months in which samples were taken, yielding 11 species. Adult longnose dace were the most abundant in August only while western blacknose dace, bluntnose minnow, and common shiner were all about equal in numbers behind the longnose dace. Seine catches produced nine species with the common shiner being the most abundant.

2.387
Silver Creek was sampled with stream seines in the fall of 1974 and with stream shocks in winter 1974 and spring-summer 1975 yielding 12 species. Two species (only two individuals) were collected in seines and 10 species were collected by shocks. During December, no fish were captured by electro-fishing. In April, four species of minnow and one northern hog sucker were caught and in August 27 individuals of seven species were caught.

2.387a
Corps staff found that pugnose minnow, which are not typically found in eastern Lake Erie tributaries, were collected at Sheridan area

TABLE 2-56

CATCH/EFFORT SUMMARY FOR ELECTROSHOCK SAMPLES FROM TRIBUTARIES IN VICINITY OF SHERIDAN, DECEMBER 1974-AUGUST 1975

Species	Life Stage	Ryder Creek Dec 23	Apr 10	May 9	Jul 2	Jul 11	Aug 19	C/f	Total No.
Alewife	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Alosa pseudoharengus)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Rainbow Trout	A	0.0	0.7	0.0	0.0	0.0	0.0	0.12	1
(Salmo gairdneri)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Stoneroller	A	0.0	0.0	2.1	0.0	0.0	1.0	0.61	5
(Campostoma anomalum)	Y	0.0	0.0	0.0	0.0	0.0	11.0	2.68	22
Common Shiner	A	0.0	0.3	2.9	6.0	3.0	2.5	2.68	22
(Notropis cornutus)	Y	1.4	0.0	0.0	0.0	0.0	6.5	1.83	15
Pugnose minnow	A	0.0	0.0	0.0	1.0	0.0	0.0	0.12	1
(N. emiliae)									
Bluntnose minnow	A	0.7	0.4	14.3	0.0	8.0	1.0	4.51	37
(Pimephales notatus)	Y	0.7	0.0	0.0	6.0	0.0	1.5	1.22	10
Western blacknose dace	A	0.0	0.0	3.6	3.0	1.0	0.0	1.10	9
(Rhinichthys atratulus)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Longnose dace	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(R. cataractae)									
Creek Chub	A	0.0	2.1	10.7	4.0	6.0	2.0	3.90	32
(Semotilus atromaculatus)	Y	0.0	0.0	0.0	0.0	0.0	7.0	1.71	14
White Sucker	A	0.0	2.1	6.4	2.0	4.0	1.0	2.44	20
(Catostomus commersoni)	Y	0.0	0.7	0.0	0.0	0.0	4.5	1.22	10
Northern hog sucker	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Hypentelium nigricans)									
Cyprinidae	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(minnow or shiner)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Rock bass	A	0.0	0.0	0.0	1.0	0.0	0.0	0.12	1
(Ambloplites rupestris)	Y	0.0	0.0	0.0	0.0	0.0	2.0	0.49	4
Pumpkin Seed	A	0.0	0.0	0.0	0.0	0.0	0.5	0.12	1
(Lepomis gibbosus)									
Bluegill	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(L. macrochirus)	Y	0.0	0.0	0.0	0.0	0.0	0.5	0.12	1
Smallmouth bass	A	0.0	0.0	0.0	0.0	..0	0.0	0.12	1
(Micropterus dolomieui)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
White crappie	A	0.0	0.0	0.0	0.0	1.0	0.0	0.12	1
(Pomoxis annularis)									
Rainbow darter	A	0.0	0.7	0.7	6.0	2.0	4.0	2.20	18
(Etheostoma caeruleum)	Y	0.0	0.0	0.0	0.0	0.0	3.5	0.85	7
Yellow perch	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Perca flavescens)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Log perch	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Percina caprodes)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Total species		2	6	7	8	8	9	14	
Total effort (10 min.)		1.4	1.4	1.4	1.0	1.0	2.0	8.2	
Total specimens		4	19	57	29	26	97	232	
Total C/f (per 10 min.)		2.9	13.9	40.7	29	26	48.5	28.3	

TABLE 2-56 (cont.)

Species	Life Stage	Eagle Bay Dec 11	Apr 10	May [illegible]	Jul [illegible]	Jul 11	Aug [illegible]	C/f	Total No.
Alewife	A	0.0	0.0	0.0	0.0	0.0	12.0	3.20	24
(Alosa pseudoharengus)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Rainbow Trout	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Salmo gairdneri)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Stoneroller	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Campostoma anomalum)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Common Shiner	A	0.0	0.7	0.0	0.0	0.0	0.0	0.13	1
(Notropis cornutus)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Pugnose minnow	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(N. emiliae)									
Bluntnose minnow	A	0.0	2.9	0.0	0.0	0.0	1.0	0.80	6
(Pimephales notatus)	Y	1.4	0.0	0.0	0.0	0.0	0.0	0.13	1
Western blacknose dace	A	0.0	0.0	7.9	0.0	7.0	8.0	4.53	34
(Rhinichthys atratulus)	Y	0.0	0.0	0.0	0.0	0.0	14.5	3.87	29
Longnose dace	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(R. cataractae)									
Creek Chub	A	0.0	1.4	11.4	0.0	19.0	1.0	5.20	39
(Semotilus atromaculatus)	Y	1.4	0.0	0.0	0.0	0.0	15.5	4.27	32
White Sucker	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Catostomus commersoni)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Northern hog sucker	A	0.0	0.7	0.0	0.0	0.0	0.0	0.13	1
(Hypentelium nigricans)									
Cyprinidae	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(minnow or shiner)	Y	0.0	0.0	0.0	0.0	11.0	0.0	1.47	11
Rock bass	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Ambloplites rupestris)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Pumpkin Seed	A	0.0	0.0	0.0	0.0	1.0	0.0	0.13	1
(Lepomis gibbosus)									
Bluegill	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(L. macrochirus)	Y	0.0	0.0	0.0	0.0	0.0	0.5	0.13	1
Smallmouth bass	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Micropterus dolomieui)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
White crappie	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Pomoxis annularis)									
Rainbow darter	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Etheostoma caeruleum)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Yellow perch	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Perca flavescens)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Log perch	A	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
(Percina caprodes)	Y	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
Total species		2	4	2	0	4	5	8	
Total effort (10 min.)		0.7	1.4	1.4	1.0	1.0	2.0	7.5	
Total specimens		2	8	27	0.0	38	105	180	
Total C/f (per 10 min.)		2.9	5.7	19.3	0.0	38	52.5	24.0	

TABLE 2-56 (cont.)

Species	Life Stage	Walnut Creek Dec 23	Apr 18	Aug 15	C/f	Total No.	Silver Creek Dec 21	Apr 19	Aug 15	C/f	Total No.
Alewife	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(Alosa pseudoharengus)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Rainbow Trout	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(Salmo gairdneri)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Stoneroller	A	0.0	29.3	2.5	9.58	46	0.0	5.7	1.5	2.92	7
(Campostoma anomalum)	Y	0.0	0.0	6.5	2.71	13	0.0	0.0	5.0	4.17	10
Common Shiner	A	1.4	29.3	7.0	11.88	57	0.0	1.4	0.0	0.42	1
(Notropis cornutus)	Y	9.3	0.0	36.5	17.92	86	0.0	0.0	0.0	0.00	0
Pugnose minnow *(N. emiliae)*	A	7.1	0.0	0.0	2.08	10	0.0	0.0	0.0	0.00	0
Bluntnose minnow	A	18.7	2.9	1.5	6.04	29	0.0	11.4	0.0	3.33	8
(Pimephales notatus)	Y	0.0	0.0	37.0	15.42	74	0.0	0.0	0.0	0.00	0
Western blacknose dace	A	0.0	0.0	49.0	20.42	98	0.0	0.0	0.5	0.42	1
(Rhinichthys atratulus)	Y	0.0	1.4	0.0	0.42	2	0.0	0.0	0.0	0.00	0
Longnose dace *(R. cataractae)*	A	0.0	0.0	178.5	74.38	357	0.0	0.0	0.0	0.00	0
Creek Chub	A	0.0	10.0	0.0	2.92	14	0.0	2.9	0.5	1.25	3
(Semotilus atromaculatus)	Y	5.0	0.0	0.0	1.46	7	0.0	0.0	0.0	0.00	0
White Sucker	A	0.0	2.9	0.5	1.04	5	0.0	0.0	0.0	0.00	0
(Catostomus commersoni)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	1.0	0.83	2
Northern hog sucker *(Hypentelium nigricans)*	A	0.0	0.0	0.5	0.21	1	0.0	1.4	0.0	0.42	1
Cyprinidae	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(minnow or shiner)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Rock bass	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(Ambloplites rupestris)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Pumpkin Seed *(Lepomis gibbosus)*	A	0.0	0.0	0.0	0.00	0	0.0	0.0	2.0	1.67	4
Bluegill	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(L. macrochirus)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Smallmouth bass	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(Micropterus dolomieui)	Y	0.0	0.0	0.5	0.21	1	0.0	0.0	0.0	0.00	0
White crappie *(Pomoxis annularis)*	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Rainbow darter	A	0.0	0.0	9.5	3.96	19	0.0	0.0	0.5	0.42	1
(Etheostoma caeruleum)	Y	0.0	0.0	4.5	1.88	9	0.0	0.0	1.5	1.25	3
Yellow perch	A	0.0	0.0	0.0	0.00	0	0.0	0.0	1.0	0.83	2
(Perca flavescens)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Log perch	A	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
(Percina caprodes)	Y	0.0	0.0	0.0	0.00	0	0.0	0.0	0.0	0.00	0
Total species		4	6	9	11		0.0	5	7	10	
Total effort (10 min.)		1.4	1.4	2.0	4.8		0.7	0.7	1.0	2.4	
Total specimens		54	106	668	828		0.0	16	[illegible]	40	
Total C/f (per 10 min.)		38.6	75.7	334	172.5		0.0	22.9	[illegible]	[illegible]	

TABLE 2-57

CATCH/EFFORT SUMMARY FOR STREAM-SEINE SAMPLES FROM TRIBUTARY STREAMS IN THE VICINITY OF SHERIDAN, FALL 1975

Species	Life* Stage	Ryder Creek 241	Ryder Creek 251	Eagle Bay 242	Eagle Bay 252	Walnut Creek 243	Walnut Creek 253	Silver Creek 244
Stoneroller	A	0.0	0.0	0.0	0.0	0.0	8.0	0.0
Campostoma anomalum	Y	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Silvery minnow *Hybognathus nuchalis*	Y	0.0	0.0	0.0	0.0	0.5	0.0	0.0
Emerald shiner *Notropis atherinoides*	Y	0.0	0.5	17.5	0.0	0.0	0.0	0.5
Common shiner	A	0.0	0.0	0.0	0.0	0.0	20.0	0.0
N. cornutus	Y	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Pugnose minnow *N. emiliae*	A	0.0	0.0	0.0	0.0	0.0	8.5	0.5
Bluntnose minnow *Pimephales notatus*	Y	0.0	0.0	0.0	0.0	0.0	13.0	0.0
Longnose dace	A	0.0	0.0	0.0	0.0	14.5	7.5	0.0
Rhinichthys cataractae	Y	0.0	0.0	0.0	0.0	1.0	10.0	0.0
Creek chub *Semotilus atromaculatus*	Y	0.0	1.0	0.0	1.0	0.0	12.5	0.0
Northern hog sucker *Hypentelium nigricans*	A	0.0	0.0	0.0	0.0	0.0	3.0	0.0
Rock bass *Ambloplites rupestris*	A	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Rainbow darter	A	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Etheostoma caeruleum	Y	0.0	0.0	0.0	0.0	0.5	1.0	0.0
Fantail darter *E. flabellare*	Y	0.0	0.0	0.0	0.0	1.5	0.5	0.0
Total species		0	3	2	1	4	9	2
Total specimens		0	5	36	2	36	169	2
Number of tows (total effort)		2	2	2	2	2	2	2
Total C/f		0.0	2.5	18.0	1.0	18.0	84.5	1.0

*Y = young of the year
A = yearling and older

streams and therefore requested reaffirmation of the identification. The applicant's consultant, Texas Instruments, is not able to definitively reaffirm the presence of pugnose minnow. The specimens retained from the 1974-75 sampling efforts were immature, thus preventing reaffirmation to the species level of the previous identification. However, based on identification of the species at that time, the consultant believes it is possible, if not probable, that pugnose minnows were found in three Sheridan area streams for brief periods of time. Pugnose minnow were also collected at the Pomfret site (see 2.157).

At the Sheridan site, seven stream sampling stations were established, one on Silver Creek, and two each on Walnut Creek, Eagle Bay Creek, and Ryder Creek. Each sampling station was sampled six times over a six month period during the 1974-75 period, with the exception of Walnut Creek and Silver Creek, which were sampled on three occasions each. Stream sampling methods consisted of electroshocking and stream-seine sampling.

At the Sheridan area streams, the 1974-75 electroshocking efforts revealed the following with respect to the presence of the species identified as the pugnose minnow:

- Ryder Creek - one specimen was counted on the July 2, 1975, sampling date

- Eagle Bay Creek - no observations were noted

- Walnut Creek - 10 specimens were counted on December 23, 1974

- Silver Creek - no specimens were observed

Sheridan area stream seine samples in the fall of 1975 indicated the following with respect to the presence of the specimens identified as the pugnose minnow:

- Ryder Creek and Eagle Bay Creek - no specimens counted

- Walnut Creek - 17 specimens counted

- Silver Creek - one specimen counted

Given the divergent stream locations of the pugnose minnow, as identified at the time of the 1974-1975 sampling effort, it appears that the on-site streams at Sheridan (i.e., Ryder Creek and Eagle Bay Creek) are not "unique" to the Lake Erie ecosystem, nor are they unique in and of themselves.

Moreover, the Sheridan area streams are not typical of good pugnose minnow habitat. This species prefers clear, slow-moving streams with abundant aquatic vegetation (Scott and Crossman, 1973), and these conditions are not typical for the streams studied.

The pugnose minnow is not on the U.S. Department of the Interior's or the New York State DEC's species list of threatened or endangered species. Authors Van Meter and Trautman (1970) regard the western basin of Lake Erie as the northern extreme of the range of the pugnose minnow in the U.S. This species is relatively common in its primary range which extends from Florida to Texas, and includes the Mississippi Valley and tributaries.

On-Site Water Bodies

2.388
Twenty-nine on-site water bodies were identified at the Sheridan site. For the first sampling period (May 20 - June 6) 11 were studied because of their proximity to the central area of the site. This number was reduced to eight water bodies for the second sampling period (September 27 - October 6). A map showing the location of these water bodies is presented in Figure 2-25.

Phytoplankton

2.389
At the Sheridan Lake Erie Generating Site, 83 phytoplankton taxa were identified from 12 on-site water bodies. The taxa found represented 39 Chlorophyta, 13 Bacillariophyta, 8 Chrysophyta, 6 Cyanophyta, 4 Xanthophyta, 5 Euglenophyta, 4 Cryptophyta, and 3 Pyrrhophyta. The total number of species collected in each pond during one season ranged from zero to 34.

2.390
Phytoplankton cell density was variable among water bodies, as it was between sampling periods Total cell density in the 12 water bodies ranged from zero to 43,763 x 10^6 cells/m^3. No total cell density temporal trends were established; the phytoplankton population and each water body fluctuated independently during the spring and fall collection periods. Lane (1969) observed similar cell density fluctuations in two New York State ponds, and indicated that the possible cause for such fluctuations was a combination of physical and chemical factors.

2.391
Dominance of major phytoplankton divisions was also variable. Chlorophyta, Cyanophyta, Chrysophyta, and Cryptophyta were the important divisions present. The dominance of these divisions is unpredictable because of the rapid changes in nutrient levels and

fluctuations of water temperatures of small water body samples. During spring, water bodies 5 and 9 were dominated by Cyptophyta, water body 13 by Bacillariophyta and Cyanophyta. Water bodies 3, 4, 7, and 12 were dominated by Chlorophyta during the spring collection period. During fall the dominant group in many of the water bodies changed. Water bodies 4 and 5 shifted to Cyanophyta. Water bodies 7, 8, and 12 were dominated by Chrysophyta while water body 3 was dominated again by Chlorophyta. Although variability was noted in species composition within major groups and among water bodies, and between periods, most of the species found are typical phytoplankton of small bodies of water such as those studied (Round, 1965).

Periphyton

2.392
A general survey of the periphyton community from on-site water bodies at the Sheridan Lake Erie Generating site revealed 68 taxa. During the spring collection period, 47 taxa were identified, while during fall 35 taxa were found. During the spring survey, the majority of the taxa found in the periphyton community were representative of Chlorophyta, Euglenophyta, and Bacillariophyta. This combination of taxa is characteristic of communities that grow on sand or silt substrates that are rich in organic material (Round, 1965). The fall sampling revealed a shift of the representative taxa to the major groups of Chlorophyta and Cyanophyta. While most taxa identified were members of the periphyton communities, such organisms as Ankistrodesmus and Coelastrum are considered to be common members of the phytoplankton communities.

Aquatic Macrophytes

2.393
A general survey of the relative abundance of aquatic macrophytes inhabiting on-site water bodies at the Sheridan Lake Erie generating site revealed the presence of 10 taxa. Spike rush (Eleocharis ovata) and narrow-leaved cattail (Typha angustifola) were the most frequent species, occurring in six of the 12 on-site water bodies surveyed. The relative abundance of aquatic macrophytes within water bodies varied only slightly from spring to fall. Submerged forms (i.e, Potamogeton) were somewhat less abundant during fall, while emergent forms such as cattail and spike rush appeared slightly more abundant. Marsh purslane (Ludwigia palustris) was the only aquatic macrophyte found during fall not previously collected during spring.

Zooplankton

2.394
Samples taken during June and October at the Sheridan Lake Erie

Generating site reveal 56 taxa. Those taxa identified included 23 cladocerans, 18 copepods, and 6 insects. The number of taxa identified during a season ranged from 7 to 28. Water bodies with higher numbers of taxa generally contained intermediate total densities (e.g. water body 7).

2.395
The variance in total densities between individual water bodies was considerable. The lowest total seasonal density (310 organisms/m^3) was reported from water body 11, while the highest density (383,334 organisms/m^3) occurred in water body 4. Water body 11 was a relatively shallow (three feet) pond with a gravel bottom and clear water. It is believed that this water body dries up during most years, thus accounting for the low densities and number of taxa.

2.396
Zooplankton densities did not vary the same among water bodies from June to October. Water bodies with high densities (e.g., water bodies 3, 4, and 7) generally showed a decrease from June to October, while water bodies exhibiting intermediate to low densities (e.g. water bodies 8 and 12) generally revealed increases. In nearly all cases when the total density increased, the number of taxa decreased.

Benthic Macroinvertebrates

2.397
Grab samples were collected at each of the water bodies sampled on the Sheridan site to identify benthic macroinvertebrate populations. During the survey, 79 taxa were identified including 48 insects, 12 crustaceans, 10 annelids and 5 mollusks. Tubificidae, Naididae, Chironomidae, and Nematoda were the major contributors of biovolume to the macroinvertebrate community.

2.398
The total number of taxa collected in on-site water bodies varied from 8 (water body 11) to 30 (water body 5). Water body 11 was a clear, gravel-bottom pond that appeared to dry up each year. In contrast, water body 5 was spring-fed with relatively high amounts of nutrient-rich bottom substrates. Most of the water bodies with higher numbers of taxa at the Sheridan site were physically similar to pond 5.

2.399
Total macroinvertebrate densities were generally on the same order of magnitude among water bodies. The lowest density was recorded from water body 1 (589 organisms/m^2) while the highest density was found in water body 8 (32,529 organisms/m^2).

Fisheries

2.400
During the investigation, a total of eight fish species was reported from a survey of water bodies on the Sheridan site. Seining produced five of the eight species while the remaining were added from observation or stocking information.

2.401
The fathead minnow (Pimephales promelas) was the most numerous fish captured. Most bodies averaged two or less captured species. Bluegill sunfish (Lepomis macrochirus) and largemouth bass (Micropterus salmoides) occurred in 6 and 5 water bodies, respectively. Several largemouth bass were sighted in water body 1. The overall catch of fish was small. Only water bodies 1 and 4 contained sufficient area or quality of habitat to host catchable-size (from a sport fishing standpoint) fish. None of the species reported were rare or endangered. The fish species and the number of individuals collected during three separate seine hauls in each water body are summarized in Table 2-58.

TERRESTRIAL ECOLOGY

Terrestrial Vegetation

2.402
Field studies were initiated in the vicinity of the Sheridan site to identify vegetation cover types and define the importance of various plant communities in relation to the overall terrestrial ecosystem. For the purpose of this discussion, the study area is defined as the area within the Sheridan site boundary, while the area within one mile of the site perimeter is referred to as the extended area.

Cover Types

2.403
During this survey, similarities in various stands of vegetation were noted. Through the use of aerial photography, such similarities stand out and when field checked can be accurately mapped as cover

TABLE 2-58

COMPOSITE CATCH OF FISH FROM BEACH SEINES FROM SHERIDAN ON-SITE WATER BODIES DURING JUNE (SPRING (SP)) AND OCTOBER (FALL (F)) 1975

	On-Site Water Bodies															
	1		3		4		5		7		8		12		13	
Common Name	SP	F	SP	F	SP	F	SP	F	SP	F	SP	F	SP	F	SP	F
Spotfin shiner	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	Not Sampled
Fathead minnow	0	0	0	0	0	0	0	0	0	0	10	102	0	0	1	
Creek chub	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	
Bluegill	0	6	0	0	12	16	0	0	0	0	0	0	0	0	0	
Largemouth bass	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	

Note: Fathead minnow observed in water body 27; Brown bullhead stocked in water body 16, 17, 20, 24; Pumpkinseed observed in water body 1, 13, 16, 17, 24, 25; Bluegill observed in water body 15, 16, 17, 20; Largemouth bass stocked in water body 15, 16, 17; Yellow perch stocked in water, body 16, 17, 24.

types. Principal cover types for the Sheridan study area are as follows:

Cover Type	On-Site Acreage*	
Open Field	158	17%
Shrub	146	16%
Northern Hardwoods Forest	166	18%
Pine plantation	12	1%
Black locust forest	4	0.4%
Willow	6	0.6%
Vineyards	153	17%
Cropland	275	30%
Total	920	

*These percentages are based on "natural vegetation" and not on total study area acreage.

Open Field Cover Type

2.404
The open field community occupies 158 acres which is 17 percent of the natural vegetation in the study area. The open field community is dominated by bentgrass or red-top and Canada bluegrass (Agrostis alba and Poa compressa). Path rush (Juncus tenuis), aster and goldenrod (Aster and Solidago), and sweet vernal grass (Anthoxanthum odoratum) also had high importance values. Slender wheatgrass (Agropyron trachycaulum) and quackgrass (A. repens) were important during fall but decreased in relative importance in the spring and summer seasons. Common forbs were strawberry (Fragaria virginiana), wild carrot (Daucus carota), cinquefoil (Potentilla canadensis and P. simplex) and red clover (Trifolium pratense).

Shrub Cover Type

2.405
The shrub community covers 146 acres which is 16 percent of the natural vegetation. Staghorn sumac (Rhus typhina) and American elm (Ulmus americana) dominated the understory layer of the shrub community. The shrub layer is dominated by southern arrowwood (Viburnum dentatum) and silky dogwood (Cornus amomum), although brambles (Rubus spp.) and staghorn sumac have rather high importance values. Other common shrubs include chokecherry (Prunus virginiana), grapes (Vitis spp.) red-osier dogwood (Cornus stolonifera), and fire cherry (Prunus pennsylvanica).

Northern Hadwood Forest Cover Type

2.406
The heterogenous forest community occupies 166 acres or 18 percent of the Sheridan study area's natural vegetation. Red maple, sugar maple, beech, white and green ash, and black cherry (Prunus serotina) are the dominant species in the overstory. Shagbark hickory (Carya ovata) and blackgum (Nyssa sylvatica) are occasionally encountered. There are no distinct dominants in the understory, but the major species are sugar maple, white, and red maple. The most commonly encountered species in the shrub layer are southern arrowwood, sugar maple, black cherry, spicebush (Lindera benzoin), beech, maple-leaved viburnum (Viburnum acerifolium), and greenbrier (Smilax rotundifolia).

2.407
The herbaceous layer is quite variable from season to season with major differences occurring during the spring. In fall, the major species include white wood aster (Aster divaricatus), Virginia creeper (Parthenocissus quinquefolia), foamflower (Tiarella cordifolia), and sensitive fern (Onoclea (sensibilis), although woody seedlings of southern arrowwood, greenbrier, and black cherry are also common. The spring-flowering species, yellow adder's tongue (Erythronium americanum) and Canada mayflower (Maianthemum canadense), dominated the herbaceous layer, Virginia creeper, white wood aster, and poison ivy (Rhus radicans) are also quite common during the summer although Canada mayflower dominates the herbaceous layer. Woody seedlings of shrub species commonly encountered include southern arrowwood, greenbrier, maple-leaved viburnum, spicebush, and chokecherry. Common woody seedlings of tree species include black cherry, red maple, basswood or Ameridan linden (Tilia americana), ash (Fraxinus spp.) and bitternut hickory (Carya cordiformis).

Pine Plantation Cover Type

2.408
The pine plantation community totals 12 acres or approximately one percent of the study area natural vegetation. The pine plantations of the Sheridan site are similar to those of the Pomfret site (see paragraph 2.176).

Black Locust Cover Type

2.409
The black locust woodland occupies four acres or approximately 0.4 percent of the natural vegetation. In addition to black locust, hawthorn and American elm are also common in the overstory. The

shrub layer is composed mainly of southern arrowwood, brambles, chokecherry, and hawthorn, although various other shrub species are present. Dominant species in the herbaceous layer in order of decreasing importance value are spotted touch-me-not (Impatiens capensis), brambles, cinquefoil, aster, goldenrod, and strawberry. Woody seedlings of southern arrowwood, buckthorn, staghorn sumac, and black cherry are encountered.

Willow Cover Type

2.410
The willow stand occupies six acres or 0.6 percent of the natural vegetation in the study area. The willow stands of Sheridan site are similar to those of the Pomfret site (see paragraph 2.178).

Vineyards

2.411
The vineyards in the Sheridan site represent 153 acres or 17 percent of the total study area's natural vegetation. The grape species grown and common weed species which invade vineyards are the same as those discussed for the Pomfret study area (see paragraph 2.179).

Croplands

2.412
The croplands in the Sheridan study area can be subdivided into three major groups: truck cropping, hay production, and general pasture. Major truck crops of the study area appeared to be corn and tomatoes, although fields of beans, grain (oat and wheat), cucumbers, and potatoes were also encountered. Total acreage occupied by croplands is 275 or 30 percent of the natural vegetation. Additional information on vegetation cover types can be found in Section 79.2 of the applicant's New York State Article VIII Application.

Successional Patterns

Open Fields

2.413
The open field community was comprised primarily of abandoned agricultural fields. Grasses and perennial weeds were the main constituents of this community, which appeared very similar in plant composition to hayfields. Although many factors govern the floral composition of the fields, the time since abandonment and use just prior to abandonment appeared to be most influential. Initially, annuals and biennials dominated the fields, although the majority of

the areas were in a perennial grass stage. Open fields are the first major stage of succession on abandoned farmland. A shrub stage would eventually succeed the open field community.

Shrub Areas

2.414
The shrub community was composed of areas that were either farmed or cleared at one time, but that have been left undisturbed for many years and have been invaded with shrubs. The shrubs that dominate the shrub community vary in height and density depending on many factors. The typical shrub areas are composed of aggregations of shrubs interspersed with open spaces dominated by perennial grasses and forbs. There were no dense shrub areas on the Sheridan study area similar to the ones on the Pomfret study area, but there were a few shrub variant areas dominated by hawthorns which frequently reached the size of understory trees. There was a great deal of evidence that the hawthorn-dominated shrub areas resulted from pasturing.

Northern Hardwood Forest

2.415
In general, the Sheridan forests were older and larger in extent than the Pomfret forests. The data indicated that the Sheridan forests were drier or better drained than the Pomfret forest, which was reflected in the over-story, understory, and shrub layer by the prevalence of sugar maple. Two other species common in the forests and characteristic of dry woods were maple-leaved viburnum and white wood aster. There were also areas that were either poorly drained or had a high seasonal water table at Sheridan similar to Pomfret. One noticeable difference in these moist forests was the common occurrence of blackgum at Sheridan. There was some evidence that sugar maple and possibly beech may increase in importance in the future, but the forests are frequently lumbered (usually selectively), and so predictions may not be applicable. Developmental and climax forests are generally considered to be important because of the time involved in the establishment of a forest and the many potential habitats available for various plants and animals.

Black Locust Stand

2.416
The shrub layer of the black locust forest was dominated by southern arrowwood and brambles. The presence of many of the dominant shrub and herbaceous species in the shrub community was indicative of the youth of the black locust forest and its recent succession from a shrub-dominated community. Because of the youth of the black locust

forest, it is difficult to predict its future. Black cherry was not an obvious successor although there was some evidence that it may eventually increase in importance. Black locust will probably be succeeded by some type of hardwood forest. It appeared from field observations that the invasion of open areas near the black locust areas will result in an increase in the size of the black locust areas. The successional patterns of the vineyard and croplands of the Sheridan site are similar to those observed at the Pomfret study area.

Productivity

2.417
The site index for red maple ranged from 21.4 to 21.8 meters (mean 21.7 meters) on Collamer soils, 19.5 to 20.6 meters (mean 20.2 meters) on Canadice soils, and 19.6 to 20.7 meters (mean 20.2 meters) on Canandaigua soils. Mean site indices of 16.9 and 18.9 meters for sugar maple were determined for the Collamer and Canandaigua soils, respectively. There are some factors that limit stand productivity on the study area. Forest stands are restricted to the poorer-drained sites on the lake plain because the better-drained areas have been cleared for farming (Stout, 1958). Diebold (1935) concluded that in south central New York, deep well-drained soils were best for natural hard-woods forests and shallow, poorly-drained soils were of low quality for the local hardwoods. Most soils on the study area are deep, but poorly drained. Human intervention has also influenced the forest stands. Repeated cutting has reportedly brought the Erie Lake Plain stands to their present low value (Satterlund and Eschner, 1963).

2.418
Regarding the natural productivity of the soil for grape growing, a team of agricultural experts surveyed the study area and concluded that almost no areas exist which are best suited for grape production. Using a scale of I to VII, with I being the best, they rated the areas bounded by the Penn Central and Norfolk and Western (Conrail) Railroads and Waite Road as IV or V. The area bounded by the Norfolk and Western Railroad, Aldrich Road, and Chapin Road was rated III.

Terrestrial Fauna
2.419
During the 12-month sampling period from August 1974 to September 1975 regional and site-specific data were collected on terrestrial fauna.

Arthropods
2.420
Arthropods were collected during each season from each of the community types on the Sheridan study site. No differences in the

occurrence and distribution of the common species sampled were noted between the Pomfret and Sheridan sites.

Amphibians

2.421

Seven species of salamanders (spotted, red-spotted newt, northern dusky, mountain dusky, red-backed, two-lined, and slimy) and six species of anurans (American toad, spring peeper, western chorus frog, green frog, wood frog, and leopard frog) were observed on the Sheridan study area. The northern two-lined salamander was the only species found on the study area in abundance. Pond-breeding salamanders (Ambystoma spp. and the red-spotted newt) were uncommon. Among the anurans found on the study area, three species (American toad, spring peeper, and western chorus frog) appear to be abundant and wide-spread within the constraints of habitat preference. The green frog was common and widespread throughout several plant communities while the wood frog was common, but restricted to the northern hardwoods forest. For two of the species (Fowler's toad, pickerel frog) not found on the study area, there is little or no suitable habitat. Several large ponds located on the study area appear to be suitable habitat for bullfrogs, but none were observed. There also appears to be suitable habitat on the study area for gray tree-frogs. None were found although they were reported in the vicinity (Benton, 1975).

Reptile

2.422

The turtle population of the Sheridan study area is extremely limited, even though there appears to be enough suitable habitat available to support larger populations of species that were observed on the study area. Only two species of turtles (snapping and painted) were observed on the study area. Two species of snakes (northern brown snake and garter snake) were numerous. Both species have wide habitat preferences and are known to be common in areas disturbed by humans. The other species observed on the study area (northern water, northern red-bellied, and milk snake) were not numerous.

Avifauna

2.423

Based on cumulative calculation, approximately 26 percent of the 372 bird species (Beardslee, C.S. and H.D. Mitchell, 1965. (Birds of the Niagara-Frontier Region) known to occur in the Niagara Frontier region were observed in the study area during the fall migration period while 29 percent were observed by the end of the winter sampling period, 43 percent by the end of the spring sampling period and 47 percent by the end of the summer. A list of the important and relatively common bird species encountered at the Sheridan site is presented in Table 2-59. In general, the breeding species of the Sheridan study area are typical of the Lake Erie flood plain in New York, Pennsylvania, and Ohio. Forty-five species were encountered in the open field areas, 93 in the shrub zone, 107 in the northern hardwood forest, 61 in the pine plantation, 66 in the black locust stand, 40 in the vineyards, and 53 in the cropland areas. The estimated number of breeding bird pairs per 100 acres was 72 in the open field, 193 in the shrub, 164 in the northern hardwood forests, 48 in the vineyard, and 46 in the cropland.

2.424
The diversity of the seasonal avian populations of the open field community was generally lower than for that of other communities. Only during the winter was the seasonal avian diversity as high as any other community. A low number of species was recorded in the open field community during all four seasons (17, 3, 19, 30). Ten species were recorded as breeding birds in the two open field census plots, and five additional species were recorded in survey areas. Only seven (killdeer, upland sandpiper, bobolink, red-winged blackbird, eastern meadowlark, savannah sparrow, and grasshopper sparrow) are typically grassland birds; the others are associated with shrub borders.

2.425
The general trend for a low number of species and a low population diversity in open field areas can be attributed to: (1) a lack of diversity of foliage growth forms providing fewer niches than in communities with greater foliage height and growth form diversity; (2) a lack of protection from harsh weather during the winter season; (3) the relatively small size of the open field areas on the Sheridan study area; and (4) a low diversity of forms of food items, since weed seeds, grass seeds, and insects would comprise most of the avian food available in this community. Many of the species that are typical open field birds are found in low numbers in this community on the Sheridan study area. Species such as the bobolink, Henslow's sparrow, and grasshopper sparrow were totally absent as breeders in some open field areas. Many of the hayfield areas (cropland) contain grassland species and often more individuals than some open fields. Only two species were encountered in high numbers in open fields during the one-year study. Large flocks of starlings were encountered during summer, and fairly high numbers of redwinged blackbirds were encountered during spring and summer.

2.426
The cumulative diversity index of shrub avian population was the second highest at all seasons. It was not significantly different from that of northern hardwoods except in summer when the shrub value was higher. The number of species seen in the shrub community showed

TABLE 2-59

IMPORTANT AND RELATIVELY COMMON BIRD SPECIES OBSERVED SHERIDAN SITE

Species*	
Black Duck	I, C
Scaup sp.	I, C
Common Goldeneye	I, C
Red-tailed Hawk	I
Marsh Hawk	I
American Kestrel	I
Ring-necked Pheasant	I
Killdeer	C
Herring Gull	C
Ring-billed Gull	C
Common Tern	C
Mourning Dove	I, C
Downy Woodpecker	C
Eastern Wood Peewee	C
Horned Lark	-
Barn Swallow	-
Blue Jay	C
Common Crow	-
Black-capped Chickadee	C
Gray Catbird	C
American Robin	C
Woodthrush	C
Golden-crowned Kinglet	-
Cedar Waxwing	C
Northern Shrike	I
Starling	C
Red-eyed Vireo	C
Yellow Warbler	C
Common Yellowthroat	C
American Redstart	C
Bobolink	C
Eastern Meadowlark	C
Red-winged Blackbird	C
Common Grackle	-
Cardinal	C
American Goldfinch	C
Rufous-sided Towhee	C
Savannah Sparrow	C
Grasshopper Sparrow	I
Henslow's Sparrow	I

TABLE 2-59 (Cont'd)

IMPORTANT AND RELATIVELY COMMON BIRD SPECIES OBSERVED SHERIDAN SITE

Species*	
Dark-eyed Junco	C
Tree Sparrow	C
Field Sparrow	C
White-throated Sparrow	-
Song Sparrow	C
Snow Bunting	C

C = Species included on list due to their abundance

I = Species included on list for reasons other than their abundance (gamebirds, etc.)

* Derived from winter and summer lists

a high peak during the migration seasons, with 67 species noted in fall and 53 species in spring. Thirteen species occurred in the winter in this community; most of these were also noted in the northern hardwoods community. Twenty-three species of birds were recorded as breeding in the four shrub areas censused, and another dozen or so species were noted breeding in other shrub areas. The estimated density of breeding pairs per 100 acres (193) of shrub community was higher than all other communities censused.

2.427
Because of the variety of shrub communities and the great diversity in shrub species, shrub height, and shrub density even within a particular shrub, it would be expected that the avian population of this community would be diverse. The value for the estimated number of breeding pairs is particularly high due to the high densities of a few species. The yellow warbler had the highest density value (40 pairs per 100 acres) of any species on the study area. Estimated density values per 100 acres for the song sparrow (25 pairs), gray catbird (24 pairs), common yellowthroat (23 pairs), and willow flycatcher (19 pairs) were approached or equaled by only a few species in northern hardwoods forest and one species in the cropland sample.

2.428
During winter, this community provides more protection from harsh weather than do the more open areas. In this season, a more diverse food supply in respect to food form is also more available in the shrub than in the open fields. In addition to weed seeds, many fruits and berries are available and these are particularly important during the winter season.

2.429
A greater number of species (107) was seen in the northern hardwoods forest than in any other plant community during the one-year study. Only in the fall migration period, when three more species were noted in the shrub than in the northern hardwoods, did any community have a higher number of species. As with the other plant communities, peaks in the number of species present in the northern hardwoods forest were noted in both spring and fall. During the winter period, 19 species were observed in the northern hardwoods; this was six more species than observed in the shrub community, which ranked second in species numbers at this time. The greatest number of species breeding within a plant community was found in the northern hardwoods forest. Thirty species were found breeding in the four census areas studied, and at least seven other species were recorded as breeding in other northern hardwoods areas. The index of diversity for the breeding population was highest in the northern hardwoods community. The estimated total number of breeding pairs of birds per 100 acres was substantially higher than for all plant communities except the shrub community.

2.430
Several species of birds are associated almost entirely with the northern hardwoods forest on the study area. Species such as the eastern wood pewee, ovenbird, great crested flycatcher, and Acadian flycatcher would occur in other communities only as visitors and would breed only in northern hardwoods or possibly other forested areas on the study area. In addition, species such as the red-eyed vireo, wood thrush, American redstart, and veery reached their peak densities in northern hardwoods forest although they were found breeding in the more mature shrub areas. Species that were more common in shrub areas as breeders but that utilize forest ecotones and understory include the song sparrow, gray catbird, indigo bunting, yellow warbler, common yellowthroat, and red-winged blackbird.

2.431
The vineyard community had the lowest number of avian species (40) of any plant community on the Sheridan study area during the one-year study. Seasonally, the number of species encountered in the vineyards was lower than all other communities except for the fall, when eight more species were found in the vineyards than in the open fields. Eight species of birds were found breeding in the two census areas, and only three other species were noted in other vineyards. The estimated number of pairs per 100 acres (48) was below all other communities except for cropland (46). The field sparrow was the only breeding species found in both vineyard census areas; however, these areas were only portions of vineyards. Field observations indicate that nearly all vineyards are utilized as breeding habitat by field sparrows, song sparrows, robins, and possibly chipping sparrows and red-winged blackbirds. The number of birds seen was lowest during fall and spring in the vineyards. In the winter, a single flock of 267 starlings accounted for all but two of the birds found.

2.432
There are several factors that contribute to the generally low level of utilization of the vineyards by avian species. Of course, the reduced diversity of plant species and growth form would directly affect the diversity of avian species. Human activity due to cultivation practices has a great effect on the bird populations. The presence of humans during seasons when vines are being pruned and retied, the use of machinery to plow between rows and during the harvest, the use of gas cannons to repel birds during late summer, and the spraying of insecticides, fungicides, and herbicides would discourage the use of this community by birds. In addition, the lack of foliage on the vines during winter and the presence of open rows provide little protection from harsh weather conditions. The highest diversity of the avian population of the vineyards was recorded during fall sampling. This may be due to the presence of ripe grapes before harvest and waste grapes after the harvest. These grapes may

serve as a food source to migrant species; however, since a low number of birds per man-hour was encountered, this probably does not represent a major food source.

2.433
During the one-year study, 53 species of birds were seen in the cropland community. The highest number of species (31) was seen in the fall and summer, and the lowest number was observed in the winter. As was the case with open fields and vineyards, the seasonal cumulative diversity values were generally low. Peak diversity for this community occurred during the fall and spring migrations. The breeding bird composition was quite similar to that of the open field. Six species of birds were recorded as breeders in the 45 acres censused, and nine species were noted in other cropland areas. In many respects, the avian populations of the cropland areas of the Sheridan study area are similar to the avian populations of open fields. Many open field species utilize croplands, especially hayfields, to a great degree and could be found in both communities at all seasons. Almost all of the species that nested in open fields were also found breeding in cropland areas.

Mammals
2.434
Forty-six mammalian species were reported (Burt 1957) to be native to western New York. A list of those species is presented in Table 2-34. Twenty-four species were positively identified at the Sheridan study area.

2.435
Burt (1957) reports five species of shrews to be native to this region; three of these, the masked shrew, least shrew, and shorttail shrew, were noted on the Sheridan study area. The smoky and longtail shrew both prefer coniferous habitats, particularly hemlock (Doutt et al., 1967). The small amount of this type of habitat on the Sheridan study area may explain the absence of these shrews.

2.436
Although moles were not observed at the Sheridan site, the starnose and hairytail moles are reported to be native to the area. The distribution of starnose moles on the study area is unknown but its preference for very wet soils may be the major factor determining where it is located. The hairytail mole commonly inhabits drier soils with a higher sand and lower clay content than was found on the lake plain (Doutt et al., 1967). Therefore, the seasonally high water table and poor drainage found in some portions of the Sheridan study area may make this area unsuitable for hairy-tail moles.

2.437
The only member of the family Leporidae found on the lake plain is the eastern cottontail (Burt, 1957). At the Sheridan site, the eastern cottontail was recorded in every plant community except cropland and was found to be very common, particularly in shrub communities. As a result of their value as a game animal and as prey for a variety of predators, cottontails are one of the most important mammalian species in this region.

2.438
The woodchuck is the largest member of the family Sciurdiae native to this region (Burt, 1957). Due to the poor soil drainage, high water table, and flat topography in this area, the number of locations suitable for the construction of burrows is limited. Thus, the majority of burrows were found along the railroad tracks where elevated track bed provided better burrowing conditions. In addition to providing shelter for woodchucks, the burrows are frequently used by other mammals, especially cottontails (Trippensee, 1948).

2.439
The forested portion of the study area supported populations of five other sciurid species: eastern chipmunk, eastern fox squirrel, eastern gray squirrel, red squirrel, and southern flying squirrel. Of these, the eastern chipmunk is probably the most abundant and widely distributed on the study area. Only three fox squirrels were sighted and those were observed in the northern hardwood forests. The low number of observations has been attributed to the fact that the Sheridan area lies on the edge of the range of fox squirrels in New York. The flying squirrel, this region's only nocturnal native sciurid, was primarily found in the forested areas where there is an abundance of dead or dying trees. The red squirrel, typically associated with coniferous forests, was commonly reported in the hardwoods forests at the Sheridan site. However, they were also seen in shrub, pine, and residential communities. On the Sheridan study area, unlike the Pomfret study area where none were observed, gray squirrels seemed to be more abundant than fox squirrels.

2.440
During spring, a beaver dam was located in the small stream south of Waite Road and between the railroad tracks and Route 5. Evidence of beaver activity included dams, aspen cuttings, and tracks in the mud along the edge of the stream. Beavers were not actually seen until summer when several sightings were recorded. Since no more than one beaver was ever seen at the same time, the exact number of beavers is unknown. Opportunities for beavers to inhabit this region are probably limited by a lack of suitable bodies of water and the presence of a great deal of human activity.

2.441
Burt (1957) reports that seven members of the family Cricetidae inhabit the eastern shore of Lake Erie. Of these, four were definitely identified on the Sheridan study area. The white-footed mouse proved to be the most abundant mammal on the Sheridan study area with a total of 338 individuals having been captured. They were found in every community sampled. The other three species found include the prairie deer mouse, meadow vole, and the muskrat.

2.442
Ecologically, the white-footed mouse is one of the most important mammals in this region. Their abundant numbers and high population turnover rate result in this species being very important in the energy flow through many plant communities. They consume large quantitites of seeds and insects and are in turn the major food source for a diverse group of predators. It is logical to assume that in the absence of high numbers of meadow voles, such as was demonstrated during this survey, white-footed mice and cottontails become the major mammalian prey species. This species is thus important as a baseline food source for local predators, and pressure on these animals probably varies from year to year partially in response to the availability of alternate prey species.

2.443
Muskrats were noted in many ponds, streams, and ditches on the Sheridan study area. No quantitative measure is available to indicate the population levels present, but enough evidence was found to indicate that they were fairly common.

2.444
Meadow jumping mice (family Zapodidae) were observed in open field, shrub, and northern hardwood forest communities.

2.445
Two native canids (red fox and gray fox) were found in most of the plant communities. There did appear to be some difference in habitat use by these two species. Gray fox sightings and tracks were usually noted in areas characterized by grape tangles and hardwoods forest, whereas evidence of red fox activity was usually found in more open situations.

2.446
The raccoon is one of the most common medium-sized mammals on the Sheridan study area. Evidence of raccoon activity was noted in the following plant communities: shrub, northern hardwoods forest, black locust forest, vineyard, and cropland. The raccoon, with its highly omnivorous food habits, is one of the most important mammals in this region (Burt, 1957). During spring and summer, almost every stream

or pond that was visited was found to have raccoon tracks in the surrounding mud, thus indicating that aquatic food was being intensively sought. Normally, raccoons reach their greatest densities in areas containing a variety of plant communities and an adequate supply of denning sites, which are used for raising young and for shelter during winter.

2.447
The striped skunk was the only mustelid definitely identified during the survey. The striped skunk is the largest of the mustelids reported by Burt (1957) to be native to this area. During summer, four skunks were trapped in the pine plantation and there was evidence that skunks had been digging in the layer of pine needles on the ground, probably in search of insects. Considering the small number of recorded observations of this species in other communities, especially the lack of road kills, it is concluded that striped skunks are not currently very common in the Sheridan study area. Of the four other mustelids found in this area (Burt, 1957) the least weasel is the rarest weasel found in this region; even under ideal conditions, it never occurs in appreciable numbers. Other species reported to be native to this area but not definitely recorded during the course of the mammal survey are the longtail and shorttail weasels (Burt, 1957). Since many weasel tracks were found in the snow and it is very difficult to distinguish the tracks of longtail from shorttail weasels, it is possible that they were both present on the study area. Two shorttail weasels were captured on the Pomfret study area and Richmond and Rosland (1949) reported that longtail weasels were much more common than shorttail weasels in northwestern Pennslyvania. As did the red and gray foxes, the small weasels appeared to be concentrating their winter hunting effort in the shrub and hardwoods forest communities. It is assumed that white-footed mice were the major prey item of these species during this study. No mink were seen during this survey, but they were reported on the Pomfret study area. In addition, some of the tracks found in the snow and recorded as unidentified weasels were large enough to have been mink but, due to unsuitable snow conditions, an exact identification was not possible.

2.448
The white-tailed deer populations of the Sheridan site are similar to those described at the Pomfret site.

2.449
Eight species of mammals were found to be permanent residents of the open field community on the Sheridan study area: woodchucks, masked shrews, least shrews, shorttail shrews, meadow voles, deer mice, white-footed mice, and meadow jumping mice. White-footed mice were the most abundant species in this community, while the number of

meadow voles appeared to be unusually low. Normally, meadow voles are the most numerous mammal in an open field; due to the cyclic properties of their populations, however, they frequently reach very low densities (Doutt et al., 1967). Woodchucks were also noted in open fields, but seemed to be more numerous in pastured fields and shrub areas along the railroad tracks where high banks provided excellent burrowing conditions.

2.450
Eastern cottontails were trapped in an open field during fall. For all practical purposes, this species was absent from open fields during winter and early spring. Cottontails probably used this habitat during summer and shifted into communities such as shrub and northern hardwoods forests in winter when the herbaceous cover in open fields was blanketed with snow.

2.451
Several species were noted traveling across open fields, including the red fox, opossum, domestic dog, striped skunk, and white-tailed deer. During summer, white-tailed deer were frequently seen feeding on herbaceous plant material, but track surveys revealed that during winter they traveled across open fields without stopping to feed.

2.452
In summary, the mammalian use of open fields during this survey was relatively low, possibly as a result of an apparently low population of meadow voles.

During periods of peak vole densities, both mammalian and avian predators (raptors) would be expected to make greater use of this type of plant community.

2.453
Thirteen species were identified in the shrub communities. The variation found in this community is probably due to the presence of a variety of both herbaceous and woody plants, which provide suitable habitat for species typical of both open fields and forested areas. For example, both meadow jumping mice and red squirrels were recorded in shrub communities. Normally, these species are found in totally different habitats, however, in this case, herbaceous ground cover and tall woody plants, allows them to coinhabit the area.

2.454
Woodchucks were sighted along the railroad tracks where elevated railbeds provide excellent burrowing conditions. Beaver were also observed in areas where aspen predominated along a small stream that flowed through the community.

2.455
Twenty mammalian species were reported in the northern hardwoods forest community. The hardwoods forests offer a wide variety of food and shelter and thus are usually occupied by a diverse assortment of mammals ranging from fossorial species such as moles, which find plentiful quantities of food in the soil and leaf litter, to arboreal types such as squirrels, whose feeding and cover requirements are met by the canopy-forming trees. Not only does each forest provide a multitude of habitat components, but each is to some extent different from all others and thus more suitable for particular species. Dead or decaying trees were numerous in some forests and were probably responsible for differences in the distribution of such species as raccoons and squirrels, both of which use tree dens for shelter and raising young. Other differences such as the presence of streams, adjacent community types, and local drainage patterns can also be responsible for differences in mammal usage. Differences in the foliage profile structure, depth of soil litter, and amount of debris found on the forest floor are responsible for some of the variation in the numbers of small rodents such as white-footed mice (McCloskey and Lajoie, 1975). On an annual basis, the population densities of small rodents and the amount of usage by large herbivores are partly influenced by the production of hard and soft mast such as the fruits of dogwood, maple, ash, hickories, beech, and oak. Since the quantity and quality of mast varies from year to year, the populations of those species that rely on mast, particularly for winter food, will reflect current successes or failures in the production of this important source of food.

2.456
Seven species of mammals were observed in the pine plantation. Of these only the shorttail shrew, white-footed mouse and red squirrel were found to be permanent residents. The white-footed mouse was the only mammal found in appreciable numbers. Deer and foxes were found to be transients utilizing the area primarily as a travel route or a temporary shelter.

2.457
The pine community bears a strong similarity to the shrub, black locust forest, and vineyard communities.

2.458
The monoculture characteristic of the pine plantation is reflected by its limited species composition. Other monocultures such as the black locust forest and vineyard communities all have a similar composition of mammalian species. Only five species were identified in the black locust forest community and seven in the vineyard community. Trapping data for these areas included chipmunks, white-footed mice, shorttail shrew, and a prairie deer mouse in the vineyard community.

2.459
Since croplands were not trapped, a completely valid comparison cannot be made with other plant communities. Only vineyards and black locust forests, both monocultural community types, displayed a similarity to cropland. Had croplands been trapped, it is suspected that a higher similarity with vineyards and open fields would have been displayed. Only five species (woodchucks, opossums, raccoons, bats, and deer) were recorded in croplands. Of these, the deer and raccoon were most important from an economic standpoint, since they both feed on agricultural crops, especially corn, when available. The amount of mammal activity in this community type depends on a variety of factors, such as the type of crop, cultivation practices, and the composition of adjacent community types.

PROTECTED, THREATENED, AND ENDANGERED STATUS

Flora
2.460
Many of the plant species collected at the Sheridan site can be found on the New York State Department of Environmental Conservation list of Protected Native Plants. A list of these species, the habitat in which they were most commonly found, and comments regarding abundance is presented for both the Sheridan and Pomfret plant sites in Table 2-36. It should be noted that collection of the plants on this list without the express permission of the landowner is a violation of Section 193.3 of the New York Penal Code and those doing so are subject to a fine. The New York State Protected Native Plants List does not offer the same kinds of protection afforded under the Federal Endangered Species Act.

2.461
None of the species included in the Smithsonian Institute's 1975 Report on Endangered and Threatened Plant Species of the United States were encountered at the Sheridan site or the extended area surrounding it.

Herpetofauna
2.462
No amphibian or reptile listed as endangered by the U.S. Department of the Interior (USDI) (United States Lists of Endangered Fauna, 1974) was found on the Sheridan study area, nor is the study area within the range of any such species.

Avifauna
2.463
No birds listed as endangered on the United States List of Endangered Fauna (USDI, 1974) were observed on the Sheridan study area. However, two such birds, a bald eagle and an peregrine falcon, did

occur on the nearby Pomfret study area and could be considered as potentially occurring on the Sheridan study area. The status of these species would be the same on the Sheridan study area as it was on the Pomfret study area.

Mammals

2.464
Three mammalian species that might possibly be found in western New York have been designated as endangered (USDI, 1974). These include the Indiana bat (Myotis sodalis), eastern timber wolf (Canis lupus lycaon), and eastern cougar (Felis concolor cougar).

2.465
The Indiana bat is native to most of the eastern United States, particularly the Appalachian mountain region (Burt, 1957). Barbour and Davis (1969) note that western New York is on the periphery of the currently known range of this species. The use of limestone caves for winter hibernation seems to be the critical factor in the survival of the Indiana bat. During the warm months, these mammals disperse from the wintering caves; little is known about their habits or distribution at this time. Since the lake plain area is basically devoid of limestone deposits (Muller, 1963), it is reasonable to assume that no appropriate wintering areas are available for Indiana bats. The actual occurrence of the Indiana bat on the study areas is unknown since bats were seen but not collected, and identification in flight is very difficult. This especially is true in the case of the Indiana bat, which is almost identical to the little brown bat (Myotis lucifugus), a common species in this region (Barbour and Davis, 1969).

2.466
Western New York is currently not in the range of the eastern timber wolf and, due to the requirements of this species for wilderness conditions, probably never will be. The U.S. Fish and Wildlife Service (Threatened Wildlife of the United States, 1973) reported that one specimen was shot in Fulton County, New York, in 1968.

2.467
The distribution of the eastern cougar is currently unknown, but there does appear to be a recent range extension from both the Maritime Provinces in Canada and the New England States. The only datum bearing any importance to the Pomfret and Sheridan study areas is of a cougar killed in 1967 in Crawford County, Pennsylvania, approximately 60 miles southwest of the study areas. As in the case of the wolf, this species requires wilderness conditions; thus, the Pomfret and Sheridan areas do not represent suitable habitat.

Arthropods

2.468

In 1975, the U.S. Department of Interior gave notice that a review of the status of a number of butterfly species was necessary in order to determine if these species should be proposed for listing as either endangered or threatened species.

2.469

One species (Hessel's hairstreak, Callophrys hesseli) and one subspecies (Karner blue, Lycaeides melissa samuelis) listed are reported to occur in New York. Neither was found on the Sheridan study area, although no special effort was made to locate them.

Fish

2.470

Several sources were consulted to derive a list of the threatened or endangered species to be found in Lake Erie and Eastern Basin tributary streams. These include Van meter and Trautman, (1970), Miller (1972), U.S. Dept. of Interior, (1974), and The New York DEC State list of fishes (1974). The species which were reported in these sources as potentially existing in Eastern Lake Erie and its tributaries are the lake sturgeon, longjaw cisco, and blue pike. The pugnose minnow (Notropis emiliae) was listed as rare in the Lake Erie watershed (Vanheter & Trautman, 1976), but is not listed on the Federal or New York State lists of threatened and endangered species.

2.470 a.

No cisco or blue pike were caught in the Lake Erie Generating Station study areas. One Lake Sturgeon over five feet long was caught during an ichthyoplankton tow with 1-meter gear near the Sheridan site. This fish was quickly released before it could harm itself. A few fish identified as pugnose minnows were caught in the tributaries near the sites, especially in Little Canadaway Creek (Pomfret site). At Sheridan, this species was collected from Ryder Creek (on-site), Walnut Creek (off-site) and Silver Creek (off-site).

2.471

The applicant's consultant on fisheries, Texas Instrument, believes there are very few of the three endangered species in the New York nearshore areas of Lake Erie. TI's sampling effort in the Dunkirk area was intense, covering parts of three years and utilized a variety of fisheries sampling gears, and only one specimen, the lake sturgeon, was found.

CHAPTER THREE: RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

POMFRET SITE

EXISTING LAND USE PLANS

3.001
The applicant will comply with all the applicable laws, rules, regulations and standards relevant to the location, design, construction, operation and maintenance of the proposed facilities. The applicant will also comply with all Federal ordinances and land use plans that pertain to the site areas.

State and Regional

3.002
State and regional ordinances and land use plans that affect the site area are cited on Table 3-1. Although the State and regional plans differ somewhat on definitions and details, there is a general consensus that the proposed Pomfret site be maintained in agricultural use due to the high economic viability of the farms generally found in this region. For instance, the New York State Development Plan (1972) and the New York Appalachian Development Plan (1972) both classify the site as "exceptional farming." Likewise, the Dunkirk-Fredonia Region Master Plan Update (1974) identifies much of the northern part of the site as "prime agriculture", while that section which centers on the Fredonia Airport and that which is located south of the railroad tracks are designated as "prime agriculture (with future industrial potential)." With the exception of portions of this latter plan, none of these plans proposes industrial uses for any portion of the site. Given those considerations, it is concluded that the proposed use of the site for a power plant is not in accord with existing State and regional land use plans which generally call for the maintenance of agricultural land.

3.003
Although the proposed use of the Pomfret site is inconsistent with State and regional plans, the actual impact on these plans is small when viewed against the relative supply of active agricultural land both locally and regionally. The 1,054-acre Pomfret site contains approximately 454 acres of active agricultural land. The project is expected to remove from active agricultural use approximately 2.2 percent of the total active farmland found in Portland and Pomfret; 1.3 percent of that found in the Dunkirk-Fredonia region; and 0.2 percent of that found in Chautauqua County.

TABLE 3-1

AREA REGULATIONS APPLICABLE TO THE USE OF POMFRET SITE

Local Zoning Ordinances

Town of Pomfret Zoning Ordinance, 1974

Local Comprehensive Plans

*Town of Pomfret Comprehensive Plan, 1965
Town of Portland Comprehensive Plan, 1974

County Plans

*Chautauqua County Dialogue Plan, 1963
**Chautauqua County Comprehensive Water Supply Plan, 1971
**Chautauqua County Comprehensive Sewerage Plan, 1971
**Chautauqua County Park System Plan, 1968

Regional Plans

*Southern Tier West General Land Use Plan, 1972
Dunkirk-Fredonia Regional Master Plan, 1974

State Plans

New York State Development Plan, 1971
New York State's Appalachian Development Plan, 1971
**New York Statewide Recreation Plan, 1972
**New York Statewide Master Plan for Transportation, 1973

State Regulations

Agricultural District Act (Article 25AA)

Special District Designations

Town of Pomfret Agricultural District
Town of Portland Agricultural District
*Brocton Central School District #51
**Fredonia Central School District #69
**Pomfret Fire Protection District
**Portland Fire Protection District #1
**Portland Water District #1

*Plan out-of-date and no longer relevant

**No identifiable use proposed for the site.

3.004
The use of the Pomfret site, located within the Portland and Pomfret Agricultural Districts, is not considered in conformity with the expressed purpose of New York State's Agricultural District Act (Article 25AA). Since the entire site is classified as being within the Portland and Pomfret Agricultural Districts (though only 442 acres are in active agricultural use), the degree of impact associated with committing the site to a non-agricultural use may be likewise evaluated in terms of the relative number of acres similarly designated in Portland and Pomfret. The proposed project would pre-empt 891 of the 13,355 acres contained within the Pomfret Agricultural District and 163 of the 15,870 acres in the Portland Agricultural District (Luensman, 1974). Based upon these statistics, the proposed action would have a moderate impact on the Pomfret Agricultural District since 6.7 percent of this special district would be pre-empted. On the other hand, the proposed action could have no significant impact on the Portland Agriculture District since 99 percent of this district would remain intact.

3.005
In conclusion, the overall impact of the proposed project in relationship to existing land use plans is quite small. Although the site area is generally classified as agricultural land at the State and regional level, the relative abundance of this activity makes the pre-emption of such land for an industrial purpose appear insignificant. Regional and local land use considerations are included in the Article VIII certification process of New York.

Local Land Use Plans

3.006
Local ordinances and land use plans that affect the site area are cited in Table 3-1. According to M. Douglas Carter, Chairman of the Pomfret Zoning Commission, the 1974 Pomfret Zoning Ordinance replaces the 1965 Pomfret Comprehensive Plan as a guide to future land uses in the town (Carter, 1975). On the other hand, Mr. Marden Cobb, Chairman of the Pomfret Planning Committee, indicates that there is in fact a current town master plan. This plan, according to Mr. Cobb, is embodied in the 1974 Dunkirk-Fredonia Regional Master Plan (Cobb, 1975), although there is no specific section devoted to Pomfret in this latter plan.

3.007
The Dunkirk-Fredonia Regional Master Plan identifies two land uses for that section of the site which is located in the town of Pomfret. The airport and the area south of the railroad tracks are designated as "prime agriculture (with future industrial potential)", while the remainder of the Pomfret section of the site west of the airport and east of the Portland town line is identified as "prime agriculture."

The proposed use of the site is considered compatible with the first land use category (agricultural with future industrial potential) under limited conditions. The proposed use of the site is considered compatible with the recited land use category under limited conditions, for as the plan notes with regard to "prime agriculture (with future industrial potential),"

> These areas should be carefully evaluated before industrial expansion occurs, since they have value as agricultural lands. Once the determination is made to convert these areas from agricultural uses to industrial uses they are not lost forever as prime agricultural land. The economic needs of the area as well as the environmental impact on the area must be considered if these areas are to be converted (Kendree and Shepard Planning Consultants, Inc., 1974).

Thus, potential future industrial use is based on a reasonable balance of economic and environmental needs. The reason for portions of the site being listed in the category of "prime agriculture (with future industrial potential)" is the proximity of those areas to the railroads and other transportation facilities, such as the New York State Thruway, U. S. Route 20 and New York Route 5.

3.008
However, the proposed industrial use of the site is considered inconsistent with the latter category, "prime agriculture," because this land use designation makes no reference to the inclusion of industrial activities. The degree of impact associated with the preemption of this land use is small when compared against the amount of active agricultural land contained within the town. According to the LUNR County Summaries, 11,827 acres of Pomfret's total land area is in active agricultural use (State of New York, Office of Planning Services, 1972). Therefore, the removal of approximately 430 acres identified as "prime agricultural" land would represent only 3.6 percent of the total active agricultural land in the town. Approximately 163 acres of the 1,054 acre site are located within the town of Portland. Although the town has no zoning ordinance to date, there is a master plan for the town which was prepared in 1974 and incorporated in the Dunkirk-Fredonia Master Plan (1974).

3.009
The Portland Master Plan identifies two uses for the site. The 113 acres located in the triangular area bounded by Route 5, Lake Road and the Pomfret-Portland town boundary are delineated as "residential" while the 51-acre switchyard area is identified as "vineyards." The proposed project is incompatible with both land use designations since neither category provides for the inclusion of industrial uses. The degree of impact associated with the preemption of these activities is small, however, when viewed against

the number of acres currently devoted to these land uses in the town of Portland.

3.010
In view of the abundance of land potentially available for future residential use in addition to that which currently serves this purpose, the pre-emption of 113 acres is minor. Similarly, the preemption of 53 acres of potential grape land is minimal, since there were approximately 4,127 acres of grapes found throughout the town in 1973, according to the aforementioned source.

3.011
Private land use plans for the site were also investigated. According to both Mr. Stewart Dudley, Supervisor of the town of Pompret (n.d.) and Mr. Gerald Tubbs, Supervisor of the town of Portland (1975), there are no such plans indicating subdivision proposals or requests for variances. As a result, the proposed use of the site is not in contravention of any known private land use plans.

3.012
In conclusion, the proposed project is considered consistent with the town of Pomfret's zoning ordinance though not in conformance with either the town of Portland's master plan or with major sections of Pomfret's updated plan. In addition, the proposed project is not compatible with either town's agricultural district status. The degree of impact upon these latter three plans is minimal, however, when viewed against the relative number of acres available in each town for each of the planned purposes. Such land use considerations, as well as resolution of zoning problems, are included in the Article VIII certification process of New York.

Compliance

3.013
The proposed facility is not in accordance with local and regional land use plans, as described above. As mentioned previously, under New York State law, Article VIII certification incorporates local zoning conflicts in its considerations and provides for a resolution. Therefore, provided Article VIII certification is attained, conflicts with local zoning will be resolved. The manner in which resolution of conflicts is achieved is discussed in paragraph 3.022.

3.014
Federal, State, and local agencies responsible for land use planning were contacted in writing by the U.S. Army Engineer District, Buffalo, to determine the relationship of the proposed action to land use plans or proposals. The agencies that were contacted are listed in Chapter Nine of this impact statement. None of the contacted

TABLE 3-2

AREA REGULATIONS APPLICABLE TO USE OF SHERIDAN SITE

Local Zoning

Town of Sheridan Zoning Ordinance, 1970

Local Comprehensive Plans

Town of Sheridan Comprehensive Plan, 1965

County Plans

*Chautauqua County Dialogue Plan, 1963

**Chautauqua County Comprehensive Water Supply Plan, 1971

**Chautauqua County Comprehensive Sewerage Plan, 1971

**Chautauqua County Park Plan, 1968

Regional Plans

*Southern Tier West General Land Use Plan, 1972

Dunkirk-Fredonia Regional Master Plan, 1974

State Plans

New York State Development Plan, 1971

New York State's Appalachian Development Plan, 1971

**New York Statewide Recreation Plan, 1972

**New York Statewide Master Plan for Transportation, 1973

State Regulations

Agricultural District Act (Article 25AA)

Special Districts

Town of Sheridan Agricultural District

**Silver Creek Central School District #67/8

**Silver Creek Central School District #67

**Sheridan Fire District #1

*Plan out-of-date and no longer relevant

**No identifiable use proposed for site

agencies submitted adverse responses concerning the proposed Lake Erie Generating Station at Pomfret or Sheridan, NY.

SHERIDAN SITE

EXISTING LAND USE PLANS

State and Regional

3.015
State and regional ordinances and land use plans that affect the site area are cited in Table 3-2. The New York State Development Plan (1972) and the New York Appalachian Development Plan (1972) both classify the site as "exceptional farming." Similarly, the Dunkirk-Fredonia Region Master Plan Update (1974) identifies that section of the site which is located south of the Norfolk and Western railroad tracks as "prime agriculture," while the northern portion of the site above those railroad tracks is delineated as "prime agriculture (with future industrial potential)." With the exception of parts of this latter plan, none of the various State or regional land use plans proposes industrial uses for any portion of the site. Given these considerations, it is concluded that the proposed use of the site for a power plant is not in accord with existing land use plans which generally call for the maintenance of agricultural land.

3.016
Although the proposed use of the Sheridan site is inconsistent with State and regional plans, the actual impact on these plans is small when viewed against the relative supply of active agricultural land both locally and regionally. The 986-acre Sheridan site contains approximately 447 acres of active agricultural land. The proposed facility will remove from active agricultural use approximately 3.6 percent of that land found in the town of Sheridan, 1.3 percent of that found in the Dunkirk-Fredonia region, and 0.2 percent of that found countywide.

3.017
The proposed use of the Sheridan site is considered not in conformity with the expressed purpose of the Agricultural District Act (Article 25AA). Since the entire site is classified as being within the Sheridan Agricultural District (though only 447 acres are in active agricultural use), the degree of impact associated with committing the site to a nonagricultural use may be likewise evaluated in terms of the number of acres similarly designated in the town of Sheridan. The proposed project would pre-empt 986 of the 20,500 acres contained within the Sheridan Agricultural District (Luensman, 1974). Based upon this relationship, the proposed action would have a moderate impact on the Sheridan Agricultural District, since 4.8 percent of

this special district would be removed. This degree of impact is somewhat mitigated in view of the true number of active agricultural acres being pre-empted by the project. As previously mentioned, approximately 3.6 percent of the total active farmland found in Sheridan will be committed to a nonagricultural use by the proposed action. Such land use considerations are included in the Article VIII certification process of New York.

Local Land Use Plans

3.018
Local ordinances and land use plans that affect the site area are cited in Table 3-2. The entire site is zoned Agricultural-Residential II, a district which does not designate power plants as a permitted use (Town of Sheridan Zoning Ordinance, 1970). Therefore, the proposed project does not conform with the Sheridan zoning ordinance, nor does it conform to any other local land use plans that call for the maintenance of agricultural land comprising the site (Table 3-2). However, under New York State law, Article VIII certification provides for the resolution of conflicts with local zoning ordinances. The manner in which conflicts are resolved is discussed in paragraph 3.022.

3.019
Private land use plans for the site were also investigated. According to Mr. Wayne L. Luce (1975), Supervisor of the town of Sheridan, there are no such plans including subdivision proposals or requests for variances. As a result, the proposed use of the site is not in contravention of any known private land use plans.

3.020
In conclusion, the overall impact of the proposed project in relationship to existing land use plans is quite small. Although the site area is generally classified as agricultural land, the relative abundance of land for this activity locally and regionally makes the pre-emption of such land for an industrial purpose appear insignificant. Such land use considerations are included in the Article VIII certification process of New York.

Compliance
3.021
The proposed facility is not in accordance with local and regional land use plans, as described above. As mentioned previously, Article VIII certification incorporates local zoning conflicts in its considerations and provides for a resolution. Therefore, providing Article VIII certification is attained, conflicts with local zoning will be resolved.

3.022

The statement of Legislative Findings which accompanied passage of Article VIII of the Public Service Law of the State of New York indicated that the purpose of the Act "was to provide for the expeditious resolution of all matters concerning the location of major stream electric generating facilities presently under the jurisdiction of multiple state and local agencies, including all matters of state and local law, in a single proceeding . . ." Public Service Law (PSL), State of New York, S140, Legislative Findings. In PSL S146(2)(d) the Board on Electric Generation Siting and the Environment (Sitting Board) is given the statutory authority to refuse to apply any local ordinance, law, resolution or the like if it finds that as applied to the proposed facility such local ordinance, law or resolution is "Unreasonably restrictive." The applicant has identified the town of Sheridan Zoning Ordinance zoning of the Sheridan site as Agricultural-Residential II, the town of Pomfret Zoning Ordinance zoning of the Pomfret site as Agricultrual and Resorts, Rural Residence and Light Industry and the incorporation of the Sheridan and Pomfret sites within agricultural districts as the local laws, ordinances or resolutions which are considered unduly restrictive. Accordingly, Niagara Mohawk has requested the New York State Board on Electric Generation Siting and the Environment to refuse to apply said zoning ordinance and agricultural district designations on the grounds that the aforementioned ordinances are contrary to the intent of,and may be superceded by, the Sitting Board's certification of the facility. It is the Siting Board which has the ultimate ability to, and responsibility for, the resolution of conflicts between the local zoning ordinances and the Article VIII steam electric generating facility siting process.

The impact of the Siting Board's waiver of compliance with the aforementioned local laws or ordinances would be a de facto rezoning of the power plant site proper to allow construction of the steam electric generating facility. The de facto rezoning would only be applicable to those zoned areas within the plant boundaries. The remainder of the areas zoned Agricultural-Residential II (Sheridan), Agricultural and Resourts, Rural Residential and Light Industry (Pomfret) or designated for inclusion within the Pomfret, Portland or Sheridan agricultural districts would remain as zoned or designated. It is possible that the building of the proposed facility, with its concomitant de facto rezoning, might occasion review of and revisions to the local zoning classifications, but such an activity is speculative and within the discretion and powers of the local governmental entities. Zoning conflicts resolution will be forthcoming with the Article VIII certification, which certification should be forthcoming by 1 January 1979 or shortly thereafter.

CHAPTER FOUR: THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

INTRODUCTION

4.001
This chapter addresses the associated impacts which are inherent in the construction, operation, and maintenance of the proposed Lake Erie Generating Station. The action with which this EIS is concerned is the application by the Niagara Mohawk Power Corporation for a Department of the Army permit to construct an offshore coal unloading facility, cooling water intake, discharge system, and coal conveyor tunnel; alter certain on-site streams; and dredge in Lake Erie. The potential direct environmental impacts associated with authorizing construction of these structures, dredging, and stream alterations, largely will be borne by the receiving waters and their biota. Indirect impacts of authorizing construction would result from operation of the generating station and would include effects on air quality, noise, aesthetics, sociological conditions, economics, and others. To describe fully the total array of potential environmental effects, this section details the impacts of construction, operation, and maintenance of the entire facility.

POMFRET SITE

IMPACT OF POWER PLANT CONSTRUCTION

LAND USE

4.002
Construction of the proposed Lake Erie Generating Station at Pomfret would require the clearing of 551 acres or 52.3 percent of the 1054 acre site. This area includes land utilized for both permanent and temporary needs as shown on Table 4-1. Temporary needs will involve approximately eleven acres of land. The remaining acreage will be permanently occupied by facility component. The areas most affected by construction clearing include 213 acres of crop-land, 57 acres of vineyard, 30 acres of residential and recreational land, 76 acres of northern hardwoods, 85 acres of shrub, and 57 acres of open field. Table 4-2 displays Pomfret site land use prior to and after construction clearing. The relationship of land use changes to existing and future land use plans was presented in Chapter Three of this statement.

Topography and Geology

4.003
The topography and underlying geologic structure of the proposed site will not be significantly altered by site preparation and plant

TABLE 4-1

SITE ACREAGE COMMITTED TO PERMANENT AND TEMPORARY POWER PLANT FACILITIES

POMFRET SITE

Permanent Facility Land Use	
Area	Acres
Parking and Receiving	29.86
Plant Island	71.51
Field Office	2.44
Field Fabrication Shops	15.50
Cooling Tower	30.99
Tunnel Adit	7.23
Coal Storage	73.92
Laydown	30.31
Switchyard	22.90
Dry Fly Ash and Bottom Ash Disposal Site	246.0
Coal Pile Runoff Sedimentation Pond	6.00
Total	536.66

Temporary Facility Land Use*	
Area	Acres
Ebasco Field Office	0.15
Owner Field Office	0.09
Craft Change Houses	3.62
Plant Island Fabricating Shop	1.15
Warehouse and Receiving	1.38
Owner Trailer Area	0.46
Subcontractor Trailer Area	1.38
Field Fabrication Shops	1.38
Field Fabrication Shops	1.38
Total	10.99

*Although areas are specified for each temporary structure, these do not add to, but are included within the permanent areas shown above.

TABLE 4 - 2

Pomfret Land Classification of Site Prior to and After Construction Clearance, Western Low Sulfur Coal

Land Classification	Acreage Prior to Construction Clearance	Construction Clearance: Acres Cleared	Construction Clearance: % of Land Lost on Site	Acreage After Construction Clearance
Managed land				
Cropland	331.5	212.9	64.2	118.6
Vineyard	89.8	57.2	63.7	32.6
Residential & Recreational	53.2	29.8	65.0	23.4
Pasture	32.8	24.4	74.4	8.4
NYS Thruway	0.0	0.0	0.0	0.0
Railroad	0.0	0.0	0.0	0.0
Roads	7.2	5.0	69.4	2.2
Fly Ash Dump & Gravel Pit	36.3	10.0	27.5	26.3
Airport	24.3	0.2	0.8	24.1
Subtotal	575.1	339.5		235.6
Vegetation Cover Type				
Northern Hardwood	110.1	76.0	69.0	34.1
Shrub	160.9	85.1	52.9	75.8
Open Field	186.3	56.7	30.4	129.6
Black Locust	1.2	0.8	66.7	0.4
Willow	4.7	3.6	76.6	1.1
Pine Plantation	14.3	13.9	97.2	0.4
Pond	1.4	0.3	21.4	1.1
Subtotal	478.9	236.4		242.5
Total	1054.0	575.9*		478.1

*These acreage figures do not include the new dry fly ash disposal plans, so acreage estimates are 25 acres in excess of what will actually be cleared. The applicant originally proposed a wet ash disposal facility.

construction. The construction of the offshore coal unloading facility will involve tunneling for a distance of 6,900 feet (2,103 m). Approximately 4,650 feet (1,417 m) of this distance will be below the lake bottom and the remainder (2,250 feet, 686 m) will be onshore. This action is not considered to constitute a significant impact which would foreclose future land use options at the site.

Agriculture

4.004
Site preparation, construction activities, and fencing will remove 474 acres of land from active agricultural production. This acreage presently produces a yearly crop (grapes, hay, pasture and truck farming) valued at $233,191. The 474 acres includes areas within the site boundaries that will not actually be cleared. These lands were included in order to meet noise criteria at the site perimeter. Since these areas will be fenced in and taken out of production they have been included in the estimated losses.

4.005
Using corn and tomato crop yields estimated by Pearce (1975), and assuming that the total acreage of cropland is composed of one crop, the applicant projected the potential productivity losses which could occur due to facility construction. However, it is highly unlikely that the total acreage of crop-land would be planted in one crop, and the estimates of productivity losses may be higher than the actual losses. The estimated productivity losses due to facility development could be 16,000-21,000 bushels of dry shelled corn or 3,000-4,300 tons of tomatoes. This is equivalent to 75.2 -98.6 bushels of dry shelled corn per acre, or 15.5 - 20.2 tons of tomatoes per acre. The 1977 average price for a bushel of dry shelled corn in the area is $2.10, which wo ld translate into a potential loss of about $33,600 - $44,100 per year. The 1977 average price for a ton of tomatoes is $75.00 or a total of $247,500 - $322,500 worth of potential agricultal productivity lost on the Pomfret site. In terms of vineyards, the estimate of grape production on the site is four tons per acre, or 228 tons of grapes total for the site. The 1977 average market price for grapes in the area is about $220/ton (including contract and open market prices). This can be translated into a potential loss of about $50,160 worth of grapes per year.

An analysis of the impact of the proposed facility on prime and unique farmland was performed by juxtaposition of the plant layout on soils maps. These maps also delineated unique farmland. Due to the preliminary nature of the Chautauqua County soils survey, extrapolation of the acreage of different soil types within the prime farmlands classification was not possible. Thus, the analysis is not subdivided according to the acreage or percentage of each soil type found on the site. The analysis is as follows:

Site acreage	1,054
Percent of site in active agricultural	45
Acreage of site in active agricultural	474
Percent of site in abandoned agricultural	18
Acreage of site in abandoned agricultural	190
Acreage of unique farmland	8.5
Unique farmland acreage to be impacted by facility components	6
Acreage of unique farmlands within site, but not covered by facility components	2.5
Acreage of prime farmland on the site	768
Acreage of prime farmland to be impacted by facility components	555
Acreage of prime farmland within the site but not covered by facility components	213
Total acreage of prime and unique farmland	776.5
Total acreage of prime and unique farmland impacted by facility components	561
Total acreage of prime and unique farmlands within the site, but not covered by facility components.	215.5

The prime farmland mapping units found within the site are Collamer silt loam, 3-8 percent slopes; Niagara silt loam, 0-3 percent slopes; Galen fine sandy loam, 3-8 percent slopes and Canandaigua silt loam.

Threats to the continued use and viability of prime and unique farmlands for those lands outside the site boundaries, and from such things as urbanization or other changes in land use that might be induced by the proposed facility, are not anticipated. The acreage of prime and unique farmlands within the Pomfret site which will not be occupied by facility components will remain viable farmland, however, those lands will not be used as such since they will be located within the plants's security fences.

The prime and unique farmland occupied by plant structures will be lost for at least the 30 to 40 year life of the facility and possibly longer if the structures remain after decommissioning. Farmland located in areas proposed for solid waste disposal areas will be irreversibly committed. Quantification of this loss of prime and unique farmland on a regional basis is not possible since the Chautauqua County soils survey has not been completed. Accordingly, while not precisely on point, the following facts are set forth to shed some perspective on this impact. While the site is generally classified as agricultural, the relative abundance of this activity both locally and regionally is fairly extensive.

The 1,054 acre Pomfret site contains approximately 474 acres of active agricultural land. The project will remove from active agricultural use approximately 2.2 percent of the total active farmland found in Portland and Pomfret; 1.3 percent of that found in the Dunkirk-Fredonia region; and 0.2 percent of that found in Chautauqua County.

Although agriculture represents the predominant activity taking place on the site, its productive value is small in comparison to the output of the larger Lake Erie Grape Belt Region.

<u>Pomfret Site</u>

Annual Value of Site Agricultural Output	$ 233,191
Annual Value of Agricultural Output of Region	25,000,000
Site as percent of Region	0.9

Transmission Line Corridors

4.006

The construction impact of additional transmission corridors to connect the proposed facility to the rest of the applicant's service system is at the present time speculative. While it is recognized that the impact of transmission lines must be considered in assessing a generating station, only generalized information can be provided due to the fact that specific routes have not yet been chosen. Construction of transmission corridors can induce temporary and permanent changes in the environment through the removal of natural ground cover and subsequent changes in topography and surface runoff characteristics. The general area through which the transmission corridors would run is composed of a variety of habitats. From an ecological point of view, agricultural land is more compatible for transmission line construction than either woodlands or wetlands. There is, thus, ample opportunity to minimize impacts in the proposed corridor by routing along the edges of woodlots or avoiding them entirely. Similarly, large wetlands can be avoided or spanned and protected with buffer zones. While it is expected that a presently unquantifiable amount of ground cover will be removed for construction and a smaller amount redisturbed periodically to protect the lines, the amount will be minimized by techniques such as selective cutting (rather than clear cutting). Inclusion of aesthetic factors in tower design and the use of topography and variable span lengths to hide towers are additional mitigative plans under consideration.

4.007
The actual acreage of land to be cleared for rights-of-way cannot be quantified at this time. On a worst-case basis, 160 miles of corridor with a width of 650 feet (765 kV lines) would occupy 12,600 acres of land. A 765 kV right-of-way with a width of 250 feet would require 4,848 acres of land. The width of the right-of-way for 345 kV circuits would vary between 150 feet and 350 feet. Based on the 150 feet width, and 160 miles of line, the right-of-way would require 2,900 acres of land. A width of 350 feet would affect 6,787 acres. In actuality, the right-of-way widths will vary from area to area, and 50 miles of the total 160 miles consists of an existing corridor which would be widened. It is, therefore, anticipated that the acreage requirements would more closely resemble the lower figures.

TERRESTRIAL ECOLOGY

Fauna

4.008
Impacts on terrestrial fauna due to site preparation and construction will primarily be related to loss of habitat (Table 4-2 and 4-3). Clearing vegetative cover from 551 acres of the site will eliminate or displace faunal species which are permanent or transient inhabitants of the site. Sedentary organisms such as moles, salamanders, and nestling birds are expected to be eliminated, while more mobile species are expected to emigrate from the area when vegetation is cleared. Emigrating individuals will be subject to stresses as a result of displacement from their home ranges. Mammals dispersed into unfamiliar surroundings are considered more vulnerable to predators and other causes of death (Davis and Golley, 1965). It is not anticipated that all of the affected animals will emigrate. Some may remain in or return to areas near temporary construction activities.

4.009
Physical alteration of construction areas will reduce the abundance of small mammals such as white-footed mouse, short-tailed shrew, and meadow vole. The reduction in numbers of these small mammals at Pomfret may affect local predators by reducing the availability of

TABLE 4-3

SMALL MAMMAL AND BREEDING BIRD DENSITIES, AND ACREAGE OF VEGETATIVE COVER TYPES CLEARED AT POMFRET - WESTERN LOW SULFUR COAL

	Vegetative Cover Types Cleared (Acres)			Small Mammals		Breeding Pair of Birds	
	Permanent	Temporary	Total	Density (No/Acre)	No. Spec.	Density (No/Acre)	No. Spec.
Northern Hardwood Forest	47.1	28.9	76.0	44	5	2.5	22
Shrub	42.4	42.7	85.1	53	7	3.1	18
Pine Plantation	13.1	0.8	13.9	25	4	0.8	7
Open Field	32.2	24.5	56.7	51	5	1.4	7
Cropland	180.9	32.0	212.9	*	*	0.1	5
Vineyard	42.2	15.0	57.2	11	2	0.6	8
Pasture	9.2	15.2	24.4	*	*	*	*
Residential	13.1	16.7	29.8	*	*	*	8
Willow	3.6	0.0	3.6	*	*	*	*
Black Locust	0.8	0.0	0.8	*	*	*	*

*Values are not available.

prey. In addition, habitat for other less common small mammals, such as the meadow jumping mouse, masked shrew, red squirrel, and eastern chipmunk will be reduced. The majority of the medium-size and large mammals were observed in shrub or forested plant communities at the site. Clearing of 85 acres of shrub and 76 acres of northern hardwoods will reduce habitat for eastern cottontail, raccoon, and white-tailed deer along with reducing the number of carnivores (red foxes) which utilize them for food. The raccoon will also be impacted due to the planned rerouting and culverting of five onsite streams. Raccoons utilize streams to obtain a portion of their food requirements.

4.010
Movement patterns of wide ranging species such as deer and fox across areas of land affected by construction will be altered to some degree. Deer activity patterns will be reduced through the elimination of forests presently used for cover, or will be altered if construction activity bisects their normal routes. Construction activity and traffic will probably increase the frequency of mammal road kills. The problem results if deer or other mammals are forced to cross a road or move along a railroad or road in the area where there is insufficient escape cover. Construction noise may initially cause many of the more mobile organisms to emigrate from areas adjacent to the noise source. Breeding and feeding activity in or near construction areas may be lower than in areas beyond hearing distance of construction noise.

4.011
Breeding birds which utilize shrub and northern hardwoods forest communities for nesting habitat will suffer the largest impact in the avian population (Table 4-3). The clearing of 76 acres of hardwoods forest will reduce breeding bird habitat for as many as 40 species. The largest number of nesting sites for redeyed vireo, wood thrush, american redstart, and song sparrow will be lost because of their high density in forest habitats. Several other species, such as the black-billed cuckoo, great horned owl, screech owl, whip-poor-will, hairy woodpecker, and ovenbird are apparently restricted to northern hardwood forest for breeding. Because of the time required to restore northern hardwoods forest, species composition of site avifauna will be altered and abundance reduced by removal of northern hardwood forest.

4.012
The removal of 85 acres of the shrub cover type has the potential for reducing habitat for 98 species of birds (Table 4-4). The shrub cover type also supports a breeding population that was higher than any other community except the northern hardwood forest. Birds which use shrub for reproductive habitat, such as the yellow warbler,

Table 4-4

Total Number of Avian Species Sighted in Each Plant Community, Pomfret Study Area, September 1974 through August 1975

Plant Community	Total Species
Open Field	55
Shrub	98
Northern Hardwoods Forest	119
Pine Plantation	61
Black Locust Forest	66
Vineyard	39
Cropland	54

willow flycatcher, common yellowthroat, and song sparrow will lose the greatest number of nesting sites. Based on the breeding bird survey, it is estimated that 3.1 pair of birds will lose nesting habitat for every acre of shrub cover type removed, and potentially, birds of 27 species may lose nesting habitat. The reduction of the shrub cover type by 53 percent on the site will affect species such as black-capped chickadee, cedar waxwing, starling, and cardinal, which use this area for wintering purposes.

4.013
Clearing 57 acres of open field cover type may affect 55 species of birds which were observed to utilize this cover type as habitat (Table 4-4). In general, the impact of clearing open fields will be less than that associated with removal of shrub and hardwoods forest cover types because of the low density and number of species which utilize this cover type. The loss of open fields will, however, reduce breeding habitat for species such as Henslow's sparrow, grasshopper sparrow, savannah sparrow, and eastern meadowlark, which extensively use open fields. Other species also associated with open fields, such as the upland sandpiper, red-winged blackbird and bobolink occur in comparable numbers in other open communities, such as pastures and cropland. Since much of the temporary construction will be restored as grasslands, the impact on this community type may be reduced due to reclamation.

4.014
The largest amount of any single cover type to be disturbed by construction and operation of the proposed facility is agricultural land, particularly cropland. Use of cropland and vineyards may affect 54 and 39 species of birds, respectively (Table 4-4). Both croplands and vineyards yielded the lowest number of breeding pairs per acre of any cover type sampled. Song sparrows, field sparrows, American robin, and chipping sparrow will lose breeding habitat with the clearing of 57 acres of vineyards.

4.015
Due to the wide distribution of snakes on the site, construction activity on 52.3 percent of the site will remove approximately half of the habitat for this reptile group and likely reduce snake populations on the site. The eastern garter snake and northern red-bellied snake will probably be most affected by the clearing of open fields and agricultural land. The northern water snake, which is restricted to Little Canadaway Creek, should not be affected by facility construction.

4.016
Sendentary amphibians will be impacted due to the filling of five ponds and the clearing of northern hardwood forest. The cool, moist

environment provided by this cover type is needed by the amphibians during the summer months. Removal of northern hardwood forest areas will limit the on-site population.

4.017
Initial clearing operations will remove approximately 551 acres of existing habitat for soil arthropods. These organisms generally occur within the upper soil horizons. The expected loss of upper soil horizon due to site preparation will, undoubtedly, impact the diversity of the arthropod community and likely destabilize the biogeochemical components of the soil systems.

Flora
4.018
Site preparation and clearing, in addition to affecting terrestrial fauna, will have impacts on floral components of the ecosystem. No plant community will be completely eliminated from the site. However, vegetation cover types such as the pine plantation and willow will be significantly reduced on the site itself. Managed cropland, vineyard and pasture will be reduced by 64, 64, and 74 percent, respectively, while northern hardwood forest and shrub will be reduced 69 and 53 percent respectively (Table 4-2). During construction, natural plant succession will begin on those areas of the site temporarily or permanently rested from construction use. As a result of these expected environmental changes, only those plant species which are members of the open field community are expected to revegetate during the construction period.

4.019
The construction of the facility is not expected to jeopardize the continued existence of natural or managed vegetative types within a one-mile extended area beyond the site. The clearing of 76 acres of northern hardwoods forest represents the greatest potential impact when compared to clearing of other vegetative types on site. It appears from the baseline studies that this northern hardwoods forest is richer in floral compostion, and more productive than many of the other cover types of the region. The acreage to be cleared comprises about 0.48 percent of the northern hardwoods forest in the towns of Pomfret and Portland. Removal of vegetation will interrupt the nutrient cycle, reduce the amount and diversity of habitat for wildlife, and result in increased susceptability of disturbed areas to erosion.

AQUATIC ECOLOGY

4.020
Construction activities which can potentially have an impact on the aquatic ecology of the Pomfret site include physical disruption of

bottom sediments and alteration of benthic habitat in Lake Erie due to dredgings and replacement of benthic habitat with offshore structures. In addition, construction runoff and/or physical damage to streams and ponds on the site could affect finfish, benthic, and plankton communities. Assessment of the degree of impact resulting from these activities is based on the consideration of the volume and type of sediment removed, amount of toxic substances and particles released, extent of area affected, productivity of the aquatic community in this area, and relative importance and uniqueness of the site to the region. The organisms which will be affected by the offshore work serve an important function in the aquatic ecosystem. Phytoplankton are algae, suspended in the water column which along with periphyton and aquatic macrophytes are the important primary producers in a lake ecosystem. Phytoplankton produce oxygen and biochemically incorporate carbon, thus, in the water column they are crucial to survival of consumer communities such as zooplankton and fish. Phytoplankton that settle to the bottom contribute to the organic matter available to the benthic consumer community. They represent the energy or food base for higher organisms and thus major alterations of phytoplankton populations could curtail secondary productions of zooplankton and ichthyoplankton. Zooplankton are small animals such as rotifers, copepods, protozoans, ichthyoplankton and crustaceans which inhabit the water column. Zooplankton serve as organisms of transfer between energy contained in the lower trophic levels (primary producers) and energy requirements of organisms higher in the food chain. They are the primary consumers. Zooplankton populations are affected by the availability of primary producers and the predation by higher organisms. Thus major alterations of zooplankton populations could affect populations of primary producers (phytoplankton) and higher trophic levels. Benthic organisms inhabit the lake bottom living in or on the sediments. Benthic fauna such as snails, worms, caddisflies, fingernail clams, and numerous others are the primary food of bottom fishes such as white sucker and yellow perch. Some benthic fauna such as various mayfly, caddisfly and midge species feed upon algae and diatoms and serve as primary consumers in the food chain. Other benthic invertebrates such as dragonfly larvae and diving water beetles prey upon aquatic organisms such as zooplankton, smaller benthic invertebrates, and ichthyoplankton. Fingernail clams function as filter feeders. Scavenger species such as crayfish, snails, and oligochaete worms feed upon detritus and thus return dead plant and animal matter into the food chain. Benthic invertebrates are an important source of food for bottom and forage fish species. The expected impacts on phytoplankton, zooplankton, and benthic fauna as a result of offshore construction activities in Lake Erie are discussed in paragraphs 4.021 through 4.023.

4.021
Construction of intakes, discharge and mooring structures should not appreciably affect the ecology of Lake Erie in the vicinity of Pomfret. The small area affected, the depth of sediment stirred up (depth of sediment averaging about one inch) and the chemical makeup of the sediment suggest that impacts will be minimal and short-term. Dissolved and particulate nutrients will be released and decomposer activity may be accelerated offshore at Pomfret. Zooplankton production may be temporarily increased due to detrital feeding. Phytoplankton productivity could increase as a result of nutrient release. No significant impacts are projected beyond the immediate, short-term impacts.

4.022
Due to dredging, a total of about 20,000 square feet of bottom area will be disturbed, destroying the habitat of all benthic organisms present. It is estimated that at an average density of 5,706 organisms per square meter of rock surface, a biomass of 772 mg/m^2 dry weight of benthic organisms will be affected. This may be an underestimate, as data were obtained from results of substrate samplers moored at the site and lifted through the water column on retrieval. The dominant taxa included: hydra, Cristallidae (bryozoan), amphipods (scuds) and gastropods (snails). Because the loss of benthic organisms will be a one-time occurrence followed by rapid recolonization, it will have an insignificant impact on the ecosystem. Physical disruption of Lake Erie bottom sediments during construction of the proposed facility will temporarily increase levels of solids and chemicals in Lake Erie at the construction site and consequently affect the aquatic biota of Lake Erie. High levels of suspended solids are damaging to fish, fish eggs, benthic invertebrates and plankton, and can result in death by clogging of gills, and affecting feeding or respiratory mechanisms. Sublethal effects of turbidity include changes in blood and tissues of fish. Levels of suspended solids known to be deleterious to aquatic animals span a wide range, which is related to the variations in ambient conditions and physiological state of the organisms (age, life stage, season, etc.). The effect of increases in suspended solids resulting from construction activity on the local aquatic ecology should be minimal due to the small amount of area disturbed and the thin layer of sediment involved. Construction activity will be concentrated near the 30-foot depth contour rather than at inshore areas where spawning activity and benthic biomass is greater. However, staff believes that dredging should be restricted to periods of low spawning activity and intends to recommend a special condition to that effect in the Department of the Army permit should it be issued.

4.023
Release of potentially toxic chemicals can occur because of sediment disturbance. A detailed discussion of sediments is presented in Chapter Two (2.066-2.068). Metals, oil, grease and other toxic chemicals present in typical lake sediments can be damaging to aquatic organisms at high concentrations or long exposure times. Oils and grease can taint fish (noticable odor) flesh. Oils, if quantities are sufficient enough, can coat gills or other respiratory surfaces causing asphyxiation (suffocation) in fish, zooplankton, or benthic communities. These effects are more typically associated with oil spills and not levels associated with sediments. Toxic elements such as lead, mercury, arsenic, cyanide, and others listed in Table 4-5 can have lethal effects on aquatic biota when concentrations are high. Sublethal effects of these elements on fish include altered behavior, reduced growth and weight, slower swimming speeds, and effects on tissues and reproductive cycles. However, sediments at Pomfret contain extremely low concentrations of such chemicals (Tables 4-5 and 2-8). Toxic chemicals are not expected to increase significantly or even approach lethal or sublethal limits due to their low concentrations in the sediment. The thin sediment layer present in the construction area and the small area disturbed suggest that the impact will be insignificant. Likewise, anoxia should not occur due to the high oxygen saturation levels of the lake, the small sediment layer disturbed and the low oxygen demand of the sediment. Nutrient content of sediments collected during 1975 at the proposed intake location at Pomfret was low (Tables 4-5 and 2-8). If these sediments were resuspended in the water column, the small increase in available dissolved nutrients could possibly lead to increased primary productivity for the duration of the disturbance. Sediment resuspension will lead to an increase in turbidity, which in turn will decrease light penetration. Decreased penetration would result in a compensation depth closer to the surface for each species of phytoplankton and could work contrary to the effect of increased nutrients by temporarily decreasing productivity. No significant impacts are expected as a result of sediment disturbance.

4.024
Two potential impacts on aquatic ecology arising from on-site construction are runoff and physical alteration of aquatic habitats. It is expected that some changes will occur in the portions of the streams adjacent to construction areas as a result of runoff. Suspended and total solids entering the streams will increase and intolerant organisms, or those sensitive to these materials, will be displaced or destroyed. Most organisms are relatively tolerant to short-term exposures to increased suspended solids and turbidity. Recolonization of affected portions of streams by aquatic organisms should occur subsequent to completion of construction. Construction

TABLE 4 - 5

POMFRET - SEDIMENT ANALYSIS *
August 1, 1975

	Range - all Stations mg/kg	Intake-Discharge (Vicinity)
Oil and Grease	2.3-81.0	8.6-10.6
Cyanide	< 0.020	< 0.020
Arsenic	0.0004-0.0044	0.0004
Cadmium	< 0.0004	< 0.0004
Chromium	< 0.0004-0.012	< 0.004
Copper	< 0.004	< 0.004
Lead	< 0.004	< 0.004
Mercury	< 0.0004-0.0288	0.0004
Nickel	0.004-0.200	0.052-0.20
Zinc	0.004-0.092	0.012-0.056
Total Organic Carbon	22.8-75.4	48.4-55.6
Chem Oxygen Demand	8.4-96.8	30-74
Immed DOD	2.5-36	7.5-30
Total K - Nitrogen	1.44-22.5	3.8-8.9
Nitrate - Nitrogen	< 0.16-0.32	< 0.16-0.24
Orthophosphate	< 0.008-0.136	

*Table 2-8 in Chapter 2 presents a more detailed analysis of Pomfret site sediment.

activities will be controlled to limit the suspended solid release into on-site streams.

4.025
Streams of the Pomfret site (Figure 1-12) which will be affected by direct physical alteration include Van Buren Bay Creek (PCA & PCB) and stream PD. Streams PCB and PD will be rerouted via channelization and culverts around the fly ash disposal area. Their stream beds will be destroyed for 900 feet and 600 feet, respectively, thereby eliminating these stretches of streams from biological production. The discharge flow of stream PCA will be rerouted around the southeast side of the stacker-reclaimer area, joining stream PCB several thousand feet upstream of the existing confluence point. The additional flow over this portion of the creek should help maintain flow at higher levels through the summer, thus possibly changing the intermittent nature of stream PCB. Rerouting of these streams will result in the elimination of benthic organisms and their substrate, primary production, and food organisms for other trophic levels, which may have been derived from affected upstream areas. Affected streams are neither unique nor limited to the site locale from the standpoint of resources and/or recreation potential. Although pugnose minnow were probably found in Van Buren Bay Creek (on-site), they were also collected from other streams in the Pomfret-Sheridan area and thus on-site creeks are not considered unique in this respect (see revised Sections 2.157, 2.240b, and 2.240c). Additionally, this stream is not typical of good pugnose minnow habitat. The streams which will be affected by plant construction are not used for spawning by migrant species of fish from Lake Erie.

4.025a
At Pomfret, Little Canadaway Creek, one of the streams where pugnose minnow were found, will remain in its natural state save for the construction of a railroad spur bridge adjacent to the present railroad bridges across the creek. No stream channel work is contemplated. The other on-site stream where pugnose minnow were identified is Van Buren Creek. On Van Buren Bay Creek, the applicant proposes to construct a new canal and reroute the two main stream channels around the ash disposal area and through the plant island area. The rechanneling will start about 3,600 feet upstream from the lakeshore. The previous stream channels are to be bypassed or intercepted and backfilled. The downstream channels are to be improved so as to allow passage of the waters from a 100 year storm event. Likewise, stream "PD", an intermittent stream, will be rechanneled via a new canal with the old stream being bypassed or intercepted and backfilled. Therefore, the first several thousand feet of the streams will remain basically in their natural state. In areas where new canals will be provided, the old stream beds will be eliminated from biological production. At Pomfret the discharge flow of stream

PCA, the western most tributary of Van Buren Bay Creek will be rerouted around the westerly side of the ash disposal area, joining the other branch of Van Buren Bay Creek "PCB several thousand feet upstream of the existing confluence point. The additional flow over this portion of the creek should help maintain flow at higher levels through the summer, thus possibly changing the intermittent nature of stream "PCB". For all streams the acreage of the area drained will remain constant. Construction activities are expected to cause temporary disruptions to the aquatic habitat of the streams. Once construction activities are completed, the streams should afford the same aquatic habitat that existed prior to construction, at least to the point of rechanneling.

4.026
Several ponds among the 21 on the Pomfret site will be altered directly by construction activities. The placement of the plant structures on the Pomfret site will eliminate six ponds, totaling 48,000 square feet of surface area (Figure 1-13). These ponds will be eliminated because of construction and placement of plant structures, roads, storage and disposal areas. The ponds which will be lost or affected (P-4, P-5, P-7, P-13, and P-25) are man-made ponds which do not exhibit high species diversity or abundances. Each of these ponds supports less than 13 taxa of zooplankton and less than 19 taxa of benthic invertebrates. Ponds P-25 and P-7 are devoid of fish and the remaining ponds support less than six fish species. Of these ponds, only P-8 contains sufficient size and quality of habitat to support fish in any abundance. These ponds are not unique in the region surrounding the Pomfret site and are characterized as very small, shallow bodies of standing water in which plant growth and quiet water predominate. When considering either the aquatic species they support or their recreational value to man, it is concluded that their elimnination will not cause a significant environmental impact other than that attributable to the particular ponds eliminated. Ponds on the site are not a major source of recreational fishing as the fish community is composed mostly of non-game forage fish.

WATER QUALITY

Runoff
4.027
Soil erosion and sediment deposition can be major sources of pollution resulting from construction activities. Exposed soil can be carried by rainfall runoff and deposited in adjacent water bodies causing increased turbidity and subsequent environmental degradation if not properly controlled. The EPA requires the treatment of construction area runoff resulting from a one in ten year, 24 hour rainfall event by limiting the amount of suspended solids that can be

discharged from the site. Since the ambient suspended solids concentration of the on-site streams varies greatly and can range from less than 1.0 mg/l to greater than 200 mg/l, depending on flow conditions, the treated discharge (in compliance with the 402 discharge permit) from control basins to these streams is expected to have a minor impact on their water quality. The discharged effluent from the sedimentation basins will not meet the former U. S. EPA effluent limitation of 50 mg/l TSS when there is significant rainfall (approximately 0.5 inches per 24 hours or greater). The U. S. EPA Region II office has indicated to the State of New York that in the absence of imposed effluent guidelines for runoff, the U. S. EPA in concert with the State will consider effluent limitions on a case-by-case basis. The effluent is not expected to exceed 380 mg/l TSS during the ten year, 24-hour storm event. Since the maximum permissable suspended solids concentration from the construction runoff ponds is 380 mg/l, as specified in the draft 402 discharge permit, a greater discharge would not be allowed except when the 10-year, 24-hour storm is exceeded. The State has concluded that suspended solid discharges from construction sites must be treated to a level which would be consistent with runoff from the area in its natural state. The State's draft 402 discharge permit would, therefore, allow suspended solids concentrations to exceed 50 mg/l up to the level of natural stream suspended solids. The permit specifies that the 50 mg/l limitation shall be met at all times except that it shall not be required to reduce the total suspended solids below that in the receiving stream when the TSS in the receiving stream is above 50 mg/l. Compliance with effluent limitations specified in the State's draft 402 discharge permit should insure that stream water quality is not significantly affected. The State has issued water quality certification (Section 401) for the proposed station contingent upon compliance with Section 402 limitations.

Dredging
4.028
A small amount of dredging will be required for the construction of the discharge diffuser, breasting dolphins and mooring dolphins. This activity will remove or disturb approximately 130 cubic yards of sediment and will remove approximately 770 cubic yards of rock. The dredging of the rock fragments will not cause any subsequent waste introduction into the environment. It can be assumed, however, that most of the fine sediment, a one-quarter inch to one-inch layer covering the rocky bottom, will be suspended in the lake water surrounding the dredging activity during the use of a dredge. This action can cause a localized increase in the turbidity levels of Lake Erie. It is anticipated, however, that the turbidity and associated suspended solids concentrations will return to ambient levels within 24 hours after the cessation of this construction activity.

4.029
The disturbance of this sediment will also cause an interaction between the chemical constituents of the sediment and the lake water (Tables 4-6). Based on the chemical analysis of the sediment, and the estimated quantities of chemical constituents released to Lake Erie from the suspension of the sediments during dredging, there will be a small release of oxygen-demanding organics. This, however, will only cause an immeasurable decrease in the dissolved oxygen levels of the lake water. The metal concentrations reported in the sediment are also extremely low, in most cases similar to the concentrations found in the lake water itself. In conclusion, the temporary increase in concentration of suspended and dissolved solids resulting from dredging will be minimal as well as transient and will have no irreversible impact on the water chemistry of the area.

Water Use
4.030
During dredging operations and construction of the offshore mooring and breasting dolphins no impact on potable water intakes is expected. These activities will also have little effect upon commercial lake navigation. Area recreational boating will be hindered during the period of offshore construction. The applicant's site reconnaissance did not identify any raw water intakes in on-site streams. Construction activities and stream alterations impacting such water supplies is not applicable. Since aquifer continuity is essentially absent in the site areas, the occurrence of groundwater in the surficial deposits overlying bedrock is local in nature. During foundation dewatering, if groundwater is encountered, there would only be a localized impact to the extent of actual groundwater quantities pumped out. This impact would apply only to the localized groundwater pocket and is not expected to influence adjacent groundwater resources. All such groundwater will be routed to the construction phase sedimentation ponds and treated for TSS and pH prior to discharge. There are two ponds on either site that would be eliminated and there would be no significant changes in the local recharge that would affect groundwater resources. Fertilizers will be used during the establishment of both temporary and permanent vegetative covers. The amount of fertilizer used in a controlled application will be such as to minimize application quantitites in accordance with generally recognized procedures. It is generally understood tha. the nitrates in fertilizers are essentially totally absorbed in root structures of the vegetation at a depth of four to six inches below ground surface. As a result, no nitrates from fertilizer application would be expected to enter the groundwater which is at an average depth of 11 to 14 feet.

TABLE 4 - 6

ESTIMATED QUANTITIES OF CHEMICAL CONTAMINANTS RELEASED TO LAKE ERIE FROM THE SUSPENSION OF BOTTOM SEDIMENT DURING DREDGING POMFRET SITE

Parameter	Total Quantity of Chemical Constituents Released to Water Column During Dredging (grams)
Total Organic Carbon	2,410
Chemical Oxygen Demand	2,540
Total Kjeldahl Nitrogen	520
Nitrate-Nitrogen	6.30
Phosphate	528
Oil and Grease	0.790
Cyanide	0.079
Arsenic	0.158
Cadmium	0.158
Chromium	0.158
Copper	0.158
Lead	0.158
Mercury	2.36
Nickel	1.38
Zinc	-

Sanitary Wastes
4.031
The applicant will tie into the municipal sewer system. The draft 402 discharge permit specifies that the applicant must tie into this system within thirty days of it's availability. There will be no sanitary waste discharge to streams, since it has been determined that the municipal sewer system will be available prior to station construction.

Chemical Wastes
4.032
Chemical wastes that may affect the water quality of the natural waters on the plant site and Lake Erie include nutrients, oil, grease, paint, and solvent wastes. Fertilizers will be used during the establishment of both temporary and permanent vegetative cover. It is presently estimated that a minimum of 239.1 acres for the Pomfret site will be restored during and upon completion of construction. Of this acreage approximately 190 acres will be seeded with grasses. Grass seeding will require approximately 170,000 pounds of fertilizer at an application rate of about 20 pounds per 1,000 square feet. Since the fertilizer seeps into the soil very quickly and since much of the site was previously utilized for agricultural purposes, increased nutrient loading to the area's water resources is not anticipated. Any effects of fertilizer on water quality will also be lessened by implementing sound erosion, sediment control and stormwater management practices which will reduce and control overland runoff. Proper application of fertilizer should protect groundwater from contamination.

4.033
Oil, grease, paint, and solvent wastes will result during construction activities from the use of oils, lubricants, paints, cleaning materials and various other oil-based materials. These wastes could occur as a result of leaks from construction equipment, spillages in storage areas or during transfer operations, and from maintenance areas and parking lots. The quantities of such wastes will be minimized by restricting equipment maintenance areas, keeping equipment and construction vehicles in good operating condition and regularly inspecting equipment storage facilities.

4.033a
Although this is not expected to occur, any major spillage of the contaminants mentioned in 4.033 which reaches a waterway in significant quantities would adversely affect water quality. Oil and grease, and some solvents, exhibit oxygen demand, contain toxic soluble components, may reduce reareation of the water surface, and impart unpleasant taste, odor, and color to the water. Paints could contain oils and solvents and possible heavy metals or trace elements depending on the pigments used. Some chemicals used during construction, if spilled into waterways, could affect water pH.

4.034
Construction materials wastes result from wasted wood, scrap metal, cardboard, synthetics and concrete materials used in construction. Materials cost and effective solid waste management will encourage minimization of these wastes. Collection depots will be established throughout the site for the disposal of these wastes. Material will be recycled whenever possible and disposed of along with other solid wastes generated at the site. The erosion and sediment control facilities will effectively control these wastes should they be carried by runoff and therefore no water quality impairment due to this source is anticipated.

4.035
A major source of liquid waste can result from a concrete batch plant operation. Wastewater will result from plant equipment cleaning waters, floor washdown wastewater, concrete truck cleaning wastewaters, and materials storage area runoff. It is expected that the primary pollutant parameters of concern will include suspended and settleable solids which will be managed by conveying all batch plant operation wastewater and runoff to the plant island settling basins incorporated in the construction erosion and sediment control plan. A preliminary estimate indicates that the untreated process wastewaters and runoff from this source could contain 2000-5000 mg/l of suspended solids. It is not anticipated, however, that this waste stream will cause the basin effluent to exceed the Federal EPA guideline on suspended solids. This resultant discharge will not significantly alter the receiving streams' water quality because, as previously noted, the present ambient suspended solids concentrations of these streams varies greatly, and the draft 402 discharge permit would limit the concentrations in the discharge to acceptable levels.

4.036
The drainage areas of streams passing through the site area will not be significantly altered by the proposed plant structures. Some of the streams, where appropriate, will be channeled around proposed structures such as fly ash and bottom ash disposal areas. Streams which would pass through proposed structures will be rerouted around the structure before going back into the original stream bed. Culverts under existing barriers such as railroad and highway embankments will be improved where necessary to avoid retention of flood flows and ponding in the site area. New culverts will be constructed where rerouted streams pass under sections of road or railroad. As a result of the proposed alterations to streambeds and culverts on those streams passing through the site, some increase in the peak flow will occur due to the elimination of natural retention ponds. This increase in peak flow would not have any impact on erosion following plant completion, since improved channelization of streams would include lining where necessary to avoid erosion.

Preoperational Wastes

4.037
During start-up of the proposed units, chemical cleaning of boiler and pre-boiler cycle equipment will be necessary, consisting of water flushing, alkaline and acid cleaning, neutralization, and passivation. It is expected that a total of 2.2 million gallons of liquid waste will be produced by this process. This total wastewater can be characterized as an acidic solution with high concentrations of dissolved solids and metallic ions, mainly iron, copper, and silica. Other major components will include phosphates, surfactants, COD, ammonia, nitrites and suspended solids. The wastewaters will be injected into the boilers at a controlled rate, following sampling, analysis, and any pretreatment necessary to insure no corrosive or scale formation potential on boiler surfaces. Evaporation following boiler injection will eliminate any liquid discharge of cleaning wastewaters to the environment. A portion of the waste will exit with the flue gas, and the remainder will be absorbed on fly ash particles, and eventually removed to the ash disposal pile.

4.038
Approximately 500,000 gallons of No. 2 grade oil will be stored at the site for use in the auxiliary boiler when required. This is a potential source of liquid waste as oil filling and pumping operations may result in leakages or spills. A spill prevention, control and countermeasure (SPCC) plan will be implemented as required under 40 CFR 110 and 40 CFR 112. The storage intake(s) will be provided with a concrete curb to positively contain any leakage or spillage that might occur during oil filng or pumping operations and to assure compliance with appropriate regulatory limits on oil discharges including those limitations included under 40 CFR 110 and CFR 112. Any waste oil will be collected and reused. No impacts on water quality are anticipated.

THREATENED OR ENDANGERED SPECIES

4.039
There were no threatened or endangered terrestrial flora or fauna found on the Pomfret site which will be adversely affected by construction of onshore facilities. In a similar manner, there are no threatened or endangered aquatic flora or fauna which will be affected by offshore construction activity.

SOILS

4.040
The primary impact on area soils during construction will be erosion. Removal of vegetation will expose areas to wind and rainfall and increase the rate of erosion. Construction will also result in soil

compaction which affects transmissibility of the soil and renders it less suitable for revegetation. Clearing of woodlands will interrupt the nutrient cycle of the soils and destruction of soil arthropods can destabilize the biogeochemical components of the soil system. Staff believes that the applicant's sedimentation and erosion control plans (Chapter One) will minimize the impact on area soils. Insofar as is possible, the applicant also plans to remove the organic rich A_0 soil horizon during excavation in a manner that will prevent any admixture of lower subsoils. This soil horizon will be stockpiled, seeded to grasses, and protected with anti-erosion matting and will be reused at a later date.

AIR QUALITY

4.041
The major impacts on local air quality during construction of the proposed Lake Erie Generating Station will be fugitive dust, vehicular emissions, and onsite open burning.

4.042
The potential sources of fugitive dust are: unpaved roads, ground excavation, and outdoor storage of minerals. Mitigative measures which will be taken include: road paving, watering, use of chemical binding agents, traffic speed control and covering of material in storage and during transit. Operation of an on-site concrete batch plant will also be a source of fugitive dust. The applicant has assumed batch plant emissions of 0.02 lbs of particulate matter per cubic yard of cement. Emissions of this magnitude will comply with applicable regulations.

4.043
Vehicular traffic during the facility construction will be comprised of employees' personal automobiles and construction equipment. During peak construction employment 1,720 cars are anticipated. An increase in carbon monoxide, hydrocarbons, and nitrogen dioxide above ambient levels but below allowable state standards is assumed by the applicant. Exhaust emissions from diesel-powered construction vehicles must not exceed Ringelmann No. 1 or an equivalent standard and diesel engines shall not idle for more than five consecutive minutes when the vehicle is not in motion.

4.044
On-site open burning will be used to dispose of slash and rubbish if that is the most economical solution. Monitored test burns witnessed by the Department of Public Services and the Department of Environmental Conservation in several regions of the State during the spring and summer of 1977 have shown that the smoke impact of open burning is unlikely to cause a contravention of suspended particulate

standards if conducted in accordance with staff guidelines. All impacts related to construction activities are expected to be of short duration and will cease once construction is completed.

CULTURAL RESOURCES

4.045
No architectural or historical resources on or nominated to the National Register of Historic Places or the National Register of Natural Landmarks are located on the Pomfret site. No archeological sites of significance, as judged by the criteria for eligibility for inclusion on the National Register were located by survey on the Pomfret site. The applicant has confirmed this through contact with L. Kuwik of the New York State Parks and Recreation Department of Historic Preservation on 8 February 1977. However, one site, the Fredonia Commons Historical District, located four miles east of the Pomfret site is being considered for inclusion in the register. The applicant's consultant, Cultural Resources Management Services, recommended the Calvin J. Dubert House, the Dedrick Farm, and the George Frost Farm for consideration for eligibility to the National Register of Historic Places. On 23 June 1978, the Corps submitted a request for determinations of eligibility on these properties to the keeper of the National Register. By letter dated 20 September 1978, the keeper of the National Register determined that all these properties are eligible for inclusion in the National Register.

4.046
If the Pomfret site is certified by the State for the Lake Erie Generating Station, the Dubert House may experience possible visual but no noise impact from the construction and operation of the station. The Frost Farm will be adjacent to, or within, the Lake Erie Generating Station site boundaries, depending on the fuel selected. With the use of either wet or dry ash handling for western coal, the Frost Farm, presently owned by NMPC, will either be sold or demolished, since the property is presently in a general state of disrepair, being poor in both integrity and condition. With the use of either eastern coal, the Frost farm will be included within the solid waste disposal area and thus the structures will be demolished. The Dedrick House will be within the plant site boundaries and will be destroyed under all current options as to sources of coal and modes of ash disposal if the State certifies the Pomfret site. Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the Advisory Council on Historic Preservation Procedures (36 CFR 800) are completed. This will allow for a thorough review of effects, and alternatives that would avoid or mitigate adverse effects on the subject properties.

4.047
Prior to construction, an intensive archeological survey of the currently identified direct impact area at the certified site for the Lake Erie Generating Station will be undertaken. This survey will attempt complete visual coverage of the surface of the direct impact areas and will systematically test locations of high archeological potential within the direct impact area. Those archeological sites located in the 1975 systematic sampling survey and any archeological sites found during the intensive survey will be examined to determine, insofar as possible, the extent and nature of the cultural remains. An evaluation of each site is to be made to determine the appropriate mode of mitigation, whether complete excavation or sample excavation is to be undertaken. Each site will then be excavated according to the mitigation decision. During the period of ground disturbing activities, a qualified professional archeologist will be employed by the applicant on an as-needed basis with a minimum of one-day per week during initial and intensive ground disturbing activity.

4.048
Power Plant construction will not result in the closing or rerouting of roads which would cause changes in accessibility to historical, cultural, or archeological sites, or natural landmarks. Also, increased traffic or fencing is not expected to affect accessibility.

4.049
The New York State Public Service Commission requested review of the applicant's archeological survey by the NYS Division of Historic Preservation, who concluded that the methodology and conclusions of the survey appeared valid and met professional standards.

AESTHETICS

4.050
During the construction period of approximately six years, there will be a visual and physical disruption to the site and environs. Clearing and stripping operations, borrow and fill maneuvers, and construction, installation, and paving procedures will contribute to the modification of the site areas. There will be some unavoidable visual intrusion on the site resulting from truck traffic and the attendant creation of noise, dust and/or mud and debris on surrounding roads, particularly on State Route 5, and Berry, Lake, and Van Buren Roads since they will serve as principal access roads to the site. These disruptions will continue until the site grading and construction of plant facilities have been completed and restorative plantings can be installed.

TRAFFIC

4.051
The average monthly work force during the construction period (1981-1986) will range from 168 to 1947. This work force will use highways and roads traveling to and from the site in addition to trucks delivering construction equipment and materials. It is expected that the New York State Thruway (I-90) will serve as the primary road for the majority of commuting workers and trucks. Since most construction workers are expected to be drawn from the Buffalo area, they will use Thruway Interchange 59, the closest interchange to the Pomfret site, located in the village of Fredonia. From there Route 60 can be used as a feeder route to either Route 5 or U.S. 20. All three of these roads are main arteries for the region. Route 5 and U.S. 20 lead directly to two collector roads, Berry Road (County Road 618) and Van Buren Road (County Road 73) and one local road, Lake Road, all of which provide immediate access to the site.

4.052
Capacity figures and other relevant statistics on I-90, Routes 5 and 60, and U.S. 20, show that within the Pomfret vicinity these roadways are currently used at approximately 15 to 40 percent of their peak hour capacities. The rerouting of Berry Road is not expected to be an impact as traffic that would ordinarily have used this road as a connector between the village of Fredonia and Route 5 will be rerouted along Van Buren and Lake Road.

4.053
With a large portion of the workers traveling to the site expected to use interchange 59 there exists the possibility of traffic disruptions occurring in the region. Disruptions are likely to occur at the time of the morning and afternoon rush hours (about 7:30 a.m. to 8:30 a.m. and 3:30 p.m. to 4:30 p.m.) during the 1-1/2 year peak employment period. At these times local people may experience delays in access onto Route 5 and U.S. 20 and other county and local roads in the vicinity of the site. If traffic problems develop as a result of the influx of employees to the site, the applicant will arrange with the local police force to regulate vehicular movements at crucial interchanges. Adequate on-site parking facilities will be provided during working hours so as not to present any area parking problems. Delivery of construction materials by train will also disrupt local traffic patterns by increasing the frequency of delays experienced at railroad crossings. The overall increase in traffic may hinder the passage of emergency vehicles (police, fire, ambulance) especially during the peak usage hours.

NOISE

4.054
Table 4-7 lists major noise sources during plant construction and the associated (estimated) average and maximum sound levels. However, it is expected that by the time construction activities begin at the proposed site, quieter construction equipment than depicted will be available. Hence, the values shown should be viewed as conservative. Sound levels will be highest during the first 20 months of construction and would reach a level of 64 dB(A) L_{eq} 2,800 feet from the construction center. Thereafter, noise would decline due to changes in the quantity and types of construction equipment in use. With the assistance and cooperation of the New York State Department of Transportation, and the New York State Chapter of Associated General Contractors, a report on construction noise was published by the New York State Department of Environmental Conservation (1974). This report recommends that in New York State, construction noise be limited initially to 70 dB(A) during the day (7 a.m. to 7 p.m.) at distances exceeding 400 feet from the construction site boundary. It also advocates that the permissible level should be decreased 5 dB(A) if the construction noise contains an impulsive or pure tone characteristic and by 10 dB(A) if it contains both. It should be noted that the above values apply to the construction noise alone and not the total sound level (including the background level).

4.055
The sound level produced during station construction at the nearest required property line (2,800 feet) will not exceed a value of 64 dB(A) during construction. Major impulsive sources such as pile driving operations are not expected to occur at the site, though some pure tones might be generated by various construction equipment. The proposed construction site, therefore, is expected to be in compliance with applicable standards. The transportation of construction equipment to and from the site may cause inconvenience to those persons living along the major transit routes to the site.

4.056
It is anticipated that during May 1981, May 1982, and May 1983, three major concrete placements will occur which will necessitate work beyond the normal eight hour per day work period. Assuming the batch plant is located on site, the nighttime work at the Pomfret site is expected to interfere with the sleep of 37 existing permanent residents.

SOCIAL AND ECONOMIC IMPACTS

4.057a
The proposed construction of the two 850 megawatt units will require approximately six years to complete. During this time period, the

TABLE 4 - 7

MAJOR NOISE SOURCES DURING PLANT CONSTRUCTION
POMFRET SITE

Equipment	Average Sound Level dB(A)	Maximum Sound Level dB(A)	Distance From Equipment (feet)
Truck Cranes	83	88	50
Mobile Cranes (Cherry Pickers)	83	88	50
Backhoes	85	93	50
Graders	85	93	50
Air Compressors	81	87	50
Pickup Trucks	58	65	50
Passenger Cars	58	65	50
Trucks	91	94	50
Bulldozers	80	90	50
Front End Loaders	79	84	50
Scrappers	88	93	50
Rock Drills	98	98	50
Crawler Cranes	83	88	50
Steam Blowout	129	129	50
Public Address System	122	124	4
Batch Plant*	93	93	50
Concrete Mixer	85	88	50
Concrete Pump	82	83	50

*The exact location of the batch plant has not been determined.

work force will impact the area's social and economic base. Four commercial businesses and a total of 95 residents will be displaced by the proposed facility. Property damage is not expected as a result of tunnel construction since the structure will be located 50 feet beneath the surface and will be accomplished utilizing a tunnel machine.

4.057b
It is anticipated that only about 10 percent of the labor force (170-188 construction workers) will relocate or immigrate to the towns near the proposed project sites. The relatively small percentage and numbers of immigrant construction workers is the result of the large number of construction workers being available from metropolitan areas within commuting distance (90 minutes) of the construction site, i.e., Buffalo, New York area and Erie, Pennsylvania area and the ability to draw upon construction workers available in the Dunkirk-Fredonia-Jamestown-Olean area.

4.058a
The impact of the construction work force on public service and facilities in the community is expected to be small. During the workday when the construction workers are at the site, the support facilities and services required from the local communities are anticipated to be minimal. Institutions (schools, hospitals, etc.) are projected to have sufficient capacity to handle and additional needs created by the work force population. Construction of the proposed plant is expected to have little impact on services (law enforcement, fire protection, etc.) in the area. Site security for the construction phase of this project will be handled by a private security agent which will be hired by the subcontractor. Local police will be consulted only in cases of criminal activity. In addition, necessary arrangements will be made with local police for traffic control at interchanges in the immediate vicinity of the site in order to regulate the movement of vehicles during starting and quitting times. These actions are not expected to necessitate additional personnel. On-site fire fighting equipment will be capable of handling all probable fires, local fire departments will be notified when required.

4.058b
During the construction period, operation of sanitary facilities will be accomplished in accordance with applicable Federal, State, and local standards. These measures to be taken by the applicant should ensure that no direct impact on the sewer system would occur. Public water service during construction is expected to come from a water supply line already running from the City of Dunkirk along the north side of Route 5 to Lake Erie State Park. The capacity of this line is adequate to supply this incremental need. The applicant is

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currently investigating the feasibility of tying into the local sewer district. If this is possible and no adverse impact will result, it will be done.

4.059
The relocation of construction workers to the area will probably increase the cost and difficulty of acquiring housing and place additional demands on the existing supply with the result being higher prices. However, the immigration will occur incrementally over a four-year period, thus increasing the ability of the local housing market to handle and adapt to the housing demand (refer to Table 4-8).

4.060
The construction phase of the proposed plant is expected to generate various negative externalities (i.e., increase traffic, noise, dust, etc.). Although construction activities may temporarily depress land values in the immediate vicinity of the site, the larger adjacent area should remain relatively unaffected due to the fact that such impacts should rapidly diminish with increased distance from the site. In absolute terms, the land use impacts should be small since the majority of the land is in agricultural use, an activity which is relatively insensitive, in general, to the negative factors associated with the construction phase of the program.

4.061
The complexity and confidential nature of gas production activity constrains accurate measurement of gas reserves associated with each well, the potential value of these reserves, etc. Any adverse impact during construction upon gas production in the vicinity of the station will be minimized. At the time of State certification of the proposed site, the applicant will negotiate with present leaseholders and well owners within the plant site boundaries with respect to the need and feasibility of gas production on the site. These negotiations will strive to prevent any reduction in the supply of natural gas that would occur as a result of the proposed plant. To minimize hazards, the applicant intends to adhere to Mine Employment and Safety Act regulations and normal precautions when tunneling in areas of known gas reserves.

4.062
Construction of the proposed facility will have a positive impact on community development and consequently the quality of life in the area. The construction activity should provide a definite stimulus to the regional economy. As presented in Tables 4-9a and 4-9b construction workers will be provided with a significant number of additional jobs, and total economic input through payrolls during the construction period is anticipated to exceed one-half billion

Table 4-8 - Annual Increment of Immigrant Construction Workers, Lake Erie Generating Station

Location	Construction Years 1	2	3	4	Total
Pomfret Site					
Dunkirk	6	17	17	1	41
Forestville Vicinity	1	5	4	0	10
Fredonia-Pomfret	6	20	20	2	48
Portland-Brocton	6	20	19	1	46
Sheridan Vicinity	2	6	6	0	14
Silver Creek Vicinity	1	4	4	0	9
Stockton-Cassadega Vicinity	1	5	4	0	10
Westfield Vicinity	1	5	4	0	10
TOTAL	24	82	78	4	188
Sheridan Site					
Dunkirk	2	8	8	0	18
Forestville Vicinity	2	7	7	0	16
Fredonia-Pomfret	1	4	4	0	9
Hamlet Vicinity	0	2	2	0	4
Sheridan Vicinity	2	7	7	0	16
Silver Creek Vicinity	14	45	45	3	107
TOTAL	21	73	73	3	170

Table 4-9a

AVERAGE MONTHLY EMPLOYMENT DURING

EACH YEAR OF CONSTRUCTION

Year	Total Manual Work Force		Total Non-Manual Work Force		Total Employees	
	Range	Average/Mo.	Range	Average/Mo.	Range	Average/Mo.
1981	Feb: 0 Dec: 315	153	Feb: 5 Dec: 33	15	Feb: 5 Dec: 348	168
1982	Jan: 338 Dec: 1240	735	Jan: 38 Dec: 130	78	Jan: 376 Dec: 1370	813
1983	Jan: 1307 Dec: 2091	1750	Jan: 140 Nov: 238	197	Jan: 1447 Dec: 2321	1947
1984	Jan: 2080 Dec: 1385	1732	Jan: 230 Dec: 130	195	Jan: 2310 Dec: 1515	1927
1985	Jan: 1304 Dec: 548	884	Jan: 115 Dec: 70	84	Jan: 1419 Dec: 618	968
1986	Jan: 506 Dec: 0	216	Jan: 70 Dec: 5	31	Jan: 576 Dec: 5	247

NOTE: This table is based on a manpower curve calculated by man-months. Under the heading "Range", are shown the months of maximum and minimum work force for each year.

Source: Ebasco Services Incorporated, Construction Department, New York, N.Y., 1975.

Table 4-9b

AVERAGE ANNUAL PAYROLL FOR CONSTRUCTION OF UNITS 1 & 2

Year		Average Payroll
1981		$ 34,910,000
1982		110,300,000
1983		176,790,000
1984		125,865,000
1985		83,810,000
1986		40,945,000
	Total	$572,620,000

Source: Ebasco Services Incorporated, Construction Department, New York, N.Y., 1975.

dollars. The economic effect on the local economy is expected to be primarily a result of secondary (multiplier) effects. These effects, due to the transient nature of construction workers, can be expected to manifest themselves in terms of retail and convenience purchases -- coffee, gasoline, lunches, etc. -- and in terms of induced economic activity.

RECREATION

4.063

Recreational land uses in the vicinity of the Pomfret site are not likely to be adversely affected during construction. With the exception of the Van Buren Drive-In Theater, most area recreational facilities are not in close proximity to the site. Although the drive-in abuts the northern site boundary, it should be relatively unaffected since the theater is open only during the nights between 1 May and 31 October at times when construction activity is not expected to occur. During May of 1981, 1982, and 1983, three major concrete pours may necessitate some night time work which would generate noise. The predicted maximum property line L_{eq} due to the overtime work involved with the extensive concrete pours is 57 dB(A). The measured Leq near Route 5, comparable to the drive-in location, was 56 dB(A) for a typical summer weekday night. Although batch plant operation may cause sleep interference at some quieter locations around the site, it is unlikely that it will be noticeable at all at the drive-in theater which is adjacent to a heavily traveled highway. The boundary of Lake Erie State Park is 0.4 miles from the switchyard fenceline, and about 1.2 miles from the location of the stack. The 335-acre park had an annual attendance of 101,000 in 1974 and a peak attendance of 50,400 in the month of July 1974. In 1975, the peak in attendance was only 18,112 occurring in August (Lindberg, 1975). There are no plans for expanding the park in the foreseeable future (Block, 1975). The major impact on the park would probably occur during the summers on weekdays when increased traffic along Route 5 could interfere with persons traveling to the park. The impact of construction-generated noise on the park should be within the acceptable limit. The two closest organized recreation areas after Lake Erie State Park are the Shorewood Country Club and Hillview Golf Course, which are approximately 1.5 miles and 0.8 miles, respectively, from the site boundary. The Shorewood Country Club is a 125-acre private club with a membership of approximately 280 persons in 1975. Neither construction or operation activities will affect these facilities.

POMFRET SITE

IMPACT OF POWER PLANT OPERATION AND MAINTENANCE

LAND USE

4.064
An evaluation of the long-term land use impacts associated with the operation and maintenance of the proposed project involves a determination of the extent to which the proposed generating facility will result in the alteration of adjacent land use patterns. The operation and maintenance of the proposed generating facility will have only a minimal effect upon adjacent land use patterns and property values. Athough residential development along the nearby Lake Erie shoreline may be adversely affected by the project due to a potential lowering of neighborhood amenity levels, the degree to which this impact is internalized in the form of changes in the future residential development of the shoreline is unclear. This uncertainty is due to the fact that there are several factors which interrelate and influence residential location decisions, with local amenity levels representing only one variable in the decision process. In terms of induced changes in adjacent land use patterns, the proposed project should not attract complementary economic activity into the immediate area, nor should it prevent the continued use of adjacent agricultural land. In the long run, changes in public policy would be expected to have a far greater influence on adjacent land use patterns than will the presence of the proposed facility.

4.065
Minimal impact is expected on recreational facilities. No disruption of existing recreational sites or areas will take place. The diffusion of permanent work force individuals by residence and the extensiveness of recreational facilities support the conclusion that the impact will be indirect and minimal.

4.066
One-thousand and fifty-four acres of land will be required for station operation. This acreage will be transformed from rural use to industrial use. Of the 1,054-acre site, over 52 percent (551 acres) will be altered by station construction, and 537 of these acres will be permanently occupied by power plant facilities. The remaining acreage inside the fenced plant boundary will not be disturbed. However, 454 acres of active agricultural land will be removed from production. Approximately 64 percent (213 acres) of cropland, 64 percent (57 acres) of vineyard, and 56 percent (30 acres) of pasture will be permanently removed. The remaining agricultural land will revert to native vegetation via secondary succession.

4.067

The acreage of land affected by operation and maintenance of the transmission line right-of-way cannot be quantified at this time. As mentioned in Chapter One of this impact statement, the independently proposed transmission corridor is ultimately certified by the State of New York in a separate proceeding. During the transmission proceedings (Article VII of the New York State Public Service Law) detailed information pertaining to the corridors will be provided to government agencies.

AIR QUALITY AND USE

4.068

The operation of the proposed plant will affect the quality of the ambient air in the area. Certain engineering features such as a tall (750-foot, 228 m) exhaust stack and electrostatic precipitators will tend to disperse the release of pollutants into the atmosphere. The pollutants which are emitted must meet the applicable National (NAAQS) and New York State (NYSAAQS) Ambient Air Quality Standards which are presented in Tables 2-9 and 2-10 respectively. Related to the NAAQS (40 CFR, Part 50), the emissions must meet the standards for prevention of significant air quality deterioration (Table 2-11) and the New Source Performance Standards (40 CFR, Part 60). Under existing rules, the applicant cannot commence construction until the EPA determines that all PSD (Prevention of Significant Deterioration) requirements are met.

The applicant has recently submitted a PSD application to U.S. EPA Region II. For the purposes of PSD analyses all areas in New York are now classified as Class II areas. The Administrator, U.S. EPA, has promulgated national ambient air quality standards for six pollutants: sulfur oxides, particulate matter, nitrigen dioxide, carbon monoxide, hydrocarbons (non-methane), and photochemical oxidants. Fossil-fueled electric generating plants are significantly involved in the production of the first three pollutants. Recent information obtained by the applicant from the U.S. EPA indicates that the proposed facility may be eliminated from the major source category for non-methane hydrocarbons if the present emission factor is changed to reflect an interim number of 0.01 lbs. of non-methane hydrocarbons emitted per ton of coal burned.

4.069

The States are allowed to establish stricter ambient air quality standards than the national standards. New York State's air quality standards are contained in 6 NYCRR, Parts 256 and 257. The State standards for particulates are stricter than Federal standards. State standards consider settleable particulates and these standards apply to cooling tower drift droplets which are deposited on the ground as well as fugitive dust from ash and coal storage areas.

4.070
In accordance with the Clean Air Act Amendments of 1977, the New Source Performance Standards are being revised by the EPA. The revised standards could result in the requirement for scrubbers at the proposed facility. The emissions expected due to coal combustion at the proposed facility and the impact on ambient conditions are presented in the following paragraphs.

4.071
Simulations of short-term and annual average concentrations combined the contributions of the proposed electric generating facility with the projected background pollutant levels. The contribution of the proposed Lake Erie Generating Station to ambient pollutant levels was estimated using the Point Source Diffusion Model (PSDM) with the power plant emissions and stack parameters as input. The background pollutant levels were calculated using the Environmental Research and Technology Air Quality model (ERTAQ). Total ambient concentrations were obtained by summing the predictions of the two models. The background levels were based on winter average emission rates of industrial, commercial, residential, and natural sources, including the Dunkirk Station, in order to simulate the relatively higher background pollution which occurs in response to low-level emissions associated with space heating requirements. A discussion of the diffusion models is contained in Appendix D. Table 4-10 summarizes the predicted pollutant concentrations within 25 km of the site.

Hourly SO_2 Concentration Associated With 100 Percent Load Emissions (Two Units)*

4.072
The highest one-hour average SO concentration expected is 0.2265 ppm (588 $\mu g/m^3$ which is 45 percent of the 0.5 ppm (1,300 $\mu g/m^3$) New York State Ambient Air Quality Standards (NYSAAQS) and occurs under full-load conditions. This concentration would occur for approximately one hour in every four years at a location 7 km ESE of the plant with neutral stability, a wind speed of 15.6 m/sec (27 mph) and a mixing depth of 300 m. The highest one-hour SO_2 level that would occur more than once per year is 0.165 ppm (429 $\mu g/m^3$) at a location 7 km ENE of the stack. The proposed facility emissions would contribute virtually all of the above peak hourly concentrations. In general, the highest one-hour SO_2 concentrations occur to the south and southeast of the facility site as a result of the influence of terrain in this region. The highest concentrations expected with light winds and stable conditions occur to the NNE and NE of the Pomfret site due to emissions from the Dunkirk area, but are not due to the proposed facility operation. The highest plant contributions

*The one-hour SO_2 standard has been deleted from the New York State standard (in effect as of March 1977).

TABLE 4 - 10

MAXIMUM PREDICTED POLLUTANT CONCENTRATIONS (μg/m3) WITHIN 25 km OF THE PROPOSED LAKE ERIE GENERATING STATION - POMFRET SITE

Averaging Time	Peak Ambient Concentrations (μg/m3)			Peak Plant Contribution at Location of Maximum Ambient Concentration* (μg/m3)			Peak Plant Contribution (μg/m3)		
	SO_2	TSP	NO_2	SO_2	TSP	NO_2	SO_2	TSP	NO_2
One-Hour	603	-	-	520	-	-	588	-	-
Three-Hour	603	-	-	520	-	-	520 (344)*	-	-
24-Hour	161	211	-	2.6	0.0	-	65	5.6	-
Annual	34	44	88	0.27	0.1	0.6	3.7	0.32	2.2

*Applicant's recalculation as indicated in paragraph 4.073.

occur during high wind speed and neutral stability when the background is low; and the highest background levels occur during light winds and stable conditions. Estimates of one-hour average SO_2 concentrations indicate that the New York State one-hour SO_2 standards of 0.5 ppm (1,300 $\mu g/m^3$), which is never to be exceeded, and 0.25 ppm (650 $\mu g/m^3$) which is not to be exceeded more than 87 hours per year at any receptor location will not be contravened.

Three-Hour SO_2 Concentrations

4.073

PSDM was also used to calculate 3-hour SO_2 levels due to the proposed Lake Erie Generating Station and background sources. The version of PSDM used to predict 3-hour concentrations simulates the crosswind dispersion of a plume by averaging the plume over a sector whose width is stability dependent. Since the predicted concentrations are substantially less than the 3-hour standards, only the frequencies calculated from Buffalo climatologicasl data are presented. The maximum 3-hour SO_2 concentration is predicted to occur when the proposed plant operates at maximum capacity and the associated meteorological conditions include a 300 m mixing depth, a 3.13 m/sec (7 mph) wind speed and a very unstable atmosphere. Under these conditions, the maximum concentrations of 0.137 ppm (356 $\mu g/m^3$) occurs 16 km northeast of the proposed plant. This SO_2 level is due entirely to background sources. The highest levels due to the proposed station emissions alone are predicted to occur when the wind is from a northerly to northwesterly direction, as a result of impact on the higher terrain to the south and southeast. The maximum concentration due to the proposed station emissions, 0.087 ppm (226 $\mu g/m^3$), occurs 7 km to the south-southeast of the plant during conditions of neutral stability and wind speed of 15.6 m/sec (35 mph). Since the peak predicted concentration is 0.137 ppm (356 $\mu g/m^3$) and the peak plant impact is 0.087 ppm (226 $\mu g/m^3$), the 3-hour 0.5 ppm (1,300 $\mu g/m^3$) NAAQS and NYSAAQS will not be exceeded.

4.074

The highest 3-hour SO_2 concentrations are expected to occur during lake-induced fumigation associated with stable onshore flow from Lake Erie. This original calculation assumed a steady-state condition throughout the 3-hour period. The plant impact under these conditions would be 0.200 ppm (520 $\mu g/m^3$) and would exceed the non-deterioration limit of 512 $\mu g/m^3$ (Table 4-10). This maximum contribution has been recalculated based on Canadian studies and ERT studies which show that the assumed wind speeds and persistence would not actually occur. The initial analysis assumed a worst case persistence of wind speed of 2 m/sec from the same direction and with the same TIBL (thermal internal boundary layer) shape for the entire 3-hour period. The applicant's recalculation assumed wind direction persistence for an hour but included shifts in wind direction over a 20-degree sector. The previous predicted concentration was, therefore, assumed representative of an hourly SO_2 level and was related to 3-hour concentration by sector averaging over a 20-degree sector. The recalculated concentration is 344 $\mu g/m^3$.

Twenty-Four Hour SO_2 Concentrations

4.075
New York State promulgated two 24-hour SO_2 standards: that 24-hour SO_2 levels not exceed 0.14 ppm (365 $\mu g/m^3$) more than once a year; and, that they exceed 0.10 ppm (260 $\mu g/m^3$) at most one percent of the time at any receptor location. The national standard is identical to the State standard in that 0.14 ppm (365 $\mu g/m^3$) may be exceeded once per year. The assessment of the impact of a source or group of sources on 24-hour SO_2 concentrations is complex; there is an infinite number of combinations of meteorological conditions that can occur in a day and each source contributes differently according to the weather conditions. Therefore, 24-hour SO_2 levels were calculated using three different techniques: Sequential Modeling Analysis, Persistence Analysis, and Case Study Analysis.

Sequential Modeling Analysis

4.076
The ten highest 24-hour SO_2 levels were calculated using Buffalo and onsite meteorological input data to the PSDM model. The maximum SO_2 levels based on Buffalo climatological data are less than 0.13 ppm (26 $\mu g/m^3$). The highest predicted 24-hour SO_2 level, 0.022 ppm (58 $\mu g/m^3$), would occur with full-load emissions and is based on onsite meteorological data. Although not expected to occur simultaneously, the addition of the highest observed 24-hour SO_2 level, 0.061 ppm (159 $\mu g/m^3$), to the maximum model prediction gives a "total" concentration of 0.079 ppm (205 $\mu g/m^3$). This demonstrates that neither of the two 24-hour NYSAAQS would be exceeded in the air quality impact area.

Persistence Analysis

4.077
The second method of calculating 24-hour average SO_2 concentrations considered wind and stability data measured at the 100 m level of the Van Buren meteorological tower. The wind data were used to determine the fraction of a 24-hour period that a specific wind direction persisted. Persistence was defined as a wind direction remaining within a 22.5° sector. Persistence was assumed to continue through calms and/or missing observations, if the same wind direction was maintained subsequent to the calms and/or missing observations. Directionally persistent winds in excess of 24 hours occurred twice between November 1974 and October 1975 at the Van Buren tower. A

southwest wind persisted for 26 hours beginning 13 February at 6 a.m. and a northwest wind persisted for 26 hours beginning 2 March at 9 a.m. Four other days were also chosen for analysis 11 January, 3 April, 18 September, and 29 October, because these days experienced directionally persistent winds for more than 12 months.

4.078
Data from soundings taken at Pomfret were not available for any of the study days. However, a comparison of coincidental soundings from Buffalo and Dunkirk show the morning mixing depths to be similar and afternoon and evening mixing depths to be slightly lower at Dunkirk, other than during the spring, when the Pomfret area mixing depths were much lower than those estimated at Buffalo. Hence, Buffalo data, which were available for all days, were used.

4.079
Three-hour concentrations as calculated by PSDM for each mixing depth, wind speed and direction were averaged together and weighted by the appropriate persistence lengths to estimate the 24-hour concentrations. Since the maximum calculated 24-hour SO_2 concentration is 0.025 ppm (65 $\mu g/m^3$), no contravention of the NYSAAQS for SO_2 is expected to occur with any of three load conditions examined. The Class II allowable increment for 24-hour SO_2 concentrations is 91 $\mu g/m^3$.

Case Study Analysis

4.080
In the third analysis, monitoring data from the period 1 November 1974 through 31 October 1975 were used in selecting particular days for case studies. The three highest monitored 24-hour SO_2 concentrations that were observed at the six Niagara Mohawk monitors were examined in order to project 1985's 24-hour concentrations. The plan contribution for each of these days was calculated by PSDM using coincidental wind speed and direction data collected from the 100 m level and from stability conditions based on vertical temperature differences between the 100 m and 10 m levels on the Van Buren meteorological tower as input to the model. Each day was divided into eight 3-hour intervals. For those intervals in which the appropriate meteorological conditions persisted for only a portion of the 3 hours, those conditions were assumed to persist throughout the interval. The eight 3-hour intervals were then averaged for a 24-hour average concentration PSDM predicted plant contributions for each of three load conditions: 100, 75, and 50 percent. As resultant concentrations varied for each load condition, the maximum calculated plant contribution was selected to predict the total (background and plant-related) concentration for each interval.

4.081
In calculating maximum plant impact, only PSDM stability Classes 1 (with a lid set at plume height), 2 (lidded at plume height), 3 (lidded at plume height), and 4 (with and without a lid at plume height) were considered. Mixing depths were limited to the height of the plume rise. This results in the complete trapping and immediate reflection of the plume below an elevated inversion lid. The conditions beneath this elevated inversion vary from very unstable to neutral stabilities.

4.082
The total 24-hour SO_2 concentrations for each of the three days studied are the sum of background (monitored) and either the plant-related contribution at the monitor location or the plant contribution at the location of maximum impact. The maximum 24-hour SO_2 level calculated is 0.062 ppm (161.2 $\mu g/m^3$) and does not approach any of the 24-hour SO_2 standards. Additionally, the plant contributions are less than 15 percent of the observed concentrations. In summary, three analysis techniques have indicated that the New York State and national 24-hour standards will not be exceeded in the air quality impact area of the proposed facility.

1985 Annual SO_2 Concentrations
4.083
The impact of the proposed Pomfret Station on annual average SO_2 concentrations will be small. This is typical of new power plants whose large effective stack heights and regulated emission rates result in low long-term pollutant concentrations. The long-term variability in wind direction acts to distribute the plant emissions around the plant.

4.084
The calibrated ERTAQ model was used to project the distribution of annual average background SO_2 concentrations within the air quality impact area of the proposed station. PSDM was used to perform separate calculations of the annual plant impact based on emissions associated with 68.6 and 100 percent loads. These calculations were performed at receptors defined by a polar grid centered on the Pomfret site and extending 25 km from the stack. For each receptor, an estimate of the annual average SO_2 concentrations from each source was obtained using ERTAQ by determining a weighted average based on the frequency of concentrations associated with each wind direction, wind speed class, and stability class. The total annual average concentration at a specific receptor due to all sources was obtained by summing the contribution from the individual sources.

4.085
Two sets of meteorological data were used as input to the annual average calculations. The first data set was derived from the surface weather observations taken at Buffalo over the period 1964 to 1973. The second set was based on wind speed and direction and vertical temperature differences measured at the Van Buren tower. Climatological mixing depths were assumed in both data sets.

4.086
The highest peak ambient SO_2 level estimated to occur using the Buffalo meteorological data (0.013 ppm (33.8 $\mu g/m^3$)) lies to the northeast of the Pomfret site, a secondary impact region lies to the southeast of the site. Higher values which occur to the northeast and south of the point of maximum concentration is attributed to the high frequency of west-southwesterly and southwesterly winds dispersing airborne SO_2 emissions from the cities of Dunkirk and Fredonia. The low frequency of easterly winds produces a steep gradient 10 to 18 km west-southwest and southwest of the plant. The western edge of the concentration area, attributed mainly to emissions from sources in the cities of Dunkirk and Fredonia, is defined by this gradient.

4.087
ERTAQ estimates of background concentrations were also examined. At the location of the peak concentration of 0.013 ppm (33.8 $\mu g/m^3$), the contribution from the plant with full-load emissions will be 0.0001 ppm (0.27 $\mu g/m^3$), only 0.7 percent of the background value. The distribution and magnitude of annual average background concentrations within 25 km of the Pomfret site are expected to remain essentially unchanged with the introduction of the proposed station.

4.088
The 0.03 ppm (80 $\mu g/m^3$) annual standard will not be contravened as a result of plant and background emissions since the highest predicted total concentration at any point within the air quality area of impact is 0.013 ppm (33.8 $\mu g/m^3$). The Federal annual and nondeterioration standards for new sources, 20 $\mu g/m^3$, would not be exceeded since the maximum expected additional annual concentration attributed to the emissions is 3.7 $\mu g/m^3$.

Impacts During Periods of Stagnation
4.089
Periods of stagnation are predicted to occur on approximately nine days over a five-year period. With conditions of wind speeds less than 5 meters per second and a mixing height equal to or greater than approximately 900 m the predicted impact of the proposed facility on ambient SO_2 levels will be less than 0.08 ppm of a 1-hour average. There is predicted to be no impact due to the proposed facility for

stagnation conditions with lighter wind speeds and lower mixing heights because the stack plume will penetrate the inversion base.

4.090
Additional analysis of anticipated SO_2 levels was performed by the State Public Service Commission and New York State Department of Environmental Conservation using meteorological data collected at the Erie Municipal Airport. The proposed facility should have no difficulty meeting the short-term 3-hour and 24-hour SO_2 standards as well as the long-term annual standard. Table 4-11 shows that the maximum increases in SO_2; anticipated are 238 $\mu g/m^3$, 52 $\mu g/m^3$, and 3.3 $\mu g/m^3$ for the 3-hour, 24-hour and annual averages respectively. These figures are well within the allowable Class II non-degradation limits.

4.091
The effect of exposure on humans to SO_2 is compounded by the synergistic effect of this gas with other atmospheric pollutants. The combination of high SO_2 levels with high smoke or particulate levels compounds and intensifies the effect of SO_2. Known effects of SO_2 in combination with low particulate levels or smoke are primarily on the respiratory systems of humans. The effects may include impairment of lung function, increased frequency and severity of lower respiratory tract disease, and aggravation of asthma and bronchitis symptoms. Atmospheric reaction products of SO_2, including sulfates and acid rain, are known to have effects similar to those mentioned above. At the present time, it is not possible to quantify the effects of SO_2 on human health. However, the national primary ambient air quality standards were promulgated as standards to protect the public health, and secondary ambient air quality standards to protect the public welfare from any known or anticipated adverse effects associated with the presence of such air pollutants in the ambient air. Sulfur dioxide is one of the pollutants controlled by EPA standards and the proposed facility is expected to meet these standards. Impacts on plants and animals are discussed in the Terrestrial Ecology Section of this chapter.

Emissions From the Auxiliary Boiler
4.092
It is anticipated that the auxiliary boiler will operate for approximately 40 hours once per month and the flue gas will be emitted from a 260-foot (79.2 m) stack, 10 feet (3.0 m) higher than the height of the adjacent boiler building. The predicted air emissions from this facility have been calculated by the PSDM for "normal" meteorological conditions and during strong winds when plume dispersion will be influenced by building downwash.

TABLE 4 - 11

MAXIMUM AIR QUALITY INCREMENTS DUE TO
GENERATING UNITS AND SINGLE NATURAL DRAFT COOLING TOWER
(PSC/DEC ANALYSIS)

	Generating Units (μg/m3)	Cooling Tower (μg/m3)	Class II Allowable Increments
SO_2			
3-hour	238	N/A	512
24-hour	52	N/A	91
Annual	3.3	N/A	20
TSP			
24-hour	4	N/C	37
Annual	0.4	0.005	19
NO_2			
Annual	1.9	N/A	
Settleable Solids			
Month	Negligible	0.0135 mg/cm^2/month	

N/A - Not applicable
N/C - Not calculated

Impact During Normal Meteorological Conditions

4.093
The highest predicted hourly SO_2 level of 0.062 ppm (163 $\mu g/m^3$) will occur 7 km SSE of the Pomfret stack with a mixing height of 300 m. The maximum combined impact of the Lake Erie Generating Station on hourly SO_2 concentrations during those periods when the auxiliary boiler is used in conjunction with one or both of the generating units at maximum load is shown below:

MAXIMUM COMBINED IMPACT* ON HOURLY SO_2 CONCENTRATIONS

	Total Concentration ($\mu g/m^3$)	Auxiliary Boiler Contribution ($\mu g/m^3$)	Location Direction	Location Downwind Distance (km)
Pomfret - 2 Generating Boilers	594	6	WNW	7.0
Pomfret - 1 Generating Boiler	383	6	WNW	7.0

*Occurs for stability Class 4, a representative wind speed of 15.6 m/sec and a 300 m mixing depth.

It is anticipated that the auxiliary boiler would operate only when neither of the steam generators is operating above twenty-five percent load. In that light, the data presented in the above chart represent a worst case impact analysis of the combined operation of the main units and the auxiliary boiler. The maximum combined impacts were found to occur for the meteorological conditions characterized by stability Class 4, a representative wind speed of 15.6 m/sec, and a 300 m mixing depth.

Impact During Building Downwash Conditions

4.094
Since the stack servicing the auxiliary boiler will be about 10 feet higher than nearby buildings, the boiler plume will experience aerodynamic downwash during moderate and high wind speed conditions. This causes the rapid mixing of the pollutants into the building wake region and a rapid transport to ground level. These conditions were simulated using a modified Gaussian plume model.

4.095
The highest hourly SO_2 concentrations expected during downwash conditions and the associated downwind distances are as follows:

Concentrations (ppm)	Downwind Distance (m)
0.25	100
0.21	200
0.17	300
0.15	400
0.13	500
0.12	600
0.11	700
0.10	800
0.09	900
0.08	1,000

It was assumed the concentrations are independent of wind direction. The highest concentration, 0.25 ppm (650 $\mu g/m^3$), would occur approximately 100 m downwind of the stack with a wind speed of 7.5 mph. Downwash will not influence plume dispersion at wind speeds less than 7 mph and the increased dilution with higher wind speeds reduces the impact.

4.096
In summary, the peak hourly concentrations are not below the 3-hour nondeterioration standard of 512 $\mu g/m^3$. This occurs onsite at a point 100 meters downwind of the stack where concentrations of 650 $\mu g/m^3$ occur. The predicted 24-hour and annual levels are below the applicable standards.

Annual NO_2 Concentrations
4.097
The highest ambient NO_2 concentrations are attributed to emissions from sources in the cities of Dunkirk and Fredonia. The peak predicted concentrations, 0.044 ppm (88 ug/m^3), occurs at the intersection of New York State Highways 20 and 60 in Fredonia. The overall spatial distribution of annual NO_2 concentrations reflects the high frequency of westerly and southwesterly winds and the low frequency of easterly winds. A band of high concentration is located to the northeast of Dunkirk and Fredonia. NO_2 emissions from vehicles on Interstate Highway 90 and New York Highway 20 are primarily responsible.

4.098
The emissions inventory probably did not include all NO_2 sources in the region. In order to account for the uninventoried sources, a calibration factor was applied to increase the concentrations from

inventoried emissions. This factor, when applied to the sources in Dunkirk and Fredonia, probably results in an overestimation of NO_2 levels near these sources. Monitoring data are not available from within the depicted area of maximum concentrations, while monitoring data from locations near the city boundaries indicate average concentrations below 0.02 ppm (40 $\mu g/m^3$).

4.099
The contribution of the proposed facility emissions is small for two units at 100 percent load. The model predicts that the proposed facility contribution at the point of maximum concentration (0.044 ppm, 88 $\mu g/m^3$) is 0.0005 ppm (1.0 $\mu g/m^3$) or 0.5 percent of the total value. The maximum percentage contribution due to the Lake Erie Generating Station at any receptor point where the annual concentration exceeds 0.03 ppm (60 $\mu g/m^3$) is three percent. This occurs 8 km ENE of the plant site, where the predicted concentration is 0.030 ppm (60 $\mu g/m^3$) and the plant's contribution is 0.0011 ppm (2.2 $\mu g/m^3$).

4.100
According to the State's analysis, the projected annual increase in NO_2 concentrations due to the proposed facility at 100 percent operating load is 1.9 $\mu g/m^3$ (.001 ppm) for low-sulfur coal (Table 4-11). This increase is not significant since the resultant air quality is well within all standards.

4.101
The USEPA is presently considering a short-term air quality standard for NO_2. The agency is focusing in on a one-hour standard of 0.25 to 0.50 ppm (470 to 940 $\mu g/m^3$). Specifically, Shalamberidge (1967) reported that most individuals responded to NO_2 odors at concentrations of 230 $\mu g/m^3$ (0.12 ppm). Other studies suggested that healthy individuals responded adversely to short-term exposures (6 hours) to NO_2 at 2,800 $\mu g/m^3$ (1.5 ppm) and intermittent concentrations ranging from 470 to 740 $\mu g/m^3$ (0.25 ppm to 0.50 ppm). Presently, the Federal primary ambient standard is 100 $\mu g/m^3$ (0.05 ppm) on an annual average basis. The peak plant concentration is predicted to be 2.2 $\mu g/m^3$ (.001 ppm). The peak ambient concentration is predicted to be 88 $\mu g/m^3$ (0.047 ppm). The peak plant contribution at the location of maximum ambient concentration of NO_2 is 0.6 $\mu g/m^3$ (0.0002 ppm). This increase is not significant since the resultant air quality is well within all standards. Projected NO_2 emissions from the power plant, coupled with ambient NO_2 concentrations, are substantially below NO_2 human irritation levels.

Effects of NO_2 on plants and animals are discussed in the Terrestrial Ecology Section of this chapter.

Hydrocarbons

4.102

The combustion of coal produces gaseous emissions in addition to the ones already addressed. Hydrocarbons were predicted to be released at a rate of 900 tons per year based on an estimated emission rate of 0.3 lbs of non-methane hydrocarbons per ton of coal and combustion of 6 million tons of coal per year. A "major source" of non-methane hydrocarbon emission is defined as a source emitting 100 or more tons per year. This would place the proposed plant in the "major source" category and require emission offsets. However, the estimate of 0.3 lbs of non-methane hydrocarbons per ton of bituminous coal is currently in revision. A new factor of 0.01 lbs per ton of bituminous coal is expected to be implemented. This would lower the predicted emission rate from 900 tons per year to 30 tons per year and remove the proposed facility from the "major source" category. If these new estimated emission rates are accepted, the proposed facility would not require any emission offsets for non-methane hydrocarbons.

Total Suspended Particulates

4.103

Twenty-four hour total suspended particulates (TSP) expected in 1985 were calculated using the same techniques which were used to estimate 24-hour SO_2 levels:

- PSDM calculations based on a time series of sequential meteorological data,
- PSDM calculations based on observed persistent wind direction and
- Case studies of observed high TSP concentrations.

Sequential Modeling Analysis

4.104

Predicted contributions of the proposed plant to 24-hour TSP levels were calculated using onsite data. The highest contribution, 4.8 $\mu g/m^3$ would occur 6 km ESE of the stack with two units operating at 100 percent load.

Persistence Analysis

4.105

The maximum TSP concentration is 5.6 $\mu g/m^3$ and occurs at 75 percent plant load.

Case Study Analysis

4.106
On two occasions the 24-hour TSP concentrations measured at Swamp Road exceeded 150 $\mu g/m^3$ resulting in a contravention of the secondary NAAQS. Single concentrations above 150 $\mu g/m^3$ were also observed at the Beebee, Chapin, and Van Buren monitors. The TSP values of 211 $\mu g/m^3$ and 161 $\mu g/m^3$ observed at the Swamp Road monitor on 31 July and 2 August 1975, respectively, were associated with an East Coast air mass stagnation episode which persisted from 29 July through the morning of 3 August. During the six-day period, a warm dome of high pressure extended vertically through 20,000 feet and the winds at all levels were light and variable. Hot, hazy, and humid conditions prevailed at the surface through the period.

4.107
A detailed examination of the composition of the particulates on the Swamp Road hi-volume filters of 31 July and 2 August was made under incident polarized light at approximately 200x magnification. The 31 July and 2 August TSP concentrations consisted of about 80 percent to 90 percent mineral and biological material and only 10 percent to 20 percent combustion products. Apparently the dryness of the surface associated with the stagnant air mass created an increase in the amount of fugitive dust while the rate of production of combustion products remained fairly constant. An additional explanation of the high TSP values may lie in the proximity of the Swamp Road shelter to a vineyard. Pollen, spores, fertilizer, and dust can all originate in a vineyard. It is, therefore, concluded that the high TSP levels recorded on 31 July and 2 August were caused by mineral and biological materials rather than from combustion products. The contribution of the proposed station to TSP concentration for the two 24-hour period during which levels exceeded 150 $\mu g/m^3$ at Swamp Road was calculated using PSDM and meteorological conditions observed at the upper level of the Van Buren tower. Since the wind direction was primarily offshore and the wind speeds were low, the proposed station would not have contributed to observed TSP levels. Overall the calculated contribution expected due to the operation of the proposed Lake Erie Generating Station is small, and the peak level from emissions is predicted to be 5.6 $\mu g/m^3$. The allowable Class II increment is 37 $\mu g/m^3$.

1985 Annual TSP Concentrations

4.108
The methodology used in the prediction of annual SO_2 concentrations was also used to predict 1985 annual TSP concentrations. The model calculations include maximum allowable emissions from the proposed facility and calibrated background emissions. The highest background

concentration (44 $\mu g/m^3$) is attributed to emissions from sources in the cities of Dunkirk and Fredonia. The highest plant contribution is 0.32 $\mu g/m^3$, less than one percent of the predicted maximum background concentration of 44 $\mu g/m^3$. The Class II allowable increment is 19 $\mu g/m^3$. Uninventorized sources, such as dirt roads, plowed fields and agriculture, are significant contributors to the ambient suspended particulate concentrations.

4.109
In summary, the primary and secondary NAAQS TSP standards of 75 $\mu g/m^3$ and 60 $\mu g/m^3$, respectively, are not expected to be exceeded within the air quality impact area of the proposed station. This is confirmed by the available monitoring data and the modeling analysis.

Fugitive Dust
4.110
Fugitive dust emissions associated with the transportation and disposal of fly ash and bottom ash from the proposed Lake Erie Generating Station and the Dunkirk Steam Station (DSS) will affect suspended particulate levels and dustfall rates at locations in the vicinity of the disposal areas. It should be noted that although the calculated impacts represent the best available estimates, there is little quantitative information and, therefore, some uncertainty concerning fugitive emissions from ash piles.

4.111
Based on the maximum expected daily ash disposal and the planned control measures, it has been estimated that about 11.1 lbs of particles less than 30 μm in diameter will be generated each workday hour by these daytime activities and wind erosion. These daily fugitive emissions will contribute to ambient concentratins of suspended particulates. In addition, wind erosion of the exposed pile over a period of about three months during the winter, when topsoil has not yet been used to permanently cover the pile, will cause fugitive emissions of fine particles that will contribute to annual levels of suspended particulates.

4.112
To control the ash pile and to minimize fugitive particulate emissions, several procedures have been developed. A berm will be constructed around the pile. Water will be applied to the ash while it is loaded onto the trucks and after dumping to control emissions during workday activities. A chemical binding agent may be applied to the inactive pile to bind the surface layer. Topsoil will be used to cover the pile every three months. Trucks used to transport the ash from the two power plants will be covered. Additional preventative measures include the planting of quick-growing trees along the border of the disposal area to act as a windbreak. These control

measures represent an excellent program to minimize the air quality impact of the dry ash disposal area.

4.113
To summarize studies done by the applicant, fugitive dust emissions from the proposed facilities ash disposal area will not produce a 24-hour TSP level above the nondeterioration increment outside the plant boundary. At all receptor locations, the applicant's predicted concentrations are less than 30 $\mu g/m^3$. The contributions of the ash disposal area to annual TSP levels are below the 19 $\mu g/m^3$ nondeterioration increment. The proposed dry ash disposal system and dust control procedures represent techniques for the minimization of the air quality effects associated with fugitive emissions.

4.114
The State, in its analyses, indicated that the applicant may have underestimated fugitive dust emissions, and that the proposed facility emissions added to fugitive dust could violate the annual nondeterioration standard of 19 $\mu g/m^3$ and the 24-hour standard of 37 $\mu g/m^3$. According to PSC staff, the emission factor used by the applicant could not be considered conservative in that the emissions factor in the reference relied on by Niagara Mohawk (Mann and Cowhard) was applied without full understanding of the material on which the emission was representative. Niagara Mohawk's "Ash Handling System Study" shows that 18-67 percent, by weight, of fly ash may be less than 30 μm in diameter, i.e., in the suspended particulate size range. Sand and gravel is indicated as having 12 percent, by weight, in the 30 μ and less size range. The emission factor referred to in Mann and Cowhard and also reported in the EPA document AP-42, "Compilation of Air Pollutant Emission Factors" was based on sand and gravel with one-to-two percent by weight in the 30 um and below size range. Thus, the applicant should have increased the emissions factor in AP-40-42 being a factor of from 1.5 to 33, according to PSC staff, rather than decreasing it by multiplying by 0.65.

Considering this development, the applicant's estimates of concentration should be increased by at least 2.3 and perhaps as much as 50. However, during the Article VIII hearings, it was indicated by the applicant's air quality witness that the fly ash emission factor had only been adjusted for rainfall, but not for the water added to the fly ash as it will be placed in trucks for transportation to the disposal area. The amount of water added is reported to be approximately 20 percent by weight. Considering only the upper one inch of the disposal site, this water addition is the equivalent of .32 inches of rain falling during the approximately eight-hour active disposal workday. This added water is the equivalent of 250 additional inches of rain per year. Added to the existing rainfall of 36 inches, this makes a total of 286 inches per year, equivalent rainfall in the active disposal area. At the end of an eight-hour shift, bottom ash will be spread on top of the fly ash and an environmentally acceptable and approved chemical-binding agent will be applied, if available, rendering further emissions from the active area negligible. Since the issuance of the draft EIS, the applicant has incorporated a correction factor for this added water.

The PSC staff, in considering all of the factors involved, has determined that construction of a berm 45 feet in height along the Thruway side of the ash disposal facility, is an acceptable method for dealing with the problem of total suspended particulates. In areas where the berm is less than 45 feet in height, PSC staff states that dense vegetation and plantings should be required. Moreover, the applicant will take all possible measures to ensure that ash is not exposed to the cold windy conditions that would result in the greatest emissions. The applicant has agreed that a berm windbreak will be built between the disposal area and site boundary and that such berm windbreak will present as great a physical height above the offsite grade as possible. Furthermore, at the end of each day's disposal, the area will be covered with bottom ash as the top layer, and treated with binding agents as previously indicated.

During the winter and early spring, ash handling and disposal activities will be confined to the interior of the site to avoid large potential offsite impacts. During extreme cold, cooling tower blowdown will be used to accomplish the wetting of the ash during the disposal site operations. A design and operational plan for the Pomfret dry disposal site, incorporating these concepts, will be developed. Such a plan will address quantitatively how the design and operation will avoid offsite high TSP concentrations. Plans for ambient monitoring of the TSP impact of the dry ash disposal system will be included.

On the basis of the evidence available, the dry ash disposal system, incorporating mitigating activities in the disposal procedures, will comply with PSD non-deterioration limits. With these procedures incorporated, compliance will be assured by TSP monitoring of the ash disposal operations and ordering an increased frequency in the application of control measures in the event TSP levels are being degraded.

4.115
Particulate matter affects human health in several ways. First, the particles themselves may have toxic effects on human health. Toxic elements in power plant emitted particles include cadmium, lead, arsenic, nickel, vanadium, zinc, and others. These particles can be inhaled and deposited in the human respiratory system. The smallest particles which are deposited in the respiratory system may be the

most harmful. Secondly, the particles may act as carriers for toxic gases such as SO_2. Known effects of particulates include acute irritation of lung tissue, aggravation of asthma symptoms, decreased lung function, and increased acute lower respiratory disease. The emission of particulates from the proposed power plant is expected to meet the Federal standards which were designed to protect the public health.

Settleable Particulate Deposition Rates

4.116

PSDM was used to determine maximum ground level deposition rates of particulate matter that would be emitted from the proposed station. Calculations were performed assuming the most adverse meteorological conditions. The highest deposition expected in any one month is 0.005 mg/cm^2/month, which is well within the NYSAAQS of 0.30 mg/cm^2/month.

New York State and National Ambient Air Quality Standards

4.117

The maximum model calculated ambient concentration (plant and background) are summarized on Table 4-10. Table 2-9 presents the national primary and secondary ambient air quality standards and Table 2-10 displays the New York State Ambient Air Quality Standards. The applicant's results demonstrate that Lake Erie Generating Station emissions will not result in contravention of either NYSAAQS or NAAQS.

Existing New Source Performance Standards

4.118

Table 1-8 shows the existing Federal Standards of Performance or New Stationary Sources. These standards limit SO_2 emissions to 1.2 lb/10^6 Btu, NO_x (as NO_2) to 0.70 lb/10^6Btu, and particulates to 0.10 lb/10^6Btu for coal fired emissions. The New York State Standard (Table 1-9) is identical except the State limits the fuel sulfur content to 0.6 lb of sulfur per 10^6Btu in addition to limiting SO_2 emissions. The proposed facility is expected to meet these present standards. Tables 1-8 and 1-9 also show the present standards for oil-fired facilities (the auxiliary boiler). Emissions from the auxiliary boiler are predicted to meet these standards. The anticipated facility emissions, as calculated by the State, are displayed on Table 4-12.

Cooling Tower Emissions

4.119

The proposed natural draft cooling tower will emit large quantities of heat and moisture into the atmosphere. However, the effects of these emissions are small. No occurrences of ground level fogging or icing are expected to result from the operation of the proposed

TABLE 4 - 12

Facility Emissions
(100% load only)

Main boiler with low-sulfur western coal	
SO_2	1.2 lb/10^6 Btu
TSP	0.1 lb/10^6 Btu
NO_x	0.1 lb/10^6 Btu
Auxiliary boiler with #2 fuel oil	
SO_2	0.8 lb/10^6 Btu
TSP	0.1 lb/10^6 Btu
NO_x	0.3 lb/10^6 Btu
Auxiliary boiler with coal	
SO_2	1.2 lb/10^6 Btu
TSP	0.1 lb/10^6 Btu
NO_x	0.7 lb/10^6 Btu

cooling tower. Peak monthly salt drift deposition rates (predicted as 0.077 lbs/acre-month) are three orders of magnitude or more below the New York State Air Quality Standard for settleable particulates (27 lbs/acre-month). The largest number of long visible plumes is expected to trend to the northeast of the tower in May. Visible plumes beyond 1 km of the station occur less than 15 hours per month-approximately two percent of the time. Cooling tower plumes with lengths exceeding 10 km can occur during conditions of light winds and high relative humidity, conditions conducive to natural cloud and fog formation. During such circumstances the cooling tower plume would merge with natural clouds and have no practical significance (Refer to paragraph 1.154 and Appendix Tables A-2 and A-3 for quantitative evaluation of cooling tower emissions).

4.120
During reduced load conditions, the cooling tower contributes less heat to the vapor plume. The buoyancy of the tower discharge is consequently reduced, resulting in a lower plume rise than would be expected to occur under any operating conditions with a 500-foot high natural draft design. The visible plume length for any specific weather conditions should be shorter with reduced load.

4.121
The drift deposition patterns corresponding to reduced load situations are expected to be concentrated closer to the tower than with full load. The lower trajectory of the plume with reduced load will allow drift droplets (especially the large drops) to reach the ground at shorter downwind distances. The spatial distribution of salt drift under reduced load will, therefore, be more concentrated, but this is counteracted by the reduction in total salt mass leaving the tower. The effects of using only one 850 MW unit upon cooling tower impact are reflected in a qualitative way in the discussion above; i.e., the results for one unit operating at full load should be similar to those obtained for two units at 50 percent load.

Meteorological Impact of the Cooling Tower

4.122
The operation of the proposed facility is not expected to impact on either normal or extreme values of temperature, wind velocity, or atmosphere pressure. Despite the release of large quantities of heat, the subsequent dilution of plume air should yield plume-environmental air temperature differences of less than 0.1°C once the plume has reached its level of neutral buoyance. The effect of this temperature difference at ground-level will be exceedingly small, even during a lake breeze or other onshore flow conditions. Similarly, fluctuations in wind velocity and atmospheric pressure will be negligible compared to those which result from natural phenomena.

4.123
The release of water vapor from the cooling tower and the availability of latent heat over a limited area may affect the development and propagation of meso- and smaller scale precipitation phenomena. Precipitation enhancement and the triggering of convective showers within a few miles of the facility are potential effects due to the increases in energy flux.

4.124
Changes in local precipitation rates in the vicinity of natural draft cooling towers have been assessed in field measurement programs and through the use of mathematical cloud models. The field programs were limited and included few ground-level measurements. Stockham (1971) investigated climatographical precipitation statistics at several locations in the vicinity of the Keystone cooling towers. This data included precipitation measurements before and after the operation of the towers. No significant differences in precipitation were observed after commencement of operation at the Keystone facility. The applicant estimated annual precipitation increases based on predictions made for the 2,200 MW Zion plant in northeast Illinois. The applicant predicts that increases in local annual precipitation will not exceed 0.5 percent. The large release of moisture from the towers creates the possibility of additional cloudiness and sky obscuration. The incremental effect on additional cloud (visible plume from the tower) is usually insignificant in terms of total cloud cover shadowing of the ground.

Local and Regional Air Traffic

4.125
The Federal Aviation Administration has issued a "no hazard" determination for the Pomfret site. No impact on air space is expected due to the operation and maintenance of the proposed facility.

HEAT DISSIPATION SYSTEM

4.126
The waste heat contained in the cooling tower blowdown will be discharged into Lake Erie using an offshore multiport diffuser. The thermal energy of the discharge is transferred to the ambient water through convection due to water movement as well as turbulent diffusion. By the time the jet reaches the zone of impingement (near the surface), the plume's centerline velocity and temperature will have been reduced considerably and only a small amount of heat will be transferred directly to the atmosphere.

4.127
Monthly surface temperature analyses for average and extreme climatic

conditions were performed. The 0.5°F surface isotherm for the worst average climatic condition (i.e., April) is shown in Appendix Figure B-7, and the maximum induced surface temperature rise is also given. Similar information for a typical average month (i.e., October) is given in Appendix Figure B-9. The month of the worst extreme climatic condition resulting in maximum surface temperature rise is also April. In addition, stagnant ambient flow conditions have been assumed for conservatism in this surface temperature analysis since this results in minimum heat dissipation and the longest detention time. Appendix Figure B-8 presents the 0.5°F surface isotherm for the month of the worst extreme climatic conditions (i.e., April). The predicted surface areas enclosed by the 0.5°F isotherm are approximately 2.2 acres, 1.2 acres, and 2.8 acres for April and October average climatic conditions, and for April extreme climatic conditions, respectively.

4.128
Discharge water from the multiport diffuser has a buoyant force in addition to an inertial force: therefore, it is termed a buoyant jet. Temperature rises at the jet exit (Table 1-15) are actually slightly lower than the values presented in Tables 1-6 and 1-7 because approximately 0.4 cfs of treated waste water discharge (assumed to be approximately at ambient lake temperature) is assumed to be added to the cooling tower blowdown pipeline prior to the diffuser discharge.

4.129
Hydraulic model tests show that the highest surface temperature rise during critical stagnant and extreme April climatic conditions is 2.6°F. These results are conservative in that it is assumed that there will be a coincident occurrence of maximum load, an ambient velocity of 0.2 fps (across the diffuser) and extreme meteorological conditions. Considering all these factors it is considered that the resulting surface temperature rise will always be lower than the 2.6°F mentioned above. Therefore, it is concluded that the maximum surface temperature rises will always be below 3°F and New York State Thermal Standards will never be exceeded.

4.130
A more complete discussion of the heat dissipation system is contained in Appendix B. The applicant's mathematical and hydraulic models and dye dispersion studies show that the thermal discharge will meet applicable State and Federal Standards and criteria. The U. S. EPA, Region II has informed the Corps that Section 316(a) of the Federal Water Pollution Control Act is not applicable to the proposed plant since its closed-cycle design would be in compliance with the effluent guideline limitations governing thermal discharges for the steam electric generating industry. The joint testimony of the

New York State Department of Environmental Conservation and NYS Public Service Commission (Article VIII proceedings) states that the proposed design for the cooling water discharge at Pomfret and Sheridan will comply with thermal standards (6 NYCRR 704.1(a)) and thermal criteria (6 NYCRR 704.2(b)(3)(i) through (iii), 704.3 and 704.5).

Recirculation Potential

4.131

Recirculation of discharged water to the intake (resulting in a temperature increase of the intake water) is insignificant. When the ambient current flow from the discharge towards the intake is of a duration of approximately one half hour or longer, the intake temperature increase during the month of the worst average climatic conditions (April) is predicted to remain below 0.03°F. Based on eight months of current measurements, the possibility of recirculation is less than five percent for flow in a 22-1/2 degree sector radiating from the diffuser and enveloping the intake area.

Evaporative Water Loss

4.132

Evaporative water losses were calculated by the method of Thackston and Parker (1971). October, a typical month of average climatic conditions, was considered. Evaporative water loss was predicted to increase by about 7.1 percent over the 1.2 acres of the lake surface around the stagnation region (1.2 acres is the approximate area enclosed by the 0.5°F surface isotherm in Figure B-9) and 1.7 percent over the adjacent 3.2 acres of the lake surface. Evaporative water loss in April under average climatic conditions was predicted to increase by about 17.4 percent over the 2.2 acres near the stagnation region (approximate area enclosed by the 0.5°F surface isotherm in Figure B-7) and 8.6 percent on the adjacent 3.4 acres of the surface. For April, under the extreme climatic conditions (the worst conditions), evaporative water loss was estimated to increase 31.2 percent on the 0.6 acres near the stagnation region (approximate area enclosed by 1.0°F) and 17.3 percent on the adjacent 2.2 acres. Evaporative water losses of the additional adjacent areas for each case will be reduced in a similar manner. Evaporative water losses under average and extreme climatic conditions have been tabulated in Tables 1-17 and 1-16. Under average climatic conditions the increase in annual evaoration loss is estimated at 24,521 cubic feet of water inside a 0.25°F isotherm. This increase is 4.64 percent of the natural evaporation rate for the same area (528,913 cubic feet per year). This small incremental loss will not significantly affect Lake Erie.

WATER QUALITY AND USE

4.133
All treated waste discharges are combined with the cooling tower blowdown and the resulting effluent is discharged through a submerged multiport diffuser into Lake Erie. The concentrations of wastes in the discharge are presented in Table 1-13. The concentration of each constituent in the discharge regulated by the EPA Effluent Limitation Guidelines is below allowable maximum and average values. The values of discharge concentration can be compared with the Lake Erie ambient water quality presented in Tables 2-16 and B-8. As can be seen, for most parameters, the concentration is approximately three times ambient concentration. This is because the cooling system operates at three cycles of concentration and represents practically the entire discharge flow (13.1 cfs, of which 12.7 cfs is cooling tower blowdown), therefore diluting the other waste sources.

4.134
The multiport diffuser is used to maximize mixing of the plant effluent with lake water, thereby minimizing the impact on ambient water quality. It has been calculated (refer to Appendix B for formula) that the maximum resultant surface concentration of most of the chemical parameters are within ten percent of ambient lake levels and, therefore, will have an insignificant effect on lake water quality. The exceptions to this statement include the parameters sulfate and sodium. The increased sulfate concentration is due mainly to the addition of approximately 90 mg/l sulfuric acid to the recirculating cooling water for pH control while the sodium concentration is due to demineralizer regeneration with sodium hydroxide.

4.135
Based on the above results it is anticipated that the discharge of chemical constituents from the Pomfret Generating Station will not alter the present water quality regime of Lake Erie, after a short period of near field plume mixing which takes place in less than 11 seconds. The effluent limitations and other limitations proposed in the State's Draft 402 Discharge Permit, if met by the applicant, will provide for compliance with surface water quality standards.

4.136
New York State does not have a general mixing zone standard but a mixing zone is described on a site-specific basis and has not yet been approved by the Siting Board for the proposed facility. However, the Draft 402 Discharge Permit specifies a surface mixing zone of six acres, an area equivalent to a circle with a radius of 300 feet. Establishment of this mixing zone is contingent on Siting Board approval and issuance of the Final Section 402 Discharge

Permit. The area enclosed by the 0.5°F increase isotherm is described in the previous section and is expected to be significantly smaller than the proposed mixing zone. New York State water quality standards are not expected to be exceeded, except in cases where the ambient lake concentration exceeds the limit. Once a mixing zone is approved, it is expected that ambient concentrations will exist outside the zone.

4.137
The discharge constituents of greatest importance to the aquatic ecology of the Pomfret area are metals, suspended and dissolved solids, nutrients, and biocides. As already stated, the water quality of Lake Erie adjacent to the Pomfret site will not be altered outside of the plume area by the proposed station operations. The rapid mixing of the plume with ambient water, the small size of the plume and the fact that chemical constituents of the discharge are basically concentrated lake water, suggest that effects of the discharges on the aquatic ecology will be minimal.

4.138
The Draft 402 Discharge Permit requires that chlorine will be discharged at a maximum concentration of 0.2 mg/l as free available chlorine for a period not to exceed two hours per day. Compliance with this time restriction will be insured by discharging the cooling tower blowdown through a holdup pond having a four-hour detention time. With this additional time, no free available chlorine is predicted to be discharged. Additionally, decay of free available chlorine would occur in the discharge pipe and there would be reactions with the chlorine demand of other plant wastes prior to discharge. The imposed effluent limitations and the holdup pond, coupled with chlorine demand of the discharge and receiving waters and the dilution and dispersion to be provided by the diffuser should reduce residual chlorine concentrations to levels acceptable to aquatic organisms.

4.139
Cooling water discharges from cooling towers tend to slightly increase the dissolved oxygen content of river water where concentrations are low and reduce it where they are above saturation (Coutant, 1973). When Lake Erie oxygen levels are above saturation, cooling tower operations will cause a reduction to the saturation point of the discharge temperature. The worst case for oxygen depletion would then be in August, when ambient oxygen levels average 8.2 mg/l and discharge temperatures average 87°F. After saturation with oxygen in the cooling towers, 7.5 mg/l dissolved oxygen should be present in the discharge. During winter conditions, oxygen values will drop from approximately 13 or 14 mg/l under average daytime lake conditions to approximately 9 mg/l in the discharge. This value is

well above levels required for protection of aquatic organisms. The maximum decrease in dissolved oxygen predicted is 0.3 mg/l at the surface. Effects on plankton and fish within the plume should be negligible, and there will be no impact outside of the plume area.

4.140
Destruction of aquatic organisms in the circulating water system may increase the organic detrital load in the discharge area. This detritus will be available for grazing by zooplankton, ichthyoplankton and forage fish as well as benthic organisms. It will also have an oxygen demand.

4.141
During the operation and maintenance of the proposed Lake Erie Generating Station the possibility will exist for accidental spills of various chemicals and other contaminants into onsite water bodies and Lake Erie. The applicant, realizing the potential danger, has formulated contingency plans and mitigative actions to cope with any spill of hazardous materials which may affect water quality.

Runoff
4.142
Runoff from the coal storage area, the ash disposal site and the concrete structures of the proposed facility will be impounded in retention basins. There the pH of the water will be adjusted to between 6.0 and 9.0 and sufficient residency time will be allowed to enable the particulate material to settle. This wastewater will be discharged to Lake Erie along with the plant discharge where little or no effect on water quality is anticipated. Appendix Tables B-1 through B-6 show the estimated water quality of various discharges prior to combination.

Supply
4.143
There is virtually no potential for contamination of domestic or municipal potable water supplies, as the lake discharge will have insignificant effect on lake water quality. No impact on ground water supplies is anticipated due to the operation of the proposed facility. Wells located on the periphery of the site will be monitored to ensure that ground water quality is not affected.

Navigation
4.144
The only aspect of facility construction which may have a potential impact on commercial navigation and recreational boating is the construction of the off-shore tunnel and breasting dolphin which will be taking place during an approximate three-year period. Exploratory drilling rigs will be present at the start of construction, but

thereafter there will be no surface obstruction to ship movements in the area. Warning buoys will be used as precautionary measure to inform small craft about the construction activities. Interference with commercial ship movements is not anticipated, as the nearest commercial shipping lane is approximately 2.3 statute miles from the proposed unloading facility, which will extend about 4,800 feet from the shore. The U.S. Coast Guard will prescribe aids for the protection of marine navigation under Title 33 Code of Federal Regulations (CFR) 66.01-35. Actual marking requirements will be in accordance with the specifications for marking deep water ports as set forth in Part 149, Subpart E, 149.799 of 33 CFR. It is the Coast Guard's intent to use the specifications for marking deep water ports as a guideline for prescribing aids to navigation for this for the facility although it cannot be classified as a deep water port as defined in Section 148.3 of 33 CFR. The proposed facility is about one mile southwest of existing shoals, a potential hazard to ships approaching or departing the facility. Commercial vessels have radar and updated navigation charts and would already be avoiding the shoal area. However, the U.S. Coast Guard recommends that the applicant may wish to mark the area with warning buoys. Additionally, the applicant will be required to install a fog signal with operational characteristics necessary for the protection of both commercial and pleasure vessels during periods of low visibility. The signal is to warn water craft of the existence of the offshore facility. Adherence to U.S. Coast Guard Regulations and recommendations should minimize potential navigation hazards associated with the offshore facility.

Water Use

4.145
The facility system requiring the largest consumptive water use is the cooling water system. The cooling tower's annual water consumption is estimated at 6.0×10^9 gallons (8.02×10^8 cu. ft.). Total plant water consumption was calculated by staff using the applicant's summary of water supply conceptual operation (Appendix Table A-3). Staff utilized the monthly differential of total water withdrawn and total water discharged and estimated a total yearly consumptive use of 6.308×10^9 gallons (8.43×10^8 cu ft). Additionally, forced evaporation at the lake surface as a result of the thermal discharge will increase annual evaporation by 183,417 gallons (24,521 cu ft). The direct water consumption related to operation of the Lake Erie Generating Station will be insignificant with respect to the availability of water from Lake Erie for plant use. However, increased construction of power plants along Lake Erie could result in the transfer of large quantities of lake water to the atmosphere and possibly result in loss of that water to another watershed. The possible cumulative effects of this water loss are presently unknown.

SHORE EROSION POTENTIAL

4.146
In the vicinity of the 80 by 80 foot docking caissons, one of which will contain the intake ports, a small wake region behind the caissons will be formed. The effects of this wake region will extend a distance of approximately 300 to 500 feet (91 to 152 m) depending on the ambient flow speed and direction. Inflow velocity at the intake ports, shown in Figure 1-8, is calculated to be approximately 0.25 fps (7.6 cm/s) for 2-unit operation, about the same speed as the ambient flow. Operation of the cooling water system is not expected to increase shore erosion rates or significantly affect currents. The thermal discharge is not expected to affect the ice cover which protects the lakeshore during the winter months.

TERRESTRIAL ECOLOGY

4.147
The major impact of plant operation upon the terrestrial environment will be the release of particulate matter and gaseous chemicals (sulfur oxides, nitrogen oxides, etc.) emitted into the atmosphere as a result of fuel combustion.

Sulfur Oxides
4.148
The sulfur in fossil fuels is usually in the form of inorganic sulfides and/or sulfur-containing organic compounds. When these fuels are burned in power plants, sulfur oxides are formed in the ratio of 40 to 80 parts of sulfur dioxide (SO_2) to 1 part of sulfur trioxide (SO_3). Aside from naturally occurring oxides of sulfur (e.g. volcanic gases and reactions of bacterial H_2S with oxygen), the burning of fossil fuels in the United States is the major source of sulfur oxides in the atmosphere.

4.149
Some agricultural species of the Pomfret region generally considered sensitive to SO_2 are cucumbers, beans, alfalfa, oats, wheat and grapes (NERC, 1973; Benedict et al., 1971). Zimmerman and Hitchcock (1956) suggest that the wild grape (Vitis labrusca) may be relatively sensitive because "moderate" foliar markings resulted from 4 to 8 hour exposures to approximately 1,300, $\mu g\ SO_2/m^3$. Benedict et al. (1971) and O'Gara cited in Thomas (1961) consider cultivated grapes (with no reference to varieties) as intermediate in sensitivity. Fujiwara (1970) observed that responses to SO_2 varied widely among different grape varieties. Of the six varieties investigated, Fredonia was "highly sensitive," Delaware, "sensitive," two Japanese varieties "intermediate," and two Japanese varieties "resistant." Tree species sensitive to SO_2, which occur in forest overstories of the Pomfret site, include trembling aspen and yellow

birch (northern hardwoods forest), European larch (conifer plantation), and willow (willow community) (Macdowal and Cole, 1971; Sucoff and Bailey, 1971).

4.150
Table 4-13 is a compilation of data generated by the National Environmental Research Center (NERC, 1973), S.N. Lizon (1973), and Jones et al (1974) which attempt to define short-term threshold SO_2 concentrations for visible plant injury, based on syntheses of selected literature and field studies. The predicted maximum ground level concentrations of SO_2 in the Pomfret area for 1 hour, 3 hour, 24 hour and annual concentrations (ambient plus stack-derived emissions) are 603, $\mu g/m^3$, 603, $\mu g/m^3$, 161, $\mu g/m^3$, and 34, $\mu g/m^3$ respectively. The 1 hour and 3 hour maxima are considerably lower than the corresponding thresholds of visible injury, and are not likely to affect sensitive vegetation in the Pomfret region significantly. However, the predicted maximum annual SO_2 average of 34 $\mu g/m^3$ may adversely affect sensitive lichen species in the region.

4.151
Plant sensitivity to SO_2 may be increased when plants are simultaneously exposed to SO_2 and NO_2 or O_3. However, plant responses to mixtures of SO_2 and NO_2, or SO_2 and O_3, vary widely with species, environmental conditions, plant age and dosage level. Responses of grape plants to mixtures of SO_2 and O_3 have not been reported in the literature. Studies contained in literature indicate that grapes exhibit oxidant stipple leaf injury and that this leaf injury was associated with and apparently caused by ozone gas.

The precise minimum ozone exposure necessary to produce oxidant stipple injury was not known. However, since Concord and Ives variety grapevines exposed to 0.3 or 0.6 ppm (parts per million) of ozone gas for six hours developed oxidant stipple leaf injury and since similar exposures to 0.1 ppm of ozone resulted in no oxidant stipple leaf injury, the sensitivity level was assumed to be between 0.1 and 0.3 ppm of ozone. Examination of grape cultivars in New York State and in Ontario, Canada, indicated that grape varieties vary greatly in oxidant stipple susceptibility and that Ives variety is very sensitive, the Delaware variety is very tolerant and the Concord variety is of intermediate sensitivity.

Literature suggested that sulfur dioxide was a possible cause of oxidant stipple. The combination of sulfur dioxide and ozone at low concentrations might also result in an ozone-type of injury suggesting that grapes may be sensitive to sulfur dioxide and ozone in synergistic combination. Literature also revealed that grape sensitivity to sulfur dioxide was not precisely known, but grapes exposed to 0.5 ppm of sulfur dioxide for 4 to 8 hours had exhibited typical sulfur dioxide leaf marking injury. The synergism between sulfur dioxide and ozone of interest would be approximately at sulfur dioxide concentrations of 0.5 ppm or lower and at ozone concentrations of 0.3 ppm or lower. It appears that existing ambient concentrations of O_3 occasionally have been sufficient to cause foliar injury on grape plants located in the Pomfret area (Shaulis _et al_., 1972; Kender, _et al_., 1973; Kender and Shaulis, 1973). The injury symptoms, termed "oxidant stipple" observed in vineyards near Pomfret have been duplicated in field chambers with six-hour exposures of grape shoots to concentrations of 588 or 1,176 $\mu g\ O_3/m^3$ (Shaulis et al., 1972). Consequently, studies performed by the applicant attempted to assess the effects of SO_2 emissions in combination with ambient levels of SO_2 and ozone. These studies are summarized in Section 4.151a.

4.151a.
In 1976 Niagara Mohawk initiated study and experimentation designed to assess the impact of SO_2 (sulfur dioxide) emissions from the proposed facility on grapevines grown in the vicinity of the power plant sites. The study included calculated ground level concentrations from the facility when mixed with ambient levels of SO_2 and ozone (O_3).

The applicant attempted to identify and quantify the sensitivity of grapes by evaluating the response symptoms resulting from the exposure of grapevines to SO_2 and O_3 in various dose combinations. Evaluation of response symptons included the percentage of leaf injury including oxidant stipple and typical SO_2 injury, vine length, berry diameter, leaf sulfur content, nutrient deficiencies (magnesium), total fruit production and berry soluble solute (sugar) content. Adverse effects were defined by the applicant as statistically significant negative impacts in the vegetative portions of the grape plant or in the parameters mentioned above. Basically, the 1976 study was designed to establish threshold levels of SO_2 doses causing leaf injury to grapevines so as to ascertain if such threshold levels would be greater or less than the levels of SO_2 plus ambient which would be experienced in the vicinity of the proposed facility assuming its operation.

Three grape varieties (Concord, Ives, and Delaware) were chosen for the 1976 study on the basis of their economic importance in the area as well as their known sensitivity to ozone.

Concord variety which constitutes approximately 85 percent of all grapes commercially grown in Chautauqua County is intermediate in sensitivity to ozone. Ives variety is the most sensitive variety identified, while Delaware is one of the most resistant varieties to ozone grown in the area. Collectively, the three grape varieties make up approximately 90 percent of the total commercial grape production for Chautauqua County.

In the field, Concord grapevines were exposed to levels of sulfur dioxide which ranged from 0.0 ppm (parts per million) to those far in excess of amounts predicted from the Lake Erie Generating Station plus ambient for both concentration (1.0 ppm) and duration (2, 4, and 6 hours) of exposure (dose). Grapevines were also exposed to doses of ozone (O_3) which ranged from 0.0 ppm to an excess of peak ambient conditions (0.3 ppm). In addition, vines were subjected to the same ranges of SO_2 together with O_3 to evalute any possible synergistic (greater than additive) effects of the two pollutants acting together. Experimental exposures consisted of 18 different treatment combinations of SO_2 and O_3 concentrations and time duration factors. A total of 60 vines were fumigated in two exposure periods (28 July to 20 August and 20 August to 3 September 1976). Thirty-five vines which were not treated were used as controls.

According to the applicant, the 1976 study results show the following:

- That for both first and second year yield parameters, there was no adverse effect resulting from any treatment level.

- That grape plants receiving the highest doses of SO_2, approximately one hundred times higher than predicted dose levels of the combined facility emissions plus peak ambient exhibited the same levels of yield for total berries and soluble solutes as did the controls which received no treatment.

- That second year yield studies showed that yields in treated vines were comparable to yields in vines of other vineyards in the area.

- The extremely wide margin of safety, above even high ambient concentration conditions, is still well below the levels of SO_2 required to adversely affect grape berry production or sugar content.

- The studies have not shown any indication of synergism between O_3 and SO_2 on Concord grapes.

- Ives and Delaware grape varieties show the basic trends and symptom responses found to occur in field studies on Concord variety.

- The observed threshold level for SO_2 injury to leaf tissue (injury expressed as a percentage of total leaf area per vine) for 2 hours continuous exposure is near 0.25 ppm of SO_2 and slightly less than 0.25 ppm for fumigation times of 4 to 6 hours of continuous exposure.

- Observed threshold level for oxidant stipple injury to leaf tissue is approximately 0.2 ppm of SO_2 and about 0.08 ppm of ozone for times of 2 to 6 hours.

- For Concord grapevines exposed to treatment levels of ozone and sulfur dioxide in combination, the field experiment indicates that the total leaf injury for separate ozone and sulfur dioxide exposure was found to be greater than the total leaf injury effect of the same levels of these two gases when used in combination, that is, the gases acted antagonistic one to another in the field.

- Delaware vines exhibit effects indicating antagonism between ozone and SO_2, while Ives shows responses indicating synergism between the two gases, that is, the two gases result in greater leaf injury than the sum total leaf injury for ozone alone and SO_2 alone.

- Concentrations as high as 4 hours continuous exposure to 0.2 ppm O_3 or 0.5 ppm SO_2 for Ives variety grapevines and 6 hours continuous exposure to 0.5 ppm O_3 or 0.75 ppm SO_2 for Delaware variety grapevines cause approximately 1 to 2 percent leaf area injury to Ives and Delaware grapevines, respectively. The Ives variety, considered to be the most sensitive to ozone, exhibited an average of 5.3 percent leaf area injury when exposed to a combination of 0.2 ppm ozone and 0.5 ppm sulfur dioxide for 4 hours of continuous fumigation. Delaware variety, considered to be among the least sensitive to ozone, exhibited an average of 0.09 percent leaf area injury when exposed to a combination of 0.5 ppm ozone and 0.75 ppm SO_2 for 6 hours of continuous fumigation. Based on available meteorological information, the applicant states that these gaseous concentrations are more than double those expected to occur in the grape growing vicinity of the proposed facility.

Considering the above study, the predicted concentrations and frequencies resulting from the proposed facility SO_2 emissions, information from literature and the applicant's consultant, Niagara Mohawk Power Corporation had concluded that the emissions would not significantly affect (statistically significant) grape crops in the vicinity of the proposed site of the Lake Erie-Lake Plain region.

In arriving at its conclusion, the applicant assessed different levels of station operation (i.e., 50 percent capacity, 100 percent capacity). The applicant's assessment of worst case conditions is based on both units operating at 50 percent capacity which under some meteorological conditions gives rise to the highest ground level SO_2 concentrations. The applicant states that assuming worst case operation and conditions for the entire growing season (5,110 hours), the number of hours at Pomfret for which the SO_2 concentrations in the grape growing region would range between 0.15 and 0.20 ppm would be a total of 19 hours. The 19 hours would be distributed in six different locations. None of the locations will receive SO_2 concentrations of 0.15 ppm or above for more than 60 consecutive minutes. For the Sheridan site, the applicant predicted that at no time would the concentrations exceed 0.15 ppm in the grape growing region.

Assuming operation of both units at rated capacity, the maximum SO_2 concentrations predicted by the applicant would range from 0.10 to 0.15 ppm at both sites. These levels are below the threshold level for observable leaf injury which was obtained in the applicant's study. The applicant has also concluded that SO_2 concentrations, either annual or peak, to be expected from the plant are low as compared to existing or ambient levels. In reaching this conclusion, the applicant states that for the 12 -month period of November 1974 to October 1975, the average annual concentration of O_3 was 0.017 ppm and for SO_2 the annual average was 0.013. During the growing season, which is the period of concern regarding effects on grape vineyards, the average concentration for O_3 and SO_2 were 0.022 ppm and 0.012 ppm, respectively. The SO_2 concentrations due to the proposed facility's anticipated SO_2 emissions as predicted by the applicant would average, in the vineyard areas during the growing seasons, 0.0005 ppm, with a peak seven-month growing period concentration calculated to be 0.0012 ppm. Existing or ambient levels of both O_3 and SO_2 were measured and analyzed during the 1976 study's experimental period. It was found that vines not subjected to experimental fumigations (control vines) exhibited foliar injury in the form of oxidant stipple at the end of the growing season. Oxidant stipple leaf injury on control vines exposed only to the ambient air averaged as high as 8.5 percent of the leaf area according to the applicant. Exposure of these vines to experimental concentrations of SO_2 similar to maximum values anticipated from the plant, however, did not produce observable leaf damage above that caused by the ambient conditions.

While the 1976 study performed by the applicant appears to indicate that no significant effects on grapevines will occur, Corps staff is in agreement with the New York State Department of Public Service, the New York State Department of Environmental Conservation, and the New York State Grape Production Research Fund that the experiment and the results of the study do not necessarily rule out the possibility of damage to grapes. The objective of the applicant's 1976 study was to assess damage (extent to which yield or use of the plant is reduced) but instead the study placed greater emphasis on visible leaf injury. Additionally, the vineyard used in the 1976 study was not typical of the region and the vines chosen for study were not uniform. This particular vineyard had produced below average by approximately 30 percent in previous years. Other aspects of the study which cast doubt on the validity of the experiment results in regard to damage are as follows:

- There was no measure of vine size and no attempt to balance prune the vines for a controlled number of buds. Since crop yield is closely related to the number of buds retained on the vine during pruning, it is difficult to determine if changes in yield were due to pollutants or to uncontrolled differences in bud number.

- The overall condition of the vineyard used in the experiment was such that productivity as far as soluble solutes were concerned was relatively low.

- Major components of yield such as flowers per cluster, percent set, weight per berry, and degrees brix are accurately determined in the second year of the fumigation not the first year. While the applicant did assess second year effects, the study was not originally designed to measure them. Additionally, any second year measurement is subject to the same questions raised in regard to original first year measurements in the 1976 study.

- Since fumigation began almost four weeks after grape bloom, fruit set in the first year (1976) could not have affected by fumigation.

- The 1976 study limited exposure time to 2, 4, and 6 hours over part of the growing season, rather than day-long exposure to low levels of pollutants over the entire growing season. Thus, the study results may define acute injury (e.g., leaf injury) which occurs from exposure to high pollutant levels over short periods of time but does not assess chronic damages (exposure to low levels of pollutants over long periods of time with manifestation of damage symptoms at a later date).

- The vines used in the 1976 study were seriously magnesium deficient and were not typical of vineyards in the area. In addition, severe magnesium deficiency was estimated visually in units of 5 or 10 percent of the total vine while SO_2 and ozone injury were estimated in increments such as 0.05 and 0.1 percent of the vine.

- The nontreated control vines used in the study demonstrated significant variation in yield. This uncontrolled variable makes it more difficult to assess any yield changes due to pollutants in treated vines.

- While the applicant's study indicates that the proposed facility SO_2 contributions of between 0.12 and 0.15 ppm will affect vineyards at only limited times, these contributions will be in addition to already high ambient concentrations of ozone and SO_2.

In considering the 1976 study, Corps staff concluded that the possibility of chronic damage to grape crops as a result of the proposed facility's emissions plus ambient SO_2 and ozone concentrations could not be ruled out without additional study. Since the issuance of the Draft EIS, the applicant has provided the following additional information and proposals:

The applicant initiated a 1977 experimental program designed to: assess the results of the 1976 acute injury experimentation; and, assess the impact on grapes of expected ground level concentrations of SO_2. The 1977 program consisted of three field experiments and laboratory experiments to supplement the field studies. One field experiment utilized stationary chambers controlling Concord variety grapevine exposure to sulfur dioxide and to ambient ozone during the entire growing season. Essentially, this experiment was a simulation of the ground level concentrations of SO_2 and ozone (O_3) (ambient and Proposed Facility). The second field experiment utilized portable chambers to expose Concord variety grapevines to controlled sulfur dioxide and ozone concentrations for two and four hour time periods and to ambient air the remainder of the growing season. Essentially, this experiment was conducted to confirm the threshold level, acute injury experimentation in 1976. The third field experiment tested the effectiveness of selected cultural practices and protectant spray applications in minimizing grapevine leaf injury from ambient ozone concentrations. These experiments were conducted cooperatively by Westinghouse Environmental Systems Department (WESD) and Cornell University Department of Pomology and Viticulture. The results of these experiments, including productivity assessments, should be available in late 1978 after the grapes are harvested and the approximate yield parameters are analyzed.

Additionally, the applicant has nearly completed the first year of a proposed three-year program, initiated in 1978, to determine the effect of simulated Lake Erie Generating Station SO_2 emissions, coupled with ambient O_3 and SO_2 on Concord grapes. Three years of fumigations are expected to be carried out during 1978-1980 and the final results will be available after the 1981 harvest. These tests will include some SO_2 fumigations at levels at least twice as high as the predicted facility contribution to determine if any possible emission excursions would be injurious to the grape crop. The 1978 ambient levels measured in the experimental vineyard have peaks five times the predicted facility peaks and the ambient season-long dose is ten times higher than the Lake Erie Generating Station dose contribution. Corps staff believe that there is sufficient lead time prior to the anticipated operation date of the proposed facility to allow for analysis of the applicant's additional long-term studies. There is also sufficient time to consider and incorporate, if necessary, engineering changes or mitigative measures that would insure protection of grape crops. Staff believes that through appropriate Federal and State air quality reviews and regulatory permits, which are now pending, there will be reasonable assurance that vineyards will be protected from damage to the greatest extent possible. These air quality reviews include U.S. EPA determinations regarding Prevention of Significant Deterioration of Air Quality, New Source Performance Standards, and Best Available Control Technology, and the State of New York's Article VIII certification.

4.152
Available information indicates that the SO_2 concentrations expected from operation of the proposed station at the Pomfret site are not likely to affect grapes acutely. Oxidant stipple injury to grape vines of the Pomfret region, however, may be exacerbated by the increased SO_2 concentrations.

4.152a.
Sulfur dioxide is capable of producing broncho constriction or other irritant effects in small mammals such as cats, rabbits, and rats. Acid rain and sulfates can cause similar effects on mammalian respiratory systems but to a greater degree than effects from SO_2. The emission of SO_2 from the proposed power plant should not result in acute injury to wildlife. Chronic long-term exposure to low concentrations may have adverse effects and sensitive wildlife species, however, sufficient research studies are not available to determine these effects.

Acid Precipitation
4.153
Sulfur dioxide and NO_2 may be oxidized in the atmosphere to

TABLE 4 - 13

ESTIMATED THRESHOLD SO_2 CONCENTRATIONS FOR VISIBLE INJURY TO SENSITIVE PLANT SPECIES

Exposure Interval (hr)	Source: National Environment (2) Research Center (1973) µg/m3)	Linzon (1973)(2)	Jones et al (1974)
1	1300-7860	1834	1300-2620
2	655-5240	1048	-
3	400-3750(1)	785(1)	786-1572
4	262-2620	681	-
8	131-1310	472	-

(1) Interpolated

(2) Refers to situations especially conducive to plant injury.

sulfuric (H_2SO_4), sulfurous (H_2SO_3), and nitric (HNO_3) acids (Wood, 1975). Rain with pH values as low as 2.1 has been measured during the past 20 years in samples collected in New Hampshire. Low pH has been tentatively attributed to coal combustion and the consequential greater concentrations of these acids in precipitation (Likens and Bormann, 1974). The extent to which stack releases from coal combustion promote acid precipitation is currently debated (Frohliger and Kane, 1975). Preliminary literature reports suggest that coal combustion may affect the pH of rain within local or large regional areas. The extent, if any, of pH change, and the effects on vegetation of precipitation of increased acidity cannot be determined with the information currently available. The National Environment Research Center (1973) states in Revised Chapter 5 of the Air Quality Criteria for Sulfur Oxides that "the effect of increasing acidic precipitation in the northeastern United States on vegetation, streams and soil has not been adequately studied." Within New York State, certain lakes in the Adirondack Mountains have been found to be acid-sensitive due to their low buffering capacity. Declines in fish populations in these lakes have been attributed to acid rain effects. Current indications are that these effects are a result of fossil fuel point source emissions generated outside of New York State and that New York State emissions may contribute to acid rain in states in New England.

The pH of the precipitation at the Pomfret site was measured and the average value was 4.0 with a range of 3.4 to 4.8. Using the conservative assumption that ten percent of the proposed Lake Erie station SO_2 is absorbed by the precipitation and entirely converted to sulfuric acid, it is predicted that the average pH would be reduced from 4.0 to 3.96, an insignificant change compared to the natural variability.

On a regional basis, EPA has estimated that the manmade SO_2 emissions in the 24-state northeast United States region are about 22×10^6 tons per year (Dana, et. al, 1973, EPA-R3-73-047). The proposed 1,700 MW Lake Erie Generating Station is projected to emit about 60,000 tons per year (assuming an emission rate of 1.2#$SO_2/10^6$ BTU). This is less than 0.3 percent of the regional loading. Any reduced emission rate would further reduce the contribution.

Sulfate Deposition

4.154

Sulfate derived from coal combustion may be added to terrestrial systems through precipitation, deposition of $SO_4^=$ particles, and indirectly through absorption of SO_2 into the soil and subsequent oxidation of the gas to SO_4 (Buckman and Brady, 1969; Abeles et al., 1971). Although plants rely on absorption of soil SO_4 to meet their sulfur requirements, high concentrations of $SO_4^=$ have been associated with leaf chlorosis (Thomas, 1961) and inhibitions of uptake of calcium and molybdenum (Richards, 1954).

4.155
Available information does not allow determination of threshold levels of $SO_4^=$ which could potentially affect vegetation. However, fluxes of this ion through some agricultural systems can be roughly estimated from the literature. Erosion, leaching processes, and harvesting of crops which require large amounts of sulfur can remove as much as 7.6 lbs $SO_4^=$/acre/month (Buchman and Brady, 1969).

4.156
Precipitation monitored for three years at Salamanca, New York, (Pearson and Fisher, 1971) added $SO_4^=$ to the soil at average monthly rates ranging from 3.3 to 4.7 pounds $SO_4^=$/acre. Additions to $SO_4^=$ to the Pomfret site and region are not expected to be significant. Maximum inputs of sulfur deposited on the land as SO_2 and $SO_4^=$ amount to 0.02 lb/acre/month. If all deposited sulfur is oxidized in the soil to $SO_4^=$, 0.02 lb S equals 0.06 lb SO_4 acre/month, a rate less than 2 percent of the lowest SO_4 deposition rate measured at Salamanca, New York, located 65 km east and south of the site (Pearson and Fisher, 1971).

Nitrogen Oxides
4.157
Of the common oxides of nitrogen, only NO_2, NO, and N_2O_5 are presently considered to be particularly toxic. Nitrogen dioxide (NO_2) is found in ambient air at a concentration usually on the order of 0.001 ppm in clean air and 0.03 ppm in urban air. Among the other nitrogen oxides, it is considered to be of most concern. Chronic effects on vegetation (e.g., suppression of growth) have been known to occur at NO_2 levels around 0.5 ppm; acute effects on plants (e.g., lesions) occur at about 2 to 10 ppm. In most animals, symptoms of acute toxicity occur at about 50 ppm or higher. Nitrogen dioxide effects on animals include lung tissue damage, emphysema-like diseases, and alteration of blood or tissue enzymes.

4.158
High concentrations of NO_2 may cause plant injury. Symptoms of acute injury are similar to those resulting from excessive dosages of SO_2. Chronic injury induced by NO_2 is characterized by discolored flecks on leaf surfaces and premature leaf abscission (Taylor, 1969). Plant responses to NO_2 vary with species, lengths of exposure, developmental stage of the plant, and environmental conditions such as soil moisture and light intensity (EPA, 1971).

4.159
Concentrations of NO_2 required to cause visible plant injury are

highly relative to levels commonly occurring in the ambient atmosphere. The following threshold dosages for visible injury were suggested by Thompson et al., (1974): 18,800-28,200 $\mu g/m^3$ for 1 hour exposures; 4,324-6,580 $\mu g/m^3$ for 8 to 21 hour exposures and 1,880 $\mu g/m^3$ for 48 hour exposures. Limited data suggest that plants exposed to NO_2 for intervals longer than 48 hours may be affected by lower concentrations. Reductions in rates of photosynthesis may result from short-term exposures to low concentrations. Some data indicate that "plants can repeatedly recover from subnecrotic acute exposures to SO_2, Cl_2, NO_2, and NO if sufficient time is allowed between fumigation for full recuperation. Generally an intervening nighttime is sufficient." Plant injury caused by NO_2 can be increased by simultaneous exposure to SO_2.

4.160
Maximum annual ground level concentrations of NO_2 expected from operation of the Lake Erie Generating Station at the Pomfret site is 2.2 $\mu g/m^3$, while the existing background level is 88 $\mu g/m^3$. This level is low compared to the 470 $\mu g/m^3$ expected to damage vegetation of the Pomfret site and region. Additionally, the projected levels of NO_2 would not be expected to constitute a direct hazard to the health of mammals in the vicinity of the site.

Particulate Matter
4.161
Few studies have been conducted on the effects of particulate matter on vegetation. Most investigators have attempted to analyze the nature of plant responses to atmospheric particulates, rather than possible injurious threshold concentrations (USDHEW, 1969). Predicted particulate concentrations resulting from operation of the Lake Erie Generating Station at the Pomfret site are reported to be 211 $\mu g/m^3$ for 24 hour, 44 $\mu g/m^3$ annual. Although visible foliar injury is not expected, the effects on vegetation cannot be accurately predicted with the information currently available. At the present time, there are no data regarding the effect of particulate emissions on wildlife species.

Cooling Tower Salt Deposition
4.162
The assessment of potential impact on vegetation from operation of cooling towers at the Pomfret site is based on the effects of aerial salt deposition.

The chemical composition of the salt emitted from the cooling towers approximates that of the blowdown water. Sulfate comprises 31 percent of the salt by weight, while calcium (Ca^{++}), and chloride (Cl^-) comprise 23 and 15 percent of the salt, respectively.

4.163
Weather conditions, ion toxicity, and plant sensitivity are factors which determine threshold aerial salt deposition rates producing toxic cellular concentrations of specific ions. Salt crystals impacted on leaf blades are washed off during periods of rain (Roffman, 1973). However, investigations of the effects of salt water from cooling towers (Roffman, 1973; Boyce Thompson Institute, 1974; Mulchi and Armbruster, 1975) on vegetation indicate that salts accumulated on leaf surfaces between rainfalls may be rapidly absorbed by foliar tissues when relative humidity is sufficient to maintain salts in the dissolved state. Through foliar absorption, plants may achieve relatively high concentrations of substances such as $SO_4^=$ and Cl^-, which are normally less available from the soil.

4.164
The maximum monthly, seasonal, and annual deposition rates from natural draft towers are 0.077 lb/acre/month (August), 0.2112 lb/acre/season (summer) and 0.43 lb/acre/yr, respectively. The maximum monthly cooling tower salt deposition rate, 0.077 lbs/acre, is 1.2 percent of the lowest average monthly salt deposition rate measured in precipitation of Salamanca, New York. An increase of this magnitude is considered negligible, and is not expected to affect soil salinity. Although aerial deposition allows build-up on foliage of salt crystals comprised of various ions, the small amounts associated with natural draft cooling tower operation are not expected to cause symptoms of specific toxicity. Deposition rates of $SO_4^=$, CA^{++}, Cl^-, Mg^{++}, Na^+, and HCO_3^-, which comprise approximately 87 percent of cooling tower blowdown water salts are presented in Table 4-14, along with the deposition rates attributable to precipitation (Pearson and Fisher, 1971). The maximum predicted deposition rate of Cl^- from the cooling tower, approximately 0.01 lb Cl^-/acre/month, represents less than two percent of estimated total input of Cl^- into terrestrial communities of the Pomfret site (based on precipitation monitored at Salamanca, New York), and does not approach aerial deposition levels employed in studies conducted by the Boyce Thompson Institute. The maximum monthly depositions of $SO_4^=$, Na^+, and HCO_3^-, from cooling tower salt represents increases of 1 to 5 percent of the minimum rates measured in precipitation of Salamanca, New York. Although cooling tower deposition of Mg^{++} and Ca^{++} represents increases of 14 to 5 percent, respectively, above Salamanca precipitation levels, cooling tower deposition rates are small relative to plant uptake of these two macronutrients.

Plant Structures
4.165
Physical obstruction of wildlife movement due to plant structures will cause additional impacts to the terrestrial environment. The

TABLE 4-14

DEPOSITION RATES OF SALTS FROM COOLING TOWER DRIFT AND PRECIPITATION

Ion	Percent of Cooling Tower Blowdown Water Total Dissolved Solids (1)	Natural Draft Cooling Tower Maximum Deposition Rate (lb/acre/month)	Minimum Deposition Rates in Precipitation at Salamanca, NY (2) (lb/acre/month)	Maximum Percent Increase in Total Deposition Rate
$SO_4^{=}$	31	0.02	3.30	1
Ca^{++}	23	0.02	0.38	5
Cl^{-}	15	0.01	0.44	2
Mg^{++}	7	0.01	0.07	14
Na^{+}	6	0.01	0.40	3
HCO_3^{-}	5	0.01	0.19	5

(1) As determined from Table P80.3, Applicant's Article VIII Application.

(2) Pearson and Fisher, 1971.

extreme height of the exhaust stack (750 ft) and cooling tower (500 ft) may pose an obstruction to migrating birds, especially during times of limited visibility. This could result in additional bird mortality at the proposed site. Possible mitigative measures include the use of strobe lighting to act as a visual repellant. Bird mortality will be monitored to assess this possible impact. Fencing required for security and safety reasons will disrupt the established movement corridors used by deer and other mammals. The fencing, if it is erected in close proximity to highways, may also result in increased road kill of mammals. The applicant will attempt to provide a deer escape corridor between the railroad tracks and the site fencing to minimize deer/train collisions.

Transmission Lines

4.166

An increase in avifauna mortality could probably be attributed to the proposed transmission lines. The portions of the transmission corridor near the site are in the vicinity of a fall migration corridor for dabbling ducks (Great Lakes Basin Framework Study, 1975). Sections of the transmission right-of-way near Buffalo, NY lie within Canada goose and diving duck fall migration corridors. Possible waterfowl deaths could be expected from collision with transmission towers and power lines and by electrocution. These losses are expected to be relatively insignificant to the bird populations of the region. However, estimated increased avifauna deaths due to the proposed transmission lines have not been quantified. It is anticipated that there will be no harmful effects on animals due to electrostatic fields resulting from operation of the proposed 765 KV lines. Although electrostatic fields may produce adverse physiological effects through long-term exposure, fauna are not expected to spend significant time in the right-of-way. Alteration of animal habitat will occur through right-of-way maintenance procedures (removal of vegetation). Animals needing tall-growing vegetation as part of their habitat requirements will lose acreage while those generally inhabiting shrub and open fields areas may gain additional habitat. Routine maintenance activities will temporarily displace fauna inhabiting the right-of-way areas. Controlled use of herbicides in accordance with applicable guidelines and regulations should minimize impacts on wildlife.

AQUATIC ECOLOGY

4.167

Operation and maintenance of the proposed Lake Erie Generating Station will affect the aquatic ecology of the Pomfret area in several ways. Potential sources of impact include entrainment of aquatic organisms, impingement of juvenile and adult fish, thermal discharges and loss of aquatic habitat. The major factor in minimizing the amount of aquatic biota affected by the intake system is the utilization of a closed cycle cooling system.

Entrainment

4.168
Withdrawal of water for cooling purposes in the circulating water system results in entrainment of organisms, which can be a source of stress to the aquatic ecosystem. Due to a lack of information to the contrary, an entrainment mortality of 100 percent is assumed. The total retention time for entrained organisms in the circulating water system, including the makeup intake system and the blowdown system, would be approximately 8,250 seconds for Unit No. 1 and 8,570 seconds for Unit No. 2. Organisms entrained (drawn into the cooling system along with makeup water) include phytoplankton, zooplankton, ichthyoplankton, and fish.

Phytoplankton

4.169
Within the phytoplankton community, those species exhibiting the highest ambient densities in the source water will comprise the larger percentage of entrained organisms. Estimates of expected entrainment at the Pomfret site range from 5.927×10^{16} to 9.214×10^{16} cells per year. Four taxa of phytoplankton (Cyanophyta, Chlorophyta, Bacillariophyta, and Cryptophyta) comprise 95 percent of the low annual estimate and 92 percent of the high estimate. Of the major taxonomic groups, Chlorophyta (green algae) are expected to be entrained in the largest numbers annually. Phytoplankton communities in the area of Lake Erie off Pomfret should not be measurably depleted. The selection of the proposed intake was based primarily on minimizing ichthyoplankton mortality. The result is that the location does not utilize water having the lowest phytoplankton density. However, phytoplankton reproductive doubling times are short (Fogg, 1965) and these organisms are, therefore, capable of absorbing the effects of entrainment withdrawal losses as would be experienced at the proposed plant intake site. Any decrease in standing crop should be of local importance only.

Zooplankton

4.170
Estimation of zooplankton entrainment was based on the assumption that zoo-plankton will be nonselectively entrained. In actuality, some of the larger zooplankters (e.g. Leptodora kindtii) may be able to avoid entrainment due to their swimming ability. The estimates ranged from 4.01×10^{12} to 1.04×10^{13} organisms per year. The estimate of 1.04×10^{13} zooplankton lost per year is based on the

applicant's 1974-75 sampling period which included vertical and oblique tows (75 μ mesh and 333 μ mesh). These estimates average the vertical stratification resulting from diel vertical migration. The annual zooplankton entrainment of 4.01×10^{12} organisms is based on 1975-76 data. A nighttime specific sampling programs performed in 1975-76 results in the following entrainment rate estimates:

Pomfret (Night) 1975-1976
30 Ft Contour (Proposed Intake Site) Mid-Depth
0.5m Tucker Trawl
Zooplankton x 10^9 Entrained/Month

	1975	1976		
	Nov	Apr	Jun	Aug
Rotifera	109.8	790.2	328.8	111.2
Cladocera	100.2	3.2	367.9	16.6
Copepoda	14.1	83.4	172.5	14.3
Calanoida	23.6	2.1	2.3	1.5
Cyclopoida	53.4	13.8	166.9	10.7
Other	0	0	0	0.6

4.171
The Rotifera dominate the entrainment, comprising 63 percent of the 1975-76 estimates and 81 percent of the 1974-75 figure. The second most abundant taxon expected in the entrainment losses is Cladocera, followed by Copepoda. Assuming 100 percent mortality of these organisms, they will be removed from their respective populations. Dead organisms discharged through the multiport diffuser may still serve a function in the lake ecosystem. Those remaining in suspension for a period of time could serve as food for other organisms while those settling to the bottom would eventually be decomposed and recycled as nutrient matter. The loss of zooplankton could cause shifts in species composition which would be highly localized, seasonal, and of no consequence to Lake Erie as a whole.

Ichthyoplankton

4.172
Entrainment of ichthyoplankton has the potential for triggering the greatest effects on the aquatic ecosystem as a whole. This is due to

the annual reproduction mode of these organisms, and their correspondingly longer generation times as well as their capacity to exploit other food chain organisms selectively and to cause shifts in community composition which may favor given species based on their food chain specificity and capacity for increase.

4.173
The applicant's two year ichthyoplankton sampling program (1974-75, 1975-76) utilized multiple gear techniques. Epibenthic sled data were singled out of the 1974-75 study because of proximity to the proposed intake location and because the data produced a conservatively high estimate of entrainment losses. However, 1975-76 data were examined for a variety of contour and depth conditions ultimately leading to selection of mid-depth for location of the intake ports.

4.174
Five taxa (rainbow smelt, minnows, yellow perch, logperch, and freshwater drum) usually accounted for 95-99 percent of the ichthyoplankton collected. Alewife, a species considered highly vulnerable to entrainment and impingement, was identified in the postlarval stage during August of 1975 and occurred in samples sporadically during other months. The sampling resulted in the identification of 17 species at Pomfret during the 1974-75 period and 18 species during 1975-76. Based on the relative abundance and densities of ichthyoplankton in the makeup water withdrawal zone, logperch, carp, yellow perch, smelt, freshwater drum, trout-perch, and walleye ichthyoplankton were singled out for extrapolation of numerical losses due to entrainment. Sample size of the remaining species was too low to allow for a useful prediction.

4.175
Rainbow smelt (Osmerus mordax), logperch (Percina caprodes) and yellow perch (Perca flavescens) are expected to sustain the heaviest losses due to entrainment. Table 4-15 displays the highest numbers of ichthyoplankton expected to be entrained per minute based on 1974-75 sampling results. This table was compiled from Table P74.4-7 of the applicant's Article VIII application which is based on samples taken between 13 May 1975 and 25 July 1975, in the vicinity of the proposed intake structure. The entrainment figures used are the highest numbers contained in the upper 95 percent confidence level rows of Table p74.4-7. Table 4-16 gives the entrainment estimates based on 1976 sampling period. This table was derived from the applicant's 316(b) demonstration and was compiled from Tables V.B.2.a-5.

4.176
The document entitled "Demonstration of Best Technology Available for Minimizing Adverse Environmental Impact With Respect to Cooling Water

TABLE 4-15

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT POMFRET (1975 DATA)

Species	Type (1)	Number	Time and Date of Sample Used (a)	
Logperch				
(*Percina caprodes*)	YSL	44.72	6/2	D
	PL	11.54	6/30	D
	PL	13.04	6/9	N
	YSL	3.44	5/29	N
Carp				
(*Cyprinus carpio*)	YSL	4.82	6/30	D
	PL	9.95	7/7	D
	PL	9.54	7/7	N
	YSL	0.00	N	
Yellow Perch				
(*Perca flavescens*)	YSL	98.52	6/2	D
	PL	18.58	6/9	D
	PL	17.27	5/29	N
	YSL	10.57	5/29	N
Rainbow Smelt				
(*Osmerus mordax*)	YSL	76.21	6/2	D
	PL	398.20	6/17	D
	PL	72.24	6/9	N
	YSL	31.57	6/9	N
	E	1.91	5/13	N
Trout-perch				
(*Percopsis omiscomaycus*)	YSL	2.81	6/22	D
	PL	4.11	6/22	N
Freshwater drum				
(*Aplodinotus grunniens*)	YSL	91.64	7/7	D
	PL	5.86	7/15	D
	E	30.82	7/15	D
	YSL	40.66	7/7	N
	E	80.21	7/7	N
Walleye				
(*Stizostedion vitreum*)	-	None		

(1) YSL: Yolk-sac larvae
PL: Postlarvae
E: Eggs. When eggs are not mentioned it is because none were found in the samples.

(2) The letter "D" designates daytime sample while "N" indicates that the entrainment level is based on nighttime samples.

TABLE 4-16

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT POMFRET (1976 DATA)

Species	Type (1)	Number	Time and Date of Sample Used (a)	
Logperch				
(*Percina caprodes*)	YSL	17.98	6/10	D
	YSL	8.60	6/10	N
	PL	6.37	7/15	D
	PL	10.88	7/6	N
Carp				
(*Cyprinus carpio*)	YSL	0.24	6/16	N
	YSL	-	Nighttime	None
	PL	None		
Yellow Perch				
(*Perca flavescens*)	YSL	1.79	5/25	D
	YSL	0.37	6/10	N
	PL	None		
Rainbow smelt				
(*Osmerus mordax*)	YSL	99.13	6/10	N
	YSL	0.73	6/10	D
	PL	1.68	6/10	D
	PL	2028.01	7/25	N
Trout-perch				
(*Percopsis omiscomaycus*)	YSL	7.75	6/10	D
	YSL	2.39	6/10	N
	PL	1.65	7/6	N
	PL	0.72	6/29	D
Freshwater drum				
(*Aplodinotus grunniens*)	YSL	0.73	7/15	N
	PL	0.91	7/22	N
Walleye				
(*Stizostedion vitreum*)	YSL	0.87	7/6	N
Other fish	YSL	5.50	6/29	D
	YSL	6.46	6/29	N
	PL	4.39	6/29	D
	PL	72.20	8/11	N

TABLE 4-16 (Cont'd)

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT POMFRET (1976 DATA)

Species	Type (1)	Number	Time and Date of Sample	Used (a)
Total Ichthyoplankton	YSL	26.68	6/10	D
	YSL	110.49	6/10	N
	PL	7.53	6/29	D
	PL	2046.51	7/25	N

(1) YSL: Yolk-sac larvae
PL: Postlarvae
E: Eggs. When eggs are not mentioned it is because none were found in the samples.

(2) The letter "D" designates daytime sample while "N" indicates that the entrainment level is based on nighttime samples.

Intake Design" (the 316-b demonstration) developed a method of estimating the significance of predicted entrainment values. Impact of entrainment on aquatic biota was considered from the fisheries viewpoint. Percent entrainment losses of the yolk-sac and post-larval stages for each fish species were calculated as follows. Along the intake column (No. 1 for Pomfret) ichthyoplankton samples during 1976 were taken at four contours and three depths for a total of ten sampling stations. (Texas Instruments, 1976). These stations sub-divided the respective intake columns from the 10 to 40-foot contours, into ten biological zones. If $d_1, \ldots, d_{10}$ are the plankton densities at each of the stations and $v_1, \ldots, v_{10}$ are the volumes of water passing through these zones during any time period, then Percent Entrainment = $100 \times vd_i / \Sigma\, v_i d_i$, where v is the intake volume during the same period. Thus, Percent Entrainment = $100 \times w/V \times$ Relative Density at Intake. Losses are estimated relative to the total ichthyoplankton which pass the site. Relative to all spawning areas on the eastern shores of Lake Erie, these losses would be considerably smaller. The significance of the losses are explained both in terms of equivalent adult losses occasioned by the ichthyoplanton entrainment as set forth in paragraph 4.178 and in terms of the ichthyoplankton lost via entrainment relative to the total ichthyoplankton which could potentially be entrained (i..e., those contained in the intake flow-pass volume of water) as set forth in the remainder of this paragraph. Comparison of projected entrainment rates with the total ichthyoplankton which could potentially be entrained (those contained in the flow-pass volume of water) indicates that ichthyoplankton relative losses vary between 0 and 0.75 percent of the entrainable population. The highest of these relative losses are 0.72 percent of the yellow perch yolk-sac larvae, 0.75 percent of the freshwater drum yolk-sac larvae and 0.48 percent of the trout-perch yolk-sac larvae.

4.177
Through predation and natural mortality, such as disease, many ichthyoplankton, regardless of entrainment, would never reach juvenile and adult life stages. Entrainment and loss of ichthyoplankton that would never have reached a higher life stage does not necessarily reduce the importance of their loss to fish populations. Fish populations generally overproduce eggs and larvae which may compensate for losses accrued in each life stage of the population. Thus under natural conditions each species can maintain a stable population (Everhart, 1975). Entrainment losses result in cropping of the compensatory population.

Equivalent Adult Losses

4.178
Using the numbers of yolk-sac larvae and postlarvae which were obtained during each sampling regime and multiplying by estimated

survival rates, yields an estimate of equivalent adult losses (Table 4-17). The general inshore dispersion of ichthyoplankton, the offshore placement of the intake structure and the density of eggs and larvae found at the proposed offshore location of the intake suggest that impact to the local fish populations is minimized and regional effects should be insignificant. As indicated in Chapter 2, paragraph 2.127, and in the U. S. EPA letter on page E-20, the Pomfret site may be an important nursery site and spawning area. There was no indication of heavy spawning by "important" species in the area, such as walleye, the salmonids, or any rare or protected species especially near the intake location. There was fairly heavy spawning in the area by forage fish species such as rainbow smelt and minnow species. The relative use of the area by various species for spawning is based on ichthyoplankton densities found at the site. Forage species are also important since they play a significant role in the lake ecosystem. It has therefore been necessary to thoroughly analyze the location and height of the proposed intake relative to fish egg and larvae densities. The majority of the fish species spawning in the study area utilize the inshore region and produce eggs of a demersal or adhesive nature and would tend not to be vulnerable to an offshore intake structure located at mid-depth. This is especially the case for rainbow smelt, yellow perch, and walleye. Although freshwater drum eggs are a type vulnerable to offshore structures, the highest densities were at the 10-foot contour in 1975, and at the surface waters of the 30-foot contour in 1976. Thus, the mid-depth location at the 30-foot contour should minimize entrainment of eggs. Freshwater drum larvae were not abundant at the intake location in either year. The larvae data collected by the applicant shows significant annual variations in species abundance. For instance, yellow perch were more abundant in 1975, and rainbow smelt was the dominant form in 1976. Yellow perch larvae were generally concentrated inshore of the proposed intake locaton while rainbow smelt were collected in highest concentrations at the 30-foot depth and deeper. Thus, while the offshore location may tend to minimize yellow perch larvae entrainment, rainbow smelt losses are not necessarily minimized by this offshore location. However, the mid-depth height of the intake port centerline should reduce entrainment of older smelt larvae since they were found in highest concentrations just off the lake bottom. The 1975 data indicate that an offshore intake location (30-foot contour) and mid-depth location, would minimize the losses of ichthyoplankton. However, the 1976 collection effort indicates that smelt may be particularly vulnerable to this location (Table 4-17). In light of the above, Corps staff concurs with the New York State Public Service Commission, the NYS Department of Environmental Conservation, and the U. S. Environmental Protection Agency recommendations regarding

TABLE 4-17

ANNUAL EQUIVALENT ADULT LOSSES 1974-1975

POMFRET SITE Losses Based on Mortality of	Yolk-Sac Larvae	Postlarvae	Annual Loss
Rainbow Smelt	3,585	176,860	180,455
Carp	79	1,586	1,665
Trout-Perch	NA	201	201
Yellow Perch	5,193	16,988	22,181
Logperch	1,206	4,424	5,630
Walleye	NA	NA	NA
Freshwater Drum	2,838	578	3,416
1975-1976			
Rainbow Smelt	12,906	2,120,549	2,133,455
Carp	20	NA	20
Trout-Perch	1,157	5,819	6,979
Yellow Perch	710	NA	710
Logperch	5,605	45,434	51,039
Walleye	73	NA	73
Freshwater Drum	61	612	673
Other Fish	3,885	107,174	111,059

Other Fish - Alewife, Gizzard Shad, Burbot, White bass, *Pomoxis* spp, *Etheostoma* spp, and slimy sculpin.

NA - Data not available to determine equivalent adult losses or no larvae sampled.

Survival rates used in this table were 0.025 through the yolk-sac stage and 0.20 through the postlarval stage.

the inclusion of the following conditions in the Final Section 402 discharge permit:

- Construction of the intake with a "stub." This would allow for locational flexibility should biological monitoring indicate the need to relocate the intake.
- Performance of additional operational site monitoring designed to determine whether relocating the intake further offshore would result in significant reductions in entrainment losses.
- Selection of an offshore, mid-depth intake location with final determination of the optimal depth contour (30-foot versus 40-foot versus 50-foot) to be made when the additional monitoring data are available.

Impingement

4.179

Impingement occurs to organism that are larger than the screen openings at the pump structure. These organisms enter the intake structure with the cooling water and are trapped or impinged on the traveling screens. Screen mesh is on the order of 3/8-inch. To estimate fish impingement, the applicant first assessed plant operating characteristics for twenty-two Great Lakes power generating stations, representing a cross-section of intake designs, locations, flows, and velocities. Preliminary analysis revealed no significant correlation betwen total fish impingement and intake flow for the sampling years 1973-1975 although impingement generally increased with capacity. A plot of impingement versus intake velocity revealed a pattern of increasing impingement with increasing intake velocity. Time-series plots for each plant revealed a marked common seasonal pattern, impingement rates being highest during the spring (April, May, June). On the lower end of the intake velocity scale, it is difficult to discriminate between plants operating with velocities less than 5 m/min. (0.28 fps) during the spring months of April, May, and June. The average number (geometric mean) of fish impinged daily at these plants is $10^{2.48} = 302$. The entire spring estimate for a plant operating at this level is 302 x 91 = 27,482 fish. A similar plot of daily impingement versus intake velocity for nonspring months yielded no substantial correlation. This may be due to the difficulty in precisely choosing spring cutoff dates which differed from year to year and from lake to lake. However, each complete time-series showed that, on the average, daily nonspring impingement = (Daily spring impingement)$^{.556}$. The exponent .556, called the seasonal impingement ratio, is the ratio between log of nonspring impingement and log of spring impingement, and depends upon the existence and dates of spring fish runs. The maximum seasonal impingement ratio for these plants was about .72. A plant with an intake velocity consistently below 5 m/min. such as the proposed Lake Erie Generating Station would have, on the average, $(302)^{.566} = 24$ fish impinged daily during the nonspring months. The maximum nonspring rate could be as high as $(302)^{.72} = 61$ fish daily. The upper limit of a 95 percent confidence interval would predict a number between these two values. Consequently, the annual impingement rate is estimated to be between 34,000 (average) and 45,000 (maximum) fish.

4.180
The susceptability of fish to impingement will vary with seasonal distribution in response to temperature and life history characteristics, such as spawning. It is estimated that the highest impingement rates will occur during the spring when large numbers of fish move inshore to spawn. A conservative estimate of 45,000 fish per year will be impinged due to the withdrawal of cooling water needed for the proposed facility at Pomfret. If the abundances for all age classes and gear types used in sampling are summed, a figure representing melded catch is produced. The relative abundances so obtained are considered to approximate that to be found in the impingement collections. For Pomfret this computes to: rainbow smelt (34.0 percent), emerald shiner (22.7 percent), yellow perch (11.6 percent), alewife (10.0 percent), and spottail shiner (7.9 percent). All other species are expected to comprise no more than 14 percent of the annual collection. Utilizing the estimate of 45,000 fish per year, impingement losses by species are: rainbow smelt 15,300, emerald shiner 10,215, yellow perch 5,220, alewife 4,500, spottail shiner 3,555, and other species 6,210. A comparison of these estimates with the number of fish removed from Lake Erie by commercial fishing operations indicates that operation of the plant will impinge less than 0.4 percent of all New York State landings (Great Lakes Fishery Commission (GLFC), 1975), and less than 0.004 percent of all Lake Erie landings.

4.181
Impingement of juvenile and adult fish by the intake facilities will also affect the various populations in a selective manner. Weakened and/or diseased fish will be the most susceptible to this water withdrawal. Overall susceptability will be controlled by intake withdrawal rates (fps), intake capacities (cfs), swimming speeds of individual fish, and seasonal changes in distribution and abundance of species. It is felt that fish population currently under stress in Lake Erie (walleye) will not experience significant losses. Abundance of walleye onsite and its characteristic distribution will minimize losses. Fish populations more subject to loss (smelt, alewife, gizzard shad, freshwater drum) are probably able to tolerate additional population mortality. It is not unreasonable to suggest

that greater adult mortality could reduce seasonal competition and/or predation by these species on piscivorous species, the loss of the former species probably being undetectable, or at least not necessarily constituting a negative impact on the ecosystem.

Thermal Impact

Phytoplankton

4.182
The potential for a great increase in phytoplankton production for a period sufficient to cause nuisance levels of phytoplankton numbers is eliminated by the extremely short exposure time to elevated temperature. Considering that some temperature increase will occur, however small, a very slight increase in productivity may occur if adequate nutrients are available. Considering the short duration of high temperature exposure and small plume area, no detectable changes are expected in the phytoplankton community outside of the immediate plume area. At the discharge, the high velocity (greater than 10 fps) and low density (higher temperature) of the discharge flow at a depth of 25 feet will vertically entrain ambient lake water and consequently planktonic organisms. These organisms, therefore, will be mixed vertically in the water column. Because this phenomenon will occur entirely within the epilimnion of Lake Erie, which is essentially homothermous and uniform in nutrient content, the biological effects are judged minor.

4.183
No thermal impact on periphyton is expected in Lake Erie due to proposed plant operation. The 20° (above the horizontal) discharge angle, the elevation of the multiport diffuser above the bottom and the buoyancy of the plume tend to preclude the plume from contacting the habitat necessary for periphytic growth.

Zooplankton

4.184
The rapid change in temperature to which the plume-entrained zooplankton are exposed could cause a lethal effect, even if maximum lethal temperatures are not exceeded. Disorientation and disruption of locomotory and feeding behavior may result due to plume turbulence and plume-induced vertical movements, possibly resulting in greater predation on zooplankton and lowered zooplankton feeding in the immediate area of the plume. No information is available which would enable prediction of the magnitude of these effects. In general, the several potential thermal impacts identified will affect zooplankton only in the immediate vicinity of the discharge structure. No impact

on zooplankton outside of the immediate area is predicted due to three reasons: the species present are not unique to that particular portion of Lake Erie; the portion of Lake Erie effected by the thermal discharge is a small portion of the lake in the vicinity of the proposed site; and, zooplankton regeneration times are short.

Ichthyoplankton

4.185
Ichthyoplankton are perhaps the planktonic group most vulnerable to thermal stress. They characteristically have thermal tolerances much lower than either phytoplankton or zooplankton species for the same body of water. Representative thermal tolerances range from a low of 68°F (20°C) for yellow perch eggs to a high of 104°F (40°C) for carp eggs in the later stages of development. Due to the extremely short exposure in high temperatures, and the relatively high thermal tolerance of most species in the plankton, mortalities as a result of thermal discharge are expected to be negligible. The location of the discharge away from areas of ichthyoplankton concentration will help reduce any potential impact.

Fish

4.186
Yearling and older fish have upper and lower temperature limits for all of their vital life processes, including growth and reproduction. Most fish and other nektonic organisms are able to avoid or escape areas of heated discharge when the temperature is elevated gradually to the lethal level (Lauer, 1971). However, sudden, sharp increases in the discharge temperature may cause mortality of even strong swimmers if the discharge is not mixed quickly with water at ambient temperature. The problem of thermal stress is particularly severe when the heated effluent flows through a confined area.

4.187
The proposed discharge at Pomfret is located in an area of unconfined mixing. The maximum Δ T will be 36°F (19.9°C) (average climatic conditions) during April, and the minimum Δ T will be 13°F (7.2°C) during August. Maximum discharge temperature (August) will be 87°F (30.5°C). Although the temperature differentials in the discharge are significant, they must be put in perspective with residence time and area enclosed by the plume to be evaluated realistically. The monthly average discharge temperature and temperature differentials over ambient indicate that during extreme winter conditions a decrease from an elevated temperature to ambient could be damaging to sensitive species of Lake Erie fish. However, as explained under thermal effects, the portion of the plume at these

elevated temperatures is extremely small, reaching the 3°F (1.7°C) isotherm within a few feet of the existing ports. In addition, the high velocities present close to the diffuser (11-15 fps) would prevent residence and acclimation of adult fish at these temperatures. The portion of the plume in which fish are likely to reside in any abundance has a temperature differential of less than two degrees above ambient. The maximum rate of plume temperature decrease under emergency shutdown conditions is 3.6°F/hour (2°C/hour) at the point of discharge and 0.02°F/hour (0.01°C/hour) at the lake surface. During scheduled shutdowns the rate of temperature decrease will be much less. The probability of significant fish loss due to plant shutdown is decreased by the ability of individual fish to acclimate slowly to the lower temperatures. Loss of fish due to cold shock should be insignificant.

316(b) Demonstration
4.188
The applicant has prepared a 316(b) Demonstration for the proposed Lake Erie Generating Station with the intent of demonstrating best technology available for minimizing adverse environmental impact with respect to cooling water intake design. This document has been reviewed by the appropriate State agencies (NYS Public Service Commission and NYS Department of Environmental Conservation) and by the U. S. Army Engineer District, Buffalo. The applicant's submittal was evaluated utilizing factors contained in U. S. Environmental Protection Agency guidance and development documents related to intake structure assessment. These documents state that care in the location, design, capacity, and construction of the intake can significantly minimize adverse environmental impacts. The applicant's proposed intake design and technology has been considered for each of these factors and a determination has been made by the State to accept the applicant's design as meeting the minimization criteria. Staff concurs with this finding conditioned on compliance by the applicant with State recommendations contained in the draft 402 permit including: the ability to relocate the intake if biological monitoring shows a necessity for relocation; an assessment of Ristroph traveling screens; and the ability to retrofit the system with fish return devices in an economical manner. The applicant has already advised the Corps that the concept of retrofitting a fish return system would not present major difficulties, nor should the cost vary significantly with the cost of incorporating the system in the initial design.

TRAFFIC

4.189
A permanent operating force of approximately 100 people will be traveling to the site daily, primarily from the Dunkirk-Fredonia area,

and possibly from Buffalo. This is not anticipated to have any significant impact on local roads and highways, which are capable of handling this slight increase in traffic. Parking facilities will be provided on the site.

NOISE

4.190
Table 4-18 depicts the estimated plant unsilenced major noise sources, their corresponding sound levels at points close to the source, equipment location, and the type of operation (continuous, intermittent, etc.). A power plant continuous noise source normally operates 24 hours a day, throughout the entire year. Equipment located indoors such as the boiler feed pumps and pulverizers radiate noise into the community through the power station building siding and are, therefore, included in the aforementioned table. However, it is obvious that an indoor type station such as the proposed facility is intrinsically quieter than it would be otherwise. The sound levels of various equipment have been developed from actual field measurements, analytical calculations, data supplied by equipment manufacturers, and published reports (Broderson, 1975). All field measurements were taken from an 800 MW class coal-fired unit. It should be emphasized that the sound levels shown in Table 4-18 are for distances very close to the source. They also do not reflect design measures to quiet the sources. Thus, these levels are illustrative of the sources, but are not illustrative of the sound levels which will be experienced by any member of the public outside the site boundaries.

4.191
Certain of the plant sound sources have pure-tone components. The main and auxiliary transformers produce sounds whose energy is most pronounced in an octave centered at 125 Hertz. The boiler feed pump produces sounds with energy most pronounced in two separate frequency ranges: the octave centered at 63 Hertz, and the octave centered at 1000 Hertz. All major equipment will either have sound reducing features incorporated into the design or be surrounded by an acoustical barrier consisting of sound absorbing material. Figure 4-1 illustrates the ambient conditions and the expected noise levels due to the proposed facility. The figure shows that the plant will produce some increase outside the site boundary for at least a few thousand feet in some directions. However, the continuous sound emission produced by the proposed facility will be restricted to a daytime limit, in general, of 55 dB(A), and to a nighttime limit of 45 dB(A) at the nearest required property line. The New York State Department of Environmental Conservation presently has no noise regulations. However, the agency is proposing noise regulations. State

TABLE 4-18

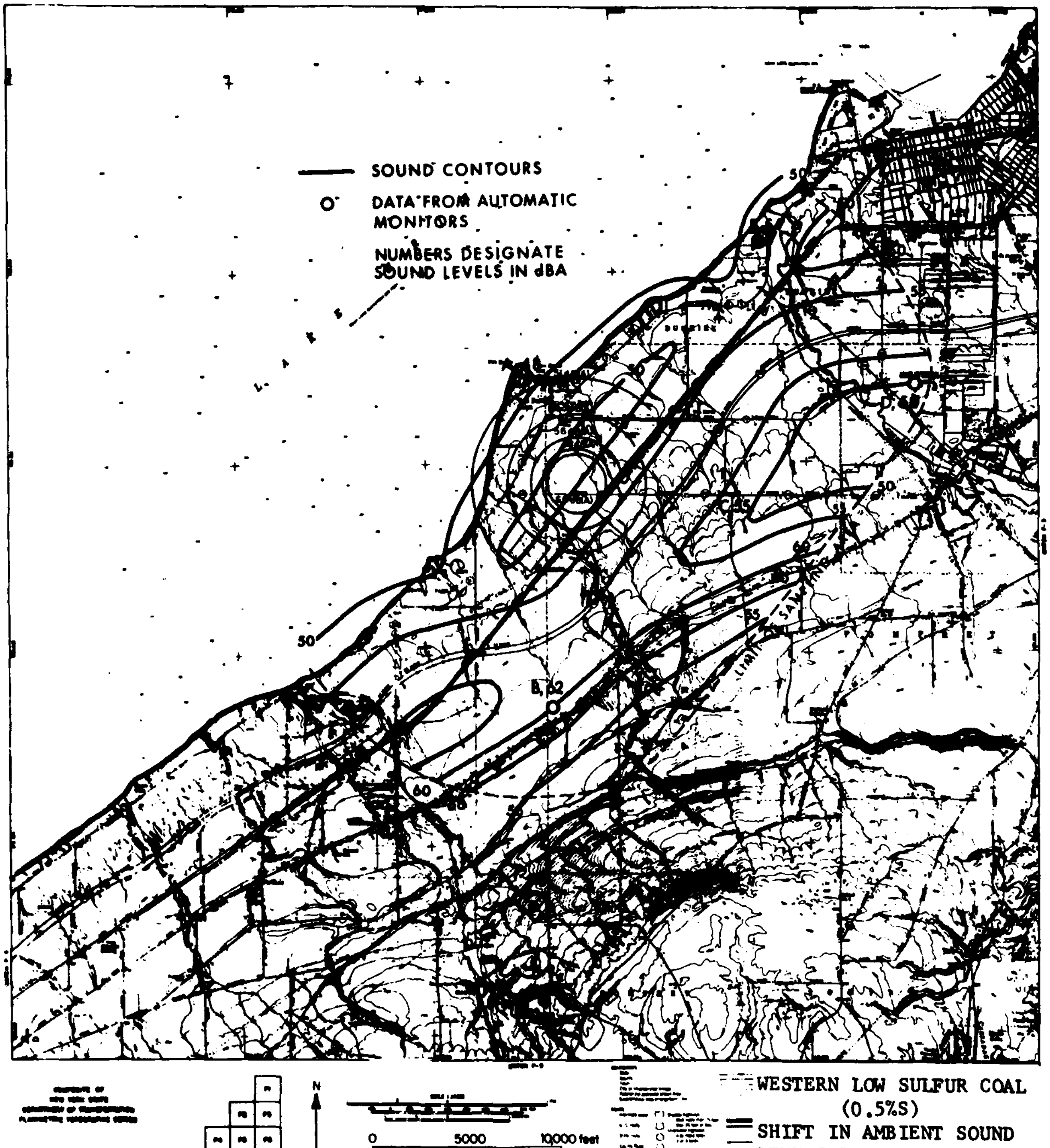
MAJOR NOISE SOURCES DURING PLANT OPERATION - UNSILENCED

Equipment	Average Sound Level	Maximum Sound Level	Distance From Equipment	Type of Operation C: Continuous I: Intermittent	Equipment Location
Turbine Generator	91 dB(A)	93 dB(A)	3 ft.	C	Indoor
Pulverizer	88 dB(A)	88 dB(A)	3 ft.	C	Indoor
Coal Conveyor	65 dB(A)	73 dB(A)	15 ft.	I	Outdoor
Stacker-Reclaimer	76 dB(A)	77 dB(A)	30 ft.	I	Outdoor
Bulldozer	80 dB(A)	90 dB(A)	50 ft.	Daytime only	Outdoor
Scraper	88 dB(A)	92 dB(A)	50 ft.	Daytime only	Outdoor
Coal Car Dump	80 dB(A)	95 dB(A)	15 ft.	Emergency	Outdoor
Precipitator Rapper	130 dB Peak Impact	136 dB Peak Impact	3 ft.	C	Indoor
Induced Draft Fan	120 dB(A)	124 dB(A)	5 ft. from open outlet	C	Indoor
Forced Draft Fan	122 dB(A)	126 dB(A)	5 ft. from open inlet	C	Indoor
Primary Air Fan	129 dB(A)	132 dB(A)	5 ft. from open inlet	C	Indoor
Boiler Feed Pump	105 dB(A)	106 dB(A)	3 ft.	C	Indoor
Boiler Feed Pump Turbine	97 dB(A)	102 dB(A)	3 ft.	C	Indoor
Circulating Water Pump Motor Assembly	82 dB(A)	83 dB(A)	3 ft.	C	Outdoor
Boiler Safety Valve Discharge Pipe	129 dB(A)	129 dB(A)	50 ft.	I	Outdoor

TABLE 4-18 (Cont'd)

MAJOR NOISE SOURCES DURING PLANT OPERATION - UNSILENCED

Equipment	Average Sound Level	Maximum Sound Level	Distance From Equipment	Type of Operation C: Continuous I: Intermittent	Equipment Location
Main Transformer	81 dB(A)	83 dB(A)	5 ft.	C	Outdoor
Auxiliary Transformer	74 dB(A)	78 dB(A)	3 ft.	C	Outdoor
Vacuum Pump	93 dB(A)	93 dB(A)	3 ft.	C	Indoor
Vacuum Pump Motor	91 dB(A)	95 dB(A)	3 ft.	C	Indoor
Emergency Diesel Generator	105 dB(A)	105 dB(A)	3 ft.	I	Indoor
Auxiliary Boiler Forced Draft Fan	103 dB(A)	106 dB(A)	5 ft. from open inlet	I	Outdoor
Auxiliary Boiler Safety Valve Discharge Pipe	125 dB(A)	125 dB(A)	50 ft.	I	Outdoor
Station Ventilation Fan	110 dB(A)	110 dB(A)	5 ft. from open inlet	C	Indoor
Cooling Tower	77 dB(A)	79 dB(A)	50 ft.	C	Outdoor
Power Control Valve Discharge Pipe	129 dB(A)	129 dB(A)	50 ft.	I	Outdoor
Coal Crusher	90 dB(A)	90 dB(A)	3 ft.	I	Indoor
Public Address System	122 dB(A)	124 dB(A)	4 ft.	I	Indoor/Outdoor



WESTERN LOW SULFUR COAL
(0.5%S)
SHIFT IN AMBIENT SOUND
LEVELS DUE TO PLANT OPE-
RATION WEEKDAY DAY - SUMMER

FIGURE 4-1

certification requires that shifts in the sound level be less than 5 dB(A) at existing noise sensitive points outside the site boundary. This is contained in Stipulation 75-1 (Article VIII Proceeding) and is based on guidelines contained in 16 NYCRR part 75. Thus, members of the public will not be exposed to higher sound levels except where ambient sound levels are higher. To ensure that these sound levels are not exceeded, the applicant will monitor noise levels during operation of the proposed facility.

CULTURAL RESOURCES

4.192
The operation of the proposed facility will not have any impact on properties listed in the National Register of Historic Places nor the register on National Historic Landmarks. As noted in Chapter 2, the applicant has performed an architectural and historical survey to list all resources of cultural significance in the site area. The Calvin Dubert House will experience visual but no noise impact from station operation. The Keeper of the National Register determined that the Dubert House is eligible for inclusion in the National Register.

AESTHETICS

4.193
After the plant has been constructed, the primary aesthetic impact will result from the imposition of the plant complex on a rural area. The cooling tower will be 360 feet in diameter and 500 feet tall. The turbine generators/silo/boilers complex for Units 1 and 2 will be approximately 400 ft x 600 ft. These are large structural elements in a flat area which are visible from a number of roads adjacent to a rural, summer tourist community. Most of the elements are simple and generally pleasing in shape. The most unpleasant elements, due to their color, mass, and generation of dust will be the 50-foot (15.2 m) high coal storage piles and the 45-foot (13.8 m) high fly ash and bottom ash disposal mounds.

Power Plant Elements
4.194
The principal buildings and structures are very high, but architectural efforts will be made to scale down the visual effects of their masses and elevations. The three main buildings, turbine enclosure, boiler buildings, and air quality control system building, will be finished in architectural and flush metal siding which will be colored to minimize the apparent visual effect of their heights. These colors will be of an off-white hue for the administration

building, the turbine-generator-boiler enclosures, and the enclosures for the electrostatic precipitators. The higher elements will have a band of medium blue panels at their top level, and there will be another band of the same medium blue as a definition of elements at the top of the generator area enclosure. The off-white color will blend with the natural finish concrete of the 750-foot (228 m) stack and the 500-foot (152 m) cooling tower, and will tend to minimize the apparent visual effects of their height and integrate them into the complex. The auxiliary buildings will be finished in colors which harmonize the treatment of the main buildings.

4.195
To ameliorate the adverse visual effects of the power plant complex on the area, permanent landscape planting and screening will be established on the site as soon as practicable. In addition, the fly ash and bottom ash disposal areas, coal storage areas and switchyard were carefully sited so as to utilize existing hardwood and coniferous plantings for screening purposes.

Offshore Unloading Facility
4.196
Due to the fact that the coal conveyor system has been placed underground in a tunnel, the only visual stimulus associated with the offshore unloading facility will be the lake ship unloading at the breasting dolphin and tied to the mooring dolphins. This sight when viewed from the shore should have little adverse impact on local aesthetics.

SOCIAL AND ECONOMIC IMPACT

Employment
4.197a
The proposed facility will employ approximately 100 full-time personnel. Employees for plant operation will be drawn primarily from the Niagara Mohawk Western Division. Some of the employees will be transferred from the existing steam station at the city of Dunkirk, and a portion of the remainder will most likely commute from the region. This labor force will either be drawn from the local vicinity (Dunkirk-Fredonia region) where they already have residences, or will commute from the general region. The number of union and

supervisory employees needed for the first and second year of plant operation is presented below:

NUMBER OF EMPLOYEES FOR FIRST TWO YEARS OF OPERATION

	Union Personnel	Supervisory Personnel	Total Personnel
Unit 1	57	16	73
Units 1 & 2	75	17	92

Source: Niagara Mohawk Power Corporation, Syracuse, New York

Average annual salaries for these first two years of operation are presented in Table 4-19. The table presents the person and subtotal figures, by union and supervisory categories, and the total annual payroll associated with Unit 1, and Unit 1 and 2 operation.

4.197b
In 1972, there were 1,795 persons employed in Chautauqua County in the public utility, transportation, and communication sector (U. S. County Business Reports). The total personnel required for the operation of the proposed facility would comprise 5.2 percent of this figure. The total impact of the operation of the proposed facility, when geographic distribution and existing employment patterns are considered, is anticipated to be positive but minor.

Tax Revenues
4.198
The major fiscal impact of the proposed project in its operation and maintenance phase will be the generation of substantial property-tax revenues. It has been estimated that by 1987 the applicant will pay some $7.5 million in property taxes annually. In 1975, the site produced $16,833 in taxes. Owing to the way in which property taxes are distributed in New York, the tax benefits received from the proposed project will be spread far beyond the boundaries of the town of Pomfret. Table 4-20 illustrates the potential implications associated with the addition of the proposed facility to the tax rolls. The facility will represent more than 85 percent of the full taxable valuation in the town by the years 1985-87. Similarly, the proposed project would eventually represent a substantial proportion of the taxable property in the Brocton School District and in the County as a whole. By the mid-1980's, the generating station would account for

TABLE 4-19

AVERAGE ANNUAL SALARIES* (dollars) FOR THE OPERATIONAL LIFE OF THE FACILITY

Year	Union (300 hrs Overtime) Per Person	Union (300 hrs Overtime) Sub Total	Supervisory Per Person	Supervisory Sub Total	Total
Base: 1975	18,000		20,000		
Unit 1 Startup: 1985	29,320	1,671,240	32,578	521,248	2,192,488
Unit 2 Startup: 1986	30,786	2,308,950	34,207	581,517	2,890,467
1987	32,325	2,424,398	35,917	610,593	3,034,991
1988	33,942	2,545,617	37,713	641,123	3,186,740
1989	35,639	2,672,898	39,599	673,179	3,346,077
1990	37,421	2,806,575	41,579	706,838	3,513,413
1991	39,292	2,946,870	43,658	742,180	3,689,050
1992	41,256	3,094,214	45,841	779,289	3,872,503
1993	43,319	3,248,925	48,133	818,253	4,067,178
1994	45,485	3,411,371	50,539	859,166	4,270,537
1995	47,759	3,581,944	53,066	902,124	4,484,068
1996	50,147	3,761,041	55,719	947,230	4,708,271
1997	52,655	3,949,093	58,505	994,592	4,943,685
1998	55,287	4,146,548	61,431	1,044,322	5,190,870
1999	58,052	4,353,875	64,502	1,096,538	5,450,413
2000	60,954	4,571,569	67,727	1,151,364	5,722,933
2001	64,002	4,800,147	71,114	1,208,933	6,009,080
2002	67,202	5,040,155	74,669	1,269,379	6,309,534
2003	70,562	5,292,162	78,403	1,332,848	6,625,010
2004	74,090	5,556,770	82,323	1,399,491	6,956,261
2005	77,795	5,834,609	86,439	1,469,465	7,304,074
2006	81,684	6,126,339	90,761	1,542,939	7,669,278
2007	85,769	6,432,656	95,299	1,620,085	8,052,741
2008	90,057	6,754,289	100,064	1,701,090	8,455,379
2009	94,560	7,092,004	105,067	1,786,144	8,878,148
2010	99,288	7,446,604	110,321	1,875,451	9,322,055
2011	104,252	7,818,934	115,837	1,969,224	9,788,158
2012	109,465	8,209,881	121,629	2,067,685	10,277,566
2013	114,938	8,620,375	127,710	2,171,069	10,791,444
2014	120,685	9,051,382	134,095	2,279,623	11,331,005
2015	126,719	9,503,963	140,800	2,393,604	11,897,567

*Assuming 5% Annual Escalation.

Source: Niagara Mohawk Power Corporation, Syracuse, New York.

TABLE 4-20

FULL VALUATIONS: A COMPARISON

	Full Valuation ($ millions)		Estimate of 1987 Full Valuation ($ millions)		Plant as % of 1987
	1970-71	1974-75	w/o Plant	w/Plant	
Brocton School District	17.5	21.0	32.6	1,022.6	96.8
Town of Pomfret	57.4	79.4	173.1	1,223.1	85.8
Fredonia School District	62.6	83.3	165.4	275.4	39.9
Chautauqua County	781.4	1,001.3	1,815.7	2,915.7	37.7

Source: Board of Legislators, Chautauqua County, New York, Journal of Proceedings, 1971-1975. Chautauqua County Board of Education Services, business records, 1971-75. 1987 estimates by ERT.

approximately 96 percent of the full valuation of the Brocton School District and nearly 38 percent of full valuation of Chautauqua County.

Public Services and Facilities

4.199

The operation of the proposed facility is not expected to have an impact on public services (law enforcement, fire protection, etc.) and facilities (schools, hospitals, housing, etc.). The applicant will handle plant security through their own security force and onsite fire-fighting equipment will be capable of handling probable fires. During the plant's operational life, sewer and water services will be provided by the plant itself and should have no effect on the capacity of the public sewer and water supply. If tying into the Fredonia sewer system is possible and impact to the community is acceptable, the applicant will follow this course of action. Increased traffic caused by the generating station might cause some slight increase in road maintenance costs for roads near the site, however, this increased cost will be more than offset by the increased tax revenues generated by the station.

Public Health

4.200

The National Primary and Secondary Ambient Air Quality Standards and the New York State Standards have been formulated to protect public health and welfare. These standards, established as a result of observed effects and epidemiological studies, have recently been reviewed by the National Academy of Sciences, National Academy of Engineering (NAS/NAE). This report indicates that the primary health-related standards are now set at levels somewhat below those at which adverse effects have actually been observed (National Academy of Sciences, 1974). The difference constitutes the safety margin. There is not and cannot be any guarantee that such effects are completely absent even at the level of the ambient air quality standards. This report also found that "the evidence that has accumulated since the promulgation of the Federal ambient air quality standards...supports those standards." Any attempt to quantify human health effects from the plant's emissions is difficult since insufficient research has been conducted on long-term exposure to low levels of atmospheric pollutants. Separation of health effects caused by the plant's emissions from effects caused by other point source emissions in the entire region may also be impossible to assess. The anticipated impact on water quality and the lack of municipal water intake structures in the vicinity of the plant's zone of influence should protect the public health from contaminated water supplies. Additionally, adverse impacts on ground water quality and wells in the area will be negligible.

Local Grape Industry

4.201a

The primary crop near the Pomfret site is grapes. This crop supports a relatively significant industry in the regional area, and atmospheric emissions, principally sulfur dioxide in combination with high ambient concentrations of SO_2 and ozone, could affect grape productivity. Although the applicant performed studies on the effects of SO_2 and ozone on grapes, these studies were deficient in certain respects and did not assess the impact on productivity. Niagara Mohawk is planning continued studies for the grape varietal responses to predicted facility SO_2 emissions and ambient ozone concentrations during the period 1977-1981. Staff believes that the major problem is long-term chronic and synergistic effects (the combined effect of two or more pollutants) on productivity rather than short-term acute injury. However, it is difficult to assess possible chronic damage on grapes at this time since there is no known literature which specifically pertains to the impact on grapes of long-term exposure to low levels of SO_2 in combination with ozone. Additionally, the results of applicant studies on long-term effects would not be available until after 1981.

4.201b

The Public Service Commission staff has recommended that sufficient studies to determine the viticultural impact of the proposed facility be incorporated as a condition of State certification, and that post-operational monitoring be performed to confirm results of the study. Staff agrees with these recommendations and believes that, if necessary, engineering changes should be made to insure that adverse impacts on the grape industry do not occur, as this industry is important to the local and regional socio-economic structure. Staff also believes that there is sufficient time so that the recommended studies can yield meaningful results prior to station operations.

4.201c

An additional impact on vineyards may result from the construction of a berm (approximately 40 feet in height and about a mile in length) near the ash disposal area. The berm is expected to impede the drainage of cold air generated south of the berm. This could result in freeze damaging effects to grape vines under radiation-type frosts. The area and extent of frost damage is presently unknown. The applicant predicts that the extent of damage will be limited to 500-700 feet at the west of the berm and a few hundred feet at the east, whereas the New York State Grape Production Researech Fund believes that damage will extend several thousand feet. Although the extent of damage is subject to debate, there will be an incremental increase in the severity and frequency of frost damage. The berm is to be constructed for prevention of significant deterioration of air quality reasons in conjunction with ash disposal, and thus, major changes in design of the berm may not be possible.

Community Cohesion

4.202
The proposed project will not create any physical obstacles to community interaction. The Director of Planning and Development for Chautauqua County has advocated the relocation of Berry Road (as opposed to closing and abandoning it) as an integral part of the traffic pattern of the area. The applicant has addressed this concern by accommodating the relocation of Berry Road in its plans for the site.

4.203
The operation and maintenance of the proposed facility will have only a minimal effect upon adjacent land use patterns and property values. Residential development along the nearby Lake Erie shoreline may be adversely affected by the proposed project due to a potential lowering of neighboring amenity levels. However, due to the fact that local amenity levels is only one of the factors which interrelate and influence residential location decisions, the intensity of the impact itself is unclear. In addition, the proposed project is not expected to draw into the area other industries or commercial enterprises which could adversely affect residential property value.

Community Development

4.204
Construction and operation of the proposed facility will have a positive impact on community development and consequently the quality of life in the area. The outmigration trend from Chautauqua County may be slowed or stemmed given the availability of good paying jobs, and thus, increasing the percentage of people working. Although the racial or ethnic compositon of the work force is unknown, it is anticipated that the percentage of nonwhite households should not decrease. The availability of well paying jobs should lead to an increase in the general economic activity of the region, the amount of money spent on leisure entertainment and amusements, and the amount of social interaction in the community. The basic social fabric of the town of Pomfret, the concept of the community shared by the inhabitants, and the socio-economic characteristics of the communities should remain intact, save for the economic " shot in the arm" the proposed project will provide to the economy of the region.

RECREATION

4.205
The most significant impact of the facility on recreation in the area will be the visual aspects of the plant's higher elements (cooling tower, main generator building, and stack). These elements will be visible to boaters on Lake Erie and by persons visiting Lake Erie

State Park. Viewers from the lake will catch glimpses of the plant itself only occasionally in the growing season, but the tops of the stack and tower would be visible. During periods when leaves are absent from screening vegetation, more elements of the plant could be seen from the lake. The eastern edge of Lake Erie State Park is well vegetated and this existing screen will partially block the view of the proposed facility. The facility elements are visually subordinate from this part of the park and become more so from other viewpoints in the park. The offshore unloading facility will create minor interference with recreational boating especially during periods of coal delivery. No significant effects on recreational facilities are expected as a result of increased traffic or noise. It is unlikely that any odors from the proposed station will be discernable at Lake Erie State Park to a point restricting park usage. Older generating stations burning relatively high sulfur coal and having short stacks have been known to produce odors. This usually occurs during high wind, downwash conditions when relatively high ground level concentrations of SO_2 can occur in the vicinity of those plants and the associated odor can be detected. The proposed facility will have a high stack which will obviate the possibility of downwash and the attendant high SO_2 concentration producing any odor.

PROPERTY DAMAGE FROM EMISSIONS
(Adapted from State Case)

4.206
Sulfur dioxide and sulfuric acid damages in the United States are due mostly to corrosion of painted and unpainted surfaces normally exposed to the environment. Other materials generally have a higher threshold level for damage. Relative humidity greatly influences the rate of corrosion, with higher humidity resulting in greater damage to metal products. The following table prepared by the State of New York for the proposed facility indicates the allowable corrosion rate for galvanized products during normal service life and the predicted corrosion rate that would presently be occurring at Pomfret and Sheridan.

Galvanized Product	Thickness of Zinc Coating	Allowable Corrosion Rate per Year	Maximum Annual Ambient SO_2 Level	Annual Average PH	Predicted Annual Corrosion Rate
	μm	μm	μg/m^3	Percent	μm
Building Accessories	26	.578	34	73	.840
Wire Fencing	26	1.30	34	73	.840
Fence Posts	54	1.80	34	73	.840
Wires and Cables	37	1.85	34	73	.840

Since the predicted corrosion rate exceeds the allowable corrosion rate only for galvanized building accessories such as gutters and downspouts, it can be concluded that only these products will corrode faster than "normally" expected. A normal service life is assumed at 45 years while the actual service life may be, as a result of SO_2 impact, as short as 31 years. At the annual SO_2 levels present near these sites, the normal service life of materials will be affected only in locations where the annual average SO_2 concentration is greater than 24 μg/m^3. The effect of sulfates (of which SO_2 is a precursor) on property damage is a current concern in the United States. The extent of sulfate damage is uncertain at the present time but sulfates may be more damaging than SO_2.

PROBABLE IMPACT OF THE PROPOSED ACTION ON THE WESTERN COAL MINING REGION

4.207
Operation of the Lake Erie Generating Station will require the direct consumption of 180,000,000 tons of western coal as fuel for the station. Additional energy resources will be indirectly consumed in support operations such as mining and materials shipping. The applicant proposes to contract with a Wyoming or Montana supplier of low-sulfur coal. The area affected in obtaining 180 million tons of coal would depend principally on the thickness of the seam. As the coal seams in this area vary from 25 to 100 feet in thickness, 180 million tons would underlie between three and twelve square miles. It should be recognized, however, that at any one time the extent of surface so disturbed would be substantially less than the area covering 180

million tons of coal. The following two paragraphs identify some typical impacts that can occur when new mines are opened on presently undeveloped or isolated areas. Since the exact area required for supply of low sulfur coal to the proposed Lake Erie Generating Station is unknown, the severity of impacts described below should not necessarily be associated with the proposed project.

Physical and Biological Impacts

4.208

The impact of strip mining on groundwater quality is of prime concern in an area where water is scarce. When rainfall is about 14-18 inches per year, the evaporation rate is high and the groundwater recharge rate is low. The coal seam is the main aquifer in many areas, although it is usually of poor quality. By removing coal, part or all of the aquifer will be destroyed. Researchers are uncertain as to the extent of destruction. Some evidence points to the conclusion that strip mining a poor aquifer will have little impact more than a mile away from the mine site, while strip mining a good aquifer will cause lowering of the groundwater beyond the one mile radius. The major concern with groundwater quality is that toxic materials in the overburden (the soil above the coal seam) be kept from contaminating existing or potential groundwater aquifers. These toxic materials include ammonium, lead, mercury, nitrates, and salts. Surface water may be impacted indirectly by contaminated groundwater or directly by pitwater pumped from the mines. It is believed that direct impacts can be avoided by drainage water management and proper treatment of pitwater. Strip mining disrupts the normally well-developed, layered soil. Soil structure and its contribution to plant productivity is destroyed. Plant reestablishment is hindered, which encourages erosion by wind and water. Studies on old mine spoils show that the beginnings of soil redevelopment can be seen only after 30 to 50 years. Rainfall in the general area should be adequate to permit revegetation. Introduced grasses, which have higher productivity for pasture and haylands than native species, could be planted. Introduced species are easier to develop on reclaimed land because their characteristics are well known. For recreation and wildlife, native species, which are slower in reestablishing, are more productive.

Socio-Economic Impacts

4.209

The more significant impacts of strip mining in the west are not the impacts at the mine site, but rather the secondary social impacts related to mining. For example, more land may be lost to ranching from the impacts of population growth than from the actual impact of coal extraction itself. The greatest impact of strip mining appears to be the loss of a way of life due to a large growth in population.

Other major impacts include social and economic stress within families and communities. The sharp increase in population and the extensive and rapid development which accompanies that increase, can serve to dramatically alter the way of life in Wyoming, and perhaps much of the northern Great Plains States. Ranching could be replaced by mining and service industries. The composition of the population will change, by occupation, educational background, years of residence, and average age. The number and range of native plants and animals will decrease. The uniqueness of the area as a tourist attraction may decrease and the character of the area will be altered. Rapid increases in population and the resulting boom town economy can induce numerous social impacts within a community. These may typically include:

- Problems integrating newcomers into existing communities.
- Stress factors in a boom town resulting in high separation and divorce rates, high juvenile delinquency, and predelinquency rates.
- Breakdown of normal information exchange system.
- Shortage of service delivery personnel, police, fire, garbage collection.
- Lack of housing, schools, hospitals, utilities, retail supplies.
- Change in age distribution of populace, shifting toward a younger population age.
- High turnover ratio in schools, coupled with high dropout rate due to employment potential, resulting in diminished quality of education.
- High cost of living, high inflation rate, long working hours.
- Increase in the number of accidental deaths and injuries as mining activity increases to meet the demand for more low sulfur coal.

Should the coal supply for the proposed station be obtained from existing mines located in already developed areas, rather than pristine areas, the socio-economic impacts due to the proposed station would probably not be as severe as those mentioned above.

Regulation
4.210
New surface mining legislation signed by President Carter in 1977 should result in stricter control and enforcement over mining activities. This should help minimize environmental and health-related impacts associated with strip mining. Strip mines are regulated by the Department of the Interior (DOI) and are generally the subject of DOI environmental impact statements when the mine is developed on Federal land.

TRANSMISSION LINES

4.211
Potential impacts arising from the operation of transmission lines needed to connect the proposed facility to the rest of the New York Power Pool are basically due to the electrical fields associated with them. Impacts also will result from maintenance operations to the transmission corridors.

4.212
The electric field associated with an energized 765-kV transmission line will induce voltages in conducting objects within the field. If the object is well grounded, the resulting potential between the object and the ground will be near zero. However, if the object is insulated from the ground, significant voltages may be induced and a potential shock hazard created. The magnitude of the charge, and therefore the severity of the shock, will be related to parameters associated with the transmission line design, live voltage, size and dimensions of the object, proximity of the object to the line, and degree of insulation of the object from the ground. The quality of the insulation between a person coming in contact with such an object and the earth will, of course, also affect the severity of the shock. Immediately after completing the construction of the transmission line when all gates and fences are in their final location, the applicant's Meter and Test Department will perform a survey along the right-of-way. The survey will consist of checking integrity of the grounding of all nearby fences, buildings, and other metal objects. If adequate grounding is not already established, grounds will be installed, unless grounding of such objects would interfere with their proper operations, in which case other protective procedures shall be used.

4.213
Under conditions of foul weather (various conditions of medium to heavy precipitation), the conductors of the transmission line will produce audible noise best characterized as a "hum." Careful attention to line design parameters as well as complete familiarity on the part of the utility industry with the various mechanisms which cause this phenomenon have made it possible to so design and construct transmission lines such that noise generated can and will be kept to acceptable levels.

4.214
Electric transmission lines in the high voltage design range can produce radio and television interference, again predominantly under adverse or bad weather conditions. This interference is caused by "corona effect" which is simply stated as the tendency for moist air

to lose some of its dielectric strength, thereby facilitating minute electric spark discharges in the immediate vicinity of energized conductors. Once again, careful attention to design parameters and particularly the requirement for surface smoothness and regularity on energized metallic parts greatly ameliorates this potential problem source. Experience with actual operation of these transmission lines has shown that virtually no RF interference problem has been unsolvable. In a very few cases, it can become necessary to make adjustments in existing receiver antenna systems adjacent to the transmission line right-of-way or, in the worst case, provide the installation of a new antenna system altogether.

4.215
While it is theoretically possible that ozone can be formed around the conductors of high voltage transmission lines during inclement weather, infield tests have been conducted on a worst case basis of 765 kV lines to the end that after extensive hearings before the New York State Public Service Commission in other cases, it was determined that ozone production did not cause a significant adverse impact upon vegetation, air quality, and animal and human life; and that ozone produced by such lines are in no way a threat to public health and safety.

SHERIDAN SITE

IMPACT OF POWER PLANT CONSTRUCTION

INTRODUCTION

4.216
The impacts of power plant construction, operation, and maintenance at Sheridan are similar and in some cases nearly identical to those described in the corresponding Pomfret Section. In order to avoid repetitious text, the Sheridan impact section refers back to the Pomfret section when anticipated impacts are identical.

LAND USE

4.217
Five hundred and twenty-five acres or 53.2 percent of the 986 acre site will be cleared for the proposed generating station. This area includes land utilized for both permanent and temporary needs as illustrated in Table 4-21. As with the Pomfret site, Sheridan construction will require 11 acres of land for temporary use. The areas most affected by construction include 211.5 acres of cropland, 79.6 acres of vineyard, 19 acres of pasture, 65 acres of northern hardwoods, 79 acres of shrub, 105 acres of open field and 23 acres of residential and recreational land.

TABLE 4-21

SITE ACREAGE COMMITTED TO PERMANENT AND TEMPORARY POWER PLANT FACILITIES

Permanent Land Use		
Area		Acres
Parking and Receiving		29.86
Plant Island		71.51
Field Office		2.44
Field Fabrication Shops		15.50
Cooling Tower		30.99
Tunnel Adit		7.23
Coal Storage		73.92
Laydown		30.31
Switchyard		22.90
Dry Fly Ash and Bottom Ash Disposal Site		205.00
Coal Pile Runoff Sedimentation Pond		6.00
	Total	495.66

Temporary Facility Land Use*		
Area		Acres
Ebasco Field Office		0.15
Owner Field Office		0.09
Craft Change Houses		3.62
Plant Island Fabricating Shop		1.15
Warehouse and Receiving		1.38
Owner Trailer Area		0.46
Subcontractor Trailer Area		1.38
Field Fabrication Shops		1.38
Field Fabrication Shops		1.38
	Total	10.99

*Although areas are specified for each temporary structure, these do not add to, but are included within the permanant areas shown above.

Topography and Geology

4.218

The topography and underlying geologic structure of the proposed site at Sheridan will not be significantly altered by site preparation and plant construction. The construction of the offshore coal unloading facility will involve tunneling for a distance of 5,200 feet (1,585 m). Of this distance 3,750 feet (1,143 m) will be below the lake bottom and the remainder 1,450 feet (442 m) will be onshore. This action is not considered to constitute a significant impact which would foreclose future land use options at the site.

Agriculture

4.219

Site preparation, construction activities, and fencing will remove 513 acres of land from active agricultural production. This acreage presently produces a yearly crop (grapes, hay, pasture, and truck farming) valued at $271,444.

4.220

The applicant has projected possible losses assuming the site were to be planted in one crop (corn or tomatoes). Based on this assumption, productivity losses due to facility construction could be 16,000-21,000 bushels of dry shelled corn or 3,200-4,200 tons of tomatoes. This is equivalent to 75.8 - 99.5 bushels of dry shelled corn/acre or 15.2 - 19.9 tons of tomatoes per acre. The 1977 average price for a bushel of dry shelled corn in the area is $2.10, which would translate into a potential loss of $33,600 -$44,100 per year. The 1977 average price for a ton of tomatoes is $75.00 or a total of $240,000 - $315,000 worth of potential agricultural productivity lost on the Sheridan site. In terms of vineyards, the estimate of grape production on the site is four tons per acre, or 318 tons of grapes for the entire site. The 1977 average market price for grapes in the area is $220/ton (including contract and open market prices). This can be translated into a potential loss of about $69,960 worth of grapes per year. It is unlikely that the total acreage would be planted in one crop and the estimates presented above are, therefore, higher than actual losses. The impact of the proposed facility on prime and unique farmland was analyzed by juxtaposition of the plant layout on soils maps. These maps also delineated unique farmlands. Due to the preliminary nature of the Chautauqua County soils survey, extrapolation of the acreages of different soil types within the farmlands classification was not possible. Thus, the analysis is not subdivided according to the acreage of percentage of each soil type found on the site. The analysis is as follows:

- Site Acreage	986
- Percent of site in active agricultural	52%
- Acreage of site in active agricultural	513
- Percent of site in abandoned agricultural	15%
- Acreage of site in abandoned agricultural	148
- Acreage of unique farmland	58
- Unique farmland acreage to be impacted by facility components	41
- Acreage of unique farmlands within site, but not covered by components	17
- Acreage of prime farmland on the site	492
- Acreage of prime farmland to be impacted by facility components	302
- Acreage of prime farmland within the site, but not covered by facility components	190
- Total acreage of prime and unique farmland	550
- Total acreage of prime and unique farmland impacted by facility components	343
- Total acreage of prime and unique farmlands within the site, but not covered by facility components	207

The prime farmland mapping units found within the site include: Canandaigua silt loam, 0-2 percent slopes; Williamson silt loam, 0-2 percent slopes; Niagara silt loam, 0-2 percent slopes, and Minoa fine sandy loam, 0-2 percent slopes. Threats to the continued use and viability of prime and unique farmlands for those lands outside the site boundaries, and from such things as urbanization or other changes in land use that might be induced by the proposed facility, are not anticipated. The acreage of prime and unique farmlands within the Sheridan site which will not be occupied by facility components, will remain viable farmland, however, those lands will not be used as such since they will be located within the plant's security fences. The prime and unique farmland occupied by plant structures will be lost for at least the 30 to 40 years life of the facility, and possibly longer if the structures remain after decommissioning. Farmland located in areas proposed for solid waste disposal areas will be irreversibly committed. Quantification of this loss of prime and unique farmland on a regional basis is not possible, since the Chautauqua County soils survey has not been completed. Accordingly, while not precisely on point, the following facts are set forth to shed some perspective on this impact. While the site is generally classified as agricultural, the relative abundance of this activity, both locally and regionally, is fairly extensive. The 986-acre Sheridan site contains approximately 447 acres of active agricultural land. The project will remove from active agricultural use approximately 3.5 percent of that found in the town of Sheridan; 1.3 percent of that found in the Dunkirk-Fredonia region; and 0.2 percent of that found in Chautauqua County. Although agriculture represents the predominant activity taking place on the site, its productive value is small in comparsion to the output of the larger Lake Erie Grape Belt Region.

<u>Sheridan Site</u>

Annual Value of Site Agricultural Output	$271,417
Annual Value of Agricultural Output of Region	$25,000,000
Site as Percent of Region	1.1

Transmission Line Corridors

4.221

The construction impact of additional transmission corridors to connect the proposed facility to the rest of the applicant's service system is at the present time speculative. While it is recognized that the impact of transmission lines must be considered in assessing a generating station, only generalized information can be provided due to the fact that specific routes have not yet been chosen. The general discussion presented in paragraphs 4.006 and 4.007 is also applicable to the Sheridan site.

TERRESTRIAL ECOLOGY

Fauna

4.222

Impacts on terrestrial fauna due to site preparation and construction will primarily be related to loss of habitat (Tables 4-22 and 4-23). Clearing vegetative cover from about 525 acres of the site will eliminate or displace animals which are either permanent or transient inhabitants of the site. Sedentary organisms such as moles, salamanders and nestling birds will probably be eliminated while more mobile species are expected to emigrate from the area when vegetation is cleared. It is not anticipated that all of the affected animals will emigrate. Some may remain in or return to areas used for temporary construction purposes (areas adjacent to permanent plant facilities).

4.223

Physical alteration of construction areas will reduce the abundance of small mammals such as the white-footed mouse, shorttail shrew, and meadow vole. The reduction in numbers of these small mammals at Pomfret may affect local predators by reducing the availability of prey. In addition, habitat for other less common small mammals, such as the meadow jumping mouse, masked shrew, red squirrel, and eastern

TABLE 4-22

SHERIDAN LAND CLASSIFICATION OF SITE PRIOR TO AND AFTER CONSTRUCTION CLEARANCE, WESTERN LOW SULFUR COAL

Land Classification	Acreage Prior to Construction Clearance	Construction Clearance: Acres Cleared	Construction Clearance: % of Land Lost on Site	Acreage After Construction Clearance
Managed Land				
Cropland	275.1	211.5	76.9	63.6
Vineyard	153.1	79.6	52.0	73.5
Residential & Recreational	42.6	22.8	53.5	19.8
Pasture	19.0	19.0	100.0	0.0
New York State Thruway	0.0	0.0	0.0	0.0
Railroad	0.0	0.0	0.0	0.0
Roads	3.7	0.0	0.0	3.7
Subtotal	493.5	332.9		160.6
Vegetation Cover Type				
Northern Hardwood	166.4	65.1	39.1	101.3
Shrub	146.4	78.4	53.6	68.0
Open Field	157.6	105.0	66.6	52.6
Black Locust	3.7	0.3	8.1	3.4
Willow	5.9	4.6	78.0	1.3
Pine Plantation	12.0	4.4	36.7	7.6
Marsh	0.0	0.0	0.0	0.0
Pond	0.7	0.0	0.0	0.7
Subtotal	492.7	257.8		234.9
Total	986.2	590.7*		

*These acreage figures do not include the new Fly Ash disposal plans, so acreage estimates are 66 acres in excess of what will actually be cleared.

TABLE 4-23

SMALL MAMMAL AND BREEDING BIRD DENSITIES, AND ACREAGE OF VEGETATIVE COVER TYPES CLEARED AT SHERIDAN - WESTERN LOW SULFUR COAL

	Vegetative Cover Types Cleared (acres)			Small Mammals		Breeding Pair of Birds	
	Permanent	Temporary	Total	Density (No./Acre)	Number Species	Density (No./Acres)	Number Species
Northern Hardwood Forest	26.7	38.4	65.1	50	5	1.6	31
Shrub	50.6	27.8	78.4	84	4	1.9	23
Pine Plantation	2.0	2.4	4.4	15	2	*	*
Open Field	71.5	33.5	105.0	42	8	0.7	10
Cropland	172.7	38.8	211.5	*	*	0.5	6
Vineyard	39.8	39.8	79.6	21	2	0.5	8
Pasture	13.4	5.6	19.0	*	*	*	*
Residential	7.9	14.9	22.8	*	*	*	*
Willow	1.5	3.1	4.6	*	*	*	*
Black Locust	0.3	0.0	0.3	*	*	*	*

* Density values are not available.

chipmunk will be reduced. The majority of the medium-size and large mammals were observed in shrub or forested plant communities at the site.

4.224
Removal of 78 acres of shrub and 65 acres of northern hardwoods will reduce habitat for eastern cottontail, raccoon and white-tailed deer along with reducing the number of carnivores (red foxes) which utilize them for food. The raccoon will also be impacted due to the planned rerouting and culverting of two onsite streams. Raccoons utilize streams to obtain a portion of their food requirements. Additionally, beaver were found inhabiting a stream one-half mile south of Waite Road (Stream S-1) and these mammals are not common on the Erie Lake Plain. However, the Sheridan site cannot be considered as good habitat for beaver and the future of these animals and expansion of their colonization is doubtful even if the station were not constructed.

4.225
Movement patterns of wide-ranging species such as deer and fox across areas of land affected by construction will be altered to some degree. Deer activity patterns will be reduced through the elimination of forests presently used for cover, or will be altered if construction activity bisects their normal routes.

4.226
Construction activity and traffic will probably increase the frequency of mammal road kills. Deer/train collisions are not as great a problem at Sheridan as at Pomfret. Construction noise may initially cause many of the more mobile organisms to emigrate from areas adjacent to the noise source. Breeding and feeding activity in or near construction areas may be lower than in areas beyond hearing distance of construction noise.

4.227
Vegetation removal will reduce habitat for breeding, migratory, and wintering bird species. The density of breeding bird pairs and the acreage of breeding bird habitat cleared for construction and operation of the proposed facility is presented in Table 4-23. It is evident that the greatest number of breeding birds to lose nesting habitats will be those in the shrub and hardwood forest cover types. The clearing of 65 acres of hardwoods forest will reduce breeding bird habitat for as many as 31 species. The red-eyed vireo, wood thrush, American redstart, veery, eastern wood pewee, and ovenbird are abundant species which will lose the largest number of nesting sites because of their high density in forest habitats. Several other birds (black-billed cuckoo, American redstart, screech owl, whip-poor-will, hairy woodpecker, and ovenbird) appear to be

restricted to northern hardwoods forest for breeding. Because of the time required to restore northern hardwoods forest, species composition of site avifauna will be altered by the reduction of these and other species which are restricted to forest habitat.

4.228
The removal of 78 acres of shrub cover type has the potential of reducing habitat for 93 species of birds (Table 4-24). Birds typical of shrub areas, such as yellow warbler, gray catbird, willow fly catcher, common yellowthroat, and song sparrow will lose the greatest number of nesting sites. Based on the breeding bird survey, it is estimated that 1.9 pairs of birds will lose nesting habitat for every acre of shrub cover type removed and, potentially, birds of 31 species may lose nesting habitat.

4.229
Clearing 105 acres of the open field cover type may affect 45 species of birds which were observed in this cover type. In general, the impact of removing this acreage of open fields will be less when compared to shrub and northern hardwood forest cover types because of the low number of species and low population diversity of this cover type. The loss of open fields will, however, reduce breeding habitat for birds such as the grasshopper sparrow, savannah sparrow, upland sandpiper, bobolink, redwinged blackbird and eastern meadowlark, which are typically grassland birds. The open field areas sampled support a low total avian population because many are of relatively small size or are in the early stage of succession and provide little cover or suitable nesting sites. Since much of the temporary construction areas will be restored as grassed areas, the impact of construction on these species may be ameliorated.

4.230
The largest amount of any single cover type to be disturbed by construction and operation of the proposed facility is agricultural land, particularly cropland. Use of cropland and vineyards may affect 53 and 40 species of birds, respectively. Both cropland and vineyards had the lowest density of breeding pairs of the cover types sampled.

4.231
The approximately 30 permanent ponds and several small streams on the site form a major component of the habitat requirements for the two species of turtles (painted and snapping) observed. The elimination of five ponds and alteration of two small streams during construction should not markedly affect the turtle population on the site. Because of the wide distribution of the snake population on the site, clearing approximately 60 percent of the site will reduce, in general, habitat for snakes and likely decrease snake population

TABLE 4-24

TOTAL NUMBER OF AVIAN SPECIES SIGHTED IN EACH PLANT COMMUNITY, SHERIDAN STUDY AREA, SEPTEMBER 1974 THROUGH AUGUST 1975

Plant Community	Total Species
Open Field	45
Shrub	93
Northern Hardwoods Forest	107
Vineyard	40
Cropland	53

levels. Sedentary amphibians, such as Rana spp. (frogs) and Ambystoma spp. (salamanders) which were observed to breed in standing water of ponds will suffer reductions in numbers and habitat due to the elimination of ponds for the ash disposal operation.

4.232
Initial clearing operations will remove approximately 525 acres of existing habitat for soil arthropods. Important taxa affected include mites, elongatebodied springtails, ants, and globular springtails. Clearing approximately 300 acres of cropland and vineyard will reduce vegetation-dependent pest species such as the grape berry moth and aphids, and their predators, such as the lady-bird beetle.

Flora
4.233
No plant community will be completely eliminated from the site. However, onsite vegetative cover types such as willow and shrub will be reduced by 78 percent and 53.6 percent, respectively. Managed cropland, vineyard, and pasture will also be significantly reduced (Table 4-22). During construction, natural plant succession will begin on those areas of the site temporarily or permanently rested from construction use. As a result of these expected environmental changes, only those plant species which are members of the open field community are expected to revegetate during the construction period.

4.234
The clearing of 65 acres of northern hardwoods forest represents the greatest potential impact on site. This forest is similar to that at Pomfret since it is richer in floral composition and more productive than many other cover types of the region. The acreage to be cleared comprises about 0.86 percent of the town of Sheridan's northern hard-woods.

AQUATIC ECOLOGY

4.235
Construction activities which can potentially have an impact on the aquatic ecology of the Sheridan site include physical disruption of bottom sediments and alteration of benthic habitat in Lake Erie. In addition, construction runoff and/or physical damage to streams and ponds on the site could affect finfish, benthic and plankton communities. Assessment of the degree of impact resulting from these activities is based on the consideration of the volume and type of sediment removed, amount of toxic substances and particles released, extent of area affected, productivity of the aquatic community in this area, and relative importance and uniqueness of the sites to the region.

Lake Construction

4.236

Construction of intake, discharge, and mooring structures should not affect the ecology of Lake Erie in the vicinity of Sheridan significantly. The small area affected, the depth of sediment stirred up (layer of sediment averaging about one-inch deep), and the chemical makeup of the sediment suggest that impacts will be minimal and short-term. Dissolved and particulate nutrients will be released and decomposer activity may be accelerated off Sheridan. Zooplankton production may be temporarily increased due to detrital feeding as well. No significant impacts are projected beyond the immediate, short-term impacts.

Dredging

4.237

A total of about 20,000 square feet of bottom area will be disturbed, destroying the habitat of all benthic organisms present. It is estimated that, at an average density of 8,260 organisms per square meter of rock surface, a biomass of 656 mg/m^2 dry weight of benthic organisms will be affected. Losses may be underestimated, due to the semiquantitative nature of the sampling. The dominant benthic taxa that will be affected include Hydra, Cristatella (Bryozoan), Pauldicella (Bryozoan), Tanytarsus (Diptera), Amphipods (scud), Turbellaria and others. It is expected that total standing crop losses due to the removal of natural substrate will be offset by increases in "aufwuchs" or attached organisms colonizing the mooring structures.

4.238

Physical disruption of Lake Erie bottom sediments during construction of the proposed facility will temporarily increase levels of solids and chemicals in Lake Erie at the construction site and consequently affect the aquatic biota of Lake Erie. High levels of suspended solids are damaging to fish, fish eggs, benthic invertebrates and plankton. Levels of suspended solids known to be deleterious to aquatic animals span a wide range. This is related to the variations in ambient conditions and physiological state of the organisms (age, life stage, season, etc.). The effect of increases in suspended solids resulting from construction activity on the local aquatic ecology should be minimal due to the small amount of area disturbed and the thin layer of sediment involved. Construction activity will be concentrated near the 30-foot depth contour rather than at inshore areas where spawning activity and benthic biomass is greatest. However, staff believes that dredging should be restricted to periods of low spawning activity.

4.239

Release of potentially toxic chemicals can occur because of sediment disturbance. A discussion of sediments is contained in Chapter Two

TABLE 4-25

SHERIDAN - SEDIMENT ANALYSIS*
JULY 31, 1975

	Range - (mg/kg) All Stations	Intake-Discharge (Vicinity)
Oil and Grease	1.8-20.7	16.5-20.7
Cyanide	0.020	< 0.020
Arsenic	< 0.0004-0.0232	0.0056-0.0064
Cadmium	< 0.004	< 0.004
Chromium	< 0.004-0.024	< 0.004
Copper	< 0.004-0.016	< 0.004-0.004
Lead	< 0.004	< 0.004
Mercury	< 0.004-0.0044	< 0.0004
Nickel	< 0.004-0.196	0.020-0.196
Zinc	< 0.004-0.176	0.060-0.156
Total Organic Carbon	28.2-88.6	80-88.6
COD	10.0-110	30-100.0
Immed DOD	0.5-52.5	35-45
Total K-Nitrogen	1.4-20.9	6.92-15.32
Nitrate-N	0.16-0.40	0.16-0.40
Orthophosphate	0.008-0.268	0.032-0.268

*Table 2-40 in Chapter 2 presents a more detailed analysis of Sheridan site sediment.

(2.292). Metals, oil, grease, and other toxic chemicals present in typical lake sediments can be damaging to aquatic organisms at high concentrations or long exposure times. However, sediments at Sheridan contain extremely low concentrations of such chemicals (Tables 4-25 and 2-40). Toxic chemicals are not expected to increase significantly or even approach lethal limits due to their low concentrations in the sediment. The thin sediment layer present in the construction area, and the small area disturbed suggest that the impact will be insignificant. Likewise, anoxia should not occur due to the high oxygen saturation levels of the lake, the small sediment layer disturbed and the low oxygen demands of the sediment. Nutrient content of sediments collected during 1975 at the proposed intake location at Sheridan was low (Tables 4-25 and 2-40). If these sediments were resuspended in the water column, the small increase in available dissolved nutrients could possibly lead to an increased primary productivity for the duration of the disturbance. Sediment resuspension will lead to an increase in turbidity, which in turn will decrease light penetration. Decreased light penetration would result in a compensation depth closer to the surface for each species of phytoplankton and could work contrary to the effect of increased nutrients by temporarily decreasing productivity.

Onsite Construction
4.240
Two potential impacts on the aquatic ecology arising from onsite construction are runoff and physical alteration of aquatic habitats.

4.241
It is expected that some changes will occur in the portions of the streams adjacent to construction areas on the site. Suspended and total solids released to the streams will increase, and intolerant organisms, or those sensitive to these perturbations may be displaced or destroyed. Most species are relatively tolerant to suspended solids and turbidity. Recolonization of affected portions of streams and ponds by aquatic organisms should occur subsequent to completion of construction. Construction activities will be adequately controlled to limit suspended solids released into site streams.

4.242
Streams on the Sheridan site (Figure 1-18) which will be affected by direct physical alteration are Ryder Creek (S-1) and Eagle Bay Creek (S-3). Stream S-1 will be rerouted along the south side of the fly ash disposal area, whereas construction activity will occur in the extreme upper reaches of stream S-3's drainge. These stream beds will be altered, resulting in the elimination of primary production, benthic organisms and their substrate, and food organisms for other trophic levels. Affected streams are neither unique nor limited to the site locale from the standpoint of resources and/or recreational

potential. Although a pugnose minnow was found in Ryder Creek (one specimen), this stream is not unique since the species was collected in other Sheridan-Pomfret area streams which were studied. The streams affected by plant construction are not used for spawning by migrant species of fish from Lake Erie.

4.242a
At Sheridan, the improvement of the drainage of the power plant site in order to prevent flooding of the plant area under a 100-year storm event will necessitate the bypassing or interception and backfilling of the uppermost reaches of Eagle Bay Creek (Stream S3, Figure 1-18) at a point approximately 2,100 feet southeast of the railroad tracks, the construction of a new canal in that area and, if necessary, a culvert and the alteration of the natural channel downstream to allow passage of the 100-year storm event. Ryder Creek, a stream where one pugnose minnow specimen was collected, will be intercepted and rechanneled for a distance of approximately 2,000 feet in the ash disposal area north of Chapin Road. Ryder Creek is designated "S-1" on Figure 1-18. The first several thousand feet of the affected streams will remain basically in their natural state. In areas where new canals will be provided, the old stream beds will be eliminated from biological production. For all streams, the acreage of the area drained will remain constant. Construction activities are expected to cause temporay disruptions to the aquatic habitat of the streams. Once construction activities are completed, the streams should afford the same aquatic habitat that existed prior to construction, at least to the point of rechanneling.

4.243
Several of the 29 ponds on the Sheridan site will be eliminated by construction activities. The placement of the plant structures at the Sheridan site will eliminate five ponds, totaling about 17,000 square feet of surface area (Figure 1-19). These ponds will be eliminated because of construction and placement of plant structures, roads, storage, and disposal areas.

WATER QUALITY

4.244
Paragraphs 4.027 through 4.029 (Pomfret) are also applicable to Sheridan. Impacts on water quality as a result of runoff, dredging, and sedimentation pond discharges are expected to be minor as long as the applicant complies with effluent limitations specified in the State's draft 402 discharge permit. Table 4-26 shows the estimated quantities of chemical contaminants released to Lake Erie from the suspension of sediment during dredging at the Sheridan site. Sanitary wastes during construction will be handled by onsite facilities described in the Pomfret section (paragraphs 4.031 and 4.032).

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FINAL ENVIRONMENTAL IMPACT STATEMENT. PERMIT APPLICATION BY NIA--ETC(U)

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TABLE 4-26

ESTIMATED QUANTITIES OF CHEMICAL CONTAMINANTS RELEASED TO LAKE ERIE FROM THE SUSPENSION OF BOTTOM SEDIMENT DURING DREDGING

SHERIDAN SITE

Parameter	Total Quantity of Chemical Constituents Released to Water Column During Dredging (Grams)
Total Organic Carbon	2,537
Chemical Oxygen Demand	2,841
Total Kjeldahl Nitrogen	556
Nitrate-Nitrogen	6.30
Phosphate	3.15
Oil and Grease	355
Cyanide	0.790
Arsenic	0.236
Cadmium	0.158
Chromium	0.158
Copper	0.158
Lead	0.158
Mercury	0.158
Nickel	2.36
Zinc	3.94

The water quality impacts due to chemical wastes, fertilizers, runoff from construction solid wastes, concrete batch plant operation, fuel storage, stream alterations, and preoperational wastes are the same as those described in paragraphs 4.033 through 4.039 for Pomfret.

Water Use

4.245

During dredging operations and construction of the offshore mooring and breasting dolphins, no impact on potable water intakes is expected. These activities will also have little effect upon commercial lake navigation. Area recreational boating will be hindered during the period of offshore construction. The applicant's site reconnaissance did not identfy any raw water intakes in onsite streams. Construction activities and stream alterations impacting such water supplies is not applicable. Aquifer continuity is essentially absent at the Sheridan site and the occurrence of groundwater is highly loca'ized. No significant impact on groundwater quality or use is anticipated as a result of power plant construction.

THREATENED AND ENDANGERED SPECIES

4.246

There were no threatened or endangered terrestrial flora or fauna found on the Sheridan site which will be adversely affected by construction of onshore facilities. In a similar manner, there are no threatened or endangered aquatic flora or fauna which will be affected by offshore construction activity.

SOILS

4.247

The impacts on Sheridan site soils during construction are identical to the impacts presented in the corresponding Pomfret section. The applicant's sedimentation and erosion control plans and measures to conserve and reuse the A_0 soil horizon should minimize construction impacts at Sheridan.

AIR QUALITY

4.248

The major impacts on local air quality during construction of the proposed Lake Erie Generating Station at Sheridan will be fugitive dust, vehicular emissions and onsite open burning.

4.249

Fugitive dust from unpaved roads, excavation, and mineral storage will be controlled by appropriate measures such as watering, chemical binding agents, covering of exposed materials and traffic speed control. The onsite concrete batch plant emissions are assumed to be 0.02 lb of particulates per cubic yard of cement. Emissions of this magnitude will comply with applicable regulations.

4.250
Vehicular emissions of carbon monoxide, hydrocarbons, and nitrogen dioxide above ambient levels but below allowable State standards is assumed by the applicant. Onsite open burning of slash and rubbish will be conducted in compliance with applicable State guidelines and standards. No significant effects on air quality are anticipated.

CULTURAL RESOURCES

4.251
No architectural or historical resources on or nominated to the National Register of Historic Places or the National Register of Natural Landmarks are located on the Sheridan site. No archeological sites of significance as judged by the criteria for eligibility for inclusion on the National Register were located by survey on the Sheridan Site. The applicant has confirmed this through contact with L. Kuwik of the New York State Parks and Recreation Department of Historic Preservation on 8 February 1977. However, one site, the Fredonia Historic District, which is located about eight miles southwest of the site, was nominated to the National Register Office on 3 January 1977. The proposed construction should not affect this site. No impacts on registered historic sites are anticipated.

4.252
The applicant's consultant, Cultural Resources Management Services, has recommended the former Daniel Reed House and the former Sheridan School District No. 3 Schoolhouse for consideration for eligibility to the National Register of Historic Places. On 23 June 1978, the Corps submitted a request for determinations of eligibility on these two properties to the Keeper of the National Register. By letter dated 20 September 1978, the Keeper of the National Register determined that these two properties are eligible for inclusion in the National Register.

4.253
If the Sheridan site is certified by the State for the Lake Erie Generating Station, the Reed House will experience visual impact under all proposed fuel and ash handling schemes. This impact will be the visual intrusion of the ash disposal area on the house's visual backdrop as seen from Center and Chapin Roads. This impact will be ameliorated to a great extent by the utilization of existing tree cover as a screening device, and by vegetative cover planted on the slopes of the ash disposal area. The Reed House will experience intermittent adverse noise impact over an approximate one-year

construction period. During operation, occasional noise at some reduced level will be heard at the Reed House during daylight hours on weekdays. Adjacent to the Sheridan site, the Schoolhouse will experience possible visual impact under all proposed fuel and ash handling systems. This impact will be the intrusion of the ash disposal area into the view from the structure looking across Chapin Road, and into the visual backdrop of the structure as seen from O'Brien Road. This impact will be ameliorated by the retention of trees as screening, and the use of vegetative cover planted on the slopes of the ash disposal area. The Schoolhouse will experience intermittent noise impact during daylight hours on weekdays for both the construction and operating phases of this project. Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the Advisory Council on Historic Preservation procedures (36 CFR 800) are completed. This will allow for a thorough review of effects and alternatives that would avoid or mitigate any adverse effects on the subject properties.

4.254
The applicant intends to perform the same type of archeological survey and mitigation during construction at Sheridan (if this site is the one certified by the State) as described in paragraph 4.048 for Pomfret.

4.255
Power plant construction at Sheridan will not result in the closing or rerouting of roads which would cause changes in accessibility to historical, cultural or archeological sites or natural landmarks. Also, increased traffic or fencing is not expected to affect accessibility.

AESTHETICS

4.256
During the construction period of approximately six years, there will be a visual and physical disruption of the site and environs. As the land at the site is very flat, a visual impact on the local residents will exist at the site during construction and site preparation. Clearing and stripping operations, borrow and fill maneuvers, and construction, installation, and paving procedures will contribute to the modification of the site areas. There will be some unavoidable visual intrusion on the site resulting from truck traffic and the attendant creation of dust and/or mud and debris on surrounding roads, particularly on State Route 5 and Chapin and Aldrich Roads since they will serve as principal access roads to the site. These disruptions will continue until the site grading and construction of plant facilities have been complete and restorative plantings can be installed.

TRAFFIC

4.257
The average monthly construction work force during the construction period (1981-1986) will range from 168 to 1,947. This work force will use highways and roads traveling to and from the site in addition to trucks delivering construction equipment and materials. It is expected that the New York State Thruway (I-90) will serve as the primary commuting road for the majority of workers and trucks. Since most construction workers are expected to be drawn from the Buffalo area, they will use Thruway Interchange 58, the closest interchange to the Sheridan site, located near the village of Silver Creek. Thruway Interchange 59, located in the village of Fredonia, along with Route 60, will be used to a lesser extent by workers coming from the south and west. From both of these Interchanges, workers will use Route 5 or US 20, arterials which lead directly to the local roads, primarily Aldrich Road, where the access points to the site are located.

4.258
The greatest influx of workers to the site will occur during a one and a half-year peak period when there is an employment overlap for the two fossil units. The greatest impact on transportation will, therefore, occur during this period, although there will be a significant impact throughout most of the construction period. The removal of Aldrich Road from public use requires that traffic that would ordinarily have used this road be rerouted along adjacent roads such as US 20, Middle, Chapin, and Center roads.

4.259
Capacity figures and other relevant statistics on I-90, Routes 5 and 60, and US 20 show that within the Sheridan vicinity these roadways are currently at approximately 15 to 50 percent of their peak hour capacities. Although these roads are theoretically capable of handling the additional traffic load that will be generated by the proposed project, it is evident that segments of these roads which tie in with Thruway Interchange 59 in Fredonia, particularly Route 60, have high peak hour demands. Although a large portion of workers traveling to the site are expected to use Interchange 58 near Silver Creek, sources of inconvenience may still develop at highway interchanges and intersections within the more populated areas of Silver Creek. Thruway Interchange 58 connects directly to combined Route 5 and 20 at a point approximately two miles to the east of the village of Silver Creek. All of the construction worker thruway traffic, plus all of the traffic resulting from construction workers who choose to use either Route 5 or Route 20 in preference to the thruway, would be funneled through one intersection in the center of the small village. Unless steps are taken to increase the capacity

of this intersection considerable congestion and delay would result. According to the applicant, the capacity of this intersection could be increased to an acceptable manner if parking was prohibited on both sides of the street for a distance of 250 feet from the intersection during peak traffic hours. Traffic disruption may occur at the time of the morning and afternoon rush hours (about 7:30 a.m. to 8:30 a.m. and 3:30 p.m. to 4:30 p.m.) during the one and a half-year peak employment period discussed earlier. At these times, local people may experience delays in access onto Routes 5 and US 20 and other County and local roads in the vicinity of the site. If traffic problems develop as a result of the influx of employees to the site, the applicant will arrange with the local police force to regulate vehicular movements at crucial interchanges.

4.260
Adequate onsite parking facilities will be provided during working hours so as not to present any area parking problems. Delivery of construction materials by rail will also disrupt local traffic patterns by increasing the frequency of delays experienced at railroad crossings. The overall increase in traffic may hinder the passage of emergency vehicles (police, fire, ambulance) especially during peak usage hours.

NOISE

4.261
Table 4-7 lists major noise sources during plant construction and the associated (estimated) average and maximum sound levels. However, it is expected that by the time construction activities begin at the proposed site, quieter construction equipment than depicted will be available. Hence, the values shown should be viewed as conservative. Sound levels will be highest during the first 20 months of construction and would reach a level of 64 dB(A) L 2,800 feet from the construction center. Thereafter, noise would decline due to changes in the quantity and types of construction equipment in use. With the assistance and cooperation of the New York State Department of Transportation and the New York State Chapter of Associated General Contractors, a report on construction noise was published by the New York State Department of Environmental Conservation (1974). This report recommends that in New York State, construction noise be limited initially to 70 dB(A) during the day (7 a.m. to 7 p.m.) at distances exceeding 400 feet from the construction site boundary. It also advocates that the permissible level should be decreased 5 dB(A) if the construction noise contains an impulsive or pure tone characteristic and by 10 dB(A) if it contains both. It should be noted that the above values apply to the construction noise alone and not the total sound level (including the background level).

4.262
The sound level produced during station construction at the nearest required property line will not exceed a value of 64 dB(A) during construction. Major impulsive sources such as pile driving operations are not expected to occur at the site, though some pure tones might be generated by various construction equipment. The proposed construction site, therefore, is expected to be in compliance with applicable standards. The transportation of construction equipment to and from the site may cause inconvenience to those persons living along the major transit routes to the site. It is anticipated that during May 1981, May 1982, and May 1983, three major concrete placements will occur which will necessitate work beyond the normal eight-hour per day work period. Assuming the batch plant is located on the site, the nighttime work at the Sheridan site is expected to interfere with the sleep of eight existing permanent residents.

SOCIAL AND ECONOMIC IMPACTS

4.263a
The proposed construction of the two 850 megawatt units at the Sheridan site will require approximately six years to complete. During this time period, the work force will impact the area's social and economic base. A direct impact as a result of construction will be the displacement of 32 homes and the elimination of natural gas production on the site.

4.263b
The impact of the construction work force on public services and facilities in the community is expected to be small. However, the closing of Aldrich Road connection with construction activities will affect fire protection in North Sheridan. Cooperative agreements with the Silver Creek Fire Department and/or changes in present fire districts would offset this impact.

4.263c
As mentioned in Chapter Two, the town of Sheridan has no sanitary sewers or public water service. During construction, water will probably be drawn from a water line which will extend from Dunkirk to the intersection of Newell and Middle Roads, and was planned for completion in 1977. Capacity is expected to be adequate to supply this incremental need. The construction and operation of sanitary facilities will be accomplished in accordance with applicable Federal, State, and local standards.

4.263d
The remaining socio-economic impacts of Sheridan Site construction are identical to those presented in the Pomfret site paragraphs 4.058b through 4.062, inclusive.

RECREATION

4.264
The two closest recreational areas to the Sheridan site are Point Wright Park and Smith Mills Game Farm, both of which are approximately 3.5 miles from the site boundary. Point Wright Park is a 30-acre public park with an attendance of 5,500 on a peak day. Smith Mills Game Farm is a private game release club whose membership is fixed at 30 persons. The club leases 550 acres of land from local farmers during the September through November hunting season. It is not expected that construction or operation of the proposed generating plant will change the area or use of these or other local organized areas due to their respective distances from the facility and the fact that major access roads to these areas will not be affected. Also, the large majority of construction employees will be commuting to the site from outside of the area and, therefore, will not be putting any extra demand on the use of these areas. Peak use of these areas also occurs during summer weekends, whereas construction will occur primarily during the work week.

SHERIDAN SITE

IMPACTS OF POWER PLANT OPERATION AND MAINTENANCE

LAND USE

4.265
An evaluation of the long-term land use impacts associated with the operation and maintenance of the proposed project at Sheridan involves a determination of the extent to which the proposed generating facility will result in the alteration of adjacent land use patterns. The operation and maintenance of the proposed generating facility will have only a minimal effect upon adjacent land use patterns and property values. Although residential development along the nearby Lake Erie shoreline may be adversely affected by the project due to a potential lowering of neighborhood amenity levels, the degree to which this impact is internalized in the form of changes in the future residential development of the shoreline is unclear. This uncertainty is due to the fact that there are a number of factors which interrelate and influence residential location decisions, with local amenity levels representing only one variable in the decision process. In terms of induced changes in adjacent land use patterns, the proposed project should not attract complementary economic activity into the immediate area, nor should it prevent the continued use of adjacent agricultural land. In the long run, changes in public policy would be expected to have a far greater influence on adjacent land use patterns than will the presence of the proposed facility.

4.266
Minimal impact is expected on recreational facilities. No disruption of existing recreational sites or areas will take place. The diffusion of permanent work force individuals by residence, and the extensiveness of recreational facilities support the conclusion that the impact will be indirect and minimal.

4.267
Nine hundred and eighty-six acres of land will be required for station operation. This acreage will be transformed from rural use to industiral use. Of the 986 acres, about 53 percent or 525 acres will be altered by station construction. The remaining acreage will be left undisturbed. However, 447 acres of agricultural land will be removed from production. Approximately 77 percent (211 acres) of cropland, 52 percent (79 acres) of vineyard, and 100 percent (19 acres) of pasture will be permanently removed. The remaining agricultural land will revert to native vegetation via secondary succession.

4.268
The acreage of land affected by operation and maintenance of the trasmission line right-of-way cannot be quantified at this time. As mentioned in Chapter One of this impact statement, the independently proposed transmission corridor is ultimately certified by the State of New York in a separate proceeding. During the transmission proceedings (Article VII of the New York State Public Service Law), detailed information pertaining to the corridors will be provided to the Government.

AIR QUALITY AND USE

4.269
The operation of the proposed plant will impact the quality of the ambient air in the area. Certain engineering features such as a tall (750 ft, 228 m) exhaust stack and electrostatic precipitators will tend to disperse the pollutants into the atmosphere. The pollutants which are emitted at Sheridan must meet the applicable Federal and New York State Standards discussed in paragraphs 4.068 through 4.070 for Pomfret. The emissions expected due to coal combustion at the proposed Sheridan station and the impact on ambient conditions are presented in the following paragraphs.

4.270
Simulations of short-term and annual average concentrations combined the contributions of the proposed electric generating facility with the projected background pollutant levels. The contribution of the proposed Lake Erie Generating Station to ambient pollutant levels was estimated using the Point Source Diffusion Model (PSDM) with the

TABLE 4-27

MAXIMUM PREDICTED POLLUTANT CONCENTRATIONS ($\mu g/m^3$) WITHIN 25 km OF THE PROPOSED LAKE ERIE GENERATING STATION (SHERIDAN SITE)

Averaging Time	Peak Ambient Concentrations ($\mu g/m^3$)			Peak Plant Contribution at Location of Maximum Ambient Concentration ($\mu g/m^3$)			Peak Plant Contribution ($\mu g/m^3$)		
	SO_2	TSP	NO_2	SO_2	TSP	NO_2	SO_2	TSP	NO_2
One-Hour	575	-	-	520	-	-	520	-	-
Three-Hour	575	-	-	520	-	-	520(344)*	-	-
24-Hour	159	211	-	0	0	-	49	4.2	-
Annual	35	44	88	0.3	0.1	0.4	2.9	0.25	1.8

*Applicant's recalculation as indicated in paragraph 4.073.

power plant emission and stack parameters as inputs. The background pollutant levels were calculated using the ERTAQ model. Total ambient concentrations were obtained by summing the predictions of the two models. The background levels were based on winter average emission rates of industrial, commercial, residential and natural sources, including the Dunkirk Station, in order to simulate the relatively higher background pollution which occurs in response to low-level emissions associated with space heating requirements. A discussion of the diffusion models is contained in Appendix D. Table 4-27 summarizes the predicted pollutant concentrations within 25 km of the Sheridan Site.

Hourly SO_2 Concentrations Associated With 100 Percent Load Emissions (Two Units)*

4.271

The highest one-hour average SO_2 concentration expected is 0.190 ppm (494 $\mu g/m^3$) which is 38 percent of the 0.5 ppm (1300 $\mu g/m^3$) New York State Ambient Air Quality Standard (NYSAAQS) and occurs under full-load conditions. This concentration would occur for approximately one-hour in every four years at a location 7 km ESE of the plant with neutral stability, a wind speed of 15.6 m/sec (27 mph) and a mixing depth of 300 m. The highest one-hour SO_2 level that would occur more than once per year is 0.155 ppm (403 $\mu g/m^3$) at a location 7 km ENE of the stack. The proposed station emissions would contribute virtually all of the above peak hourly concentrations. In general, the highest one-hour SO_2 concentrations occur to the south and southeast of the facility site as a result of the influence of terrain in this region. The highest concentrations expected with light winds and stable conditions occur to the NNE and NE of the Sheridan site due to emissions from the Dunkirk area. Estimates of one-hour average SO_2 concentrations indicate that the New York State one-hour SO_2 standards of 0.5 ppm (1300 $\mu g/m^3$), which is never to be exceeded, and 0.25 ppm (650 $\mu g/m^3$) which is not to be exceeded more than 87 hours per year at any receptor location, will not be contravened. The highest plant contributions occur during high wind speed and neutral stability when the background is low; and the highest background levels occur during light winds and stable conditions.

Three-Hour SO_2 Concentrations

4.272

PSDM was also used to calculate three-hour SO_2 levels due to the proposed Lake Erie Generating Station and background sources. The version of PSDM used to predict three-hour concentrations simulates the crosswind dispersion of a plume by averaging the plume over a

* The one-hour SO_2 standard has been deleted from the new State standard (in effect as of March 1977).

sector whose width is stability dependent. Since the predicted concentrations are substantially less than the three-hour standards, only the frequencies calculated from Buffalo climatological data are presented.

4.273
The maximum three-hour SO_2 concentration is predicted to occur when the proposed plant operates at maximum capacity and the associated meteorological conditions include a 300 m mixing depth, a 3.13 m/sec (7 mph) wind speed and a very unstable atmosphere. Under these conditions, the maximum concentration of 0.127 ppm (330 $\mu g/m^3$) occurs 17 km west-southwest of the proposed plant. This SO_2 level is due entirely to background sources. The highest levels due to the proposed station emissions alone are predicted to occur when the wind is from a northerly to northwesterly direction, as a result of impact on the higher terrain to the south and southeast. The maximum concentration due to the proposed facility emissions, 0.065 ppm (169 $\mu g/m^3$), occurs 6 km to the south-southeast of the plant during conditions of neutral stability and wind speed of 15.6 m/sec (35 mph). Since the peak predicted concentration is 0.127 ppm (330 $\mu g/m^3$) and the peak plant impact is 0.065 ppm (169 $\mu g/m^3$), the three-hour 0.5 ppm (1300 $\mu g/m^3$) NAAQS and NYSAAQS will not be exceeded.

4.274
The highest three-hour SO_2 concentrations are expected to occur during lake-induced fumigation associated with stable onshore flow from Lake Erie. The original calculation for peak plant contribution of 0.200 ppm (520 $\mu g/m^3$) was recalculated by the applicant as indicated in paragraph 4.074. The recalculated value of 344 $\mu g/m^3$ is within the nondeterioration limit of 512 $\mu g/m^3$.

Twenty-Four Hour SO_2 Concentrations
4.275
New York State has promulgated two 24-hour SO_2 standards: that 24-hour SO_2 levels not exceed 0.14 ppm (365 $\mu g/m^3$) more than once a year; and, that they exceed 0.10 ppm (260 $\mu g/m^3$) at most one percent of the time at any receptor location. The National standard is identical to the State standard in that 0.14 ppm (365 $\mu g/m^3$) may be exceeded once per year. The assessment of the impact of a source or group of sources on 24-hour SO_2 concentrations is complex; there is an infinite number of combinations of meteorological conditions that can occur in a day and each source contributes differently according to the weather conditions. Therefore, 24-hour SO_2 levels were calculated using three different techniques; sequential modeling analysis, persistence analysis and case study analysis.

Sequential Modeling Analysis

4.276
The highest predicted 24-hour SO_2 level, 0.018 ppm (47 $\mu g/m^3$),

would occur with full-load emissions and is based on on-site meteorological data. Although not expected to occur simultaneously, the addition of the highest observed 24-hour SO_2 level, 0.061 ppm (159 $\mu g/m^3$), to the maximum model prediction gives a "total" concentration of 0.079 ppm (205 $\mu g/m^3$). This demonstrates that neither of the two 24-hour NYSAAQS would be exceeded in the air quality impact area.

Persistence Analysis

4.277
The second method of calculating 24-hour average SO_2 concentrations considered wind and stability data measured at the 100 m level of the Kuhrt meteorological tower. The wind data were used to determine the fraction of a 24-hour period that a specific wind direction persisted. Persistence was assumed to continue through calms and/or missing observations if the same wind direction was maintained subsequent to the calms and/or missing observations. Directionally persistent winds in excess of 24 hours occurred twice between November 1974 and October 1975 at the Kuhrt tower. A westsouthwest wind persisted for 31 hours beginning February 25 at 7 p.m. Five other days were also chosen for analysis, (January 16, February 13, March 2, March 30, and April 19), because these days experienced directionally persistent winds for more than sixteen hours. The stability measurements for all six days indicated neutral stability conditions.

4.278
Three-hour concentrations as calculated by PSDM for each mixing depth, wind speed and direction were averaged together, weighted by the appropriate persistence lengths, to estimate the 24-hour concentrations. Since the maximum calculated 24-hour SO_2 concentration is 0.02 ppm (52 $\mu g/m^3$), no contravention of the NYSAAQS for SO_2 is expected to occur with any of three load conditions examined. The Class II allowable increment for 24-hour SO_2 concentrations is 91 $\mu g/m^3$.

Case Study Analysis

4.279
In the third analysis, monitoring data from the period November 1, 1974 through October 31, 1975 were used in selecting particular days for case studies. The three highest monitored 24-hour SO_2 concentrations that were observed at the six Niagara Mohawk monitors were examined in order to project 1985's 24-hour concentrations. The plant contribution for each of these days was calculated by PSDM using coincidental wind speed and direction data collected from the 100 m level and from stability conditions based on vertical temperature differences between the 100 and 10 m levels on the Kuhrt meteorological tower as input to the model. Each day was divided

into eight three-hour intervals. For those intervals in which the appropriate meteorological conditions persisted for only a portion of the three hours, those conditions were assumed to persist throughout the interval. The eight three-hour intervals were then averaged for a 24-hour average concentration.

4.280
PSDM predicted plant contributions for each of three load conditions: 100, 75, and 50 percent. As resultant concentrations varied for each load condition, the maximum calculated plant contribution was selected to predict the total (background and plant-related) concentration for each interval. In calculating maximum plant impact, only PSDM stability Classes 1 (with a lid set at plume height), 2 (lidded at plume height), 3 (lidded at plume height) and 4 (with and without a lid at plume height) were considered. Mixing depths were limited to the height of the plume rise. This results in the complete trapping and immediate reflection of the plume below an elevated inversion lid. The conditions beneath this elevated inversion vary from very unstable to neutral stabilities.

4.281
The total 24-hour SO_2 concentrations, for each of the three days studied, are the sum of background (monitored) and either the plant-related contribution at the monitor location or the plant contribution at the location of maximm impact. The maximum 24-hour SO_2 level calculated is 0.061 ppm (158.6 $\mu g/m^3$) and does not approach any of the four-hour SO_2 standards. Additionally, the plant contributions are less than eight percent of the observed concentrations. In summary, three analysis techniques have indicated that the New York State and National 24-hour standards will not be exceeded in the air quality impact area of the proposed facility.

1985 Annual SO_2 Concentrations
4.282
The impact of the proposed Sheridan station on the annual average SO_2 concentrations will be small. This is typical of new power plants whose large effective stack heights and regulated emission rates result in low long-term pollutant concentrations. The long-term variability in wind direction acts to distribute the plant emissions around the plant.

4.283
The calibrated ERTAQ model was used to project the distribution of annual average background SO_2 concentrations within the air quality impact area of the proposed station. PSDM was used to perform separate calculations of the annual plant impact based on emissions associated with 68.6 and 100 percent loads. These calculations were performed at receptors defined by a polar grid centered on the Sheridan site and extending 25 km from the stack. For each receptor, an estimae of the annual average SO_2 concentrations from each

source was obtained using ERTAQ by determining a weighted average based on the frequency of concentrations associated with each wind direction, wind speed class and stability class. The total annual average concentration at a specific receptor due to all sources was obtained by summing the contribution from the individual sources.

4.284
Two sets of meteorological data were used as input to the annual average calculations. The first data set was derived from the surface weather observations taken at Buffalo over the period 1964 to 1973. The second set was based on wind speed and direction and vertical temperature differences measured at the Kuhrt tower. Climatological mixing depths were assumed in both data sets.

4.285
The highest peak ambient SO_2 level estimated to occur using the Buffalo meteorological data (0.013 ppm (33.8 $\mu g/m^3$)) lies to the west-southwest of the Sheridan site, and a secondary impact region lies to the southwest of the site. Higher values which occur to the northeast and south of the point of maximum concentration are attributed to the high frequency of west-southwesterly and southwesterly winds dispersing airborne SO_2 emissions from the cities of Dunkirk and Fredonia. The low frequency of easterly winds produces a steep gradient 10 to 18 km west-southwest and southwest of the plant. The western edge of the concentration area, attributed mainly to emissions from sources in the cities of Dunkirk and Fredonia, is defined by this gradient.

4.286
ERTAQ estimates of background concentrations were also examined. At the location of the peak concentration of 0.013 ppm (33.8 $\mu g/m^3$), the contrbution from the plant with full-load emissions will be 0.0001 ppm (0.26 $\mu g/m^3$), only 0.7 percent of the background value. The distribution and magnitude of annual average background concentrations within 25 km of the Sheridan site are expected to remain essentially unchanged with the introduction of the proposed station.

4.287
The 0.03 ppm (80 $\mu g/m^3$) annual standard will not be contravened as a result of plant and background emissions since the highest predicted total concentration at any point within the air quality area of impact is 0.013 ppm (33.8 $\mu g/m^3$). The Federal annual and nondeterioration standards for new sources, 20 $\mu g/m^3$ would not be exceeded since the maximum expected additional annual concentration attributed to the emissions is 2.9 $\mu g/m^3$.

Impacts During Periods of Stagnation

4.288

During periods of stagnation the predicted impact of the proposed facility on ambient SO_2 levels will be less than 0.08 ppm for a one-hour average. This will occur on about nine days over a five-year period.

New York State Analysis

4.289

The State of New York, using meteorological data from the Erie, PA municipal airport, predicted emissions from the proposed facility. The State indicates that the proposed facility should have no difficulty meeting the short-term 3- and 24-hour SO_2 standards as well as the long-term annual standard. The predicted maximum increases in SO_2 are well within the allowable Class II nondeterioration limits. The effects of SO_2 on human health were discussed in Paragraph 4.091.

Emission From the Auxiliary Boiler

4.290

It is anticipated that the auxiliary boiler will operate for approximately 40 hours once per month and the flue gas will be emitted from a 260-foot (79.2 m) stack, 10 feet (3.0 m) higher than the height of the adjacent boiler building. The predicted air emissions from this facility have been calculated by the PSDM for "normal" meteorological conditions and during strong winds when plume dispersion will be influenced by building downwash.

Impact During Normal Meteorological Conditions

4.291

The highest predicted hourly SO_2 level of 0.045 ppm (117 $\mu g/m^3$) will occur 6 km SSE of the Sheridan stack with a mixing height of 300 m. The maximum combined impact of the proposed facility on hourly SO_2 concentrations during those periods when the auxiliary boiler is used in conjunction with one or both of the generating units at maximum load is shown below:

MAXIMUM COMBINED IMPACT* ON HOURLY SO_2 CONCENTRATIONS ($\mu g/m^3$)

	Total Concentration ($\mu g/m^3$)	Auxiliary Boiler Contribution ($\mu g/m^3$)	Direction	Location Downwind DCRAFZWB (km)
Sheridan				
2 Generating Boilers	501	6	NNW	7.0
Sheridan				
1 Generating Boiler	267	7	NNW	6.0

*Occurs for stability Class 4, a representative wind speed of 15.6 m/sec, and a 300 m mixing depth.

It is anticipated that the auxiliary boiler would operate only when neither of the steam generators is operating above twenty-five percent load. In that light, the data presented in the above chart represent a worst case impact analysis of the combined operation of the main units and the auxiliary boiler. The maximum combined impacts were found to occur for the meteorological conditions characterized by stability Class 4, a representative wind speed of 15.6 m/sec, and a 300 m mixing depth.

Impact During Building Downwash Conditions

4.292
Since the stack servicing the auxiliary boiler will be about 10 feet higher than nearby buildings, the boiler plume will experience aerodynamic downwash during moderate and high wind speed conditions. This causes the rapid mixing of the pollutants into the building wake region and a rapid transport to ground level. These conditions were simulated using a modified Gaussian plume model.

4.293
The highest hourly SO_2 concentrations expected during downwash conditions and the associated downwind distances are the same as those

shown in paragraph 4.095. It was assumed the concentrations are independent of wind direction. The highest concentration, 0.25 ppm (650 $\mu g/m^3$), would occur approximately 100 m downwind of the stack with a wind speed of 7.5 mph. Downwash will not influence plume dispersion of wind speeds less than 7 mph and the increased dilution with higher wind speeds reduces the impact.

4.294
In summary, the peak hourly concentrations are not below the three-hour non-deterioration standard of 512 $\mu g/m^3$. The predicted 24-hour and annual levels are below the applicable standards.

Annual NO_2 Concentrations
4.295
The highest ambient NO_2 concentrations are attributed to emissions from sources in the cities of Dunkirk and Fredonia. The peak predicted concentration, 0.044 ppm (88 $\mu g/m^3$), occurs at the intersection of New York State Highways 20 and 60 in Fredonia. The overall spatial distribution of annual NO_2 concentrations reflects the high frequency of westerly and southwesterly winds and the low frequency of easterly winds. A band of high concentration is located to the northeast of the two cities. Nitrogen dioxide emissions from vehicles on Interstate Highway 90 and New York Highway 20 are primarily responsible.

4.296
The emissions inventory probably did not include all NO_2 sources in the region. In order to account for the uninventoried sources, a calibration factor was applied to increase the concentrations from inventoried emissions.

This factor, when applied to the sources in Dunkirk and Fredonia, probably results in an overestimation of NO_2 levels near these sources. Monitoring data are not available from within the depicted area of maximum concentrations, while monitoring data from locations near the city boundaries indicate average concentrations below 0.02 ppm (40 $\mu g/m^3$).

4.297
The predicted contribution of the proposed facility emissions is small for two units at 100 percent load. The model predicts that the proposed plant contribution at the point of maximum concentration (0.044 ppm, 88 $\mu g/m^3$) is 0.0002 ppm (0.4 $\mu g/m^3$) or 0.5 percent of the total value. The maximum percentage contribution due to the proposed facility at any receptor point where the annual concentration exceeds 0.03 ppm (60 $\mu g/m^3$) is 2.7 percent. This occurs 15 km SW of the plant site, where the predicted concentration is 0.030 ppm (60 $\mu g/m^3$) and the plant's contribution is 0.0008 ppm (1.6 $\mu g/m^3$).

4.298
According to the State's analysis (Erie Airport data) the annual increase in NO_2 as a result of facility operation is within applicable standards.

Hydrocarbons
4.299
The combustion of coal produces gaseous emissions in addition to the ones already addressed. Hydrocarbons are predicted to be released at a rate of 900 tons per year based on an estimated emission rate of 0.3 lbs of nonmethane hydrocarbons per ton of coal and combustion of six million tons of coal per year. A "major source" of nonmethane hydrocarbon emission is defined as a source emitting 100 or more tons per year. This would place the proposed plant in the "major source" category and require emission offsets. However, the estimate of 0.3 lbs of nonmethane hydrocarbons per tons of bituminous coal is currently in revision. New standards of 0.01 lbs per ton of bituminous coal are expected to be implemented. This would lower the predicted emission rate from 900 tons per year to 30 tons per year and remove the proposed facility from the "major source" category. If these new estimated emission rates are accepted, the proposed facility would probably not require any emission offsets for nonmethane hydrocarbons.

Total Suspended Particulates
4.300
Twenty-four hour total suspended particulates (TSP) expected in 1985 were calculated using the same techniques which were used to estimate 24-hour SO_2 levels:

- PSDM calculations based on a time series of sequential meteorological data,
- PSDM calculations based on observed persistent wind directions, and,
- Case studies of observed high TSP concentrations.

Sequential Modeling Analysis

4.301
Predicted contributions of the proposed facility to 24-hour TSP levels were calculated using onsite data. The highest contribution, 3.9 $\mu g/m^3$. would occur 7 km ENE of the stack with two units operating at 100 percent load.

Persistence Analysis

4.302
The maximum TSP concentration is 4.2 $\mu g/m^3$ and occurs at 100 percent plant load.

Cyse Study Analysis

4.303
On two occasions the 24-hour TSP concentrations measured at Swamp Road exceeded 150 $\mu g/m^3$ resulting in a contravention of the secondary NAAQS. Single concentrations above 150 $\mu g/m^3$ were also observed at the Beebee, Chapin, and Van Buren monitors. The TSP values of 211 $\mu g/m^3$ and 161 $\mu g/m^3$ observed at the Swamp Road monitor on July 31 and August 2, 1975, respectively, were associated with an East Coast air mass stagnation episode which persisted from July 29 through the morning of August 3. During the six-day period, a warm dome of high pressure extended vertically through 20,000 feet and the winds at all levels were light and variable. Hot, hazy, and humid conditions prevailed at the surface throughout the period.

4.304
A detailed examination of the composition of the particulates on the Swamp Road hi-vol filters of July 31 and August 2 was made under incident polarized light at approximately 200x magnification. The July 31 and August 2 TSP concentrations consisted of about 80 percent to 90 percent mineral and biological material and only 10 percent to 20 percent combustion products. Apparently the dryness of the surface associated with the stagnant air mass created an increase in the amount of fugitive dust while the rate of production of combustion products remained fairly constant. An additional explanation of the high TSP values may lie in the proximity of the Swamp Road shelter to a vineyard. Pollen, spores, fertilizer, and dust can all emanate from a vineyard. It is therefore concluded that the high TSP levels recorded on July 31 and August 2 were caused by mineral and biological materials rather than combustion. The contribution of the proposed facility to TSP concentrations for the two 24-hour periods during which levels exceeded 150 $\mu g/m^3$ at Swamp Road was calculated using PSDM and meteorological conditions observed at the upper level of the Kuhrt tower. Since the wind direction was primarily offshore and the wind speeds were low, the facility would not have contributed to observed TSP levels. Overall the calculated contribution expected due to the operation of the proposed Lake Erie Generating Station is small. The peak level resulting from emissions is predicted to be 4.2 $\mu g/m^3$. The allowable Class II nondeterioration increment is 37 $\mu g/m^3$.

1985 Annual TSP Concentrations
4.305
The methodology used in the prediction of annual SO_2 model concentrations was also used to predict 1985 annual TSP concentrations. The model calculations include maximum allowable emissions from the proposed facility and calibrated background emissions. The highest concentration (44 $\mu g/m^3$) is attributed to emissions from sources in

the cities of Dunkirk and Fredonia. The highest plant contribution is 0.25 $\mu g/m^3$, less than one percent of the predicted maximum background concentration of 44 $\mu g/m^3$. The Class II allowable annual TSP limit is 19 $\mu g/m^3$. Uninventoried sources, such as dirt roads, plowed fields and agriculture, are significant contributors to the ambient suspended particulate concentrations.

4.306
In summary, the primary and secondary NAAQS TSP standards of 75 $\mu g/m^3$ and 60 $\mu g/m^3$, respectively, are not expected to be exceeded within the air quality impact area of the proposed station. This is confirmed by the available monitoring data and the modeling analysis.

Fugitive Dust
4.307
Fugitive dust emissions associated with the transportation and disposal of fly ash and bottom ash from the proposed Lake Erie Generating Station and the Dunkirk Steam Station (DSS) will affect suspended particulate levels and dustfall rates at locations in the vicinity of the disposal areas. It should be noted that although the calculated impacts represent the best available estimates there is little quantitative information and, therefore, some uncertainty concerning fugitive emissions from ash piles.

4.308
Based on the maximum expected daily ash disposal and the planned control measures, it has been estimated that about 11.1 lbs of particles less than 30 μm in diameter will be generated each workday hour by these daytime activities and wind erosion. These daily fugitive emissions will contribute to ambient concentrations of suspended particulates. In addition, wind erosion of the exposed pile over a period of about three months during the winter, when topsoil has not yet been used to permanently cover the pile, will cause fugitive emissions of fine particles that will contribute to annual levels of suspended particulates.

4.309
To control the ash pile and to minimize fugitive particulate emissions several procedures have been developed. Water will be applied to the ash while it is loaded onto the trucks and after dumping to control emissions during workday activities. A chemical binding agent may be applied to the inactive pile to bind the surface layer. Topsoil will be used to cover the pile every three months. Trucks used to transport the ash from the two power plants will be covered. Additional preventive measures include the planting of quick-growing trees along the border of the disposal area to act as a windbreak. These control measures represent an excellent program to minimize the air quality impact of the dry ash disposal area.

4.310
To summarize studies done by the applicant, fugitive dust emissions from the proposed facility's ash disposal area will not produce a 24-hour TSP level above the nondeterioration increment outside the plant boundary with the construction of a berm around the ash disposal pile. At all receptor locations the applicant's predicted concentrations are less than 30 $\mu g/m^3$. The contributions of the ash disposal area to annual TSP levels are below the 19 ug/m^3 nondeterioration increment. The proposed dry ash disposal system and dust control procedures represent excellent techniques for the minimization of the air quality effects associated with fugitive emission.

4.311
The State, in its analyses, indicates that the applicant may have underestimated fugitive dust emissions, and that the proposed facility emissions added to fugitive dust could violate the annual nondeterioration standard of 19 $\mu g/m^3$ and the 24-hour standard of 37 $\mu g/m^3$. However, the State did admit that its evaluation technique is highly conservative and uncertain.

Settleable Particulate Deposition Rate
4.312
PSDM was used to determine maximum ground level deposition rates of particulate matter than would be emitted from the facility. Calculations were performed assuming the most adverse meteorological conditions. The highest deposition expected is 0.005 mg/cm^2/month, which is well within the NYSAAQS of 0.30 mg/cm^2/month.

New York State and National Ambient Air Quality Standards
4.313
The maximum model calculated ambient concentration (plant and background) are summarized in Table 4-10. Table 2-9 presents the national primary and secondary ambient air quality standards and Table 2-10 displays the New York State Ambient Air Quality Standards. The applicant's results demonstrate that Lake Erie Generating Station emissions will not result in contravention of either NYSAAQS or NAAQS.

Existing New Source Performance Standards
4.314
Table 1-8 shows the existing Federal Standards for Performance for New Stationary Sources. These standards limit SO_2 emissions to 1.2 $lb/10^6$ Btu. NO_x (as NO_2) to 0.70 $lb/10^6$ Btu, and particulates to 0.10 $lb/10^6$ Btu for coal-fired emissions. The New York State standard (Table 1-9) is identical except the State limits the fuel sulfur content to 0.6 lb of sulfur/10^6 Btu in addition to limiting SO_2 emissions. The proposed facility is expected to meet these

present standards. Tables 1-8 and 1-9 also show the present standards for oil-fired facilities (the auxiliary boiler). Emissions from the auxiliary boiler are predicted to meet these standards. The anticipated facility emissions, as calculated by the State, are displayed on Table 4-12.

Cooling Tower Emissions

4.315

The proposed natural draft cooling tower will emit large quantitites of heat and moisture into the atmosphere. However, the effects of these emissions are small. No occurrences of ground level fogging or icing are expected to result from the operation of the proposed cooling tower. Peak monthly salt drift deposition rates (predicted as 0.077 lbs/acre/month) are three orders of magnitude or more below the New York State Air Quality Standard for settleable particulates (27 lbs/acre/month). The largest number of long visible plumes is expected to trend to the northeast of the tower in May. Visible plumes beyond 1 km of the proposed station occur less than 15 hours per month - approximately two percent of the time. Cooling tower plumes with lengths exceeding 10 km can occur during conditions of light winds and high relative humidity, conditions conducive to natural cloud and fog formation. During such circumstances the cooling tower plume would merge with natural clouds and have no practical significance.

4.316

During reduced load conditions, the cooling tower impacts less heat to the vapor plume. Although the buoyance of the tower discharge is consequently reduced, resulting in a lower plume rise than would be expected to occur under any operating conditions with a 500-foot-high natural draft design, visible plume length for any specific weather condition should be shorter with reduced load.

4.317

The drift deposition patterns corresponding to reduced load situations are expected to be concentrated closer to the tower than with full load. The tower trajectory of the plume with reduced load will allow drift droplets (especially the large drops) to reach the ground at shorter downwind distances. The spatial distribution of salt drift under reduced load will therefore be more concentrated, but this is counteracted by the reduction in total salt mass leaving the tower. The results of the drift calculations with 100 percent load are considered to be conservative estimates of the impacts with lower loads. The effects of using only one 850 MW unit upon cooling tower impact are reflected in a qualitative way in the discussion above; i.e., the results for one unit operation at full load should be similar to those obtained for two units at 50 percent load.

Meteorological Impact of The Cooling Tower

4.318
The meteorological impact of cooling towers discussed in Pomfret paragraphs 4.122 through 4.124 applies equally to the Sheridan site.

Local and Regional Air Traffic
4.319
Selection of the Sheridan site for the proposed Lake Erie Generating Station will foreclose certain options on use at the Dunkirk Airport. The construction of the stack and cooling tower will eliminate the only existing instrument approach to the airport. It is estimated that if a customized landing system were installed at an estimated cost of $160,000 to $250,000, the problem might be resolved and allow continued instrument flight operations. This problem could also be resolved by construction of a new runway at an estimated cost in excess of $1,000,000. Under present conditions, construction of the proposed facility at the Sheridan site will impact local and regional air use.

HEAT DISSIPATION SYSTEM

4.320
Appendix B presents a discussion of the heat dissipation system at Sheridan. The predicted surface isotherms at Sheridan during the months of worst and average case (April and October, respectively) under both average and extreme climatic conditions are identical to those presented for Pomfret (paragraphs 4.126 to 4.130). Table 4-28 shows the maximum lake surface temperature increase at the jet impingement region at Sheridan.

4.321
The applicant's mathematical and hydraulic models and dye dispersion studies show that the thermal discharge will meet applicable State and Federal standards and criteria. The U.S. EPA Region II has informed the Corps that Section 316(a) of the Federal Water Pollution Control Act is not applicable to the proposed plant since its closed-cycle design would be in compliance with the effluent guideline limitations governing thermal discharges for the steam electric generating industry. The joint testimony of the New York State Department of Environmental Conservation and NYS Public Service Commission (Article VIII proceedings) states that the proposed design for the cooling water discharge at Pomfret and Sheridan will comply with thermal standards (6 NYCRR 704.1(a)) and thermal criteria (6 NYCRR 704.2(b)(3)(i) through (iii), 704.3 and 704.5).

TABLE 4-28

MAXIMUM LAKE SURFACE TEMPERATURE INCREASE
AT THE JET IMPINGEMENT REGION - SHERIDAN SITE

	Temperature Rise At Jet Exit		Maximum Surface Temperature Rise	
Month	Average Climatic Condition (°F)	Extreme Climatic Condition (°F)	Average Climatic Condition (°F)	Extreme Climatic Condition (°F)
Jan	30.1	40.4	0.85	1.18
Feb	31.6	42.2	0.89	1.23
Mar	32.6	50.6	0.93	1.51
Apr	35.0	55.9	1.01	1.68
May	24.2	41.0	0.7	1.23
Jun	19.8	31.5	0.57	0.93
Jul	14.9	23.8	0.42	0.69
Aug	13.0	22.9	0.37	0.67
Sep	19.4	31.6	0.56	0.94
Oct	24.1	40.5	0.7	1.21
Nov	24.2	37.2	0.7	1.1
Dec	28.8	42.7	0.82	1.26

Recirculation Potential and Evaporation Water Loss

4.322
The recirculation potential at Sheridan is insignificant and is identical to the potential predicted for Pomfret. Evaporation water loss at Sheridan is the same as that presented in paragraph 4.132 (Pomfret).

WATER QUALITY AND WATER USE

4.323
All treated waste discharges are combined with the cooling tower blowdown and the resulting effluent is discharged through a submerged multiport diffuser into Lake Erie. The concentrations of wastes in the discharge are presented in Table 1-21. The concentration of each constituent in the discharge regulated by the EPA Effluent Limitation Guidelines is below allowable maximum and average values. The values of discharge concentration can be compared with the Lake Erie ambient water quality presented in Chapter Two and Appendix Table B-11. For most parameters, the concentration is approximately three times ambient concentration. This is because the cooling system operates at three cycles of concentration and represents practically the entire discharge flow (13.1 cfs, of which 12.7 cfs is cooling tower blowdown), therefore diluting the other waste sources.

4.324
The multiport diffuser is used to maximize mixing of the plant effluent with lake water, thereby minimizing the impact on ambient water quality. It has been calculated (refer to Appendix B for formula) that the maximum resultant surface concentrations of most of the chemical parameters are within ten percent of ambient lake levels and therefore will have an insignificant effect on lake water quality. The exceptions to this statement include the parameters sulfate and sodium. The increased sulfate concentration is due mainly to the addition of approximately 90 mg/l sulfuric acid to the recirculating cooling water for pH control while the sodium concentration is due to demineralizer regeneration with sodium hydroxide.

4.325
Based on the above results it is anticipated that the discharge of chemical constituents from the Sheridan Generating Station will not alter the present water quality regime of Lake Erie after a short period of near field plume mixing which takes place in less than 11 seconds. The effluent limitations and other limitations proposed in the State's Draft 402 Discharge Permit, if met by the applicant, will provide for compliance with surface water quality standards.

4.326
New York State does not have a general mixing zone standard but a mixing zone is described on a site-specific basis and has not been established by the Siting Board for the proposed facility. However, the draft 402 discharge permit specifies a surface mixing zone of six acres, an area equivalent to a circle with a radius of 300 feet. Establishment of the mixing zone is contingent on Siting Board approval and issuance of the final 402 discharge permit. The area enclosed by the 0.5°F increase isotherm is described in the previous section and is expected to be significantly smaller than the proposed mixing zone. New York State water quality standards are not expected to be exceeded, except in cases where the ambient lake concentration exceeds the limit. Once a mixing zone is approved it is expected that ambient concentrations will exist outside of the zone.

4.327
The discharge constituents of greatest importance to the aquatic ecology of the Sheridan area are metals, suspended and dissolved solids, nutrients, and biocides. As already stated, the water quality of Lake Erie adjacent to the Sheridan site will not be altered outside of the plume area by the proposed station operations. The rapid mixing of the plume with ambient water, the small size of the plume and the fact that chemical constituents of the discharge are basically concentrated lake water, suggest that effects of these discharges on the aquatic ecology will be minimal. The maximum concentrations of chlorine and maximum decreases in ambient water dissolved oxygen levels as a result of the Sheridan cooling water discharge are identical to those discussed in paragraphs 4.138 and 4.139 (Pomfret). Pomfret section paragraphs 4.140 through 4.146 also pertain to the Sheridan site.

TERRESTRIAL ECOLOGY

4.328
The impact of station operation on the terrestrial ecosystem as presented for Pomfret is equally applicable to the Sheridan site.

AQUATIC ECOLOGY

4.329
Operation and maintenance of the proposed Lake Erie Generating Station will affect the aquatic ecology of the Sheridan area in several ways. Potential sources of impact include entrainment of aquatic organisms, impingement of juvenile and adult fish, thermal discharges and loss of aquatic habitat. The major factor in minimizing the amount of aquatic biota affected by the intake system is the utilization of a closed cycle cooling system.

Entrainment

4.330
Withdrawal of water for cooling purposes in the circulating water system results in entrainment of organisms and can be of a source of stress to the aquatic ecosystem. Due to a lack of information to the contrary, an entrainment mortality of 100 percent is assumed. The total retention time for entrained organisms in the circulating water system, including the makeup intake system and the blowdown system, would be approximately 6,500 seconds for Unit No. 1 and 6,710 for Unit No. 2. Organisms entrained (drawn into the cooling system along with makeup water) include phytoplankton, zooplankton, ichthyoplankton and fish.

Phytoplankton

4.331
Within the phytoplankton community, those species exhibiting the highest ambient densities in the source water will comprise the larger percentage of entrained organisms. Estimates of expected entrainment at the Sheridan site range from 5.655×10^{16} to 8.938×10^{16} cells per year. Four taxa of phytoplankton (Cyanophyta, Chlorophyta, Bacillariophyta, and Cryptophyta) comprise 97 percent of the low annual estimate and 88 percent of the high estimate. Phytoplankton communities in the area of Lake Erie offshore of the Sheridan site should not be measurably depleted. The selection of the proposed intake was based primarily on minimizing ichthyoplankton mortality. The result is that this location does not utilize water having the lowest phytoplankton density. However, phytoplankton reproductive doubling times are short (Fogg, 1965), and these organisms are therefore capable of absorbing the effects of entrainment withdrawal losses as would be experienced at the proposed plant intake site. Any decrease in standing crop should be of local importance only.

Zooplankton

4.332
Estimation of zooplankton entrainment was based on the assumption that zooplankton will be nonselectively entrained. In actuality, some of the large zooplankters (eg. Leptodora Kindtii) may be able to avoid entrainment due to their swimming ability. The estimates ranged from 3.447×10^{12} to 9.970×10^{12} organisms per year. The estimate of 3.447×10^{12} zooplankton entrained per year is based on the applicant's 1975-76 sampling period. A nighttime specific

sampling program performed in 1975-76 resulted in the following entrainment rate estimates:

Sheridan (Night) 1975-1976
30 Ft Contour (Proposed Intake Site) Mid-Depth
0.5m Tucker Trawl
Zooplankton x 10^9 Entrained/Month

	1975	1976		
	Nov	Apr	Jun	Aug
Rotifera	29.6	1,272.6	329.1	467.8
Cladocera	39.9	8.2	458.9	3.6
Copepoda	2.2	103.3	205.9	31.5
Calanoida	2.4	1.6	6.8	0.8
Cyclopoida	15.8	40.3	256.1	10.1
Other	0	0.1	0	0.4

The estimate of 9.970×10^{12} zooplankton entrained per year is based on 1974-75 collection efforts which included vertical and oblique tows (75 μ mesh and 333 μ mesh). These estimates average the vertical stratification resulting from diel vertical migration.

4.333
Rotifera dominate the entrainment, comprising 56 percent of the 1974-75 figure and 71 percent of the 1975-76 figure. The second most abundant taxon expected in the entrainment losses is Cladocera. Assuming 100 percent mortality of these organisms, they will be removed from their respective populations. Dead organisms discharged through the multiport diffuser may still serve a function in the lake ecosystem. Those remaining in suspension for a period of time could serve as food for other organisms while those settling to the bottom would eventually be decomposed and recycled as nutrient matter. The loss of zooplankton could cause shifts in species composition which would be highly localized, seasonal, and of no consequence to Lake Erie as a whole.

Ichthyoplankton

4.334
Entrainment of ichthyoplankton has the potential for triggering the greatest effect on the aquatic ecosystem as a whole. This is due to

the annual reproduction mode of these organisms, and their correspondingly longer generation times as well as their capacity to exploit other food chain organisms selectively and to cause shifts in community composition which may favor given species based on their food chain specificity and capacity for increase.

4.335
The applicant's two-year ichthyoplankton sampling program (1974-75, 1975-76) utilized multiple gear techniques. The epibenthic sled data were singled out of the 1974-75 study because of proximity to the proposed intake. The 1975-76 data were examined for a variety of contour and depth considerations ultimately leading to a mid-depth location of the ports.

4.336
Five taxa (rainbow smelt, minnows, yellow perch, logperch, and freshwater drum) usually accounted for 95-99 percent of the ichthyoplankton collected. Alewife, a species considered highly susceptible to entrainment and impingement, was identified in postlarva form during June 1975 and occurred sporadically during other months in low numbers. The sampling resulted in the identification of 15 species at Sheridan during the 1974-75 period and 16 species during 1975-76. Based on relative abundance and densities of ichthyoplankton in the makeup water withdrawal zone, logperch, carp, yellow perch, smelt, freshwater drum, trout-perch, and walleye ichthyoplankton were singled out for extrapolation of numerical losses due to entrainment. Sample sizes of the remaining species were too low for a useful prediction.

4.337
Rainbow smelt (Osmerus mordax), logperch (Percina caprodes) and yellow perch (Perca flavescens) are expected to sustain the heaviest losses due to entrainments. Table 4-29 depicts the highest numbers of ichthyoplankton expected to be entrained per minute based on 1974-75 sampling results. This table was compiled from Table S74.4-7 of the applicant's Article VIII application which is based on samples taken between 13 May 1975 and 28 July 1975 in the vicinity of the proposed intake structure. The figures used are the highest numbers contained in the upper 95 percent confidence level row of Table S74.4-7. Table 4-30 presents the entrainment rates based on the 1976 sampling period. This table was derived from the applicant's 316(b) demonstration and was compiled from Tables V.B.2.a-5.

4.338
Impact of entrainment on aquatic biota was considered from the fisheries viewpoint. Percent entrainment losses of the yolk-sac and post-larval stages for each fish species were calculated as follows. Along the intake column (No. 2 for Sheridan) ichthyoplankton samples

TABLE 4-29

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT SHERIDAN (1975 DATA)

Species	Type (1)	Number	Time and Date of Sample Used (2)	
Logperch				
(*Percina caprodes*)	YSL	469.16	6/4	D
	PL	19.06	6/4	D
	PL	11.81	6/10	N
	YSL	8.32	6/10	N
Carp				
(*Cyprinus carpio*)	YSL	22.10	7/9	D
	PL	12.14	6/4	D
	PL	5.24	7/10	N
	YSL	19.07	6/23	N
Yellow perch				
(*Perca flavescens*)	YSL	81.44	6/4	D
	PL	9.13	6/4	D
	PL	7.42	6/10	N
	YSL	30.30	5/30	N
Rainbow smelt				
(*Osmerus mordax*)	YSL	33.37	6/4	D
	PL	85.90	6/18	D
	E	2.68	5/12	N
	PL	204.27	7/23	N
Trout-perch				
(*Percopsis omiscomaycus*)	E	3.01	6/4	D
	YSL	3.81	6/23	D
	YSL	12.44	6/10	N
	PL	2.41	6/10	N
Freshwater drum				
(*Aplodinotus grunniens*)	E	4.49	7/9	D
	YSL	8.83	7/16	D
	PL	0.94	7/16	D
	E	25.23	7/10	N
	YSL	5.24	7/10	N
	PL	2.22	7/23	N
Alewife				
(*Alosa pseudoharengus*)	PL	13.85	6/23	N

(1) YSL: Yolk-sac larvae
PL: Postlarvae
E: Eggs. When eggs are not mentioned it is because none were found in the samples.

(2) The letter "D" designates daytime sample while "N" indicates that the entrainment level is based on nighttime samples.

TABLE 4-30

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT SHERIDAN (1976 DATA)

Species	Type (1)	Number	Time and Date of Sample Used (2)	
Logperch (*Percina caprodes*)	YSL	45.74	6/18	D
	YSL	6.75	7/7	N
	PL	2.59	7/22	D
	PL	46.45	7/26	N
Carp (*Cyprinus carpio*)	YSL	77.84	6/18	D
	YSL	4.18	6/18	N
	PL	1.00	6/30	D
	PL	NC (3)		N
Yellow perch (*Perca flavescens*)	YSL	0.13	5/14	D
	YSL	NC		N
	PL	1.54	6/13	D
	PL	0.56	7/7	N
Rainbow smelt (*Osmerus mordax*)	YSL	9.27	6/13	D
	YSL	31.96	6/18	N
	PL	145.19	7/22	D
	PL	691.17	7/21	N
Trout-perch (*Percopsis omiscomaycus*	YSL	0.35	6/18	D
	YSL	3.35	6/24	N
	PL	NC		D
	PL	2.14	7/21	N
Freshwater drum (*Aplodinotus grunniens*)	YSL	0.38	7/22	D
	YSL	1.69	7/7	N
	PL	0.31	7/26	D
	PL	2.71	7/26	N
Walleye (*Stizostedion vitreum*)	YSL	NC		
	YSL	NC		
	PL	NC		
	PL	NC		
Other Fish	YSL	5.34	6/30	D
	YSL	3.87	6/30	N
	PL	1.67	6/30	D
	PL	78.59	7/26	N

TABLE 4-30 (Cont'd)

HIGHEST ESTIMATES OF NUMBERS OF ICHTHYOPLANKTON ENTRAINED PER MINUTE AT SHERIDAN (1976 DATA)

Species	Type (1)	Number	Time and Date of Sample	Used (2)
Total Ichthyoplankton	YSL	128.55	6/18	D
	YSL	42.77	6/18	N
	PL	39.47	6/13	D
	PL	706.4	7/21	N

(1) YSL: Yolk-sac larvae
PL: Postlarvae

(2) D - Daytime Sample
N - Nighttime Sample

(3) NC - Not calculated due to insufficient data.

during 1976 were taken at four contours and three depths for a total of ten sampling stations. (Texas Instruments, 1976). These stations sub-divided the respective intake columns, from the 10 to 40 foot contours, into ten biological zones. If d_1, ..., d_{10} are the plankton densities at each of the stations and v_1, ... v_{10} are the volumes of water passing through these zones during any time period, then Percent Entrainment $100 \times vd_j/\sum v_i d_i$, where v is the intake volume during the same time period. Thus, Percent Entrainment = $100 \times \mu/V$ x Relative Density at Intake.

Losses are estimated relative to the total ichthyoplankton which pass the site. Relative to all spawning areas on the eastern shores of Lake Erie, these losses would be considerably smaller.

The significance of the losses are explained both in terms of equivalent adult losses occasioned by the ichthyoplankton entrainment as set forth in paragraph 4.340 and in terms of the ichthyoplankton lost via entrainment relative to the total ichthyoplankton which could potentially be entrained (i.e., those contained in the intake flow-pass volume of water) as set forth in the remainder of this paragraph.

Comparison of projected entrainment rates with the total ichthyoplankton which could potentially be entrained (those contained in the flow-pass volume of water) indicates that ichthyoplankton relative losses vary between 0 and 2.2 percent of the entrainable population. The highest of these relative losses are 1.73 percent of the freshwater drum yolk-sac larvae, 1.00 percent of the carp yolk-sac larvae, 0.52 percent of the rainbow smelt yolk-sac larvae, 0.73 percent of the rainbow smelt postlarvae, 1.35 percent of the freshwater drum postlarvae, and 2.20 percent of the carp postlarvae.

4.339
Through predation and natural mortality such as disease many ichthyoplankton, regardless of entrainment, would never reach juvenile and adult life stages. Entrainment and loss of ichthyoplankton that would never have reached a higher life stage does not necessarily reduce the importance of their loss to fish populations. Fish populations generally overproduce eggs and larvae which may compensate for losses accrued in each life stage of the population. Thus, under natural conditions each species can maintain a stable population (Everhart, 1975). Entrainment losses can result in cropping of the compensatory population.

Equivalent Adult Losses

4.340
Using the numbers of yolk-sac larvae and postlarvae which were obtained during each sampling regime and multiplying by estimated

TABLE 4-31

ANNUAL EQUIVALENT ADULT LOSSES 1974-1975

	Sheridan Site Losses Based on Mortality of Yolk-Sac Larvae	Sheridan Site Losses Based on Mortality of Postlarvae	Annual Loss
Rainbow smelt	5,279	117,510	112,789
Carp	1,855	4,214	6,069
Trout-Perch	818	394	1,212
Yellow Perch	6,368	5,980	12,348
Logperch	8,580	7,324	15,904
Alewife	NA	11,306	11,306
Freshwater Drum	1,576	1,831	3,407
	1975-1976		
Rainbow smelt	8,308	3,427,376	3,440,282
Carp	20,522	1,344	21,866
Trout-Perch	656	5,658	6,314
Yellow Perch	22	8,139	8,161
Logperch	18,252	75,934	94,186
Walleye	NA	NA	NA
Freshwater Drum	547	3,400	3,947
Other Fish	4,883	90,290	95,173

Other Fish - Alewife, Gizzard Shad, Burbot, White Bass, *Pomoxis* spp, *Etheostoma* spp, and Slimy sculpin.

NA - Data not available to determine equivalent adult losses or no larvae sampled

Survival rates used in this table were 0.025 through the Yolk-sac stage and 0.20 through the postlarval stage.

survival rates yields an estimate of equivalent adult losses (Table 4-31). The general inshore dispersion of ichthyoplankton, the offshore placement of the intake structure, the densities of eggs and larvae at the area proposed for intake location suggest that impact to the local fish populations is minimized and regional effects should be insignificant. As indicated in Chapter 2, paragraphs 2.344 and 2.345 and in the U.S. EPA letter on page E-20, the Sheridan site may be an important nursery site and spawning area. The information and recommendations contained in Pomfret site paragraph 4.178 are equally applicable to the Sheridan site.

Impingement

4.341
The susceptibility of fish to impingement will vary with seasonal distribution in response to temperature and life history characteristics, such as spawning. It is estimated that the highest impingement rates will occur during the spring when large numbers of fish move inshore to spawn. A conservative estimate of 45,000 fish per year will be impinged due to the withdrawal of cooling water needed for the proposed facility at Sheridan. If the abundances for all age classes and gear types used in sampling are summed, a figure representing melded catch is produced. The relative abundances so obtained are considered to approximate that to be found in the impingement collections. For Sheridan this computes to: emerald shiner (25.4%), spottail shiner (22.2%), rainbow smelt (19.8%), yellow perch (13.3%), and other species (19.3%). Utilizing the estimate of 45,000 fish per year, impingement losses by species are: emerald shiner 11,430, spottail shiner 9,990, rainbow smelt 8,910, yellow perch 5,985, and other species 8,685.

4.342
A comparison of these estimates with the number of fish removed from Lake Erie by commercial fishing operations indicates that operation of the plant will impinge less than 0.4 percent of all New York State landings (Great Lakes Fishery Commission (GLFC), 1975) and less than 0.004 percent of all Lake Erie landings.

4.343
Impingement of juvenile and adult fish by the intake facilities will also affect the various populations in a selective manner. Weakened and/or diseased fish will be the most susceptible to this water withdrawal. Overall susceptibility will be controlled by intake withdrawal rates (fps), intake capacities (cfs), swimming speeds of individual fish, and seasonal changes in distribution and abundance of species. It is felt that fish population currently under stress in Lake Erie (walleye), will not experience significant losses. Abundance of walleye onsite and its characteristic distribution will

minimize losses. Fish populations more subject to loss (smelt, alewife, gizzard shad, freshwater drum) are probably able to tolerate additional population mortality. It is not unreasonable to suggest that greater adult mortality could reduce seasonal competition and/or predation by these species on piscivorous species, the loss of the former species probably being undetectable, or at least not necessarily constituting a negative impact on the ecosystem.

Thermal Impact

4.344

The discussion of thermal impacts for Pomfret (paragraphs 4.182 through 4.187) also characterizes the thermal impact anticipated at Sheridan since mixing of effluents, diffuser performance, vertical and surface isotherms and aquatic biota are very similar at both sites. Impacts on phytoplankton and zooplankton are expected to be minimal and highly localized. Ichthyoplankton populations, although more sensitive to temperature than other planktonic forms, should not be significantly affected due to the extremely short thermal exposure times anticipated and the location of the discharge diffuser in a zone of low ichthyoplankton densities. The characteristics of the thermal discharge discussed in paragraph 4.187 will reduce the impact on fish populations.

316(b) Demonstration

4.345

The applicant has prepared a 316(b) Demonstration for the proposed Lake Erie Generating Station with the intent of demonstrating best technology available for minimizing adverse environmental impact with respect to cooling water intake design. This document has been reviewed by the appropriate State agencies (NYS Public Service Commission and NYS Department of Environmental Conservation) and by the U. S. Army Engineer District, Buffalo. The applicant's submittal was evaluated utilizing factors contained in U. S. Environmental Protection Agency guidance and development documents related to intake structure assessment. These documents state that care in the location, design, capacity, and construction of the intake can significantly minimize adverse environmental impacts. The applicant's proposed intake design and technology has been considered for each of these factors and a determination has been made by the State to accept the applicant's design at Sheridan as meeting the minimization criteria. Staff concurs with this finding conditioned on compliance by the applicant with State recommendations contained in the draft 402 permit including: the ability to relocate the intake if biological monitoring shows a necessity for relocation; an assessment of Ristroph traveling screens; and the ability to retrofit the system with fish return devices in an economical manner. The applicant has already advised the Corps that the concept of retrofitting a fish return system would not present major difficulties nor should the cost vary significantly with the cost of incorporating the system in the initial design.

TRAFFIC

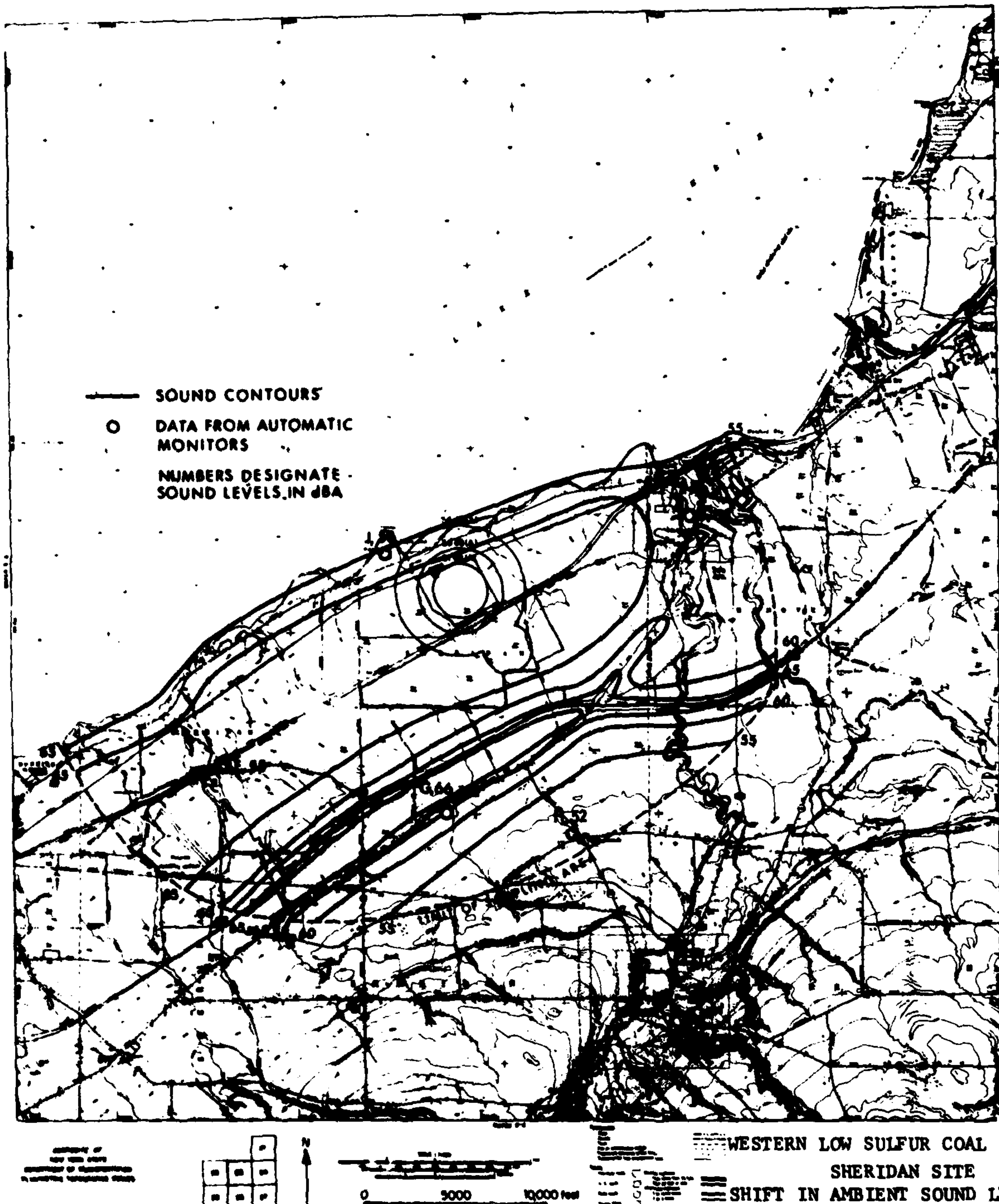
4.346
A permanent operating force of approximately 100 people will be traveling to the site daily, primarily from the Dunkirk-Fredonia area, and possibly from Buffalo. This is not anticipated to have any significant impact on local roads and highways, which are capable of handling this slight increase in traffic. Parking facilities will be provided on the site.

NOISE

4.347
The proposed generating station will produce continuous noise for 24 hours a day, throughout the entire year. The acoustic design of the facility will significantly reduce operating sound levels. Major noise sources during operation are presented in Table 4-18. Figure 4-2 illustrates the ambient conditions and the anticipated noise levels due to station operation. The figure shows that the plant will produce some increase outside the site boundary for at least a few thousand feet in at least some directions. However, the continuous sound emission produced by the proposed facility will be restricted to a daytime limit, in general, of 55 dB(A), and to a night-time limit of 45 dB(A) at the nearest required property line. The New York State Department of Environmental Conservation presently has no noise regulations. However, the agency is proposing noise regulations. State certification requires that shifts in the sound level be less than 5 dB(A) at existing noise-sensitive points outside the site boundary. This is containd in stipulation 75-1 (Article VIII proceeding) and is based on guidelines in 16 NYCRR part 75. Thus, members of the public will not be exposed to higher sound levels except where ambient sound levels are higher. To ensure that these sound levels are not exceeded the applicant will monitor noise levels during operation of the proposed facility.

CULTURAL RESOURCES

4.348
The operation of the proposed facility at Sheridan will not have any impact on properties listed in the National Register of Historic Places nor the register on National Historic Landmarks. As noted in Chapter 2, the applicant has performed an architectural and historical survey to list all resources of cultural significance in the site area. The Reed house will experience visual impact. This impact will be the visual intrusion of the ash disposal area on the house's



WESTERN LOW SULFUR COAL (0.5%S)
SHERIDAN SITE
SHIFT IN AMBIENT SOUND LEVELS DUE TO PLANT OPERATIONS WEEK-DAY DAY - SUMMER

FIGURE 4-2

visual backdrop. During operation some intermittent adverse noise impact will occur, during daylight hours on weekdays. The Sheridan School District No. 3 schoolhouse will be affected in the same manner as that described for the Reed house. The Corps intends to complete the steps contained in the Advisory Council on Historic Preservation Procedures (36 CFR 800). Completion of these procedures includes evaluation of effect and alternatives that would avoid or mitigate adverse effects.

AESTHETICS

4.349
The Sheridan Generating Facility is expected to have the same aesthetic impact as that described in the corresponding Pomfret section.

SOCIAL AND ECONOMIC IMPACT

Employment
4.350
The impact on employment of the proposed generating station at Sheridan is identical to that presented in paragraph 4.197a and 4.197b.

Tax Revenues
4.351
The major fiscal impact of the proposed project in its operation and maintenance phase will be the generation of substantial property tax revenues. It has been estimated that by 1987 the applicant will pay some $6.5 million in property taxes annually. In 1975, the site produced $19,000 in taxes. Owing to the way in which property taxes are distributed in New York, the tax benefits received from the proposed project will be spread far beyond the boundaries of the town of Sheridan. Table 4-32 illustrates the potential implications associated with the addition of the proposed facility to the tax rolls. The facility will represent approximately 96 percent of the full taxable valuation in the town by the years 1985-87. Similarly, the proposed project would eventually represent a substantial proportion of the taxable property in the Silver Creek School District and in the county as a whole. By the mid-1980's, the generating station would account for approximately 96 percent of the full valuation of the Silver Creek School District and nearly 38 percent of full valuation of Chautauqua County.

Public Services and Facilities
4.352
The operation of the proposed facility is not expected to have an impact on public services (law enforcement, fire protection, etc.) and facilities (schools, hospitals, housing, etc.). The applicant

TABLE 4-32

FULL VALUATIONS: A COMPARISON

	Full Valuation ($ millions)		Estimate of 1987 Full Valuation ($ millions)		Plant as Percent of 1987
	1970-71	1974-75	w/o Plant	w/Plant	
Town of Sheridan	17.3	23.7	50.5	1,150.5	95.6
Silver Creek School Dist.	37.7	41.2	51.0	1,151.0	95.6
Chautauqua County	781.4	1,001.3	1,815.7	2,915.7	37.7

Source: Board of Legislators, Chautauqua County, New York, Journal of Proceedings, 1971-1975. Chautauqua County Board of Education Services, business records, 1971-1975. 1987 estimates by ERT.

will handle plant security through their own security force and on-site fire-fighting equipment will be capable of handing probable fires. During the plant's operational life sewer and water services will be provided by the plant itself and should have no effect on the capacity of the public sewer and water supply. Increased traffic caused by the generating station might cause some slight increase in road maintenance costs for roads near the site, however, this increased cost will be more than offset by the increased tax revenues generated by the station.

Public Health
4.353a
The impact on public health of the proposed generating station at Sheridan is identical to that presented in paragraph 4.200.

Local Grape Industry
4.353b
The primary crop near the Sheridan site is grapes. The impact on grapes of the proposed generating station at Sheridan is identical to that presented in paragraphs 4.201a, 4.201b, and 4.201c.

Community Cohesion
4.354a
The impact on community cohesion of the proposed generating station at Sheridan is identical to that presented in paragraphs 4.202 and 4.203.

Community Development
4.354b
The impact on community development of the proposed generating station at Sheridan is identical to that presented in paragraphs 4.204.

RECREATION

4.355
The most significant impact of the facility on recreation in the area will be the visual aspects of the plant's higher elements (cooling tower, main generator building, and stack). The facility components will be observed by viewers using Lake Erie for recreational boating. Even with the addition of evergreen trees along Route 5 by the applicant (and even with foliage on deciduous trees during spring, summer, and fall), facility elements will dominate the scene when viewed from Lake Erie. The two closest recreational facilities are Point Wright Park and Smith Mills game farm, both of which are approximately 3.5 miles from the Sheridan site. The visual impact of the higher plant elements is diminished by the distance between the site and these recreational facilities. Fencing in the plant site will remove it as a potential deer hunting area, No significant effects on

recreational areas are expected as a result of increased traffic or noise. The offshore coal unloading facility will create minor interference with recreational boating, especially during periods of coal delivery.

CHAPTER FIVE: ANY PROBABLE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

INTRODUCTION

5.001
Implementation of a project on the scale of the Lake Erie Generating Station will result in unavoidable environmental, social and/or economic consequences that might be considered undesirable. In the following paragraphs the most undesirable consequences of the construction, operation, and maintenance of the proposed facility are discussed.

POMFRET SITE

LAND USE

5.002
Once the construction phase begins, the site will be committed to an industrial land use. Of the 1,054 acre site, 551 acres will be cleared for the proposed site facilities. Although all prior land use types will be compromised, agricultural land (454 acres) committed to the project area is the only form of land use loss that would result in a notable impact. Regional impacts would be minimal. Because the transmission corridors have not been selected, impacts cannot be accurately assessed. It can be assumed, however, that right-of-way clearance will disturb or destroy significant amounts of wildlife habitat. Aesthetic degradation is also a likely impact resulting from transmission line construction.

SOCIAL AND ECONOMIC IMPACTS

5.003
Prior to or during the construction phase, four commercial businesses and approximately 95 residents will be permanently relocated. This adverse impact is unavoidable but will be made more tolerable by just compensation for the preempted property by the applicant. Preemption of access to the site and the rerouting of traffic to circumvent the site area are minor adverse impacts that are unavoidable and will be incurred for the design life of the facility. Site improvements discussed in the report written by Wallace Champagne and Associates (1976) should lessen any adverse impacts incurred by the alteration of the road network in the vicinity of the site.

5.004
The loss of a yearly crop (grapes, hay, pasture, and truck farming) valued at $233,191 will constitute the major adverse economic impact. However, this unavoidable negative impact will be minimized through compensatory measures and the capacity for regional economy to absorb farm labor.

5.005
Adverse impacts on commercial on-site natural gas operations will be minimal. At the time of certification of the proposed site the applicant will negotiate with the present leaseholders and well owners in a manner that will strive to prevent any reduction in the supply of natural gas.

WATER QUALITY

5.006
During construction of the plant, increased soil erosion and sedimentation will affect on-site streams and waterbodies. Proper control measures and sedimentation ponds will alleviate some of the turbidity problem, but an increase in suspended solids concentration will be detectable during the construction period.

5.007
Adverse environmental impacts which cannot be avoided during operation of the plant will include some slight deterioration of water quality in on-site streams, as well as a very small portion of Lake Erie (within the mixing zone of the wastewater discharge). Sulfate and sodium concentrations are the only chemical parameters that would have levels greater than ten percent of ambient lake levels. However, it is anticipated that these levels would become insignificant shortly (11 seconds) after near field plume mixing takes place. Impacts on aquatic biota within the plume should be negligible and little or no effect is anticipated outside of the plume area. This impact will last for the entire life of the plant, which is expected to be 30 years. Once this discharge is stopped, no lasting effect is expected. Groundwater quality is not expected to be affected because of proper control measures such as lining waste ponds and material storage areas. An increase in evaporation from Lake Erie due to the thermal discharge will occur during the 30 year life of the plant. No lasting effects are anticipated from this occurrence.

AIR QUALITY

5.008
The adverse environmental effect associated with air quality which cannot be avoided is some deterioration of air quality in the region due to the plant's emissions. Major impacts on local air quality

from construction would be fugitive dust, vehicular emissions, and on-site open burning. Major operational impacts on air quality would be power plant emissions. These include increased concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), hydrocarbons and total suspended particulates (TSP). All emission rates are expected to be within the allowable Class II non-degradation limits. These emissions will occur throughout the projected 30-year operating life of the plant.

NOISE

5.009
Both construction and operation of the proposed Lake Erie Generating Station will result in some increased noise. The increased noise will generally be measurable only within a few thousand feet of the site.

RESOURCE CONSUMPTION

5.010
Construction of the proposed units will require the use of construction materials which are depletable. Almost all of the plant will be made of concrete and steel but numerous other materials, including some which are considered "strategic" (Lincoln, G.A., 1972) (aluminum, nickel, tin, zinc, etc.) will be used to a lesser extent. Many of these materials can be recycled following the plant's life. Economic conditions and material needs early in the next century will determine the extent to which recycling is actually carried out. The amount of such materials actually consumed in construction of the proposed units will, in any event, be a very small fraction of U.S. and world production of these materials and construction of the proposed facility should have an insignificant impact on the availability of these resources.

5.011
Operation of the proposed Lake Erie Generating Station will require the direct consumption of 180,000,000 tons of Western coal or 120,000,000 tons of Eastern coal. Additional energy resources will be indirectly consumed in support operations such as mining and materials shipping. Though the proposed facility's coal consumption is large in absolute terms, it is insignificant compared to total available U.S. and world resources. Available U.S. resources are estimated to be adequate to supply U.S. needs for one to several centuries, depending on projections of future energy and organic chemical demand. Social and environmental constraints on total energy use have been suggested as more important constraints on the long-term use of coal than is depletion of coal reserves (Ford Foundation, 1974). Thus, any impact of the proposed plant consumption is likely to be insignificant in scale.

5.012
Total water loss as a result of direct water consumption by the proposed facility, and through forced evaporation is estimated at approximately $8.44x10^8$ cu ft per year.

AQUATIC ENVIRONMENT

Lake Erie

5.013
Construction activities which can potentially have an impact on the aquatic ecology of the Pomfret site include physical disruption of bottom sediments and alteration of benthic habitat in Lake Erie. In addition, construction runoff and/or physical damage to streams and ponds on the site could affect finfish, benthic, and plankton communities. Assessment of the degree of impact resulting from these activities is based on the consideration of the volume and type of sediment removed, amount of toxic substances and particles released, extent of area affected, productivity of the aquatic community in this area, and relative importance and uniqueness of the site to the region. Losses of biota during construction are not expected to affect whole populations.

5.014
Operational activities will affect aquatic ecology in several ways. Potential sources of impact include entrainment of aquatic organisms, impingement of juvenile and adult fish, thermal discharges and loss of aquatic habitat. The levels of entrainment which are anticipated due to water withdrawal are not considered to be significant enough to adversely affect the lake ecosystem at the Pomfret site, except in the immediate vicinity of the intake. Heaviest ichthyoplankton losses are expected to be incurred by rainbow smelt, logperch, and yellow perch. Maximum annual equivalent adult losses have been estimated at 2,133,455, 51,039, and 22,181, respectively. Impingement losses have been estimated at 45,000 fish per year, which include rainbow smelt 15,300, emerald shiner 10,215, yellow perch 5,200, alewife 4,500, spottail shiner 3,555, and other 6,210. Thermal impacts are expected to be minimal and limited to the immediate vicinity of the discharge structure.

5.015
Construction of intake, discharge and mooring structures should not appreciably affect the aquatic habitat of Lake Erie in the vicinity of Pomfret. A total of about 20,000 sq. ft. of bottom area will be disturbed during construction, destroying the habitat of all the benthic organisms present. It is estimated that at an average density of 5,706 organisms per square meter of substrate, a biomass of 272 mg/m^2 dry weight of benthic organisms will be affected. Suspended solids, toxic chemicals and nutrients released into the

water column during construction are all a potential threat to various aspects of the aquatic ecosystems within the Pomfret area. However, because of the small amount of area disturbed, the thin layer of sediment involved, and the estimated tolerances of aquatic species present at the site, effects of increases in suspended solids resulting from construction activity on the local aquatic ecology should be minimal. Construction activity will be concentrated near the 30-foot depth contour rather than at inshore areas where most fish spawning activity occurs and benthic biomass is greatest. A total of approximately 19,000 square feet will be permanently occupied by project structures.

On-site Construction

5.016

Two potential impacts on aquatic ecology at the Pomfret site resulting from on-site construction are physical alteration of aquatic habitat and runoff problems. Streams of the Pomfret site which will be affected by direct physical alteration include Van Buren Bay Creek (PCA & PCB) and stream PD. Streams PCB and PD will be rerouted via channelization and culverts around the fly ash disposal area. Their stream beds will be destroyed for 900 feet and 600 feet, respectively, thereby eliminating these stretches of streams from biological productivity. (Figure 1-12) The discharge flow of stream PCA will be rerouted around the southeast side of the stacker-reclaimer area, joining stream PCB several thousand feet upstream of the existing confluence point. The additional flow over this portion of the creek should help maintain flow at higher levels through the summer, thus possibly changing the intermittent nature of stream PCB.

5.017

Several ponds among the 21 on the Pomfret site will be altered directly by construction activities. The placement of the plant structures on the Pomfret site will eliminate six ponds, totaling 48,000 square feet of surface area. These ponds will be eliminated because of construction and placement of plant structures, roads, storage and disposal areas. It is likely that portions of the aquatic habitat will be affected by increased runoff due to construction and operation of the proposed facility. Streams adjacent to construction areas will experience increased loadings of suspended and total solids. Those organisms which are intolerant or sensitive to these materials will be displaced or destroyed. Recolonization of affected portions of streams by aquatic organisms should occur subsequent to completion of construction. Construction activities will be adequately controlled to limit the suspended solid release into site streams.

TERRESTRIAL ENVIRONMENT

5.018
The probable adverse environmental effects on the terrestrial environment which cannot be avoided are the loss of vegetation (natural and agricultural) and wildlife habitat as well as subsequent reduction in the number and diversity of wildlife species in areas where ash disposal and coal pile areas will be situated. Additional impacts which will not occur on-site but which will affect the terrestrial habitat are the result of strip mining activity to supply the proposed plant with low-sulfur western coal. Approximately 3 to 12 square miles of land will be disrupted to supply the amount of coal needed for the projected 30-year operating life of the facility.

Transmission Lines
5.019
The operation of high voltage transmission lines will result in noise, radio, and television interference and potential shock hazard to inadequately grounded objects.

GRAPE INDUSTRY

5.020
Emissions from the proposed facility may have long-term chronic and synergistic effects on local grape crops. Although acute injury may not occur, the potential for impacts on productivity does exist. Decreased grape productivity would have serious economic and social consequences on the grape industry.

SHERIDAN SITE

LAND USE

5.021
Once the construction phase begins, the site will be committed to an industrial land use. Of the 986 acre site, 525 acres will be cleared for the proposed site facilities. Although all prior land use types will be compromised, agricultural land (447 acres) committed to the project area is the only form of land use loss that would result in a notable impact. The regional impact, however, would be minimal. Because the transmission corridors have not been selected, impacts cannot be accurately assessed. It can be assumed, however, that impacts resulting from corridor clearance would include loss or disturbance of wildlife habitat and aesthetic degradation, particularly from a visual point of view.

SOCIAL AND ECONOMIC IMPACTS

5.022
Prior to or during the construction phase, approximately 108 residents will be permanently relocated. This adverse impact is unavoidable, but will be made more tolerable by just compensation for the preempted property by the applicant. During construction, access to the area within the proposed site boundaries will be restricted to construction personnel. A 4,500 foot portion of Aldrich Road, the only public road that traverses the site, will be permanently removed from public use. The preemption of access to the site and the rerouting of traffic to circumvent the closure of Aldrich Road are minor adverse impacts that are unavoidable and will be incurred for the design life of the facility.

5.023
During the construction period there will be unavoidable disruptions of the normal agricultural pursuits of the site area. However, negative impacts will be minimized through the capacity of the regional economy to absorb reallocated resources such as farm labor. This impact, on a regional basis, is not substantial.

5.024
Natural gas concerns will be handled in a similar manner as proposed for the Pomfret site.

WATER QUALITY

5.025
Information supplied for the analogous Pomfret section is applicable to the Sheridan site.

AIR QUALITY

5.026
Information supplied for the analogous Pomfret section also applies to the Sheridan site.

NOISE

5.027
Information supplied for the analogous Pomfret section is applicable to the Sheridan site.

RESOURCE CONSUMPTION

5.028
While there may be slight quantitative differences in materials consumed in the construction and operation of the proposed station, depending on the site which is chosen (due to such factors as length

of transmission corridor or distance of the site from the lakeshore) no qualitatively significant differences in resource consumption are anticipated as a function of site selection. Thus, information on resource consumption for the Sheridan site is identical to that contained in the analogous Pomfret section.

AQUATIC ENVIRONMENT

5.029
Construction activities which can potentially have an impact on the aquatic ecology at the Sheridan site are similar to those of the Pomfret site since the same in-lake structures would be required at Sheridan. Similar to the Pomfret impact, construction of intake, discharge, and mooring structures at Sheridan should not affect the ecology of Lake Erie significantly. The specific differences between Sheridan and those previously described for Pomfret are listed below. A total of about 20,000 square feet of bottom area will be disturbed, destroying the habitat of all benthic organisms present. It is estimated that at an average density of 8,260 organisms per square meter of substrate, a biomass of 656 mg/m^2 dry weight of benthic organisms will be affected.

5.030
Streams on the Sheridan site which will be affected by direct physical alteration include Ryder Creek (S-1) and Eagle Bay Creek (S-3). Stream S-1 will be rerouted along the south side of the ash disposal area, whereas construction activity will occur in the extreme upper reaches of stream S-3's drainage (Figure 1-18).

5.031
Several of the 29 ponds on the Sheridan site will be altered directly by construction activities. These ponds will be eliminated because of construction and placement of plant structures, roads, storage and disposal areas. The placement of the plant structures on the Sheridan site will eliminate five ponds, totaling 17,000 square feet of surface area.

TERRESTRIAL ENVIRONMENT

5.032
The probable adverse environmental effects on the terrestrial environment of the Sheridan site, which cannot be avoided, are identical to those discussed for the Pomfret site.

GRAPE INDUSTRY

5.033
Emissions from the proposed facility at Sheridan may have long-term chronic and synergistic effects on local grape crops. Although acute injury may not occur, the potential for impacts on productivity does exist. Decreased grape productivity would have serious economic and social consequences on the grape industry.

CHAPTER SIX: ALTERNATIVES TO THE PROPOSED ACTION

POMFRET AND SHERIDAN SITES

INTRODUCTION

6.001
The purpose of this chapter is to set forth the presently available alternatives to the proposed action. The alternatives encompass a wide range of economic, environmental and social concerns and can be categorized as follows: alternatives not requiring the creation of new base load generating capacity; alternative power sources; alternative sites; and alternative plant designs. Several of these alternatives are deemed to be viable and applicable options to the proposed action. Other feasible alternatives are not considered preferable to the proposed action due to economic, social, or environmental concerns. Flue gas desulfurization (FGD) systems are addressed in this chapter and have been given special consideration in light of the Clean Air Act Amendments of 1977. With respect to the present New Source Performance Standards, the FGD systems represent an alternative to the use of low sulfur compliance coal. However, the U.S. Environmental Protection Agency is revising these standards in accordance with the new amendments. Should the revised standards significantly reduce the allowable emission of sulfur dioxide or define and mandate the use of FGD systems as "best available technology," the applicant would probably be required to install such systems at the proposed facility. The applicant has evaluated various FGD systems currently available and has indicated a preference for a non-regenerative or throwaway system with low sulfur western coal as the preferred fuel. The alternatives are essentially the same for the Sheridan and Pomfret sites. When differences do occur, they are discussed in this chapter.

ALTERNATIVES NOT REQUIRING THE CREATION OF NEW BASE LOAD GENERATING CAPACITY

"No Action" Alternative
6.002
The "no action" alternative would occur if the applicant did not take any steps to provide additional power by construction of new capacity (base load, peaking, or cycling units), purchase or transfer of electricity, upgrading of old plants, or delaying the retirement of existing plants. Therefore, the "no action" alternative places reliance on present peak load capacity to meet future demand. The demand for power from the applicant's system and from the New York Power Pool is projected to rise to a point where present generating

capacities will be unable to supply adequate power reserves. The consequences of inadequate reserves would be an increase in the frequency and severity of service disruption, with accompanying economic losses and social inconveniences. Further, the applicant is obligated to supply adequate electrical power to the customers within its service area and to maintain sufficient reserve capacity. The alternative of "no action" would violate this obligation to the applicant's customers and would be contrary to contractual arrangements with member companies of the New York Power Pool (NYPP). This alternative has been rejected as being impractical.

Purchased Power and Exchanges of Power

6.003

The sale of surplus power by neighboring power concerns and the exchange of power between members of the NYPP have been considered as alternatives to construction of the proposed facility. Commitments for the long-term purchase of power are unavailable due to the projected growth in usage which is anticipated for most power companies over the next several years. If purchased power were available it is unlikely that it could be obtained as cheaply as it could be produced by the proposed Lake Erie Station.

6.004

According to the projections contained in Table 1-6, there may be a brief period of time beyond 1985 when the NYPP would have some excess power which could be made available to help meet the applicant's needs without lowering pool reserves below 22 percent. However, this excess is not large enough, nor is it projected to persist long enough to substitute for construction of additional generating capacity by the applicant. Although the alternatives cited are viable, they have been rejected by the applicant as impractical given its own reserve requirements and the reserve requirements and supply plans of neighboring systems.

Reactivation or Upgrading of Older Plants

6.005

The proposed facility will have a capacity equal to approximately one-third of the entire existing capacity of the Niagara Mohawk system (Table 1-1). Currently, in the applicant's system there exists no one plant which possesses even one-half the capacity of the proposed facility. Upgrading of existing plants as an alternative to the construction of a new facility is not a feasible course of action given the large incremental addition to demand which the proposed units are planned to meet.

6.006

The applicant plans no retirements of units which could be deferred, and has no decommissioned plants which could be reactivated to provide needed capacity in place of the proposed facility. The applicant could provide additional energy by operating existing peaking units in a base load mode. However, this action would be irrelevant to meeting the need for additional power demand since peaking units are presumed operational during times of peak demand in any event. Furthermore, the energy thus obtained would be more costly than energy from the proposed station because of the economic inefficiency of peaking units. The applicant concludes that reactivation or upgrading of elements of its existing system does not provide a feasible alternative to the construction of new generating capacity.

Conservation and Demand Reduction

6.007
One can attempt to bring projected electricity supply and demand into line by cutting demand as well as by raising supply, i.e., by conservation. Conservation of electricity can be encouraged by means of publicity or monetary incentives and penalties. The applicant has attempted to encourage conservation through conservation campaigns which include the distribution of pamphlets outlining measures that can be taken to conserve electricity and through television campaigns. Conservation can lead to lower demand but only if public attitudes and practices toward conservation become much more vigorous than studies show them to be at present. The applicant's demand projections contained in Chapter One of this statement already incorporate conservation in a reasonable manner. However, the projections are based on conservation as a result of economic variables rather than by a "conservation ethic." The actual contribution of the "conservation ethic" in demand reductions is questionable at this time.

6.008
Although they depend on the attainment of requisite regulatory approvals and subsequent acceptance by customers, alternative rate structures designed to encourage energy conservation have been considered as a means of reducing peak consumption and consequently needed capacity. The applicant already has a rate tariff for 70 percent of its commercial sales and virtually all of its industrial sales. The tariff incorporates a demand charge which serves as an incentive for the customer to minimize his monthly peak load. The rate structure also encourages high monthly load factors, and discourages major seasonal variations. Increases in the tariff would probably result in economic hardships for industrial and commercial customers and consequently increased costs of their products rather than further reductions in peak demand.

6.009
The institution of a demand charge applied only to daytime loads to

encourage industrial customers to use electricty during off-peak nighttime hours has been rejected as impractical since it is doubtful that such a modification would yield a significant increase in system load factor. The applicant's daily and annual load factors are already very high and have displayed stability since the early 1950's. This stability has been attributed to the applicant's broad mix of customer types, the sheer expanse of the service territory, load diversity, the hetegeneous array of communities served, and the moderate summers in the service area. For any typical day the load curve is essentially flat for a fourteen hour period extending from 8 a.m. to 10 p.m. The remaining "nighttime" hours, during which large users of electricity would be immune to a demand charge, represent a generally unattractive period for industrial and commercial operation. Labor resistance and wage premiums would constitute the foremost obstacles to an industrial customer's shifting a major amount of usage to the nighttime hours. For a commercial enterprise, such a shift in operations from conventional business hours would be totally infeasible. There is also the further question of the cost-justification of any time-differentiation of rates.

Contrary to the premise underlying this proposal, the cost justification has yet to be conclusively demonstrated for the applicant's system.

6.010
Another rate alternative is the installation of a peak load pricing principle that attempts to make the price of electricity equal to the marginal cost of producing electricity. In peak periods, the cost is higher than in off-peak periods because the cost of supplying peak demand includes the additions to capacity and the higher cost of the less efficient plants necessary to meet the peak. This alternative has also been rejected for the cost-justification reasons. Niagara Mohawk's unique situation in this regard is a result of two basic causes. The first is the flatness and stability of the load curve. The second is the match of Niagara Mohawk's generation resource mix to its load profile. In particular, most "peaking" energy is supplied not by petroleum-based combustion turbines, but rather by conventional and pumped-storage hydro units. As a result, present analyses suggest that, on Niagara Mohawk's system, it may not be possible to isolate significant periods of the day during which a pricing differential would be warranted. Moreover, any major shift of energy consumption from peak to off-peak periods might actually increase reliance on expensive, base- and intermediate-load, oil-fired generation. Ultimately, such shifting would intensify the need for more base load generation of the type represented by the proposed Lake Erie Generating Station. The company is now conducting a marginal cost study which, when concluded, will provide firmer evidence as to the economic justification for time-differentiated pricing. Even

if this study provides support for such rates, their potential as an alternative to building the proposed facility would likely be minimal. Given the delays in the rate-making process, it is doubtful that such rates could be implemented much before 1980. Because of the high costs and logistical problems of installing meters it would take many more years before such rates could be fully implemented with all customers. Other factors tend to diminish the likely impact of such rates if they are put into effect. What studies do exist suggest that electric demand is less price elastic during peak periods than it is in general. Finally, with the load factor as high as it is, the absolute potential for economic peak reduction is less than it is for most other utilities. In view of these considerations, it is very unlikely that present investigation of the peak load pricing concept will lead to a significant reduction in the applicant's 1985 peak demand.

6.011
A possible means of inducing energy conservation by residential users is to provide conservation rate incentives designed to provide lower rates for consumers using less than a designated number of kilowatt hours per month. It is first worth noting that Niagara Mohawk's present residential tariff constitutes an essentially flat rate structure. The tail block begins at 201 kwhr, a level which the vast majority of customers exceed on a monthly basis. For most residential customers, therefore, this tariff appears no different from one in which there is a fixed customer charge plus a flat rate for each kilowatt-hour used. This rate structure is designed so that each customer's bill will accurately reflect the costs of providing him service, regardless of his level of usage. During the applicant's most recent, completed rate proceeding, Niagara Mohawk proposed a residential rate of the type emphasized in this alternative. The suggested rate would have reduced bills for monthly usage less than 360 kwhr, while at the same time raising bills for monthly use above that level. The NYS Public Service Commission rejected this proposed rate structure since it would not allocate costs fairly among residential users. The higher use customers would be subsidizing lower use ones by paying a large proportion of the latter's customer costs. In imposing the structure now in effect, the Public Service Commision stated, "Niagara Mohawk will have a virtually flat rate structure for the recovery of energy and demand costs." The evidence then is that any shift away from present residential rate structure toward a "conservation" rate would in effect represent a departure from cost-based pricing. As such, the conservation rate would have to be considered undesirable on grounds of economic efficiency.

6.012
A measure for eliminating or reducing demand is load curtailment. Interruptible load contracts fall into this category. A customer on

an interruptible load contract may have service discontinued during periods when capacity is inadequate. The attractiveness of this contract depends on the rate incentive that is awarded, and the identification of the number and duration of interruptions that may be specified in the contract. Industrial interruptible power, as it exists in the United States, is concentrated in basic metal industries such as steel and aluminum, where batch process operations are used. At the moment, Niagara Mohawk has no customers who take service under interruptible load contacts. The company, however, is presently holding exploratory discussions on the subject with the Public Service Commission (PSC) and with the Industrial Power Consumers Conference (IPCC), an association of large industrial customers. Research into the appropriate design for an interruptible rate has not progressed far enough to allow any firm conclusions concerning its acceptability to customers. Consequently, while it is the applicant's present judgment that the ultimate effect of these deliberations upon demand growth will be slight, it is not yet possible to make any quantitative projections.

6.012a.
A 1973 report to the President on "The Nation's Energy Future" focused attention on the importance of energy conservation as a major effort in national energy self-sufficiency. Conservation through increased efficiency of energy use has been legislated in areas such as automobiles, electric appliances, and building insulation. The role of conservation as part of national energy policy was stressed by the President in 1977 by the National Energy Plan. The applicant has carried out conservation programs with the intent of informing customers of measures which can be taken to conserve electricity and is continuing these programs. The applicant promotes measures to reduce heat loss through adequate insulation including an advisory service to area customers. Although the applicant cannot quantify the effect of these programs, especially in light of abnormal economic and climatic conditions, there is an indication of decreased consumption of electrical energy in the service area. Corps staff finds that the actual energy demand during the past years has failed to meet projected values. This may be partially due to conservation but economics probably played a greater role. Classical economic theory dictates that, all other factors held equal, the rising cost of electricity will induce households and businesses to lower their demand for electricity. The result is an array of actions commonly associated with the concept of energy conservation such as those listed below:

By households:

- elimination of excessive lighting

- lower thermostat settings

- insulation retrofit in existing homes and heavier insulation in new dwellings

- consideration of energy efficiency in the purchase of appliances.

By business:

- total energy budget concepts applied to commercial construction

- waste heat recycling

- lower lighting standards

- marginal substitution of labor for capital.

In regard to national energy plans and future energy legislation, the applicant's forecasts for the major customer sectors have already made certain assumptions concerning the expected impact of these programs. Thus, to the extent possible, forecasts have already been adjusted in anticipation of governmental policy. A factor which may mask conservation efforts to reduce consumption of electricity is the possible future substitution of electricity for other energy forms such as oil and natural gas.

6.012b.
Federal government and many state and local governments have set up priority conservation programs. Agencies such as the Department of Commerce, Federal Energy Regulatory Commission, Department of Energy, National Endowment for the Arts, and National Bureau of Standards have programs to promote energy conservation by encouraging: more energy-efficient products, energy-efficient buildings, and development of efficiency standards.

Efficiency can be achieved in space heating and cooling by improved insulation and use of building materials with better insulation properties. The use of equipment which transfers or stores excess heat or cold also increases efficiency. The American Society of Heating, Refrigerating, and Air Conditioning Engineers recommends insulation standards which are more efficient than existing standards. Following these standards could reduce energy consumption by about eleven percent in single family residences. The American Institute of Architects (AIA) recently issued guidelines on Energy and the Built Environment. The AIA estimates that the built environment consumes about one-third of the nation's energy and that consistent energy conservation in buildings could save the equivalent of 12.5

million barrels of petroleum per day by the year 1990. This is greater than the estimated 1990 production capacity of domestic oil. The AIA has also computed 1990 production capacities for nuclear, natural gas, and coal sources based on a million barrels of oil per day equivalent. Energy savings through conservation (12.5 million barrels per day) could exceed the 1990 nuclear or natural gas production capacity and approach that of coal. These savings are sizeable and use of AIA guidelines could reduce energy consumption.

Consumption of electricity can be lowered by decreasing lighting which accounts for about 24 percent of all electricity sold nationally. In many industries and commercial buildings, lighting may be reduced by almost 50 percent through various design and operational changes.

The measures and programs summarized in paragraphs 6.012a. and b. are examples of potential future energy savings. Although these may reduce the need for capacity additions at some point in the future, it is difficult to predict the conservation effects on need for the Lake Erie Generating Station capacity.

New Non-Base Load Capacity

6.013

New capacity may be designed for either base load or non-base load operation. Niagara Mohawk has taken part in on-going optimum-mix generating studies of the New York Power Pool which have been reported in recent years in the annual 149-b Reports of the New York Power Pool Member Companies. These optimum-mix studies have concluded that for the New York Power Pool as a whole, peaking capacity on the order of 15 percent of total capacity is economically optimal. This result is based on pool-wide energy requirements, with an annual load factor on the order of 62 percent. For a system like Niagara Mohawk, with an annual load factor of approximately 70 percent, it follows then that peaking capacity less than 15 percent of total capacity is economically optimal. While this level has not been calculated exactly, it is judged to be in the range of 11 to 13 percent of total capacity. Environmental factors have been included in these studies to the extent that capital and operating costs of the appropriate environmental equipment associated with the various types of generation have been included (NY Power Pool, 1976).

6.014

For the year 1985, Niagara Mohawk's peaking capacity, with or without construction of the Lake Erie Generating Station units will be greater than 15 percent of its total system capacity. Thus, construction of new base load rather than new non-base load capacity is preferable for economic reasons.

ALTERNATIVE POWER SOURCES

Oil

6.015

Combustion of oil is a commercially proven alternative for the generation of base load power. Presently this method supplies nearly 40 percent of the base load power in the applicant's system (Table 1-1). Future availability of oil is an important factor when evaluating the use of oil for industrial applications. Oil supplies from foreign countries (which make up a significant part of the countries total annual consumption) are subject to availability and costs as dictated to a large extent by political considerations. Due to the unreliability of future supplies the applicant concludes that the use of oil as a fuel source is inadvisable if other viable alternatives are present.

Natural Gas

6.016

From an environmental viewpoint, natural gas is the preferred fossil fuel, since the combustion-related emissions of particulate matter and oxides of sulfur are significantly less than those generated by other fossil fuels. Also, gas-fired generation units require the least complex equipment, and require lower construction and operating costs. However, the quantity of natural gas necessary to generate the required amount of electricity is not available to Niagara Mohawk's system and cannot presently be obtained and delivered on an economical basis. Therefore, no further consideration was given to this alternative.

Nuclear Fission

6.017

Nuclear fission is considered a viable alternative to the use of coal in powering the proposed Lake Erie Generating Station units. Economically, the methods are comparable with a nuclear plant having a higher capital cost but an offsetting lower fuel cost. The impact to the environment for each method is summarized in Table 6-1 for a hypothetical situation involving two 1,000 MW units. According to Table 6-1, coal-fired units could have potentially more impact from the standpoint of atmospheric emissions, waste deposition, aesthetics, and noise.

Nuclear units, on the other hand, could have greater impact from the standpoint of liquid discharges, consumptive water use, effects on aquatic biota and, possibly, natural resource utilization. In addition, there are potential environmental impacts associated with the mining, processing, and transportation of the fuels. Although nuclear fission is a viable alternative, the applicant has decided that in order to maintain a diversity of fuel usage in the base load

TABLE 6-1 (Sheet 1 of 3)

COMPARISON ENVIRONMENTAL FACTORS [1]
COAL-FIRED GENERATING UNIT

VERSUS
NUCLEAR-FIRED GENERATING UNIT [2]
1000 MW CLASS

Item	Coal-Fired Unit	Nuclear-Fired Unit (BWR)
1. Land Use	500-600 acres	700-1000 acres
2. Atmospheric Discharges		
a. Noble Gases	None [3]	20,000-30,000 ci/yr
b. I-131	None [3]	0.6 ci/yr
c. I-133	None [3]	3.0 ci/yr
d. SO_2	9×10^7 lb/yr	None [4]
e. NO_2	10×10^7 lb/yr	None [4]
f. Particulates	$2\text{-}3 \times 10^6$ lb/yr	None [4]
g. Hydrocarbons	$1\text{-}2 \times 10^6$ lb/yr	None [4]
h. Heat [5]	6.3×10^9 Btu/hr	7.0×10^9 Btu/hr
3. Liquid Discharges [6]		
a. Tritium	None	20 ci/yr
b. Other Radioactive Isotopes	None	2-5 ci/yr
c. Blowdown Water	1.9×10^9 gal/yr	2.6×10^9 gal/yr
d. Heat	18×10^6 Btu/hr	25.7×10^6 Btu/hr
e. Chemicals	(7)	(7)
4. Other Effects [8]		
a. Consumptive Water Use	3.7×10^9 gal/yr	5.2×10^9 gal/yr
b. Makeup Water Required	5.6×10^9 gal/yr	7.8×10^9 gal/yr
c. Fuel Consumption	3.75×10^6 ton/yr	1375 kgs/yr U^{235}
d. Fuel Wastes	(9)	(9)
e. Aesthetics	(10)	(10)
f. Noise	Some	None

TABLE 6-1
(Sheet 2 of 3)

Notes:

(a) The factors presented in this tabulation reflect only those associated with the type of fuel being utilized and not all the discharges or potential environmental related factors associated with electric generating stations.

(b) All numbers in the tabulation are based on a 1000 MW generating unit operating at 100 percent capacity unless otherwise noted.

(c) Coal-fired units would emit radioactivity in the atmospheric emissions. These quantities are not of regulatory concern.

(d) During plant start-up and for some auxiliary diesel generators, a nuclear unit would emit atmospheric discharges containing fossil fuel constituents. These discharges are neither large nor continuous and amount to orders-of-magnitude less lbs/yr than the coal-fired unit.

(e) Utilization of a closed-cycle natural draft cooling tower system for waste heat dissipation results in substantial quantities of heat rejected directly to the atmosphere.

(f) The liquid discharges constitute those specifically related to the fuels being burned.

(g) Though both plants would discharge chemical effluents associated with the condenser cooling water system, the quantities would be dependent on ambient water quality and plant design features and cannot be estimated for this tabulation. In any event, the effluents would be in accord with the applicable EPA effluent limitation requirements.

(h) These effects correspond to those that are related to the fuel being used and can potentially result in environmental impacts.

(i) The wastes associated with nuclear-fired units are commonly quantified in truck loads removed for reprocessing or storage. For a 1000 MW class BWR nuclear unit, approximately 94 truck loads of radioactive waste would be removed per year.

Waste from burning coal consists primarily of fly ash. This waste would be contained in an ash pond within the site boundaries. The approximate amount of ash produced per year for the 1000 MW coal-fired plant is 6×10^8 lbs.

TABLE 6-1
Sheet 3 of 3)

(j) Quantitative estimates for aesthetic effects cannot be given. However, the coal-fired unit would entail a coal storage area of about 30 acres (45 day supply), an ash pond of between 300-400 acres (total plant life), coal handling facilities, and stacks approximately 750 feet high. The nuclear facility would have none of the above mentioned installations.

units and because a nuclear plant has a projected lead time of approximately ten years, a coal-fired plant is more feasible for the proposed Lake Erie Generating Station.

Nuclear Fusion
6.018
Fusion reactors are being researched in the United States and other parts of the world. While some breakthroughs have been made in this field, there is no assurance that this energy source will be a technically feasible alternative before the end of this century.

Nuclear Breeder Reactors
6.019
The breeder reactor is presently being developed by industry and various national governments, including that of the United States (through the Energy Research and Development Administration). Demonstration breeder reactors are already in operation abroad. However, commercial application of the breeder within this country is dependent upon creation of a nuclear fuel reprocessing industry and favorable resolution of public policy questions about the handling of plutonium fuel. Commercial application of the breeder is not expected before 1990 and, therefore, cannot meet the demand which the Lake Erie units are intended to fulfill.

Hydroelectric
6.020
There are no sites in the state which possess the hydroelectric potential that could supply the electrical output necessary to meet the desired future load demands. Niagara Mohawk has 81 hydroelectric plants throughout its system, which presently account for approximately 10 percent of the installed system capacity and the company intends to install additional plants. Most of these existing plants are small supervisory load-controlled units with the largest being 50 MW. Hydroelectric power is not considered a viable alternative to the proposed units.

Pumped Storage
6.021
A pumped storage project would be unsuitable because it represents peak load capacity and not the base load type capacity required to meet Niagara Mohawk's power needs. For these reasons, no further consideration was given to this alternative.

Geothermal Energy
6.022
Power generated from geothermal wells is technically feasible today. Many areas of the world use steam from heated geological sources to produce electric power and some limited sources are being used in the

western part of the United States for the production of electricity. However, there are no known or anticipated feasible resources of geothermal steam in the New York area.

Solar Energy
6.023
Techniques for the conversion of solar energy to electric power have been proposed and are currently being investigated. At the present time this technique is feasible for small-scale applications, such as heating and cooling of individual homes. However, because of the intermittent nature of solar energy, until a low-cost method of energy storage can be coupled with solar units this type of production will remain unsuited as a source of base load power. For this reason, solar energy was deemed inapplicable as an alternative method.

Wind Energy
6.024
Since New York State appears to have some relatively favorable sites for wind generation, the applicant has developed a conceptual design and cost estimate for a wind power system comparable in generating capacity to Lake Erie Units 1 and 2. A conservative cost estimate shows that the lifetime cost of power from a wind generation system would be twice that of the power from the proposed coal generation system. Additionally, like solar energy, wind energy is intermittent and would necessitate a system of energy storage. The applicant believes that from a reliability standpoint a large scale wind generating system is infeasible given current technology. For this reason wind energy has been rejected as an alternative method.

Coal Gasification and Liquefaction
6.025
Production of liquid and gaseous fuels from coal has been accomplished in the past. Numerous technical problems remain to be solved, however, before this technology can be deployed on a scale and with the environmental compatability consistent with current public needs and values. It is likely that when such fuels become available they will be preempted by market forces or public policy for uses now requiring oil or natural gas. In addition, the desirability of first processing coal into liquid or gaseous fuels--with the associated environmental, economic, energy, and social costs--and then burning the products to produce electricity rather than burning the coal directly is questionable at best.

Municipal Solid Wastes
6.026
Energy recovery from municipal refuse does not represent a viable alternative to the Lake Erie Station for several reasons. The amount

of municipal refuse available in the Niagara Mohawk service territory is insufficient as the sole fuel for the required 1,700 MW of generating capacity. Municipal refuse produced in Erie and Niagara Counties could supply the fuel requirements for about 200 MW of electrical generating capacity. Based on the Erie-Niagara data, it is estimated that the total amount of municipal refuse produced in the Niagara Mohawk service area could fuel only about 400 MW. On the same basis, the fuel value of all municipal refuse produced in New York State might be sufficient for up to 2,400 MW. However, the logistical problems of collecting, transporting and processing all of this widely-dispersed waste would be insurmountable. For example, to fuel a 1,700 MW power plant about 2,200 truck deliveries of refuse would be required per day, using special high-tonnage trucks.

6.027
Use of municipal refuse as a supplemental fuel (supplying about 20 percent of the fuel requirement for a conventional fossil plant) rather than a primary fuel appears to be better suited both to the combustion properties of refuse and to the quantities locally available. The use of processed shredded municipal refuse as a supplemental fuel in a conventional coal boiler has been demonstrated in St. Louis. Niagara Mohawk has studied this technique since 1970, and believes it can be economically competitive. At present, Niagara Mohawk is exploring the possibility of obtaining supplemental fuel derived from Erie County municipal refuse for use in one of Niagara Mohawk's existing coal-fired stations.

Bioconversion
6.028
The growing of burnable crops on land of marginal value for food crops has been proposed as an energy source. The applicant does not believe this to be a demonstrably reliable energy source on the scale and time frame of the proposed Lake Erie units and has not considered this alternative further.

Magneto-hydrodynamics
6.029
Magneto-hydrodynamics systems are presently being researched. There is potential for high efficiency generation with low environmental costs. However, technology does not exist today which would allow reliable generation by this means.

Electrogasdynamics
6.030
Electrogasdynamics generating systems are also being researched now. Again, technology does not exist today which would allow reliable generation by this means.

Gas Turbines

6.031

Gas turbines are generally unsuited for the continuous operation required of base loaded units. They are known to have a relatively low availability due to maintenance requirements and to have a high fuel cost. Significant environmental impact could be experienced due to sound levels emitted by the large number of units (approximately 20 to 30) necessary to generate the required amount of electric power. Finally, the use of oil required to fuel these units is inconsistent with national energy policy. Therefore, this alternative was not evaluated in greater detail.

Combined Cycle Systems

6.032

A combined cycle plant is one in which the waste heat output of a gas turbine plant is used as the primary energy source (supplemented by additional fuel combustion as necessary) of a conventional steam plant. Since such plants involve use of gas turbines, they are best suited to operation as intermediate units rather than the base load units presently needed by the applicant. Furthermore, the economics of combined cycle operation depend on fuel oil costs and availability (Pridely, 1973). This alternative, therefore, is not considered desirable compared to coal.

Fuel Cells

6.033

Commercially sized fuel cells are being developed by Niagara Mohawk and others in the electric utility and related industries. As now anticipated, prototype units for testing purposes may be available in 1978. Based upon favorable results of the testing as well as advances in technology, fuel cells may become feasible for providing base load electric power in future generating units. They cannot now be relied upon to provide an alternative for a base load unit scheduled to come on-line in the mid-80's.

Decentralization of Power Systems

6.033a.

The American Institute of Architects (AIA) recommends the decentralization of energy production and placing smaller production units as close as possible to the local demand area. Thus, rather than large generating facilities which transmit energy over a great distance, small units serving a local area would be used. Various alternative sources of energy such as solar energy, wind power, or solid waste combustion, could be used to power these localized facilities. This would decrease energy loss through long-distance transmission .While the use of alternative power sources for decentralized systems may play an important role in the future, these sources, be they decentralized or not, are regarded as either uneconomical, technically infeasible, unreliable for base load capacity, unavailable within the state, lacking in sufficient quantities of generating material or a combination of any or all of the above. Consequently, the concept of decentralized alternative generation is not regarded as a viable economic alternative to the facility proposed.

Others

6.034

There are a number of other means of generating electrical power which are not considered technically feasible in New York though these are in various stages of research and development and may be feasible in the future or in other locations. These alternatives were, therefore, not considered in detail. They include oil shale, waves, tidal energy, thermionic devices, and ocean thermal gradients.

ALTERNATIVE COAL SUPPLIES

6.035

Six general areas were investigated as possible suppliers of coal for the proposed Lake Erie Generating Station: Eastern Kentucky - bituminous; Western Pennsylvania/Northern Western Virginia - bituminous; Ohio/Illinois - bituminous; Utah/Colorado - bituminous; Montana/Wyoming - subbituminous; and North Dakota - lignite. Each area was evaluated in terms of surety of supply, levelized fuel costs, plant capital costs, and potential operating problems. Plant capital costs included control and waste disposal systems requisite to meet air quality standards based on chemical composition of the particular coal. Alternative coals were reevaluated in light of the Clean Air Act Amendments of 1977. The reevaluation is discussed in this chapter in the section entitled "Flue Gas Desulfurization Systems."

6.036

The Eastern Kentucky coal is high in heat content and can meet present sulfur dioxide emission standards without a sulfur removal system. It is also a metallurgical-grade coking coal. Due to market pressure, this coal is both the highest priced fuel and the one with the lowest certainty of supply.

The Western Pennsylvania/Northern West Virginia coal could meet the fuel requirements for these units, but a sulfur removal system would be required, raising the cost of the plant, reducing the overall efficiency of the station and creating an additional waste disposal problem for the removal of system wastes.

6.037

The Ohio/Illinois coal is less attractive than the Pennsylvania coal due to its lower heat content, higher sulfur and ash fractions, and longer transportation distance. The Utah/Colorado bituminous coal has a sulfur content very near the present limit for regulatory compliance without using a sulfur removal system. This fuel will probably require desulfurization, and it has a high transportation penalty due to the long rail haul. Montana and Wyoming strip-mineable sub-bituminous coal is gathering the interest of both electric utilities and oil companies for possible coal gasification usage. Since the sulfur content varies from place to place, the necessity for a sulfur removal system would not be known until a coal contract is negotiated and boring data are available. The lower heat content and higher moisture content of this fuel dictate that a larger boiler and higher capacity coal handling equipment be used than with a bituminous coal. North Dakota lignite has an even lower heat content and higher moisture content than the Montana/Wyoming subbituminous coal. This would necessitate larger increases in boiler and coal handling capacity. Another problem concerning the use of lignite is the serious problem of spontaneous combustion when the ore is being shipped or stored.

6.038
The applicant's initial study indicated that there are significant economic and environmental incentives for using a western coal of low sulfur content without flue gas desulfurization systems. Since eastern bituminous coal (Penn-W Va) is a fuel with adequate reserves, and is the coal that the applicant is familiar with, it was retained as a viable option. Though the initial studies of western bituminous coal indicated it was less desirable than Pennsylvania coal, if scrubbers were required, simultaneous studies performed by other New York utilities indicated that western coal was a viable option and should be included in the second stage of analysis. Detailed study showed that even when a scrubber is added to the subbituminous plant, it still maintains its economic advantages over the eastern coal.

6.039
Based on the results of the study performed by the applicant, it was concluded that western subbituminous coal is the preferable fuel for the proposed facility. However, it is recognized that during the life of the facility, it may be necessary or economically desirable to change to an alternate fuel. To accommodate this possible switch the plant will be designed to burn various grades of coal with minimum plant modifications.

COAL TRANSPORTATION ALTERNATIVES

6.040
Three possible methods for the delivery of low sulfur western coal to the proposed station were evaluated by the applicant. The coal will

probably be mined in the Powder River Basin area of Montana/Wyoming. It would be transported by rail to Superior, Wisconsin and from there by lake ship directly to the proposed offshore unloading facility. This is the applicant's preferred alternative. The second alternative involves shipping the coal to an existing port such as Ashtabula, OH, Erie, PA, or Buffalo, NY. From these ports, it would be loaded into rail cars and brought to the proposed site. The third alternative is direct shipment from the Powder River Basin by rail to the proposed station. The last two alternatives would eliminate the need for an offshore unloading facility, but would necessitate construction of onshore rail unloading units. The use of Dunkirk Harbor has also been suggested as an alternative. This alternative has been rejected since the harbor is not a deep draft port capable of the large quantity of coal needed to supply the proposed station. Development of the harbor to handle coal for the proposed facility would be a major undertaking with significant environmental impacts.

Shipment Through the Port of Buffalo

6.041

A coal transshipment facility has been proposed for the Port of Buffalo. Although this proposed facility is in the planning stage, it has been considered as an alternative to direct on-site delivery. The incremental coal delivery cost of using the proposed Buffalo transshipment facility is estimated by the applicant to be $2.93/ton in 1977 dollars and $6.31/ton on a levelized basis over the 30-year life of the plant. The applicant estimates that based on the use of six million tons of coal per year, the cost differential associated with delivery of western coal to the Port of Buffalo rather than the proposed offshore unloading facility would be 18 million dollars per year in 1976 dollars or 37 million dollars per year levelized over the 30-year economic life of the facility. These incremental costs do not include the purchase of approximately 140 additional rail cars for transportation of the coal from Buffalo to the site. The applicant estimates that this investment would require an additional $6,800,000.

6.042

The capital costs associated with the two different modes of transportation also differ. The capital cost of the proposed offshore unloading facility and its associated equipment amounts to an investment of $90,300,000 according to the applicant's cost analyses. The Port of Buffalo proposal is estimated to have a capital cost of $33,000,000. The capital cost differential for coal delivery facilities themselves is about $57 million dollars in favor of the Port of Buffalo. The applicant believes that the higher delivery costs offset the capital cost differential. The applicant's analysis indicates that the capital cost reduction of using the proposed transshipment facility is $1.69/ton on a levelized basis. However, the net cost is still $4.62/ton higher than using an offshore facility at the site. From a reliability of supply standpoint the applicant is of the opinion that the transshipment option requires two extra handling steps in the delivery process with attendant increased susceptibility to work stoppages and decreased reliability of fuel supply in either the transshipment step or rail delivery step. The applicant is aware that support of the Buffalo transshipment proposal may help stimulate industrial growth in the Buffalo area, but believes that selection of this option would be at the expense of its ratepayers systemwide.

6.043
In its response to Corps of Engineers questions about the Port of Buffalo alternative, the applicant stated, "Niagara Mohawk Power Corporation is in favor of the development of the Port of Buffalo and of the development of coal transshipment facilities at the Port of Buffalo since these developments would have wide ranging and favorable consequences in the industrial, manufacturing, economic, and social spheres of the western New York community. Since Niagara Mohawk's service territory encompasses a large portion of the western New York region, Niagara Mohawk would stand to benefit also. However, it should be understood that, based upon the economic evaluation discussed above, Niagara Mohawk is not willing to become the lead or main tenant of a Port of Buffalo western coal transshipment facility. Niagara Mohawk has been informed by the Department of Commerce that its plans for development of the Port of Buffalo western coal transshipment facility are contingent upon its securing a lead or main tenant who would process large quantities of bulk materials through a transshipment center. Niagara Mohawk Power Corporation is sympathetic with the problem faced by the Department of Commerce in attempting to secure a lead or main tenant to finance a western coal transshipment facility, but Niagara Mohawk feels that it will not and should not be locked into routing LEGS coal delivery through the Port of Buffalo by virtue of the contemporaneous evolution of plans to build LEGS and the Department of Commerce's efforts to develop the Port of Buffalo. Niagara Mohawk's economic analysis indicates that it should be discounted as the viable candidate to fill the lead tenant's role in a Port of Buffalo transshipment facility. Niagara Mohawk feels that it is uneconomical and imprudent to saddle our ratepayers with the millions of dollars in increased coal delivery costs associated with delivery of coal to the Port of Buffalo." Moreover, the applicant indicates that "the Public Service Law of the State of New York, Section 65(3) bars any electric corporation from making or granting 'any undue or unreasonable preference or advantage to any person, corporation or locality...,' and that it would not be acceptable to expect customers statewide to subsidize a speculative venture which might help one specific region of the State."

6.044
The applicant's original estimates of the incremental costs of coal delivery through the Port of Buffalo were based on rail rates furnished verbally by Conrail "for study purposes only." Since that time, the applicant has obtained an official Conrail estimate. The official rate quote performed with respect to a rail rate between Buffalo and the Lake Erie Generating Station sites indicates that the original estimates were correct. The original estimate was $2.00 per ton for a volume of 6 million tons per year and the official quote from Conrail on 10 November 1977 was $2.00 per ton.

6.045
The New York State Job Development Authority (JDA) is not in agreement with the applicant's cost analyses for use of the Buffalo facility. The JDA believes that the applicant has underestimated the capital cost of their offshore facility and that the actual differential between the two proposals is closer to one dollar per ton rather than $1.69/ton. Another major difference between the proposals is the estimated Conrail cost of $2.00 per ton. The JDA believes that Conrail can profitably transport the coal from Buffalo to the proposed Lake Erie Generating Station at a rate of $1.00 per ton. Based on this rate, the incremental cost of delivery would be $1.93 per ton rather than the $2.93 per ton estimated by the applicant. Further, the JDA estimates that operating and maintenance costs for the offshore facility would be higher than those for the Buffalo based facility, and that the offshore facility would be subject to higher real property tax. The proposed Buffalo Transshipment Facility is intended as a multi-user, multi-purpose facility which will handle coal, iron ore pellets, and a wide variety of basic metals and ores. The JDA contends that the Buffalo facility would mean a substantial increase in the industrial growth of western New York whereas the single user facility proposed by the applicant would not provide these benefits. Additionally, the JDA indicates that the implementation of the applicant's proposal would jeopardize construction of the Buffalo facility and deprive the state of the opportunity to revitalize the economy of western New York.

6.046
The coal transportation alternative of routing the western coal through the proposed Buffalo facility was also evaluated by the Public Service Commission. The PSC direct case concluded that routing western coal through Buffalo would result in an additional present worth revenue requirement of over 174 million dollars and that the 90 million dollar savings of capital investment obtained by not building the offshore proposal is not enough to offset additional transportation charges that result by shipping through Buffalo. Corps staff is in agreement with the applicant and the Public Service

Commission that the transportation of six million tons of coal per year directly to the proposed site by lake ship is the most cost effective alternative for low sulfur western coal. Use of the proposed Buffalo facility involves shipping coal past the proposed generating sites by lake ship and then hauling this coal back to the site by rail. The additional lake ship charge, handling costs, and rail fees are additional marginal costs subject to future escalation. Although capital costs favor the Buffalo facility, staff does not believe that these costs offset transportation costs. The added ship and rail hauling distances needed to transship through Buffalo will require additional energy consumption. While this additional fuel consumption may be small on a national scale, it is contrary to national energy conservation programs and policies. Environmental impacts resulting from construction and operation of the applicant's proposed offshore facility have been analyzed by Corps staff. Staff found the impacts to be minimal and acceptable. A similar in-depth environmental study and assessment on the proposed Buffalo facility is not possible since the necessary baseline data have not been generated to date. Thus, meaningful environmental comparisons between the proposals cannot be made. While staff agrees that a multi-purpose multi-user facility is preferable to a single user facility, there is no guarantee that the proposed multi-purpose facility would be available in time to serve the applicant's needs or that this facility would be the most environmentally acceptable and cost effective alternative.

Shipment Through Ashtabula, Ohio, and Erie, Pennsylvania

6.047

These alternatives involve transportation of western coal to Superior, Wisconsin by unit train, then by lake ship to either Ashtabula, Ohio or Erie, Pennsylvania. The coal would be off-loaded at these ports and delivered to the proposed Lake Erie Generating Station by rail. However, the Ohio and Pennsylvania terminals would require additional capacity development and possible adoption of these facilities to transship coal. Although the additional revenue requirements for unloading lake ships at Ashtabula or Erie would be less than those at Buffalo, these modes of delivery nevertheless represent incremental cost adders when compared to the proposed offshore facility at the site.

Direct Rail Shipment

6.048

Direct all-rail shipment of coal is projected to cost approximately an additional $5.00/ton of coal more than the proposed option (in 1977 dollars) and greater than $10.00/ton on a thirty-year levelized basis.

ALTERNATIVE SITES

6.049
The criteria for site selection include the broad disciplines of engineering, economics, and environmental impacts. The objectives are to define the potential sites which could support the desired generating units in an economically and environmentally acceptable manner while also satisfying system planning and engineering requirements.

Regional Investigations
6.050
Four regions were considered by the applicant in its initial siting study: Hudson Valley Region; Lake Ontario-St. Lawrence Region; Buffalo-Niagara River Region; and the Lake Erie Shoreline Region (Table 6-2).

6.051
The Hudson Valley Region was rejected because of the number of historical and conservation areas along the river, the potential licensing problems associated with environmental considerations, and the higher fuel delivery costs which would be incurred by a plant situated in the region. No further detailed studies or site investigations were conducted in this region. The Lake Ontario-St. Lawrence region appears to have reasonably good potential due to the large supplies of cooling water and available land. Fuel shipment costs would be higher in this region because of the added distance from the potential sources of supply and shipping limitations of the Welland Canal. Detailed site evaluation was not undertaken in this region. The Buffalo-Niagara River Region was rejected because of the difficulty of finding a large, environmentally suitable tract of land and an environmentally suitable transmission route in an area as highly developed as the Buffalo-Niagara River Region. The Lake Erie Shoreline region was found by the applicant to be the most suitable region for the proposed plant.

6.052
Because of the need for fuel diversity, coal was chosen as the fuel source for this generating station. Western New York (and the Lake Erie shoreline in particular) is close to ideal as sites for coal-fired generation. The major advantages concern coal transportation. The main line trackage for two major railroads (Norfolk and Western, and Conrail) pass through most site areas or are immediately adjacent. Both lines consist of multiple tracks. In addition, the proximity to Lake Erie makes feasible the use of coal delivered by large lake freighters. The diverse transportation facilities should foster fuel supply competition and minimize fuel supply disruptions. In addition, the applicant's system's western division is projected

TABLE 6-2

ALTERNATIVE SITE REGIONS

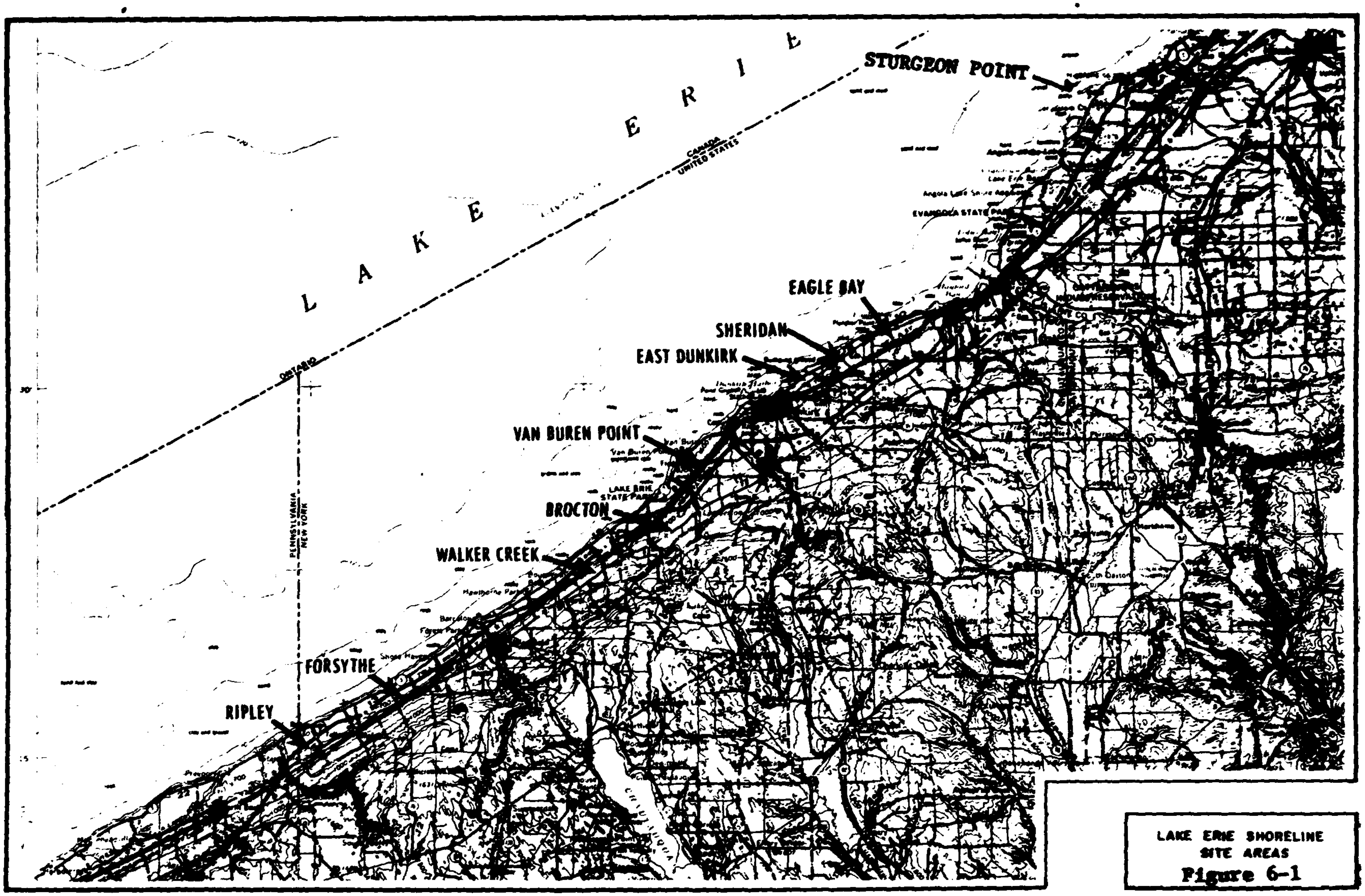
<table>
<tr><th>Name</th><th>Type of Facility</th><th>Cooling System</th><th>Water Source</th><th>Why Rejected</th></tr>
<tr><td>Hudson Valley</td><td rowspan="4">Two 850 megawatt coal units with provision for solid waste disposal on site and potential for expansion to 4 units (chosen on generic basis; see Paragraphs 6.12-6.52)</td><td rowspan="4">closed cycle system chosen on generic basis; particular type of closed cycle system (mechanical draft towers, natural draft towers, etc) not considered in regional investigations</td><td>Hudson River drainage system</td><td>many historical and conservation areas, environmental concerns, fuel costs</td></tr>
<tr><td>Lake Ontario-St. Lawrence</td><td>Lake Ontario or St. Lawrence River</td><td>fuel shipment costs and difficulties (region not totally impractical)</td></tr>
<tr><td>Buffalo-Niagara River</td><td>Lake Erie or Niagara River</td><td>too developed</td></tr>
<tr><td>Lake Erie Shoreline</td><td>Lake Erie</td><td>not rejected; the preferred alternative</td></tr>
</table>

to be deficient in generation in the late 1980's, which implies that transmission costs will not be excessive for plants sited on Lake Erie. Since environmentally acceptable sites were believed to be available in the region, these economic factors were judged to be of primary importance and detailed site analysis was confined to this region.

Individual Site Investigations
6.053
The following set of criteria was established to assist in choosing potential sites within the Lake Erie Shoreline Region:

- The site must be able to support at least two 850 MW units with the potential for two additional units;
- In order to minimize both environmental impacts and economic costs, the site must be capable of accepting all fly ash, bottom ash, and other solid wastes generated during the life of the station;
- In order to maintain flexibility of fuel supply, the site should have access to both rail and lake transportation;
- The site would have to be satisfactory from the standpoint of noise, aesthetics, land use and other environmental factors along with engineering and economic considerations;
- The site would not have to possess the potential for once-through cooling, since closed-cycle cooling would probably be used;
- The plant could be set back from the actual shoreline to reduce the aesthetic impact as viewed from the lake;
- The distance from the lake to the plant should not be excessive, thereby minimizing the length of the makeup and discharge water pipelines;
- The general area should have relatively flat topography, which is a significant advantage from a construction point of view.

Based on the criteria listed above, nine sites were identified for further investigation (Figure 6-1). As further information became available, the boundaries of the Van Buren Point site were adjusted slightly and the site was redesignated the Pomfret site; it is as the Pomfret site that this parcel is described throughout this document. Similarly, portions of the original Sheridan site were combined with portions of the Eagle Bay site and intervening land to produce a new Sheridan site, which is the Sheridan site discussed throughout this document. In compliance with New York State law, both the primary Pomfret and secondary Sheridan sites were investigated in great detail. Investigations at the other sites were dropped when it was judged that they were less desirable than the primary and secondary sites.



LAKE ERIE SHORELINE
SITE AREAS
Figure 6-1

Ripley Site
6.054
The Ripley site is typical of the topography found in the Lake Erie Shoreline Region in that it is relatively flat and used for croplands or vineyards or left as scrubland. The site is 600 acres in size but is split by the thruway. As a result, a 300 acre plot barely fits into the area between Route 20 and the thruway and since the railroad is across Route 20 the power plant spur would require a rail crossing over Route 20 to the site. The site is fairly close to the village of Ripley but it is not too near any other significant population centers. The distance from the lake for makeup water and possible coal delivery from a ship is not so excessive as to impose a significant economic penalty on this site, nor would disruption of the current land use appear to cause a significant impact if this area were selected as the plant site. However, a significant negative characteristic of the site is that there is almost no potential for screening any part of the station from the thruway. In addition, the proximity of the thruway would appear to preclude the use of low level cooling towers which do not have a plume abatement design since fogging and icing conditions could occur at certain times of the year.

Forsythe Site
6.055
The area on the other side of Route 76 and Ripley near Forsythe is similar in all respects to the land described above for the Ripley site. However, moving up to the Westfield township line astride Forsythe Road, the railroad crosses Route 20 and is directly contiguous to the site. As a result, the necessity for a railroad crossing would be eliminated. Again, the thruway splits the required acreage and presents potential aesthetic, fogging, and icing problems. As at Ripley, this site is not in a heavily populated zone, is a reasonable distance from the lake, and does not support any critical activities which would be taken out of production.

Walker Creek Site
6.056
The Walker Creek area is similar to both the Ripley and Forsythe Site. It has more potential for screening to reduce the visual impact of the low silhouette portions of the plant but, still has the potential cooling tower produced fog and ice problems. It is a reasonable distance from the lake, has on-site rail access, is not adjacent to any large population areas, and is not the basis for any critical land use activities.

Brocton Site
6.057
Most of the acreage of the Brocton area is on the south side of the

thruway and is the greatest distance from the lake of any of the areas considered. Although this feature would not preclude the site from use, it represents a negative characteristic. This site had potential for screening parts of facilities from the thruway, and since parts of the site are a reasonable distance from the thruway, the potential fogging or icing problems on the thruway are somewhat reduced. The area has on-site rail access, is not in the midst of any large population centers, and does not have any critical activities currently in effect which would be precluded if the plant were built there.

East Dunkirk Site
6.058
The East Dunkirk site area is located south of Route 5 near the city of Dunkirk. The area is in an industrial section, but it is not too far from residential areas. The site has rail access and is located at a reasonable distance from the lake. There are no critical land uses which would be precluded if the station were built on this area. Due to the site's proximity to the Dunkirk Airport, potential interference with aircraft operations resulting from tall structures associated with the facility or fog generated by a cooling tower may be a problem. The site is not adjacent to the thruway, so potential aesthetic and fogging problems encountered because of the proximity of the thruway are not considered significant. However, the proximity of a nearby residential area could raise aesthetic problems.

Sturgeon Point Site
6.059
This area turned out to be a private shooting reserve and, as such, was not considered any further.

Pomfret Site
6.060
The Pomfret site lies between Route 5 and the thruway with a road cutting through the central portion of the site. Since the majority of the area is away from the thruway and on the northern side of the railroad, the low level facilities could be hidden from the thruway, and the fogging and icing potential on the thruway could be reduced. The site is not a major population center, but is closer to Dunkirk and Fredonia than the other sites. The distance to the lake is reasonable and there are no critical activities which would be taken out of service. During preliminary site surveys, a major concern about the area was its proximity to the Lake Erie State Park and the associated aesthetic impact it could have on that visually sensitive land use. Specifically, it was recognized that the stack and, if used, a hyperbolic cooling tower would represent potential aesthetic impacts on the park. Further investigation and more detailed studies demonstrated that facility elements are visually subordinate

from the park due to partial blocking of the view by existing park vegetation.

Sheridan Site

6.061

The redesignated Sheridan site area is further away from Dunkirk and the populated shoreline near the East Dunkirk area. Although movement of the defined site area toward Eagle Bay has reduced the potential for airport interference, the site's proximity to the airport is a minor disadvantage. The site has adequate rail access, is not too far from the lake, and is not adjacent to the thruway. There is also potential for increasing the amount of natural screening so that there would be minimal aesthetic impact along the lake shore.
No critical land use would be removed from service if this site were selected.

6.062

The major considerations in choosing Pomfret as the primary site and Sheridan as the secondary site rather than the sites farther west was the reduction of potential for plant-induced meteorological impact on the thruway and better visual screening. Other factors were also of greater or lesser importance, depending on the given alternative site. The East Dunkirk site was not selected as a preferred or secondary site primarily because of the disadvantage of potential interference with Dunkirk Airport operations. In the applicant's judgment, the Pomfret and Sheridan sites represent the best balance of economic, environmental, and social factors pertinent to site selection. While Pomfret is designated as the preferred site, the applicant believes that Sheridan would also be an excellent site for these facilities. Table 6-3 shows a matrix summarizing pertinent information about the alternative sites in the Lake Erie shoreline region.

6.063

Alternative sites for solid waste disposal facilities were not considered by the applicant except in response to specific interrogatories addressed to the applicant during the Article VIII certification process. Due to adverse environmental and economic factors involved in the transport of large volumes of coal-related wastes (fly ash and bottom ash) the applicant believes that on-site storage be used whenever practical.

ALTERNATIVE PLANT DESIGNS

Cooling Systems

6.064

A single natural draft cooling tower which will serve both units, has

TABLE 6-3

ALTERNATIVE SITES ALONG LAKE ERIE SHORELINE

Name	Facility Type	Cooling System	Water Source	Viability	Reason for Rejection
Ripley	Two 850 megawatt coal units with provision for solid waste disposal on site and potential for expansion to 4 units (chosen on generic basis; see Paragraphs 6.12-6.52)	Closed Cycle (Specific type not considered in detail)	Lake Erie	Undesirable	Poor Rail and Adverse Cooling Tower Effects, Poor Aesthetics
Forsythe		Same as Ripley		Viable, but less desirable than Primary and Secondary Sites	Adverse Cooling Tower Effects, Poor Aesthetics
Walker Creek		Same as Ripley		Viable, but less desirable than Primary and Secondary Sites	Adverse Cooling Tower Effects
Brocton		Same as Ripley		Viable, but less desirable than Primary and Secondary Sites	Distance from Water Supply
Pomfret (1)		(3)		Primary Site	Not Rejected
East Dunkirk		Same as Ripley		Viable, but less desirable than Primary and Secondary Sites	Potential for Airport Interference, Proximity to Residential Areas
Sheridan (2)		Same as Pomfret		Secondary Site	Not Rejected
Sturgeon Point		Same as Ripley		Not Viable	Private Shooting Range

(1) Originally designated Van Buren Point site.
(2) Incorporating originally designated Eagle Bay Site
(3) Single natural draft cooling tower; 2 natural draft cooling towers; round mechanical draft cooling towers; plume abatement cooling towers; wet/dry cooling towers; spray canal; cooling pond; dry cooling towers; once-through system with diffuser discharge; once-through system with shoreline discharge

been selected by the applicant as the preferred method for dissipating the heat load from the proposed station. This type of cooling system will not result in fogging or icing along the thruway, yet it will provide a reliable and proven type of cooling in comparison with other closed-cycle designs. Also, the makeup water requirement of this system is greatly reduced compared to the once-through open cycle designs.

6.065
In selecting the type of cooling system, consideration was given to all cooling systems presently available for domestic generating stations of this size. Eleven systems were identified as warranting consideration as alternatives.

- Two Natural Draft Cooling Towers (one for each unit)
- Rectangular Mechanical Draft Cooling Towers
- Round Mechanical Draft Cooling Towers
- Fan-Assisted Natural Draft Cooling Towers
- Plume Abatement Cooling Towers
- Wet/Dry Cooling Towers
- Dry Cooling Towers
- Cooling Pond
- Spray Canal
- Once-Through Cooling System (diffuser discharge)
- Once-Through Cooling System (shoreline discharge)

6.066
A double natural draft cooling tower system (one for each unit) would exhibit the same advantages and deficiencies as the single natural draft cooling tower. In this design, each unit would employ a separate cooling tower to dissipate waste heat. Aesthetically, the cumulative effect of two smaller towers may be greater than the one tower. The two tower system would be slightly more expensive to build and is, therefore, economically less desirable than the single natural draft cooling tower system.

6.067
Mechanical cooling towers are dependent upon induced draft fans to draw ambient air into the tower whereas in the natural draft tower the air flow is induced by the chimney effect created by the lower density moist warm air rising through the hyperbolic cooling tower shell. Two types of mechanical draft cooling towers were considered, a rectangular design and a round design. Fogging potential with either type is greater than with a natural draft tower because neither possesses the plume rise of the natural draft tower. The increased potential for fogging would negatively impact area roads, especially the New York State Thruway. Consequently, because of the thruway safety factor, these systems were not considered viable alternatives to the preferred system.

6.068
Fan-assisted natural draft cooling towers combine certain factors of natural draft and mechanical draft towers. The fan-assisted natural draft towers utilize the counterflow principle, similar to certain types of natural draft towers; but with the use of fans, the required tower height is reduced. The applicant considered fan-assisted natural draft cooling towers in the same class as round mechanical draft towers with respect to environmental considerations. Consequently, this design was deemed unacceptable due to the potential for fogging on area roads.

6.069
The plume abatement tower reduces the level of fogging which is associated with mechanical tower systems. This is accomplished by the incorporation of dry cooling sections which slightly reduces the amount of water vapor released to the atmosphere. There is still some degree of low level fogging associated with this system. Economically, the plume abatement towers are more expensive than the natural draft tower design.

6.070
The wet/dry cooling tower system is a variation in design of the plume abatement system previously discussed. However, where the plume abatement system is designed principally to minimize the extent of visible plumes, the wet/dry system is designed both to reduce consumptive water use by the towers and to reduce the formation of visible plumes. This type of system is more expensive than natural draft towers and for this reason it was determined to be impracticable by the applicant.

6.071
Dry cooling tower performance is optimized when turbines capable of attaining back pressures as high as 14 inches Hg_a are available. However, current domestic designs are limited to operation at approximately five inches Hg_a maximum operating pressure and short time duration operation at approximately eight inches Hg_a. Currently there are no dry towers in operation in this country for the unit size contemplated at the Lake Erie Generating Station. The costs of dry cooling systems range between three to four times the cost of other conventional evaporative cooling tower systems. The reasons for this increase are the result of higher operative costs due to the auxiliary power requirements and the decreases in plant efficiency due to larger turbine back pressures. Environmentally this is the most favorable method due to the small amount of makeup water required and the lack of a visible plume. Due to the engineering and the economic requirements, this method has been found to be impracticable by the applicant.

6.072
A 4,000 acre pond would be necessary to dissipate the heat load which is expected from the proposed station. This acreage is approximately four times the size of the entire proposed site. Acquiring an additional 4,000 acres is deemed impracticable by the applicant in light of the additional effects this land acquisition would have on the terrestrial ecology and agriculture in the local area.

6.073
A closed-cycle spray canal was also considered as a possible alternative. The canal would have to be approximately 200 feet in width and about 9,000 feet in length. The potential for fogging will be increased at the plant site but it will be thinner than that from cooling towers and very localized. Area roads are not expected to be impacted by the fog. Spray canals are a viable alternative but are unproven for use as the primary cooling system for a facility the size of the proposed Lake Erie Generating Station.

6.074
The two once-through alternatives would require an intake structure capable of supplying the plant with 2,500 cfs. This water requirement is about 50 times that of the closed-cycle makeup system (45 cfs). Consequently, the once-through intake would result in considerably increased entrapment of fish on the intake screens and increased entrainment of planktonic organisms in the cooling water system. While population impacts of even very high rates of entrainment and entrapment are poorly understood at present, it is recommended that this impact to the aquatic environment be minimized if possible. The thermal impact of the once-through systems would also be greater than that of the closed-cycle system, significantly greater with the shoreline discharge. The waste heat load from the once-through alternatives would be 8.6×10^9 btu/hr. This is about 100 times the amount of waste heat contained in the closed-cycle system blowdown (7×10^7 btu/hr). The discharge from the once-through systems would result in greater thermal stress on the lake organisms and would have a greater potential for damage due to cold shock should forced outage occur during the winter months. The once-through system with the shoreline discharge would have the greatest aquatic impact of all the alternatives since it would be discharging heated water into a large area of the shallow, sensitive spawning and nursery areas at each of the two sites. Detrital, nutrient, and thermal input into this zone is expected to produce a significant impact on the area ecology. For the above environmental reasons and also because of the increased expense the applicant has decided that open-cycle cooling is impracticable for the proposed Lake Erie Generating Station.

Intake Systems

6.075

One primary factor in determining the design of the intake system is the source of water. This source must be capable of supplying the amount of water required to reliably meet the plant demand. The three sources considered for this plant were groundwater, on-site surface water, and Lake Erie. After studying the information on the existing ground water conditions, it was determined that the amount of water required for makeup could not be feasibly withdrawn from the on-site ground water supply. The number and size of either the wells or collectors needed for such a system would make these systems uneconomical. Inspection of the hydrology of the surface waters at both sites revealed that no source was capable of meeting the plant water needs reliably on a continual basis. Subsequently, Lake Erie was the source of water selected to meet the plant water needs. This source is capable of reliably supplying water requirements for the plant on a continual basis.

6.076

Possible intake structures were designed to be compatible with a closed-cycle cooling system and a makeup water requirement of 45 cfs. Alternate intake structures for the proposed site consist of: an intake with ports located in the breasting dolphin of the coal unloading dock, a submerged velocity cap intake and a surface intake.

6.077

Of the designs considered the intake with ports located in the coal unloading dock is the preferred alternative. This design is expected to result in less impingement and entrapment of fish than the other designs considered because of a number of reasons. First, its offshore location in 30 feet of water is an area where the concentration of fish has been found generally to be less than in the shallower waters closer to the shore. Secondly, specific features incorporated in the intake design reduce the aquatic impacts. The intake ports will be set flush with the face of the structure and will withdraw water horizontally from the lake at a maximum velocity of about 0.25 fps. By incorporating these ports into the coal unloading dock no additional disturbance of the lake bottom will be necessary.

6.078

The remaining two alternatives would involve increased construction costs and additional perturbations to the environment. The inshore location of the latter two alternatives could result in increased impact on the aquatic biome. Withdrawing water from the inshore areas which are utilized for fish spawning and have high ichthyoplankton densities would result in increased rates of entrainment and impingement.

6.079
Variations of the chosen design have also been considered as alternatives. These variations consist of locating the intake ports on the easterly or westerly side of the breasting dolphins rather than the shoreward facing side; locating the ports on the lakeward facing side; or constructing a submerged velocity cap intake at the 40-foot contour with an entrenched pipeline joining the intake to the coal conveyor tunnel. These variations were evaluated for the following reasons: the premise that fish may seek shelter from wave activity and would congregate on the shoreward facing side of the dolphin in the vicinity of the intake ports; and epiphytic organisms inhabiting the substate provided by the dolphins would tend to attract fish species seeking food.

6.080
Aquatic sampling studies at both the Pomfret and Sheridan sites demonstrated that higher densities of organisms including fish exited at the 10-foot contour in high wave activity than at the 30-foot contour, suggesting that wave action and turbulence is no deterrent to fish location. The exception to this finding was alewife. Although certain fish species are known to seek overhead cover, fallen tree snags, and artificial reefs, no evidence exists as to whether or not fish would seek shelter on the shoreward side of the dolphins. A potential attractant effect from moored ships or lights in the area may be more influential than the dolphins. At the present time there is nothing regarding fish behavior to suggest that placement of the ports on the east or west side of the dolphin would be advantageous.

6.081
Placement of the ports on the lakeward facing side was rejected since the water source would be affected by docked ships. There would be a more pronounced horizontal flow of water around the ship and it is suspected that little incoming water would pass in the space between the bottom of the ship hull and the lake bottom.

6.082
Epiphytic organisms on the dolphins will probably attract emerald and spot-tail shiners, trout-perch, logperch and other particulate feeders, which in turn could promote the presence of predators including yellow perch, bass, and walleye. However, fish may remain attracted to epiphytes on the ship's hull and stay in relatively safe water rather than move to the intake port locations. The placing of any intake structure lakeward of the dolphins to avoid the attractiveness of epiphytic assemblages immediately places restrictions on the location of the submerged intake. For example, ships taking up to 28 feet of draft would have to pass over or near the intake prior to docking. A velocity cap on the 40-foot contour would be

restricted to being no more than 10 feet off the bottom to avoid collision with incoming ships. Additionally, the construction expense of placing the intake at the 40-foot contour would increase. The applicant has rejected this alternative since there is no significant biological advantage attained by moving the intake from the 30-foot to the 40-foot contour and, therefore, the added expense is not justified. Additionally, the submerged velocity cap would also be subject to epibiotic growth.

6.083
The Section 402 draft discharge permit for the proposed facility includes evaluation of the intake location, design, construction, and capacity in accordance with Section 316(b) of the Federal Water Pollution Control Act and Section 704.5 of the Water Quality Standards. The draft permit requires biological monitoring programs to investigate the actual operating effects of the intake. The evaluation of the intake in accordance with 316(b) led to the recommendation that the applicant include a stub or extension of the intake pipe which could be valved or blind flanged in order to assure that the intake location could be changed in the future with minimum disruption to plant operation if the biological monitoring program demonstrates that relocation is necessary. Staff concurs with this recommendation.

Discharge Systems
6.084
The alternative discharge system designs were compared and assessed on the basis of engineering feasibility, environmental impact and economics. All of the designs considered were capable of discharging the effluent of two 850 MW coal-fired units utilizing a closed-cycle natural draft cooling tower system based on three cycles of concentration.

6.085
Initially, consideration was given to the possibility of discharging the effluent into one of the streams which flows through the sites. However, inspection of the hydrology of these streams revealed that they possess insufficient flow to provide an adequate amount of dilution water and, therefore, could adversely affect the character of the streams. Consideration was also given to utilization of a discharge structure located along the shoreline of Lake Erie. However, due to the shallowness of the water along the shoreline, use of this area for spawning by some species of fish and because of the concern over the possible accumulation of ice in the vicinity of the discharge, an acceptable design did not appear feasible and this mode of discharge was, therefore, rejected. Consequently, it was felt that the only acceptable mode of discharge was by utilizing an offshore discharge structure located in Lake Erie.

6.086
Three types of offshore discharge structures were evaluated by the applicant: a multiport diffuser located in 25 feet (7.6 m) of water, a multiport diffuser located in 30 feet (9.1 m) of water, and a single port discharge pipe located in 25 feet (7.6 m) of water. Because of the ice conditions which occur along the lakeshore in the site vicinity out to a depth of approximately 25 feet (7.6 m), this depth was established as the minimum depth for the location of a subaqueous discharge structure. Also a 600-foot (182.9 m) minimum separation distance was required between the location of the discharge structure and the intake ports to minimize the potential for recirculation of the heated discharge back to the intake.

6.087
The preferred alternative is the multiport diffuser located in 25 feet (7.6 m) of water. This design would comply with the New York State Department of Environmental Conservation's thermal criteria and would require little additional construction since the discharge pipe will utilize the coal conveyor tunnel. The multiport diffuser located at a depth of 30 feet (9.1 m) would also meet the thermal criteria but would involve additional construction impact to the lake habitat and is the most expensive of the three alternatives. The single port discharge located in 25 feet (7.6 m) of water is the least expensive design but would have the most significant thermal impact. The less efficient single port diffuser results in a larger zone of higher temperature, and hence greater potential for thermal stress to aquatic organisms than the other two alternatives.

Auxiliary Boiler Design

6.088
At present it is proposed that the auxiliary boiler will burn No. 2 fuel oil. While this is not contrary to law, the applicant's preferred alternative is inconsistent with national energy policy. An auxiliary boiler designed to utilize coal as fuel is a viable alternative to the preferred system.

WASTE HEAT UTILIZATION

6.089
Numerous uses of waste heat have been studied over the last 20 years in the United States and abroad. Principal uses are for agriculture, mariculture, sanitary waste treatment, saltwater desalinization, and space heating in urban areas. Application of any of these technologies is for the most part a marginal alternative and is, therefore, extremely site specific. One agricultural application which could significantly benefit from a cheap source of heated water is the growing of hothouse vegetables. This practice is presently used extensively in Ohio. Using waste heat in adjacent greenhouses could add a viable new industry to the area permitting year-round

agricultural endeavor. Another potential use of the waste heat would be the sale of steam to nearby industries for use as space heat or in manufacturing processes. Presently, the applicant has no plans for utilization of waste heat.

EQUIPMENT CLEANING METHODS

6.090
Two alternative methods of equipment cleaning are currently available in addition to the proposed use of chlorine. The substitution of ozone for chlorine is presently in use at sewage treatment plants in Europe. Ozone has several advantages over chlorine. Residual chlorine and certain chlorinated compounds can be toxic to fish and aquatic life at very low concentration, and residual chlorine can be fairly persistent under many circumstances. Because it is a very strong oxidizing agent, ozone dissipates rapidly, and therefore, would probably not be detectable in the discharge. Due to its high oxidizing ability, it would also react with any ammonia, chlorinated hydrocarbons, and other oxidizable compounds in the wastewater which may be present and detoxify them. At present the capital and operating costs of using ozone for equipment cleaning purposes are several times that of chlorine.

6.091
Mechanical equipment cleaning methods have been demonstrated to be effective means of cleaning condenser tubes in large utility power plants. These systems use sponge rubber balls or small brushes to continually scour the condenser tubes to keep the tubes clean. The balls or brushes are collected at the outlet of the condenser and returned to the condenser inlet. The continuous scouring mechanism system is considered highly acceptable from an environmental viewpoint because no net additional foreign elements above background are conveyed to the receiving waters from condenser cleaning operations. The use of the mechanical system, however, is restricted to cleaning condenser tubes and is not a viable alternative by itself for the proposed plant system, since it includes cooling towers.

FISH RETURN SYSTEMS AND INTAKE SCREENING

6.092
The applicant estimates an annual maximum (commercial value) savings of $3,500 (1974 dollars) of smelt (1,500 individuals) and yellow perch (10,000 individuals) if a fish return system returned all entrapped fish back into Lake Erie. Due partially to the low numbers of fish expected to be impinged annually, fish return systems have not been incorporated in the intake design. However, these systems have been evaluated as alternatives and their installation is recommended if the pre-operational or operational monitoring programs

required by the State's draft 402 discharge permit indicate the need. The applicant's 316(b) demonstration of intake design, location, construction, and capacity has been independently evaluated by the staffs of the New York State Public Service Commission, the NYS Department of Environmental Conservation, and the Buffalo District staff. The proposed intake design has been accepted as meeting the requirements of best available technology for minimizing adverse environmental impacts whether installed at Sheridan or Pomfret. The following paragraphs discuss the fish return systems which were considered.

6.093
Preliminary assessment of a conceptual fish return system for the proposed makeup water intake incorporated the following:

- fish removal at the screens of the onshore pump structure
- concrete holding chamber and fish pump
- return pipeline to Lake Erie

The order-of-magnitude initial investment cost for the system was estimated at $1,000,000 (1985 dollars). Annulized using a fixed charge rate of 22.6 percent this would represent an annual carrying charge of $226,000 that Niagara Mohawk Power Corporation must pay out, in addition to operating and maintenance costs, over the life of the station. A portion of this cost is the length of pipeline required to release fish during winter, beyond the ice; the distance required was estimated at 900 feet. The capital cost of such a return pipeline to Lake Erie has been estimated at approximately $50 per linear foot (1985 dollars). If the operation of the fish return system is not required during winter months, consistent with baseline data, then the return pipeline would terminate near the shoreline rather than extend out 900 feet into the lake. The resultant return pipeline would constitute a minor cost item. The cost-benefit analysis, on this basis only, indicates that at best, assuming no fish mortality and valuation of fish in 1974 dollars, it would take about 13 years of returning fish (with no consideration for operation and maintenance cost of the fish return system) to offset the cost of the fish return pipe alone. The applicant rejected these systems due to high costs and the low estimates of impingement.

6.094
The concept of retrofitting this type of fish return system would not present major difficulties, nor should the cost of retrofitting vary significantly with the cost of incorporating the system in the initial design. Modifications to an existing onshore pump structure would involve the installation of auxiliary retaining lips on the traveling screens, a gravity line to sluice fish to the holding

chamber and, if required, a dual pressure spray system. The additional capital investment for these modifications would not significantly alter the order-of-magnitude estimate presented above, wherein the predominant cost item remains the concrete holding chamber. Since the design and location of the holding chamber and fish pump system are independent of the onshore pump structure, increase in capital investment would only be reflective of material and labor escalation at the time of construction. The applicant has commissioned research to develop methods of alleviating potential fish entrapment at its proposed Nine Mile Point Nuclear Station - Unit 2 on Lake Ontario (Stone & Webster, 1977). Systems evaluated included:

- an onshore screenwell fish diversion system
- an offshore intake fish diversion system, and
- a transportation system to return bypassed fish safely to Lake Ontario

Test fish species included the alewife, smelt, and coho salmon. Several of the tested systems were relatively effective in diverting and/or transporting fish with low resultant mortality. However, these systems would increase the cost of the designed system and were rejected by the applicant for the Lake Erie Generating Station.

6.095
Ray et al. (1976) provide a recent review of state-of-the-art intake technology and discuss in some detail fish bypass and return systems. Fish bypass systems (e.g. vacuum pumps, louvers, etc.) for removal of fish "after entrainment but prior to impingement" are, in the opinion of the applicant and his consultant, appropriate where there is some reason to believe that impingement would crop a significant portion of the fish community. That not being the case, these systems were dismissed from further thought by the applicant. In point of fact, however, the "state-of-the-art" clearly indicates that, depending on site and intake locations, the design of the power plant and intake structure, and the species of fish present, there is high variability in terms of species diversion efficiency and survival, in fish bypass systems.

6.096
Ristroph traveling screens or "fish conservation screens" are an alternative to conventional traveling screens. These devices are modified traveling screens with troughs to lift the fish caught on the screens and gently wash them off the screens for transport back to the receiving waterway. The screens are generally operated continuously. Ristroph screens installed at the Surry Power Station, James River, Virginia are reported to demonstrate a survival rate near 90 percent for larger game fish. Corps staff considers Ristroph traveling screens or equivalent bucket-screen type systems with a

two-stage screen wash and piping system to return fish to Lake Erie to be viable alternatives. The New York State Public Service Commission has recommended that the applicant develop an engineering and cost estimate for these systems. This recommendation has been incorporated in the State's draft 402 permit.

6.096a.
Surface water intake screens represent another intake design alternative intended to eliminate debris from intake cooling water and reduce fish entrapment. In this alternative, screening would be installed at the intake port itself. Basically, three types of screens or barriers could be placed across the intake openings: perforated plates; stainless steel wire mesh, and; most recently, uniform flow screens constructed of "V" shaped wire on vertical rods. Screens over the port openings could prevent fish and debris from entering the intake system along with the intake water. Perforated plates have a very low percentage of open area and thus have distinct disadvantages. These plates could be susceptible to clogging by debris and frazil ice (small needle-like ice crystals which can adhere to metal surfaces) and are difficult to backwash because the large amount of dead area reduces backwash efficiency. Additionally, intake velocity would have to be greatly increased if perforated plates were used to screen the intake ports. Staff does not believe that perforated plates are a viable alternative to the proposed intake design.

The use of stainless steel wire mesh screens at the intake ports has been considered as an alternative to the proposed design. Stainless steel screens, with properly sized mesh, would reduce fish impingement. The smaller the mesh, the more effective the screen. The disadvantage of the screens are their cost and the operational and maintenance difficulties and costs occasioned by their clogging.

Several results would occur as the consequence of placing stainless steel at the intake openings in an attempt to reduce fish impingement. These include operational problems occasioned by clogging of the screens; increased intake velocity due to the reduced available flow area; and increased costs associated with screen installation and maintenance and provisions for cleaning the screens.

The aquatic sampling programs at the two sites revealed that there are large areas of cladophora growth on the bottom of the lake near the intake location. When these algae break off in mass, it is possible that the algae and debris could accumulate on the screens and diminish or completely shut off the water flow. If the screens were not cleaned, the clogging would cause a plant shutdown.

With an onshore screenhouse as conceptually planned, the screens used are traveling screens which are mechanically washed when each screen section is out of the water. However, installation of traveling screens at the intake portals is not feasible because, in order to use a traveling screen offshore, a significant and costly structure would have to be built at the intake portal and provisions would have to be made to operate and maintain the screens.

The basic problems of access and maintenance face all other schemes of cleaning screens installed at the intake portals of the offshore breasting dolphin. One method of resolving these problems is backwashing. In order to backwash the screens, the various screen sections would have to be isolated from the remaining intake area and a source of backwash water flow installed to wash the debris off the screens. It is also possible that any debris removed might have to be collected rather than returning it to the lake, either for environmental reasons or simply to avoid the potential for the reclogging of the screens with the material washed off. Such a condition would require additional equipment. All mechanical items (i.e., valves and pumps, etc.) would have to be inspected and serviced on a regular basis, at least, if not on an as needed basis as occasioned by the clogging.

A screen hoisting system which would lift the screens from the flow path to manually clean would probably be the simplest method of using screens at the offshore location. However, there will be organism growth on the screens which must be cleaned on a regular basis. Even this method would require lifting mechanisms and the presence of operating personnel. During a period when significant amounts of cladophora were being impinged, it may require the constant presence of operating personnel to clean the screens.

With the exception of the hoisting scheme, all of these systems using screens at the intake ports would be susceptible to ice buildup and blockage during the winter months. If required, coarse mesh bars normally located at intakes can be heated by various methods to preclude or remove ice buildup. These methods, such as electronically heated bars, would not be appropriate for the small mesh screens needed to keep fish out of the intake. To alleviate ice problems, the use of screens only during non-winter months has been considered. However, it would be a major undertaking to remove the screens for the winter for both the traveling screens and the system which would isolate and then backwash the screens. It would be possible to remove the screens for the winter in the case of the hoist system.

The capital cost of the three systems has not been estimated in detail by the applicant, however, approximations are as follows: A traveling screen located offshore would be the most expensive screening alternative, costing several million dollars. The backwash system would be the next most expensive alternative, costing in excess of one million dollars. The hoist system would probably be the least expensive alternative, probably less than one million dollars.

In addition to the capital costs, all systems would require different degrees of operator attention which would add to the overall cost of the system.

The question of the increased velocity caused by clogging of the intake would not be significant until the velocity became sufficiently high such that fish pulled against the screen could not escape. In that case, a larger intake area would be needed. However, increasing the size of or number of intake portals is probably the most expensive alternative method of addressing an intake portal screen clogging problem. The additional portal assumedly diminishing velocity would be subject to clogging also, thereby compounding the extent of the problem.

Although screening would reduce fish impingement, the additional maintenance costs, chronic operating problems, and equipment costs associated with this type of screening may not be warranted in light of the low predictions of fish impingement.

The third alternative is uniform flow screens such as those manufactured by Johnson UOP, Inc. or similar type screens which produce nearly uniform flow. Uniform flow screens are generally most effective from a biological and engineering standpoint when they are constructed in a cylindrical shape rather than as a flat screen. However, even a flat screen can be designed to cover port openings and produce nearly uniform flow characteristics. These screens have relatively little dead area. This allows for efficient backwashing and means that entrance velocity can be kept low while still maintaining high intake capacity. The use of "V" shaped wire for uniform flow screens produces a smooth surface and this tends to minimize clogging of the screens by waterborne materials. When particles, including aquatic organisms, are trapped against the screen, they tend to be washed away by natural currents since the intake velocity is relatively low and the smooth surface has little resistance. However, some cleaning may eventually be needed.

The ability of uniform flow type screens to protect fish, fish larvae, and fish eggs from impingement and entrainment while still supplying the necessary intake water requirements is the subject of ongoing research. Preliminary studies show that impingement may be greatly reduced since these screens produce a nearly uniform flow of low enough velocity to allow most fish species trapped on the screen to escape or be washed away by natural currents. The smooth surface may also minimize abrasive injuries associated with many standard wire mesh screens. Research is currently being performed on uniform flow screens produced by Johnson UOP, Inc. at the McNerry Dam in Oregon. This research is being performed by the U.S. Army Corps of Engineers and the National Marine Fisheries Service.

The screens can be manufactured with openings as small as 0.25 mm and properly designed screens show promise of reducing entrainment of fish eggs and larvae. Demonstrations using scale models in test flumes indicate that the screens may be able to reduce impingement and entrainment of fish eggs. To date there are no known operating power plant intake systems which utilize uniform flow type screens over the intake ports. Due to the lack of operational data, Corps staff cannot conclusively state that these screens would protect aquatic organisms while reliably providing a source of power plant intake water year-round. However, staff does believe that screens of this type may be a viable solution in reducing the impingement of most adult fish.

ATMOSPHERIC EMISSION CONTROL SYSTEMS

Electrostatic Precipitator

6.097
The appropriate control technology for particulate matter is electrostatic precipitators. The applicant proposes to utilize electrostatic precipitators with approximately 99.4 percent collection efficiency. A precipitator with 99.4 percent efficiency is considered Best Available Control Technology for a facility of this type and size and has a proven record of reliability at other operating plants. No other alternatives were considered feasible by the applicant for the Lake Erie Generating Station. However, alternative particulate control systems such as bag filters are becoming more established and may have decided advantages in use with low sulfur coals. There is presently concern about those particles which are not efficiently collected by electrostatic precipitators. These uncollected particles are small in size (between 0.4 and 10.0 microns) and usually contain heavy metals. The health aspects of these particles are presently being investigated. Bag filters may prove to be the most economic method of obtaining high particulate removal efficiencies while also removing these presently uncollected particles.

Nitrogen Oxide Control

6.098
Emissions of nitrogen oxides (NO_x) will be controlled through boiler design. Boiler manufacturers guarantee that NO_x emissions from their boilers will meet and comply with the standard of 0.7

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lb/MBtu of NO_x as (NO_2). A possible alternative removal of NO_x from the flue gas, is not commercially available for the size boiler proposed at the Lake Erie Generating Station.

Sulfur Dioxide Removal

6.099
Sulfur dioxide reduction may be accomplished by implementation of boiler construction based on fluidized bed combustion techniques. The fluidized-bed principal has been used extensively in the petroleum and chemical process industries. However, it has only been in recent years that substantial effort has been expended to develop the fluidized bed combustion process as a technique for burning high sulfur solid fuels, while maintaining stack emissions within the EPA limits. In theory, the combustion of solid fuels can be economically accomplished in a fluidized bed of limestone while controlling SO_2 and NO_x emissions below the limits established by the EPA. The fluidized bed combustion technique should permit the design of smaller, more economical steam generators for coal and lignite combustion. The fluidized bed consists of particles of limestone supported by a non-sifting grid through which an upward flow of air is passed with sufficient velocity to separate and float or suspend the particles. When the bed is heated with an ignition device to a temperature that will support combustion, crushed coal introduced will ignite and the heat of combustion of the coal will raise the bed temperature still further. The temperature of the bed can be controlled by the regulation of excess air, the addition of heat transfer surface within the bed, the introduction of recycled flue gas or the addition of quantities of cool non-combustible solids. This would allow high sulfur coal to be burned within existing environmental regulations. Substantial reserves of low quality fuel will then become available at competitive costs, with additional savings from reduced pollution control equipment requirements and boiler costs. Several pilot projects are currently underway to develop fluidized bed combustion techniques. However, until development is completed and reliable electric power generation is demonstrated, this process cannot be considered as an alternative to conventional design fossil boilers.

6.100
Emissions of sulfur dioxide from the proposed plant will be controlled by a combination of two factors: a 750-foot stack to minimize ground level concentrations; and coal with such sulfur and heat content to meet existing SO_2 emission standards. A viable alternative to the proposed method is the use of scrubbers or flue gas desulfurization (FGD) systems. Revisions to the new source performance standards (NSPS), in accordance with the Clean Air Act

Amendments of 1977, may necessitate the installation of FGD systems at the proposed Lake Erie Generating Station.

FLUE GAS DESULFURIZATION SYSTEMS

6.101
Regenerable SO_2 removal processes are those in which process byproducts such as elemental sulfur, sulfuric acid and sulfur dioxide are recovered for commercial use. Pilot systems are being tested for technical capability, economic feasibility and general reliability, however, their reliability has not been established for coal-fired power plants of a capacity similar to the proposed plant. Additionally, the applicant would have to market these byproducts in order to dispose of them.

6.102
The applicant has indicated a preference for a non-regenerable (throw-away) scrubbing process. Non-regenerable scrubbing processes are those in which sulfur materials are disposed of as waste. Limestone is introduced into the flue gas via a scrubbing liquid (slurry) which absorbs the sulfur dioxide. The applicant has evaluated FGD systems which are technically viable and commercially accepted with designs based on the current state-of-the art. The following two plans are evaluated as alternatives:

Plan I - Plant utilizing eastern coal (Pennsylvania/West Virginia) with an average sulfur content of 2.3 percent (2.8 percent maximum) and flue gas reheat.

Plan II - Plant utilizing western coal (Wyoming) with an average sulfur content of 0.5 percent (0.7 percent maximum) and no flue gas reheat.

Both plans are formulated on the design philosophy of treating 100 percent of the flue gas and removing 90 percent of the sulfur dioxide. The FGD systems discussed below are conceptual designs considered most feasible by the applicant. The FGD industry is a developing industry and a number of other alternative FGD systems are in varying stages of development. Hence, the final selection of the FGD system will have to be made in light of the emerging technologies.

General Description
6.103
The purpose of the Flue Gas Desulfurization (FGD) system is to affect the removal of gaseous sulfur dioxide from the flue gas stream, to discharge the treated flue gas into the atmosphere and to provide for the disposal of the sulfur-laden liquid waste in an environmentally

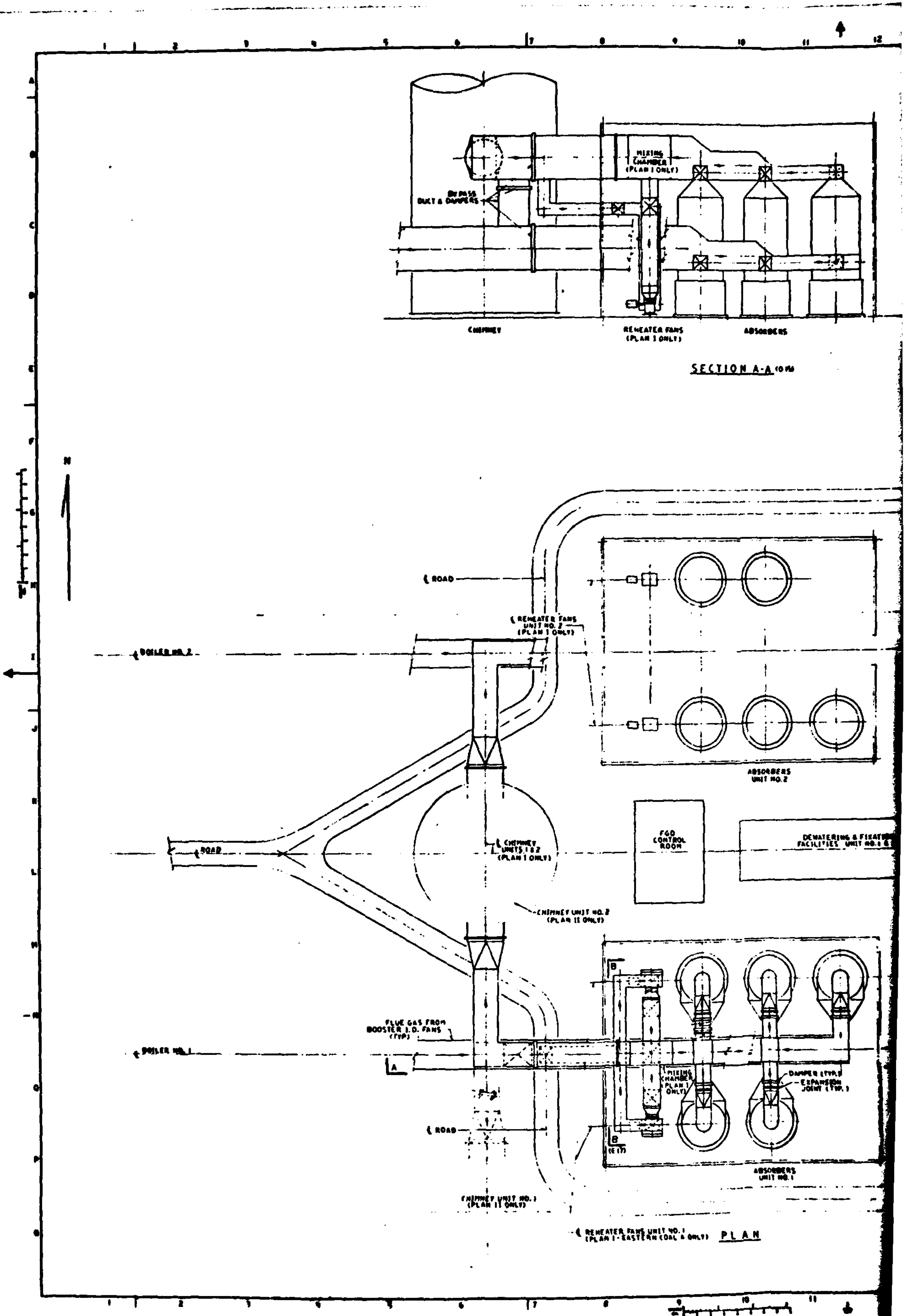
acceptable manner. The FGD system evaluated for the proposed station is based on alkali absorption using limestone as the reagent. The liquid waste is first dewatered and the remaining "cake" is stabilized with fly ash and lime to yield a dry stable product which is stored in the ultimate disposal area. Plan I based on high sulfur Eastern coal requires greater SO_2 removal capability and increased capacity in reagent preparation and waste handling systems compared to Plan II which is based on lower sulfur Western coal. Another major design difference between Plan I and II is that the former includes flue gas reheat system whereas the latter requires no reheating of the treated gases. This has an impact on the ductwork arrangement and stack configuration. The general arrangement of the proposed FGD system for Plan I is shown on Figure 6-2. Plan II layout is identical except for exclusion of the reheat system and the common stack. Major design parameters and a more detailed description of the system are contained in Appendix C.

6.104
Limestone will be transported to the plant site by rail and stored in an open pile. Stored limestone will be delivered by a conveyor belt from the pile to the day feed silos. The storage piles for Plan I (eastern coal) will be about 200 feet in diameter and 75 feet high and are sized to hold 40,000 tons of limestone. The storage area for Plan II is sized for 15,000 tons (150 feet in diameter, 55 feet high. The storage is adequate to meet a 24-day requirement assuming the use of maximum sulfur coal.

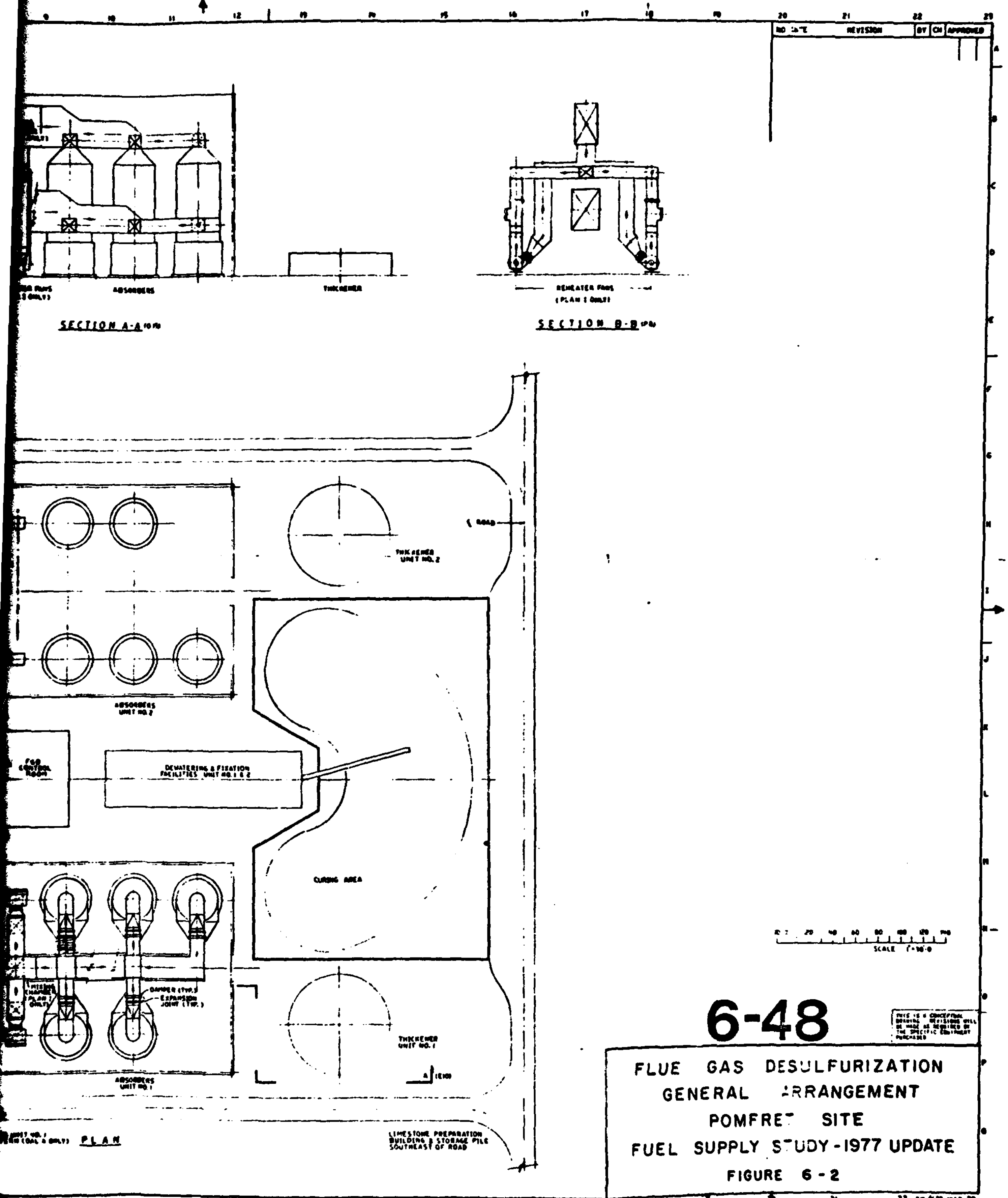
6.105
The liquid system flow is described along with the gas system in Appendix C. Essentially, the liquid system is designed to operate in a closed-loop manner with respect to water effluents. Makeup water is restricted to requirements for water loss due to evaporative cooling of the gases, water bound with waste sludge, and water of hydration associated with calcium salts.

6.106
Unstabilized sludge from the FGD unit which has been thickened and dewatered will be conveyed to a pug-mill mixer for combination with dry fly ash and lime injected at predetermined ratios. This processed material will then be stockpiled via a radial stacker where it is allowed to cure for several days prior to disposal. Details of this process are presented in Appendix C.

6.107
The high sulfur eastern coal will result in the annual production of 380,000 tons of sludge, 544,000 tons of fly ash, and 138,000 tons of bottom ash. Western coal (Plan II) will generate 126,000 tons per year (TPY) of sludge, 368,000 TPY of fly ash, and 92,000 TPY of bottom ash. After sludge is stabilized with fly ash, the eastern coal



BYPASS DUCT & DAMPERS
MIXING CHAMBER (PLAN I ONLY)
CHIMNEY
REHEATER FANS (PLAN I ONLY)
ABSORBERS
SECTION A-A
N
ROAD
REHEATER FANS UNIT NO. 2 (PLAN I ONLY)
BOILER NO. 2
ABSORBERS UNIT NO. 2
FGD CONTROL ROOM
CHIMNEY UNITS 1 & 2 (PLAN I ONLY)
CHIMNEY UNIT NO. 2 (PLAN II ONLY)
FLUE GAS FROM BOOSTER I.D. FANS (TYP)
BOILER NO. 1
MIXING CHAMBER (PLAN I ONLY)
DAMPER (TYP.)
EXPANSION JOINT (TYP.)
ROAD
ABSORBERS UNIT NO. 1
CHIMNEY UNIT NO. 1 (PLAN II ONLY)
REHEATER FANS UNIT NO. 1 (PLAN I - EASTERN COAL & ONLY)
PLAN



FLUE GAS DESULFURIZATION
GENERAL ARRANGEMENT
POMFRET SITE
FUEL SUPPLY STUDY - 1977 UPDATE
FIGURE 6 - 2

produces 1,350,000 TPY of stabilized sludge and western coal produces 367,000 TPY of stabilized sludge. In Plan I (eastern coal) almost all of the fly ash is used to stabilize the sludge whereas Plan II utilizes only a portion of the fly ash leaving a residual of 242,000 TPY of fly ash.

6.108
With the Lake Erie Generating Station Units 1 and 2 operating at a 69 percent capacity and including ash from the applicant's Dunkirk Station, the total combined waste volume at Pomfret would occupy approximately 286 acres for Plan II (western coal) and 512 acres for Plan I (eastern coal). These acreages are based on a 30-year plant life, and wastes piled to a height of 60 feet. At Sheridan, only Lake Erie Generating Station wastes would require on-site disposal. The land required for disposal at Sheridan is estimated at 246 acres for western coal and 455 acres for eastern coal.

6.109
Figure 6-3 shows the plot plan for the Pomfret site using eastern coal with FGD units and Figure 6-4 displays the layout at Pomfret with western coal. Figures 6-5 and 6-6, are the corresponding plot plans for the Sheridan site.

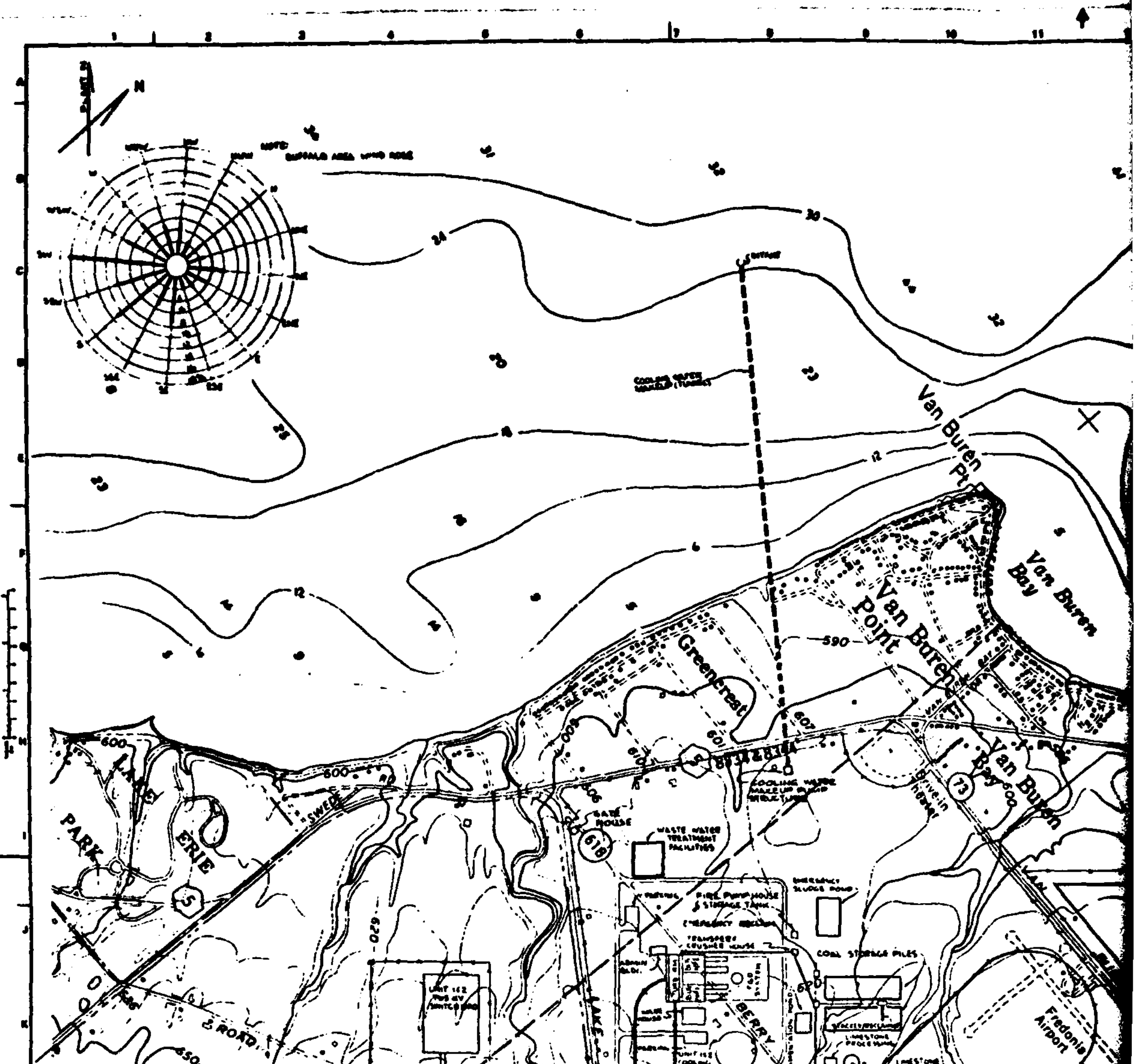
Environmental Impact of the FGD Alternatives

Air Quality

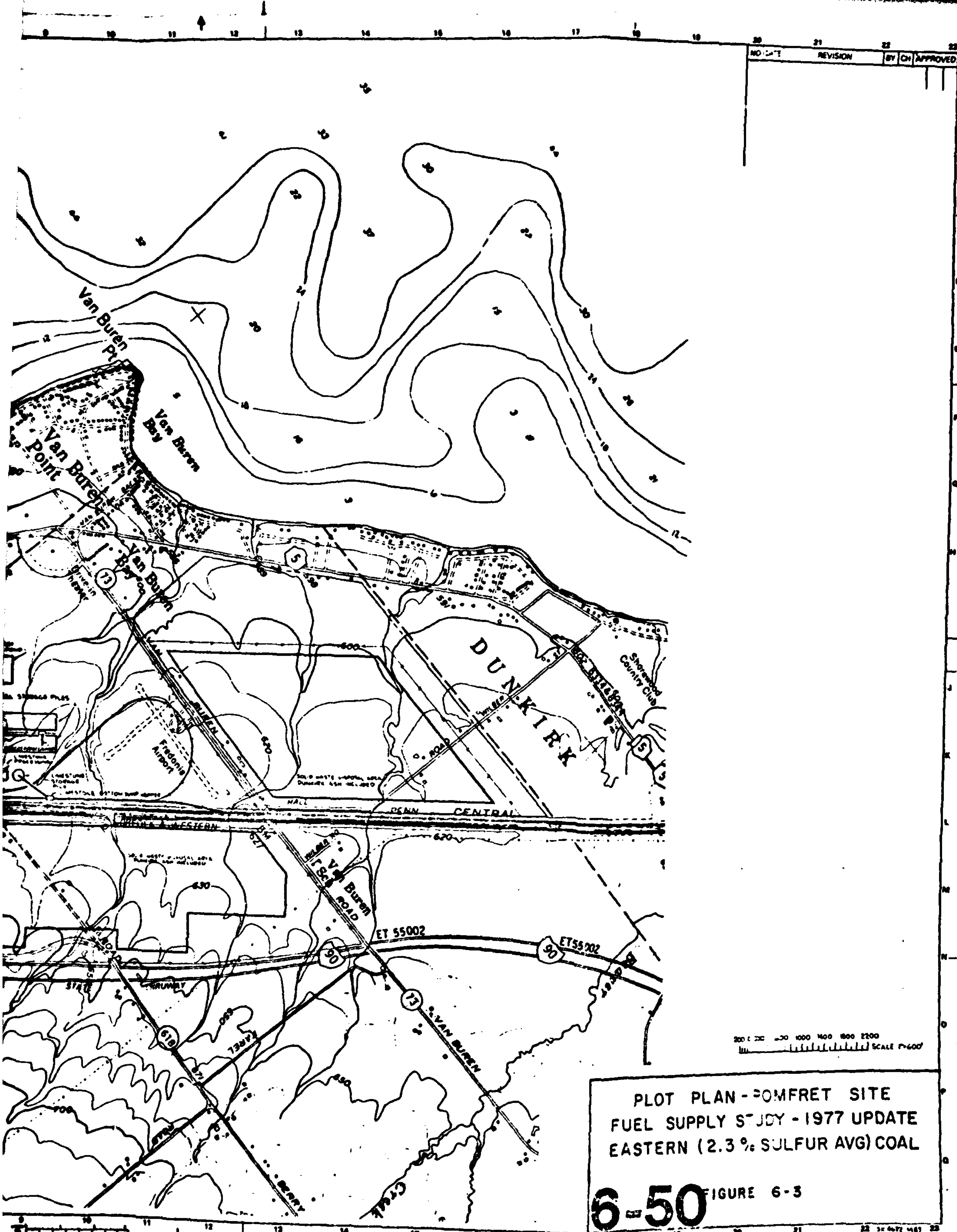
6.110
The air quality impact analysis assumes 90 percent SO_2 scrubbing of 100 percent of the flue gas. Calculations were performed using maximum sulfur values to give the highest possible emission rates in the ERT Point Source Diffusion Model (PSDM). The stack height used in the analysis was 2.5 times the height of plant structures or 625 feet. The maximum incremental contributions (ug/m^3) of the proposed facility to ambient pollutant concentrations are shown below.

EASTERN COAL (2.3% S)
POMFRET SITE

Averaging Time	Peak Plant Contribution (ug/m^3)*	Class II Allowable Increment
3 hour SO_2	66 (232)	512
24 hour SO_2	30 (86)	91
Annual SO_2	1.7 (6.0)	20
24 hour TSP	6 (18)	37
Annual TSP	0.3 (1.2)	19
Annual NO_2	2.4 (8.6)	-

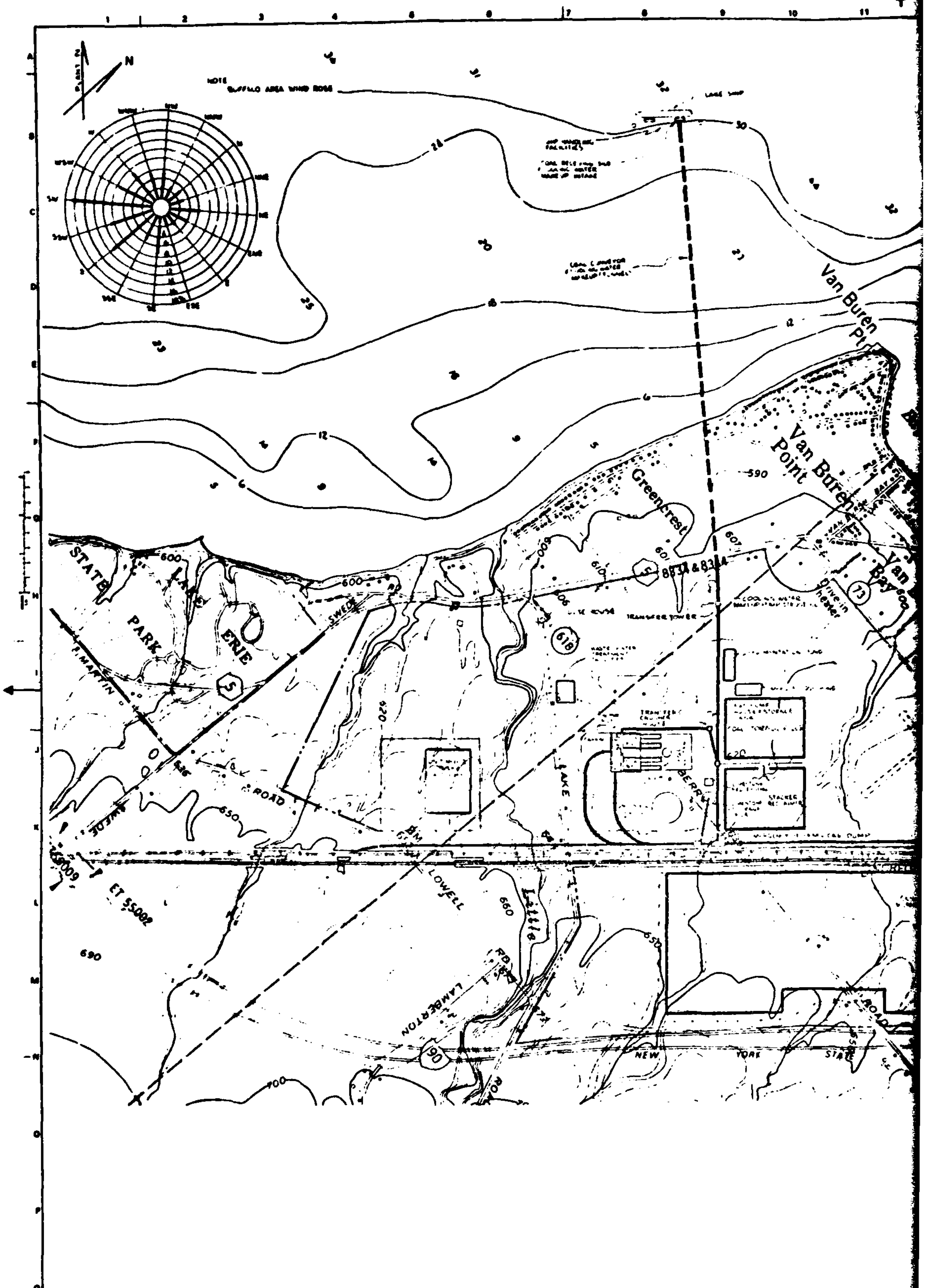


Van Buren Pt.
Van Buren Bay
Van Buren Point
Van Buren Bay
Greencrest
LAKE ERIE
PARK
Fredonia Airport
WASTE WATER TREATMENT FACILITIES
FIRE PUMP HOUSE & STORAGE TANK
EMERGENCY SLUDGE POND
COAL STORAGE PILES
LIMESTONE PROCESSING
LAKE
BERRY
LOWELL
LAMBERTON
Little
NEW YORK STATE THRUWAY

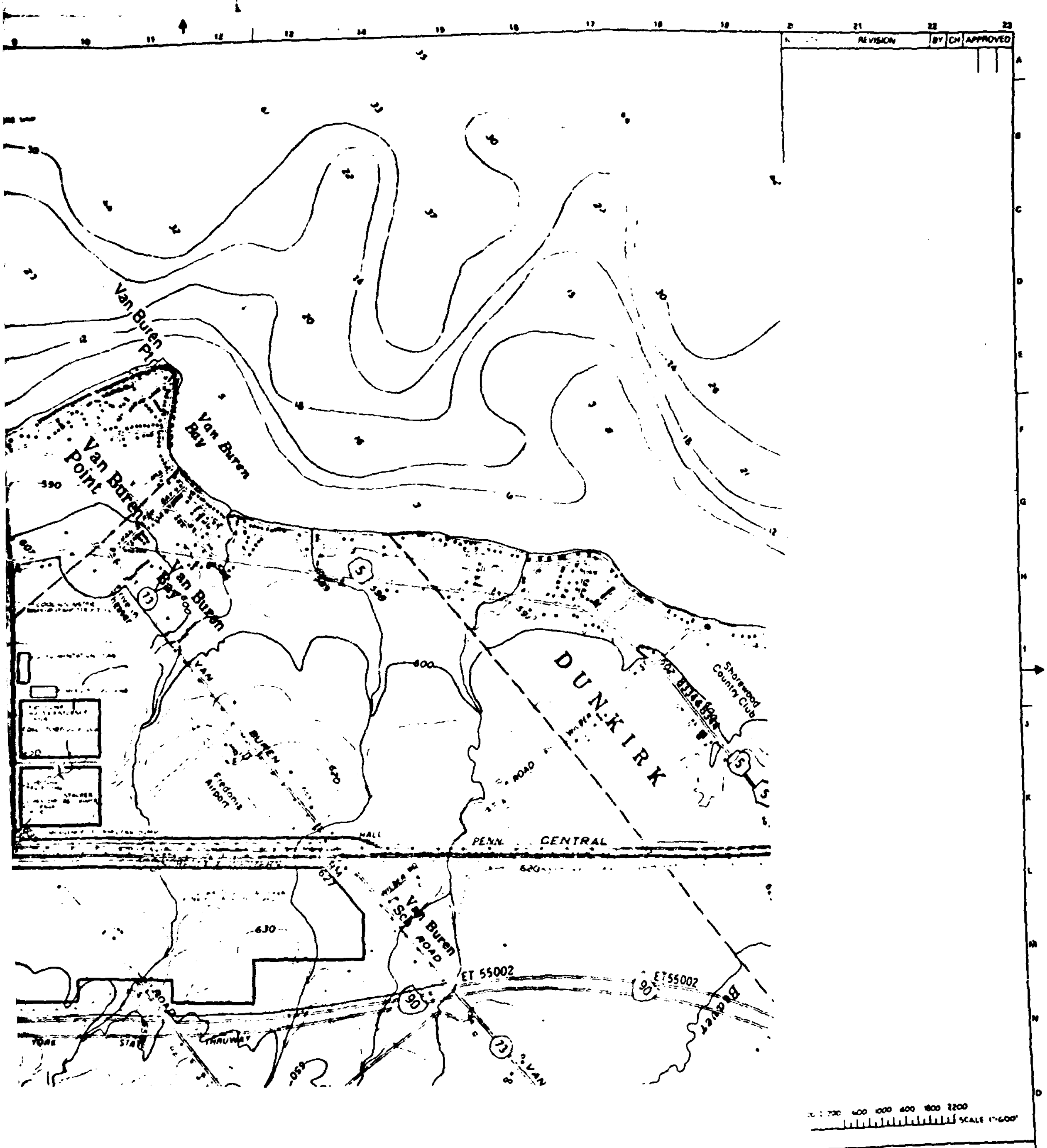


PLOT PLAN - POMFRET SITE
FUEL SUPPLY STUDY - 1977 UPDATE
EASTERN (2.3% SULFUR AVG) COAL

FIGURE 6-3

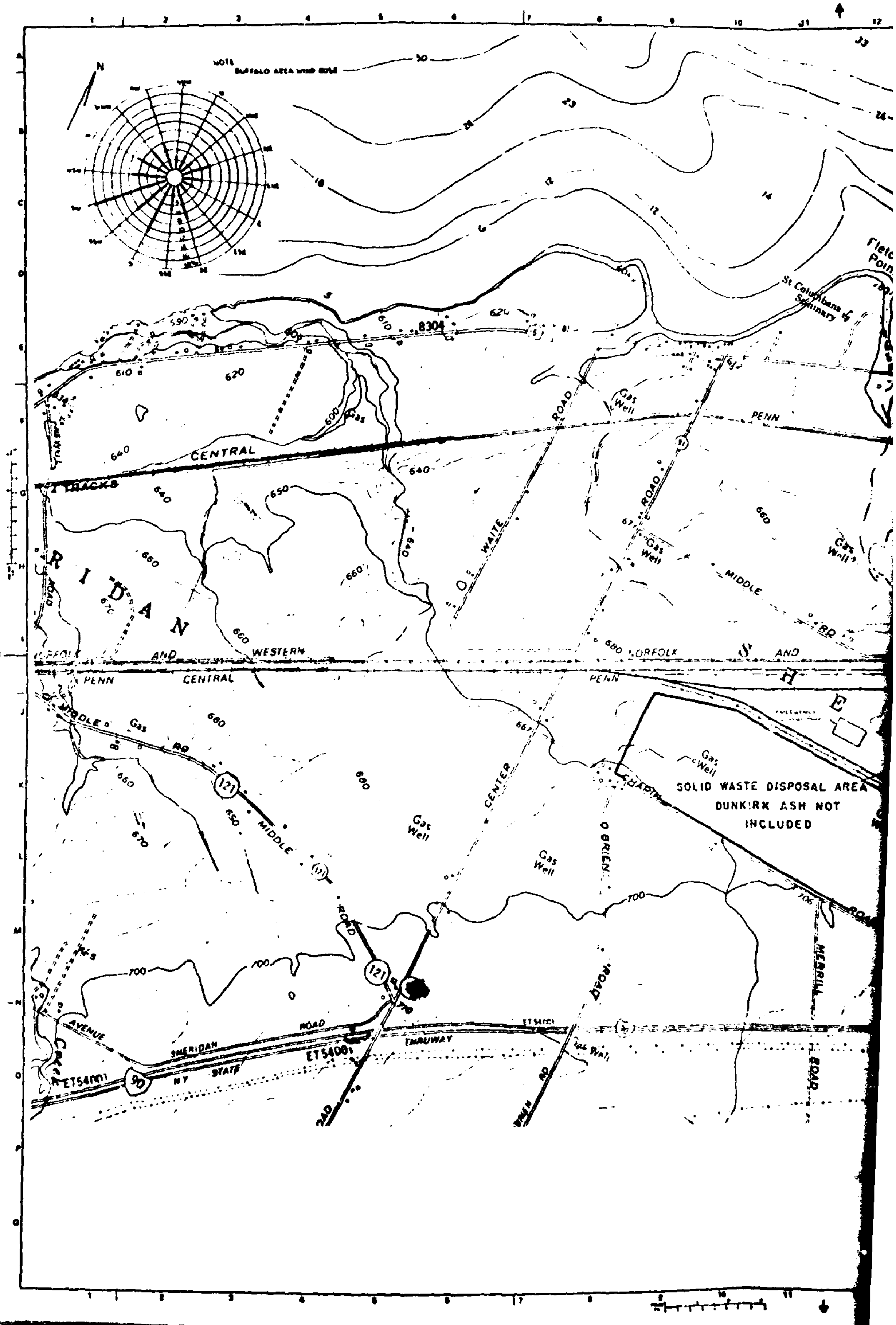


N
NOTE
BUFFALO AREA WIND ROSE
Van Buren Pt.
Van Buren Point
Greencrest
590
600
620
650
660
690
700
STATE
PARK
LAKE
ERIE
SWEDE
ROAD
TRANSFER TOWER
Drive in theater
LOWELL
Little
LAMBERTON
NEW
YORK
STATE

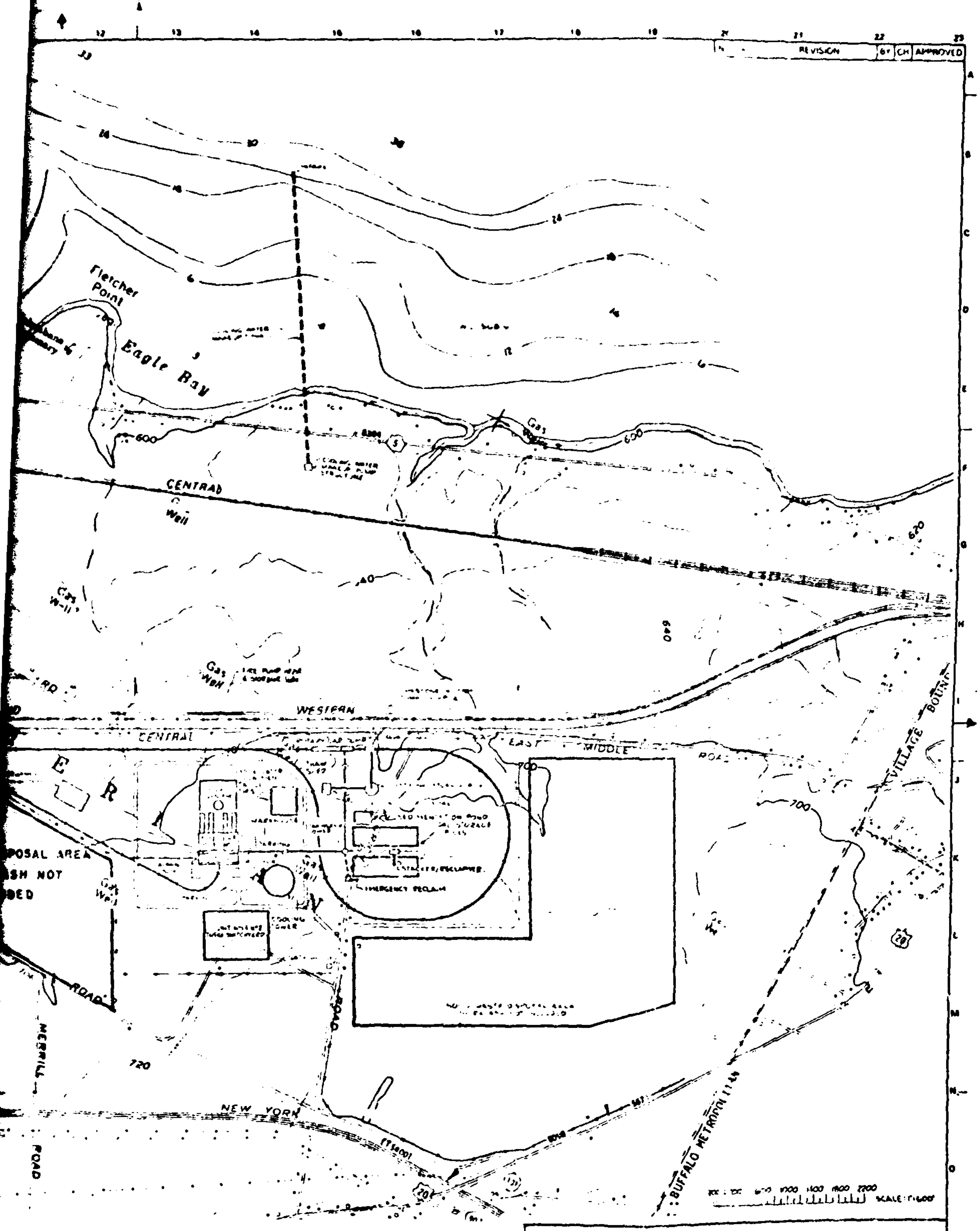


PLOT PLAN - POMFRET SITE
FUEL SUPPLY STUDY - 1977 UPDATE
WESTERN (0.5% SULFUR AVG) COAL

FIGURE 6-4

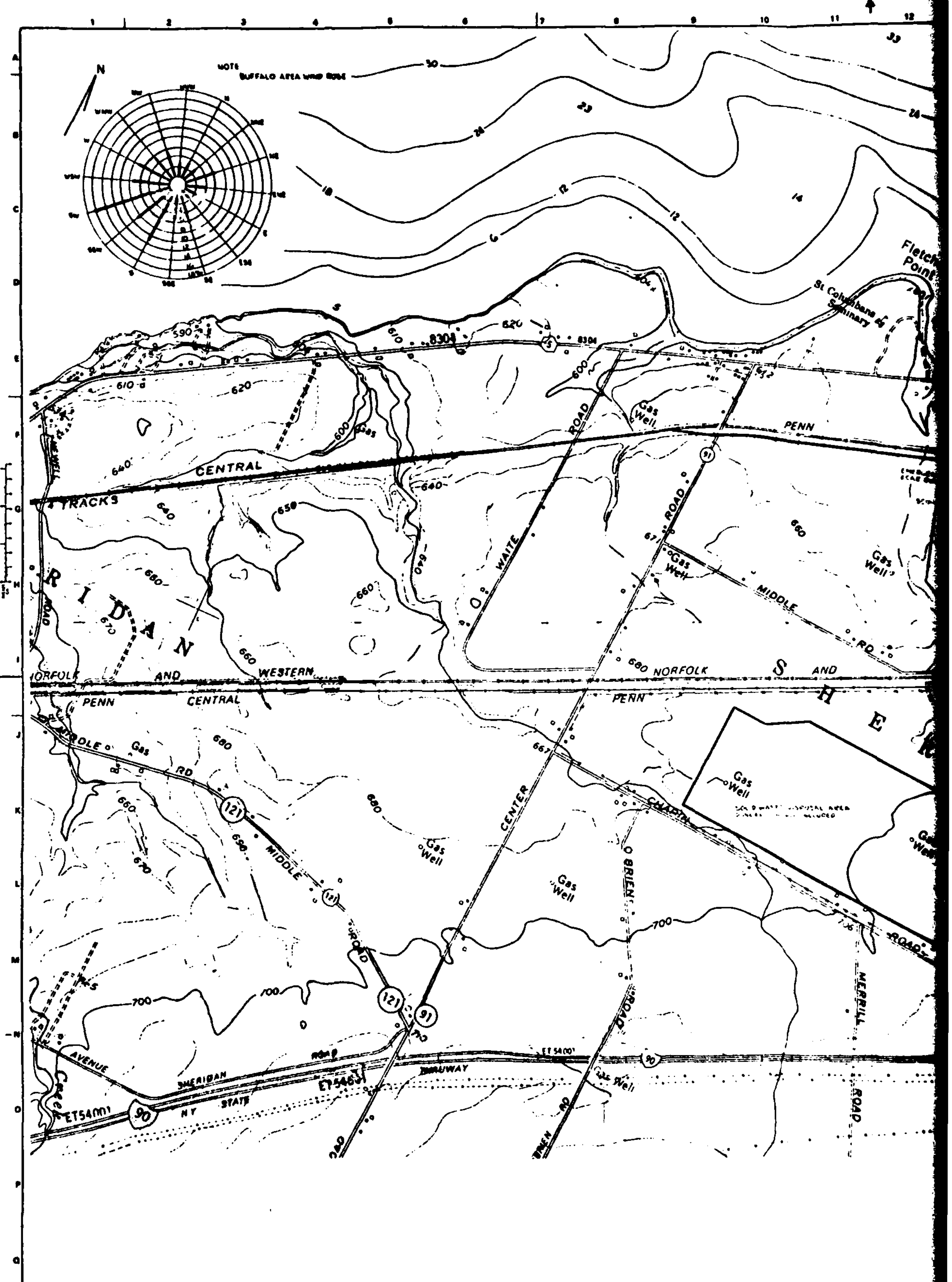


St Columbans Seminary
CENTRAL
2 TRACKS
PENN
WAITE
ROAD
MIDDLE
RD
AND
WESTERN
PENN
CENTRAL
MIDDLE
Gas
Well
CENTER
O BRIEN
SOLID WASTE DISPOSAL AREA
DUNKIRK ASH NOT
INCLUDED
MERRILL
ROAD
AVENUE
SHERIDAN
THRUWAY
NY
STATE
ET54001



PLOT PLAN - SHERIDAN SITE
FUEL SUPPLY STUDY 1977 UPDATE
EASTERN (2.3% SULFUR AVG) COAL

FIGURE 6-5


NOTE BUFFALO AREA WIND ROSE
N
Fletch Point
St Columbans Seminary
CENTRAL
4 TRACKS
PENN
WAITE ROAD
ROAD
MIDDLE RD
NORFOLK AND WESTERN
NORFOLK AND
PENN CENTRAL
PENN
WINDROLE RD
CENTER
CHAPIN
O BRIEN ROAD
MIDDLE ROAD
MERRILL ROAD
AVENUE ROAD
SHERIDAN
NY STATE THRUWAY
Gas Well
ET54001
ET5460
ET54001
121
91
90
R I D A N
S H E
8304
590
600
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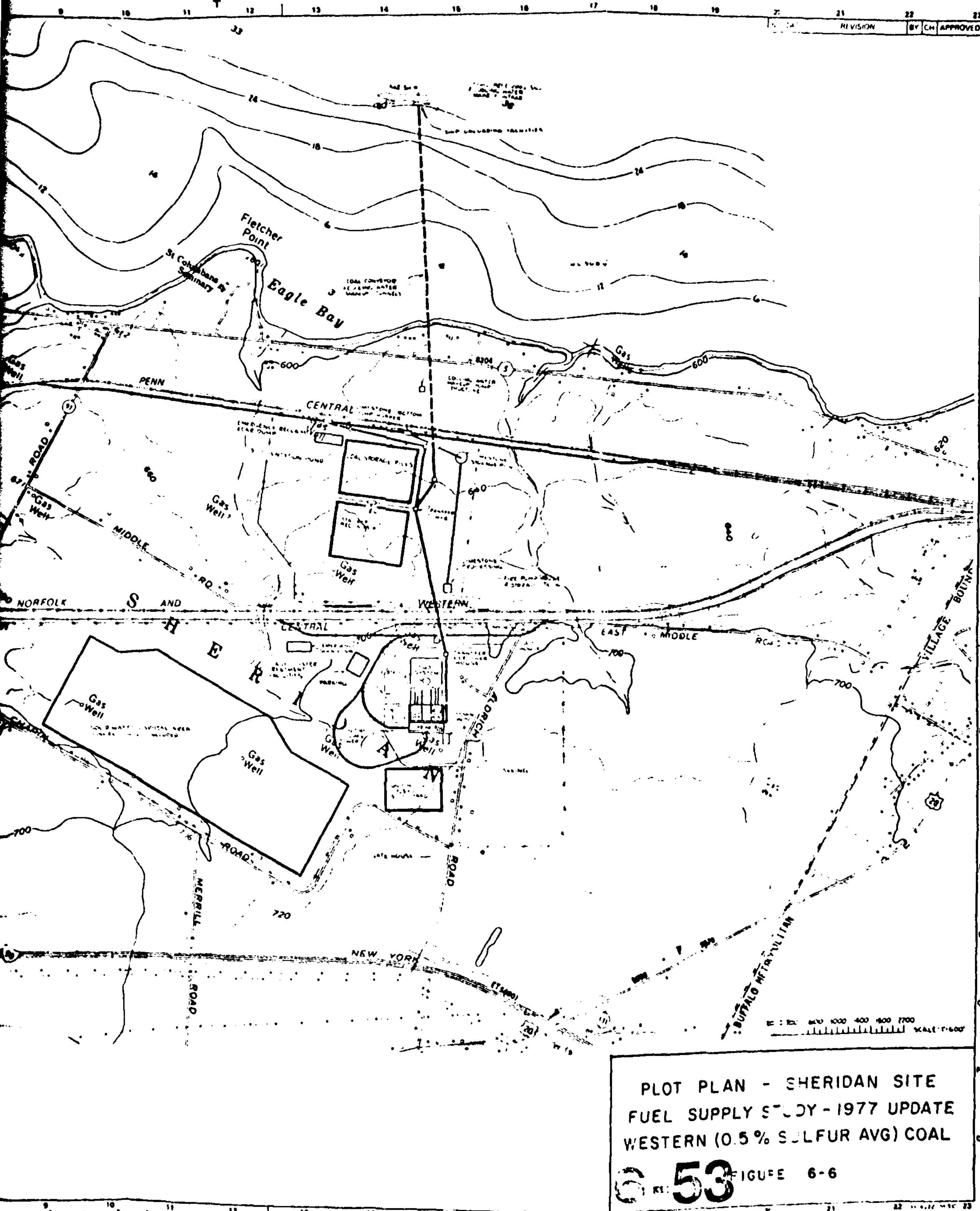
660
667
670
671
680
700



PLOT PLAN - SHERIDAN SITE
FUEL SUPPLY STUDY - 1977 UPDATE
WESTERN (0.5% SULFUR AVG) COAL
FIGURE 6-6

Averaging Time	Peak Plant Contribution (ug/m^3)*	Class II Allowable Increment
	SHERIDAN SITE	
3 hour SO_2	92 (217)	512
24 hour SO_2	29 (73)	91
Annual SO_2	2.2 (6.6)	20
24 hour TSP	6 (16)	37
Annual TSP	0.4 (1.3)	19
Annual NO_2	3.2 (9.5)	-

*Figure in parentheses is value obtained with no reheat.

WESTERN COAL (0.5% Sulfur) - NO REHEAT

POMFRET SITE

Averaging Time	Peak Plant Contribution (ug/m^3)*	Class II Allowable Increment
3 hour SO_2	95 (115)	512
24 hour SO_2	30 (36)	91
Annual SO_2	2.4 (2.9)	20
24 hour TSP	16 (19)	37
Annual TSP	1.3 (1.6)	19
Annual NO_2	9.1 (6.4)	-
	SHERIDAN SITE	
3 hour SO_2	120 (145)	512
24 hour SO_2	37 (44)	91
Annual SO_2	2.6 (3.1)	20
24 hour TSP	22 (24)	37
Annual TSP	1.4 (1.7)	19
Annual NO_2	9.8 (6.9)	-

*Values in parantheses occur if western 0.85 percent sulfur coal (Montana) with an average heating value of 8,800 Btu/lb and average ash content of 9.0 percent were used.

6.111
The maximum incremental contributions (ug/m³) of the proposed facility to 3-hour SO_2 concentrations during fumigation conditions associated with stable onshore flow are as follows:

Fuel	Maximum Contribution	Class II Standard	FGD Type
Eastern (2.3%S)	234	512	reheat
Eastern (2.3%S)	546	512	no reheat
Western (0.5%S)	104	512	no reheat
Western (0.85%S)	182	512	no reheat

6.112
The applicant's modeling predicts Plan I and Plan II maximum contributions to ambient levels to be within the allowable Class II nondegradation limits for the 3-hour, 24-hour, and annual SO_2 standards and 24-hour and annual TSP standards. The exception would occur during fumigation conditions if no reheat were provided to eastern 2.3 percent sulfur coal.

Aquatic Ecology

6.113
At the Pomfret site the alternative designs which incorporate SO_2 removal systems result in the elimination of serveral ponds not previously affected by construction. The eastern 2.3 percent sulfur alternative affects P-13 and P-16 in addition to those originally affected. Pond P-7 is not eliminated in this alternative whereas as it is eliminated in the original design. No significance is attached to this change. The additional ponds are eliminated by additional road construction, solid waste disposal and switchyard placement. Pond P-12 is located on the periphery of the solid waste disposal area.

6.114
The western 0.5 percent sulfur alternative with SO_2 removal systems eliminates Ponds P-6, P-13, and P-16 in addition to P-4, P-5, P-7, P-8, and P-25 for the non-scrubber alternative. Pond P-12 is also on the periphery of the solid waste disposal area. Generally, those ponds eliminated do not have valuable fish populations. Pond P-6 has a mixed community of minnows and shiners and sticklebacks, P-12 has a few bluegills and P-16 has a few more bluegills. Pond P-7, which is the only pond eliminated by the western coal alternative which is not eliminated by the eastern coal alternative, does not have a good fish population at least as evidenced by seining in the spring and fall of 1975. The differential impact to on-site streams is minor among the various alternatives evaluated. At Pomfret, the western coal alternative with scrubber affects stream PCA and PCB (upper reaches).

This is virtually the same as without scrubbers. The eastern coal alternative impacts the lower portions of streams PD and PE in addition to the upper reaches of PCA and PCB.

6.115
At the Sheridan Site, the eastern coal alternative designs which incorporate SO_2 removal systems result in the elimination of several ponds not previously affected by construction. The eastern 2.3 percent sulfur alternative eliminates Ponds P-1 and P-2 and leaves P-14 and P-18 which were eliminated in the original plan. Ponds P-1 and P-2 have a more valuable fishery resource than P-14 and P-18 and therefore the impact is greater for eastern coal. No differences are seen in pond impacts for western coals with or without scrubbers. The eastern coal (2.3 percent sulfur) alternative impacts the extreme upper portion of Eagle Bay creek and the upper 300 feet of stream S-4. Neither of these impacts is great. The western coal alternative has virtually no impact on the site streams; only about 300 feet of Ryder Creek is affected.

6.116
The chemical discharges from the waste management systems for each alternative vary. For the western coal alternative utilizing scrubbers, the runoff from the waste disposal area is recycled through the scrubber system instead of being discharged to Lake Erie. Coal pile runoff would be discharged through the diffuser to Lake Erie only when flows exceed the capability to recycle to the scrubber system. For the eastern coal alternative, no discharge of any runoff occurs. Runoff from the waste disposal area and the coal pile is recycled through the scrubber system.

Intake Effects

6.117
If Plan I were utilized, the offshore unloading facility and conveyor tunnel which also houses the intake and discharge systems would not be constructed since coal would be delivered by rail. Implementation of Plan I would require construction of a plant cooling water intake and discharge system different from that described in Chapter One. Two water lines would run out into Lake Erie within an intake/discharge tunnel. The intake structure would be a velocity cap type at the 30-foot contour.

6.118
The most economical plan for locating the intake and discharge would be to locate them along a common line to minimize dredging. To meet discharge temperature criteria, the diffuser must be at approximately a 25-foot depth. This means that the intake must be extended further, or transposed laterally. This discussion considers the

former case. For both sites, the minimum offshore separation for the discharge and intake to ensure $\leq 0.5^{o}F$ ΔT at the intake ports (-15 feet from surface) would be 120 feet. This would place the intake at about the -27 foot contour at Pomfret and about the -27 foot contour at Sheridan. To achieve a $\Delta T \leq 0.2^{o}F$ at the intake ports ($0.5^{o}F$ at the water body surface) the separation distance would be 450 feet. At Pomfret, the intake would thus remain approximately at -30 feet, and at Sheridan, it would be at approximately -30 feet. The criteria used in establishing these distances considered worst case conditions, i.e. ambient current from diffuser to intake during extreme (April) conditions. Temperatures and distances were calculated from the Koh and Fan model, and verified by examining the results of the hydraulic model study performed by the Iowa Institute of Hydraulic Research.

6.119
The entrapment estimates used in the Lake Erie Generating Station 316(b) demonstration are based on velocity at the face of the intake structure. The prediction is based on operating experience at power plants on Lakes Michigan, Erie, and Ontario, which have similar impingeable species. Given the derivation of the estimate, no differences are predicted between the original intake incorporated in the coal unloading dock and a velocity cap with similar approach velocities at either the 25- or 30-foot contours. These impingement estimates were presented in Chapter Four. Behavorial differences due to each of these structures cannot be predicted.

6.120
Entrainment estimates for a proposed velocity cap at or about the 30-foot contour (as required for $\leq 0.2^{o}F$ recirculation) would be identical to those given for the 30-foot mid-depth intake described in Chapter Four and the applicant's 316(b) demonstration. For an intake located closer to the 25-foot contour, (i.e. 120 feet based on a recirculation potential of $\leq 0.5^{o}F$ under extreme conditions), entrainment would be higher. The Lake Erie Station interim studies program documented by Texas Instruments, Incorporated, reported statistically significant differences in ichthyoplankton (primarily yolk-sac larvae) concentrations between the 25- and 30-foot contours. Roughly 1 million additional smelt could be entrained at the 25-foot contour, bottom compared to the 30-foot contour bottom. Similarly, logperch estimates are higher (by about 50,000) at the 25-foot contour. A proportionate increase between the 30-foot mid-depth and 25-foot mid-depth contours is assumed.

Land Use and Aesthetics

6.121
The land use and aesthetic considerations of solid waste disposal areas are related to two primary concerns: The reduction of land

available to the area, especially loss of commercially valuable land such as croplands and land devoted to viticulture; and the physical dimensions of the disposal areas and the projected impact upon the aesthetic sensibilities of viewers. A corollary concern is the possibility of revegetation to screen or at least soften the impact of the disposal areas. Planting on the slopes themselves will be limited to grass and/or groundcovers, and any larger plant materials will have to be installed in relatively narrow areas between the runoff ditches and the security fences. Construction spoil materials generated by foundation excavation, tunnel tailings, pond excavations, etc. will be used to create intermittent free-form earth mounds where space permits. Informal groups of deciduous hardwood trees, evergreens, and shrubs will be placed on these embankments where it is aesthetically appropriate. This will allow partial screening and enhancement of the overview of the solid waste disposal areas for observers on nearby roads.

6.122
The following disposal scheme would be utilized if Plan I (eastern coal) were implemented at Pomfret. All of the solid waste material generated by both the existing Dunkirk Station and the proposed station will be placed in two disposal areas. The first disposal area, lying between the Conrail-Norfolk and Western Railroad tracks and the NYS Thruway, is 60 feet high and approximately 286 acres. In addition to that area, another 60-foot high area will be required which will lie northeast of the intersection of Van Buren and Hall Roads. This area will be about 226 acres in extent. The most important land use features affected by waste disposal are as follows:

- A total of 512 acres of land will be required. This is 70 percent of the total generating facility requirement of 730 acres.

- The largest single category affected will be croplands and vineyards (381 acres).

- Other important affected areas include 43 acres of forested land, 28 acres shrubbed areas, 15 acres of residential land and 43 acres of open fields.

Grasses and/or groundcovers will be planted upon the outer slopes of the deposited material after it has been shaped and topsoiled. Any potential installation of larger plant material (trees and/or shrubs) will be limited to the areas between the toe-of-slope ditch and the security fence, either at grade or on earth mounds where feasible.

6.123
At Sheridan, Plan I (eastern coal) would require 455 acres of land for waste disposal. This arrangement will have several land use

implications. First, it will require the relocation of both Chapin and Aldrich Roads. In the case of Chapin Road, it will require cutting a road through an existing stand of hardwood trees which may have some long-term effects on interior trees. Second, it will require the development of much more land for processing of the wastes at the plant area, in addition to the disposal area. The disposal area will be about 250 feet at its closest point from U.S. Route 20. Total acreage of land area required for eastern 2.3 percent average sulfur content coal solid waste disposal area is 455 acres or 69 percent of the total facility requirement of 658 acres. The largest single land category required for solid wastes will be that of croplands and vineyards, and this will amount to 205 acres or 45 percent of the total disposal area. Other land affected by the proposal includes 130 acres of forest, 66 acres of shrubbed area, 53 acres of open field, and one acre of residential land. Plantings on the outer dike slopes will be limited to grasses and/or groundcovers. Planting of deciduous trees and evergreens will be placed, as conditions allow, between the ditches at the toes of slope and the security fences.

6.124
Implementation of Plan II (western coal with scrubbers) at Pomfret would require a total disposal area of 286 acres (including Dunkirk ash). In comparing this scheme to the one proposed in Chapter One for western low sulfur coal without scrubbers, some advantages can be noted. It is possible, by increasing the height of the material from 45 feet (as originally proposed) to 60 feet, to continue to preserve the existing group of northern hardwoods which is located at the easterly end of the deposition area between the area itself and the thruway. This will be a valuable visual resource, since this group is composed primarily of mature mixed hardwoods which have achieved their maximum height of 50-60 feet. They are literally irreplaceable. The creation of this solid waste disposal area will require reductions in the existing land use inventories of the immediate region. The salient features of these land use reductions are as follows:

- A total of 286 acres will be required for the solid waste materials generated by this type of coal, which is 56 percent of the total developed site area of 511 acres.

- Of the total acreage for solid waste, the largest single reduction will be that of croplands and vineyards. Approximately 183 acres (64 percent of the total) will be removed from these two categories.

- Other smaller reductions will be 30 acres of forested lands (10 percent of the total), 27 acres of naturally shrubbed areas (9 percent) 13 acres of residential land (5 percent), and 33 acres of open field areas (12 percent).

The method of deposition of solid waste material will proceed in a way which will allow the earliest planting of slopes along the thruway side of the area. The next area, in sequential order, will be along the westerly (Lake Road) side of the deposition area to allow planting to become established for the viewer on that road. Plantings on the 3:1 slopes of the combined ash-stabilized sludge will be restricted to material which will thrive on 8"-12" of topsoil, placed on the slopes after completion. Grasses or groundcovers (or a combination of these types or plant materials) will be established on these areas. If feasible, groups of plantings, such as evergreen and deciduous trees, will be established between the ditches at the outer toes of slopes and the property fence line, either at grade, or on earth mounds where space permits. However, in places the total area between the toe of slope and fence line is only 100 feet wide, particularly in the vicinity of relocated Berry Road.

6.125
Utilizing Plan II (western coal with scrubbers) at Sheridan requires 246 acres of land for waste disposal. In comparing this arrangement with the original non-scrubber scheme presented in Chapter One, it has been noted that, by increasing the height of the deposition from 45 to 60 feet, it is possible to maintain the western boundary of the area at a point approximately 2,200 feet away from Center Road. This allows the retention of a portion of a stream in the area north of the intersection of Chapin and Center Roads. This configuration also preserves some large vegetation in this area, principally large willow trees, which will allow for some screening and softening of the plant elements for observers on these roads. Further, it will preserve the existing setting for the Reed house, (located on Center Road) which has local historic interest and is an aesthetic asset in the area. Grasses and/or groundcovers will be planted on the outer dike slopes. There will be a limited amount of space between the toe of the dike slope and the security fence along Chapin Road for the installation of large plant material, e.g. deciduous trees and evergreens. Such plant material would be installed to soften the views of the solid waste area and the plant beyond for observers traveling along Chapin Road. Views of the facility from the thruway will be adequately screened by large stands of native vegetation lying between Chapin Road and the thruway itself. The most important land use implications of disposal at Sheridan under Plan II are as follows:

- The total acreage for the land area required for western low sulfur coal waste deposition is 246 acres, which is 58 percent of the total facility requirement of 423 acres.

- Of this total required for solid waste, the largest single category reduction will be from croplands and vineyards. Approximately 204 acres of these two uses (or 83 percent) will be required.

- Other smaller reductions will be as follows: forested areas - 4 acres (2 percent), naturally shrubbed areas - 9 acres (4 percent), residential land -5 acres (2 percent), and open field areas - 24 acres (10 percent).

Noise Impact

6.126
The installation of FGD systems with eastern coal (Plan I) as fuel at Pomfret or Sheridan, will result in higher noise levels during station operation than those expected from the primary proposal (low sulfur western coal without scrubbers). Increased noise levels occur primarily as a result of additional trucks and bulldozers needed for solid waste disposal and from trains delivering limestone. The estimated noise levels generated by the various solid waste handling equipment were combined on an energy basis and projected around the plant boundary lines using "hemispherical spreading" and molecular absorption.

6.127
These noise contours were then combined with the existing "Leq" ambient noise levels to show any projected shift in the ambient contours. It is expected that at the Pomfret site, 56 existing permanent residents will be impacted by an ambient shift ranging between 5 and 28 dB(A). Also, the sound level produced by the station (including the waste handling system) at the property line (80 dB(A)) will exceed the maximum Lake Erie Generating Station design criterion of 55 dB(A). At the Sheridan site, it is expected that 37 existing permanent residents will be impacted by an ambient shift ranging from 6 to 12 dB(A). Also, most of the solid waste disposal area is located outside the original property line.

6.128
The Flue Gas Desulfurization System (FGD) equipment such as Absorber Modules and various pumps and motors will be totally enclosed (and also specifications limiting sound levels will be issued) to meet the acoustical design criteria established in the application (an L_{dn} of 55 db(A) and less than 5 dB(A) shift) at both sites. Also, the stack generated noise will be attenuated by splitter baffle type silencers.

6.129
The coal and limestone trains, while unloading at the Pomfret site, are expected to produce about 41-46 (dB(A) at the property line, and the pneumatically operated limestone car doors are expected to

generate an intermittent sound level of about 58-64 dB(A) at the property line. The coal and limestone trains, while unloading at the Sheridan site, are expected to produce about 41-46 dB(A) and 42-47 dB(A), respectively, at the property line, and the pneumatically operated limestone car doors are expected to generate an intermittent sound level of about 64-70 dB(A) at the property line. The rotary car dumper is expected to generate 34-49 dB(A) at the property line of both sides.

6.130
The noise produced by the equipment operating in the solid waste disposal area exceeds the acoustical design criteria established for the facility's operation (less than 5 dB(A) shift, and 55 dB(A) maximum at the boundary line). To meet these criteria, the original boundary lines could be expanded. The Pomfret site would have to be expanded by approximately 791 acres consisting mostly of brush cover (262.7 acres), agricultural lands (292 acres), pasture (45 acres), vineyards (68 acres) and forests (49 acres). At Sheridan, expansion to meet noise criteria would involve 602 additional acres. The Sheridan expanded area includes 171 acres of brush cover, 129 acres of vineyard, 119 acres of cropland, 62 acres of agricultural extensive land, 59 acres of forest and various other land uses.

Noise Impact (Plan II)

6.131
Western coal with FGD systems will also increase noise levels beyond the original proposal but to a lesser extent than the eastern coal-FGD option. At the Pomfret site, it is expected that 33 existing permanent residents will be impacted by an ambient shift ranging between 6 and 15 dB(A) (maximum 25 dB(A) at the property line). Also, the sound level produced by the station (including the waste handling system) at the property line (80 dB(A)) will exceed the maximum design criterion of 55 dB(A). At the Sheridan site, there will be a shift less than 5 dB(A) at the existing residences outside the plant boundary line due to station operation (maximum of 6 dB(A) at the property line). However, the sound level produced by the station (including the waste disposal handling system) at the property line (67 dB(A)) will exceed the maximum design criteria of 55 dB(A).

6.132
The FGD system equipment such as Absorber Modules and various pumps and motors will be totally enclosed to meet the acoustical design criteria (an l_{dn} of 55 dB(A) and less than 5 dB(A) at both sites. Also, the stack generated noise will be attenuated by splitter baffle type silencers.

6.133
The limestone trains, while unloading at the Pomfret site, are expected to produce about 42-47 dB(A) at the property line, and the

pneumatically operated hopper doors are expected to produce an intermittent sound level of about 63-69 dB(A) at the property line. The limestone trains, while unloading at the Sheridan site, are expected to produce about 43-48 dB(A) at the property line. The pneumatically operated limestone hopper doors are expected to generate an intermittent sound level of about 65-71 dB(A) at the property line.

6.134
The noise generated by the equipment operating in the solid waste disposal area exceeds the acoustical design criteria established for Lake Erie Generating Station operation (less than 5 dB(A) shift, and 55 dB(A) maximum at the boundary line). To meet these criteria, the original boundary line would be expanded. Acreage and land use in the expanded area at Pomfret is as follows:

Land Use	Approximate Acreage
(Ac) Cropland/Cropland Pasture	45.0
(Ai) Agriculture Extensive	45.9
(Ap) Permanent Pasture	26.6
(Av) Vineyard	3.6
(Fc) Brush Cover	101.9
(Fn) Forest, over 30'	4.6
(Th) Thruway	72.6
Total	300.2

The expanded area at Sheridan would consist of the following acreages:

Land Use	Approximate Acreage
(Ac) Cropland/Cropland Pasture	68.0
(Ai) Agriculture Extensive	19.3
(Ap) Permanent Pasture	24.8
(Av) Vineyard	27.6
(Fc) Brush Cover	116.6
(Fn) Forests over 30'	45.9
(Ns) Sands	0.9
(Wb) Bogs, Shrub Wetlands	1.8
Total	304.9 acres

Terrestrial Ecology

6.135
Use of a Flue Gas Desulfurization (FGD) system will impact terrestrial communities through site preparations for additional

waste disposal areas and for construction of additional components of the system, including the emergency sludge pond and facilities associated with the use of limestone in the FGD process. Additionally, the use of eastern coal necessitates the construction of a railroad loop not required if western coal is to be utilized as a fuel source. It is assumed that a properly functioning FGD System will decrease any likelihood of stack-emitted SO_2 occurring in concentrations that would be potentially injurious to the terrestrial ecosystem. This would reduce the impact on area's grape production. The magnitude of impact upon terrestrial ecology from adoption of a FGD System is therefore largely a function of the system's acreage requirements and the habitat value of land permanently committed to the entire system. These factors are discussed below in reference to alternative sites and types of coal.

6.136
The acreage required for all facility components for each type of coal on each site are presented by habitat in Table 6-4. These acreages include only areas to be permanently altered and, therefore, must be considered as minimum values. It can be assumed that most areas lying within the fence will ultimately be affected by the construction of the plant. For example, it is assumed that no agricultural activities will be practiced within the fenced area. Therefore, even where a permanent structure is not constructed within the fenced area, the land will still be affected. In the same manner, it is assumed that most facilities will have access via road. Acreage requirements of these thoroughfares are not included in the table. Acreage requirements do not include any areas slated to be used as laydown areas during construction. Therefore, impacts associated with disturbance of these areas cannot be discussed. Following construction, it can be assumed that some areas within the fence will provide appropriate habitat for some wildlife species, particularly those often associated with ecotones. In addition, habitats such as agricultural areas which have relatively low cover value to many species, will undergo successional changes following abandonment and will thereby potentially provide better habitat for wildlife than at present.

Terrestrial Ecosystem (Plan I, Pomfret Site)

6.137
The use of eastern coal with a FGD system at the Pomfret site necessitates clearing a minimum of approximately 729 acres. The increased acreage requirement of the eastern coal system, compared to the primary western coal system proposal, is attributable to the additional waste disposal area. Development of this second disposal area (the northernmost disposal area), and location of a rail loop northeast of the coal storage piles are the principal features which differentiate eastern and western coal facilities.

TABLE 6-4

HABITAT ACREAGE PERMANENTLY ALTERED

	Pomfret Site		Sheridan Site	
	Western Coal	Eastern Coal	Western Coal	Eastern Coal
Northern Hardwoods	64	65	35	174
Black Locust	1	1	0	3
Willow	3	12	0	0
Shrub	79	72	59	119
Pine Plantation	4	3	1	7
Open Field	51	63	74	92
Cropland	211	407	183	165
Vineyard, Orchard	62	79	59	86
Pond	1	2	0	2
Existing Fly Ash Dump	8	2	0	0
Residential, Recreational	23	24	12	10
Existing Roads	4	0	0	0
Total Acres	510	729	423	658
Total Fenced Acreage	1,050	1,354	1,082	1,120

6.138
With the exception of two streams that will be disturbed, the northern waste disposal area is at present primarily of relatively low ecological and game value. The two streams will require rerouting, effecting changes in local stream characteristics such as substrate and flow rates. This disposal area will eliminate a small portion of a forest stand, as will the fence running through it. The rail loop required for the eastern coal system will eliminate or adversely affect much of the existing breeding area of Henslow's sparrow and other field species. The remaining area of open field will consist of smaller segments which will be subjected to rail activity. This will further reduce its value as breeding habitat for open field species. The configuration of this site plan will virtually eliminate all open field habitat in the original study area. The eastern coal rail system will involve several stream crossings, one in close proximity to a small pond. Disturbance of these areas will decrease their value as habitat for the species inhabiting them.

Terrestrial Ecosystem (Plan I, Sheridan Site)

6.139
Construction of a facility utilizing eastern coal with a FGD system eliminates a minimum of approximately 658 acres of habitat. The sizeable increased acreage requirement of an eastern coal system, compared to a western coal system, is attributable to the former's larger solid waste disposal area (approximately 455 acres). The eastern coal FGD System requires the clearing of two large forest stands and several small woodlots in the solid waste disposal area. A large pond is also located within this area. The coal storage piles and associated railroad will necessitate clearing another hardwood stand. The power plant island, emergency sludge pond, and railroad will virtually eliminate a large stand of northern hardwoods and cause severe disturbance to the associated stream. Additionally, the stand south of the switchyard will be infringed upon by the switchyard, fencing, and new road to connect Chapin Road with Aldrich Road.

Terrestrial Ecosystem (Plan II, Pomfret Site)

6.140
Use of western coal with an FGD system will require a minimum of approximately 510 acres. The three areas of major land clearing will be for the coal storage piles, the solid waste disposal area, and the power plant island. The coal storage piles will eliminate approximately 30 acres of northern hardwoods forest which provide relatively good habitat for deer and raccoon, and support a diverse community of floral and non-game faunal species. The association of this forest stand with two small streams enhances its value as wildlife habitat.

This forest area is already stressed, however, by the existing fly ash dump and has been reduced in size since the original application due to landfill enlargement. This stand would likely become less valuable as wildlife habitat once the power plant island facilities are constructed to the immediate southwest. The two streams previously mentioned will be rerouted and subsequently decrease in value as wildlife habitat.

6.141
The solid waste disposal area encompasses mostly agricultural land (approximately 183 acres) of lower ecological value. Two separate stands of northern hardwoods, each associated with a stream, are located in this area. Approximately 27 acres of these two stands will be cleared for solid waste disposal. The value of the remaining northern hardwoods will be greatly reduced for most wildlife due to their small stand sizes and proximity to fence lines and New York Thruway traffic, as well as the rerouting of portions of the streams.

Terrestrial Ecosystem (Plan II, Sheridan Site)

6.142
The western coal FGD system will require permanent alteration of approximately 423 acres: Approximately 15 percent for the coal storage piles, 55 percent for solid waste disposal, and 30 percent for the plant island and miscellaneous facility components. The value of wildlife habitat is partly a function of the particular spatial arrangement of relatively large tracts of hardwoods forest, streams, shrub community, and agricultural land. Removal of one component, such as cropland, would lower the value of adjacent forested land as habitat for many species by decreasing overall habitat diversity. This type of impact is particularly important at the Sheridan site, which is a mosaic of extensive tracts of woodlands, agricultural fields, and shrub lands.

6.143
The wildlife value of some hardwood stands on the site will be decreased as the necessary supporting components of a species' habitat such as agricultural fields are removed. One hardwood tract affected in this manner is the one located north of the solid waste disposal area. In addition to this infringement on the south site, this tract will be disturbed on the east by the emergency sludge pond and somewhat by the wastewater treatment facilities. This eastern section of the woodlot will be virtually eliminated. In addition, construction of the railroad loop near the plant island through shrub and other communities will undoubtedly adversely affect the stream which flows through the woodlot and which originates in this area.

6.144
Several small woodlots located within the area of the power plant island will be eliminated, as will a small portion of wooded area on the corner of Chapin Road and Aldrich Road. The acreage required by the coal storage piles, nearby structures, and construction activity at this location will probably result in total elimination of the woodlot north of the railroad trestle. In addition, a portion of the corner of the woodlot east of this coal storage area will be eliminated to accommodate the limestone processing facilities and the outer fence. As much as 20 acres of this woodlot may be eliminated. Finally, another woodlot located east of the power plant island will be included in the fenced area. Fencing alone will somewhat affect certain species of wildlife presently utilizing this area.

Water Management and Quality (Plan I)

6.145
The overall water management concept for both eastern and western coal with FGD systems remains unchanged from the primary proposal discussed in Chapter One. However, with Plan II (western coal) the fly ash transport system will not be operated in the closed loop mode. Instead the fly ash transport system will operate in a recirculation mode producing a blowdown. Thus makeup to the system will be equal to the sum of the water consumed by the settled ash and blowdown and is estimated at 170 gpm. Blowdown from the system will be reused at the limestone slurry production facility within the closed-loop FGD system. Similar to the western coal, the Plan I (eastern coal), fly ash transport system will operate in a recirculation mode producing blowdown. This coal requires larger sluice water quantities due to greater ash content, The system would require a makeup flow of 280 gpm for the fly ash transport system. Blowdown will be used in the closed-loop FGD system. The FGD system with either coal will produce no liquid blowdowns. Makeup water requirements for the FGD system will be equal to the sum of evaporative losses in the scrubbers (about 960 gpm for western, 2,240 gpm for eastern), and water entrained within settled solids (50 gpm for western, 290 gpm for eastern). The following sections update the relevant portions of plant water management programs for both FGD plans.

Wastewater Quality and Quantity (Plan I)

6.146
The selection of a sulfur dioxide scrubber system utilizing limestone and incorporating sludge stabilization necessitates the consideration of treatment for rainwater runoff from the curing area, limestone storage and combined waste disposal piles. The quantity and quality of other waste streams have been discussed in Chapters One and Four.

The runoffs resulting from the 100-year, 24-hour rainfall event are estimated as follows: 130,000 gallons per day from the curing area, 65,000 gallons per day from the limestone pile, one million gallons per day from the combined waste disposal area, and 1.8 million gallons per day from the coal pile. These values are based on the assumption that 80 percent of the rainfall would run off these areas. It has been anticipated that eastern coal pile runoff would require pH control and addition of flocculants in order to meet discharge quality criteria. The need for treatment is obviated under this plan by introducing the runoff to the scrubber water circuit. The alkalinity of the limestone pile runoff water could be useful in the scrubber water circuit.

6.147
Curing area runoff will exhibit high levels of total dissolved solids (TDS) and suspended solids (SS) and slightly elevated pH. Relatively high TDS and SS along with alkaline conditions are expected components of limestone pile runoff. The waste disposal pile runoff will contain high TDS and SS levels. Coal pile runoff will exhibit variable levels of TDS, SS, and metals and will vary in pH.

Wastewater Management (Plan I)

6.148
Conceptual consideration of the plant water management program leads to the conclusion that under conditions presented in this FGD study, opportunities exist for the elimination of certain discharges, and the reuse of substantial amounts of water. Water reuse will serve the objectives of economy of operation, reduction of volume for treatment, and discharge. The adoption of a limestone-based air quality control system (AQCS) requires the dedication of significant volumes of makeup water, or service water, to the scrubber system. As previously discussed, the air quality control system is operated in a closed loop mode. Blowdown from the system is limited to the moisture content of the waste solids. Under the proposed plan, runoff water from the curing area, limestone pile, waste disposal pile, and coal pile will be stored and fed at a controlled rate to an air quality control system waste slurry tank, at such times as runoff is available. These wastes represent supplementary makeup water available on an intermittent basis. On a continuous basis, blowdown from the bottom ash system will be introduced to the system waste slurry tank. Following a storm which produces runoff, up to 220 gpm of supplementary makeup water will be available. This will reduce the scrubber makeup water demand by a corresponding amount. Previous water management plans indicated that sludge from plant drains and sumps, after removal from the liquid portion, would be disposed of on-site, in conjunction with ash solids. The present plan calls for the disposal of this sludge by an outside contractor.

6.149
Facilities to implement the proposed water management program are holding basins and pumps or other means of producing controlled flow rates compatible with water reuse objectives. Rainwater runoff from the curing area, limestone pile, the combined waste disposal pile and the coal pile will be transported to lined holding basins using lined ditches or pipes, depending on site constraints and hydraulic conditions. The curing area, limestone pile, combined water disposal, and coal pile holding basins will be sized to retain the runoff from the 100-year, 24-hour rainfall event.

Wastewater Quality and Quantity (Plan II)

6.150
Western coal conditions will require the on-site storage of less limestone and will, therefore, involve less runoff water collection and handling. Since runoff from the working face of the combined waste disposal pile will be collected in either case, the quantity remains unchanged from the eastern coal case. The runoff from the curing area will also be reduced for western coal. The 100-year, 24-hour rainfall event is expected to produce the following runoff: 44,000 gallons per day (gpd) from the curing area; 35,000 gpd from the limestone pile, one million gpd from the combined waste disposal area and 5.5 million gallons from the coal pile. Wastewater will exhibit contaminants similar to those discussed in the section on eastern coal.

Wastewater Management (Plan II)

6.151
The water management plan proposed for western coal differs from that for eastern coal in the handling of rainwater runoff from the coal pile. The proposed plan indicates that a limited volume of coal pile runoff water will be pumped from a settling pond to the scrubber system for reuse. Runoff in excess of the volume reused will be discharged to Lake Erie through the cooling tower blowdown line.

Economic Evaluation

6.152
The economic evaluation factors used in the FGD study are tabulated below:

Average Annual Capacity Factor	%	69
Annual Fixed Charge Rate	%	20.1
Plant Life	yrs	30
Discount Rate	%	11.5
Fuel Escalation Rates		
Thru 1978 (Plan I & Plan II)	%	8
After 1978		
For Plan I - Eastern Coal	%	5
For Plan II - Western Coal	%	4

Levelized Fuel Cost		
For Plan I - Eastern Coal (min)	$/10Btu	3.83
For Plan I - Eastern Coal (max)	$\$/10^6$Btu	4.38
For Plan II - Western Coal	$\$/10^6$Btu	3.15
Capability Charge	$/kW	650
FGD & Sludge Stabilization System Cost Factors		
Levelized Limestone Cost	$/ton	23.50
Levelized Lime Additive Cost	$/ton	109.00
Levelized Operating Labor Cost	$/man-yr	51,100
Levelized Maintenance Cost	% of Total Inv	3
Solid Waste TransPort/Placement Vehicle Cost Factors		
Levelized Operating Labor Cost	$/Veh Operating Hr	64
Levelized Maintenance Cost	$/Veh Operating Hr	50
Levelized Fuel Cost	$/Veh Operating Hr	36

The economic evaluation includes the impact each coal has on cycle parameters such as steam generator efficiency, plant capability, and net station heat rate. The total auxiliary power required by each alternative FGD and sludge stabilization system is also incorporated into the study. Balance of plant auxiliary power requirements such as electrostatic precipitators, fans, circulating water and coal handling are included. The overall impact on cycle parameters may be summarized as follows:

		Plan I	Plan II
Net Unit Capability	kw	785,350	794,800
Differential		(9,450)	Base
Net Station Heat Rate	Btu/kwhr	9,410	9,795

6.153
Comparative order-of-magnitude estimates have been made of the investment associated with each plan studied at the Pomfret site. The estimates are presented in two parts, the FGD and stabilization systems estimate and the comparative balance of plant estimate. These estimates are not total plant estimates.

6.154
The FGD and stabilization systems estimate is based on Vendor budgetary quotations and the conceptual design presented in Appendix C. The scope of each Vendor supplied system includes all equipment, ductwork, structural support steel, piping, and complete instrumentation and controls. Items not in the Vendor estimate, such as foundation, buildings, insulation and lagging, certain mechanical equipment, complete electrical requirement (transformers,

switchgears, motors above 250 HP and wiring), limestone unloading and handling facilities and stacks are based on Ebasco estimates. The FGD and stabilization system order of magnitude investment estimates indicate a total construction cost of 263 million dollars for Plan I and 245 million dollars for Plan II.

6.155
The comparative balance of plant estimate has been derived from previous Lake Erie Station studies relating to the following equipment required for the alternative plans.

Plan I - Eastern Coal	Plan II - Western Coal
Steam Generator	Steam Generator
Cold Side Precipitator	Hot Side Precipitator
Coal Handling System	Coal Handling System
Make-up & Blowdown Tunnel	Coal Unloading Tunnel including Mooring Facility

The balance of plant comparative order of magnitude investment analysis shows a total construction cost of 490 million dollars for Plan I and 625 million dollars for Plan II. The total construction cost estimates include escalation to Trial Operating Dates of April 1985 for Unit No. 1, and October 1986 for Unit No. 2. Also included are indirect construction costs, an allowance for contingency and Ebasco's professional services and fees. The cost of Sales/Use Tax, interest during construction and client's charges, including cost of land and land rights are excluded from these estimates. Material escalation is included at six (6) percent per year. Labor is escalated at eight (8) percent per year. Facilities common to both units are included in Unit No. 1 cost.

6.156
The applicant also analyzed the annual owning and operating cost of the two alternative FGD plans. The following items are included in the annual owning and operating cost analysis of the two plans under consideration:

- Fixed charges on total plant construction cost.
- Capability charge for differential capacity. This item reflects the effect of auxiliary power and the impact of steam reheat and the heat loss across the hotside precipitator.
- Total plant fuel charge.
- All charges associated with operating and maintaining the FGD, waste stabilization and disposal systems components.

All annual costs are based on an annual average capacity factor of 0.69. The cost items which are affected by the coal sulfur content, namely limestone and waste stabilization additive charges, are predicated on the assumption that average sulfur coal is burned. For comparative purposes the lime waste stabilization additive requirement for Plan I (eastern coal) has been reduced from 18,500 TPY to 15,200 TPY reflecting the same waste sludge to fly ash ratio (1:1) assumed for Plan II (western coal). The comparative owning and operating costs are summarized below:

	Units 1 and 2		
	Plan I Eastern Coal		Plan II Western Coal
Fuel Cost, $/MBtu	3.83	4.38	3.15
Fixed Charges - $1,000/yr	$ 151,355	$151,355	$ 174,870
Total Plant Fuel Charge - $1,000/yr	346,280	396,000	296,460
All Other Charges - $1,000/yr	23,530*	23,530*	14,640*
Total Cost - $1,000/yr	$ 521,165	$570,885	$ 485,970
Capitalized Cost - $1,000	$2,592,860	$2,840,220	$2,417,760

* includes capability charge

6.157
The economic analysis indicates that on an investment basis only, the eastern coal alternative (Plan I) is the least expensive. The overall evaluation indicates that Plan II (western coal) is the most economic plan if coal is delivered on site by lake ship.

6.158
The applicant's FGD study also included qualitative evaluations of two other coal sources. These are 3.4 percent sulfur eastern coal (Illinois) and 0.85 percent sulfur western coal (Montana). The economic analysis shows that when considering coal costs and delivery costs only, the Montana coal is the least expensive fuel of the four coals evaluated. This is premised on delivery to the site by lake ship. Comparison of the four fuels on an investment cost basis favors the Plan I eastern coal (Pennsylvania/West Virginia). The overall economic evaluation including annual owning and operating costs shows that Montana coal is the most economic fuel and Wyoming coal (Plan II) is the second most economic fuel when these coals are delivered to the site by lake ship. The environmental analysis of the four fuels demonstrates that the two western coals would result in less impact than eastern coals. Western coals require less land for waste disposal and the SO_2 emission levels are lower than from the eastern fuels. Comparison of the two western coals indicates that Montana coal requires 65 more acres of land for waste disposal than would be required for Wyoming coal. Wyoming coal SO_2 emission levels would be slightly less than Montana coal. The applicant has tentatively determined that the preferred FGD system alternative is Plan II with a subbituminous western coal as fuel.

6.159

The N.Y.S. Public Service Commission's analysis is not in agreement with the applicant's conclusion that a scrubber with low sulfur western coal is the least expensive alternative. The PSC's economic analysis shows that the use of 2.3 percent sulfur eastern coal will result in the lowest cost. The major reason for the differing results is the applicant's use of a lowered escalation rate in the cost of western coal. The applicant assumed an escalation rate of four percent for western coal and five percent for eastern coal. PSC used a uniform escalation rate of five percent for both fuels. However, PSC agrees that there would probably be fewer adverse environmental impacts with low sulfur western coal.

CHAPTER SEVEN: THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

INTRODUCTION

7.001
This chapter sets forth the relationship between the short term use of man's environment implicit in the construction and operation of the proposed Lake Erie Generating Station and the inherent long-term impact of the proposal on future generations. During the relatively short thirty-year life of the proposed facility the present generation will derive benefits principally in the form of electrical energy. The effect of meeting society's demand for electricity is a continuation and possibly expansion of the standard of living. However, the environmental cost of this short-term use can be transmitted to future generations affecting their standard of living. The following paragraphs contain a discussion of the postulated long-term impacts, beyond the expected life of the Lake Erie Generating Station, with the realization that the present generation is trustee of the environment for future generations and that proper control of the short-term use of the site can minimize long term effects. However, even with proper control of the site, there are trade-offs between derived short-term benefits and impacts on future generations.

POMFRET SITE

LAND USE

7.002
The proposed Pomfret site comprises a total of 1054 acres. Plant construction will necessitate the clearing of 551 acres or 52.3 percent of the site. Of the 551 acres, 367 acres will be used for permanent structures and the remaining 184 acres will be cleared for construction-related facilities. The site is considered agricultural according to regional and State land use plans due to the high economic viability of the farms generally found in this region. Although the proposed use is inconsistent with land use plans, the site comprises only 0.2 percent of the total active farmland presently found in Chautauqua County. Long-term projections on a regional basis suggest that the site will comprise approximately 0.1 percent of the total active agricultural land available in the year 2020. Although the long-term regional projections may not have considered power plant construction, several case histories of nuclear power plants indicate that power plant-induced development does not occur. Thus, only that agricultural land actually committed to use has been considered. This resultant loss will have a minimal long-term impact

provided agricultural land does not become scarce in the future. After the effective life of the plant, future land use will depend on the power plant decommissioning plans. If the site is not re-used as a power plant facility, only those areas which contained structures which could not be economically removed would be unavailable for reclamation.

AQUATIC ECOSYSTEM

7.003
The major long-term impact of the proposed facility at Pomfret is the permanent loss of aquatic habitat. A total of six ponds and sections of three streams will be eliminated due to construction. These on-site bodies were found to be neither unique nor significant to the Lake Erie ecosystem (see 4.025, 2.157, 2.240 b and c).

7.004
The withdrawal of Lake Erie waters for cooling purposes will entail entrainment and impingement of aquatic organisms. Through design and location of the intake structures these effects will be minimized and are expected to have no measurable impact on the long-term stability and productivity of Lake Erie's fish population. The discharge is also expected to cause no measurable long-term changes in the lake's resources and assimilative capacity. The losses of aquatic organisms are considered to be short-term losses of individuals rather than long-term losses of species or populations.

TERRESTRIAL ECOSYSTEM

7.005
Impacts on the terrestrial ecosystem of the Pomfret site will occur due to construction activities and solid waste disposal operations. Disruption of vegetational succession as a result of land clearing, displacement of wildlife, and changes in movement of fauna due to physical barriers will be by-products of the proposed construction. The proposed procedure for fly ash and bottom ash disposal will result in the creation of 45-foot high mounds. By applying proper reclamation techniques these waste mounds will have only a short-term impact on the area although they will be a permanent alteration of the landscape.

7.006
Long-term impacts associated with the proposed Pomfret site ash disposal facility can occur from the accumulation of trace elements in plants and soil. Proper reclamation procedures will minimize these effects.

7.007
Strip mining activities required to supply the low sulfur Western coal for the operation of the proposed Lake Erie Generating Station could have long-term impacts on the affected mined areas. If sufficient rainfall or surface water is not available when the mine is exhausted and ready for reclamation, revegetation may not be successful.

AIR QUALITY

7.008
Construction and operation of the proposed generating station will result in some short-term degradation of air quality. Increases in ambient water vapor, carbon dioxide, sulfur oxides, nitrogen oxides, particulates and trace elements will result from plant operation. However, these emissions will be below allowable Federal and State standards. If at the end of the projected thirty-year life of the plant all combustion-produced emissions cease, no long-term impacts on air quality are foreseen.

WATER QUALITY

7.009
No long-term impacts on water quality are expected as a result of the construction or operation and maintenance of the proposed facility, nor will the proposed plant foreclose future options on area water quality if all necessary precautions are taken to control leaching of toxic substances from land disposal sites. Waste heat, increased suspended solids levels and increased loading of organics are short-term impacts expected during plant operation.

AIR USE

7.010
The proposed construction has been issued a "no hazard" determination to regional and local aircraft by the Federal Aviation Administration. The long-term impact of the facility on air use will depend on decommissioning plans. If the cooling tower and stacks are removed, no restrictions on air space are anticipated.

MINERAL USE

7.011
Over the anticipated thirty-year lifetime of the plant, approximately 180,000,000 tons of Western or 120,000,000 tons of Eastern coal will be required as fuel. Support operations such as mining and shipping will result in additional energy demands. The coal demand of the facility will constitute only a small percentage of the total U.S. reserves.

AESTHETICS

7.012
The long-term impact of the proposed plant on local aesthetics will depend on the actions taken during decommissioning. Assuming all above-ground structures are removed, no long-term aesthetic impact will result. During the operational life of the plant and after, if the structures remain, the plant will dominate the rural landscape. The ash disposal facility, if properly revegetated, will provide relief in an area that is relatively flat, resulting in a long-term change in appearance of the site.

SHERIDAN SITE

LAND USE

7.013
The proposed Sheridan site consists of a total of 986 acres. Plant construction will necessitate the clearing of 525 acres or 53.2 percent of the site. Of the 525 acres, 320 acres will be used for permanent structures. The remaining 205 acres will be cleared for construction-related activities. The site is classified as "exceptional farming" land by State and local land use plans. Although the proposed use is inconsistent with the above classification, the site comprises only 0.2 percent of the total active farmland presently found in Chautauqua County. Long-term projections in regional land use, covering an area greater than Chautauqua County, suggest that by the year 2020 the Sheridan site will comprise about 0.1 percent of the active agricultural land in production. Provided agricultural land does not become scarce in the future, the removal of Sheridan site land from agricultural production will have a minimal long-term impact. After the effective life of the plant, future land-use will depend on the decommissioning plans. If the site is not re-used as a power plant facility only those areas which contained structures which could not be economically removed would be unavailable for reclamation.

AQUATIC ECOSYSTEM

7.014
The major long-term impact of the proposed power plant at Sheridan is the permanent loss of aquatic habitat. A total of five ponds and sections of two streams will be eliminated due to construction. These on-site bodies of water were found to be neither unique nor significant to the Lake Erie eco-system.

7.015
The withdrawal of Lake Erie waters for cooling purposes will entail entrainment, impingement, and subsequent loss of aquatic organisms.

Through design and location of the intake structures these effects will be minimized and are expected to have no measurable impact on the long-term stability and productivity of Lake Erie's fish population. The discharge of cooling water is not expected to cause any measurable long-term changes in the lake's resources and assimilative capacity. Although aquatic organisms will be lost during the operational life of the proposed power plant, the short-term loss of individuals is not expected to have long-term impacts on species or populations.

TERRESTRIAL ECOSYSTEM

7.016
Impacts on the Sheridan site terrestrial ecosystem will occur due to construction activities and solid waste disposal operations. Disruption of vegetational succession as a result of land clearing, displacement of wildlife, and changes in movement of fauna due to physical barriers will be by-products of the proposed construction. The proposed procedure for fly ash and bottom ash disposal will result in the creation of 45-foot high mounds. By applying proper reclamation techniques, these waste mounds will have only a short-term impact on the area although they will be a permanent alteration of the landscape.

7.017
Long-term impacts associated with the proposed Sheridan site ash disposal facility can occur from the accumulation of trace elements in plants and soil. Proper reclamation procedures will minimize these effects.

7.018
Strip mining activities required to supply the low sulfur Western coal for the operation of the proposed Lake Erie Generating Station could have long-term impacts on the affected areas. If sufficient rainfall or surface water is not available when the mine is exhausted and ready for reclamation, revegetation may not be successful.

AIR QUALITY

7.019
Construction and operation of the proposed generating station will result in some short-term degradation of air quality. Increases in ambient water vapor, carbon dioxide, sulfur oxides, nitrogen oxides, particulates and trace elements will result from plant operation. However, these emissions will be below allowable Federal and State standards. If at the end of the projected thirty-year life of the plant all combustion-produced emissions cease, no long-term impacts on air quality are foreseen.

WATER QUALITY

7.020
No long-term impacts on water quality are expected as a result of the construction or operation and maintenance of the proposed facility, nor will the plant foreclose future options on area water quality if all necessary precautions are taken to control leaching of toxic substances from land disposal sites. Waste heat, increased suspended solids levels and increased loading of organics are short-term impacts expected during plant operation.

AIR USE

7.021
The long-term impact of the facility on air use will depend on the decommissioning plans. If the cooling tower and stacks are removed after station retirement, no restrictions on air space are anticipated. However, during the proposed plant's economic life of thirty years, modified operational procedures for the nearby Dunkirk Airport may be required by the Federal Aviation Administration to insure that no hazard to aircraft occurs.

MINERAL USE

7.022
Over the anticipated thirty-year lifetime of the plant, approximately 180,000,000 tons of Western or 120,000,000 tons of Eastern coal will be required as fuel. Support operations such as mining and shipping will result in additional demands. The coal demand of the facility will constitute only a small percentage of the total U.S. reserves.

AESTHETICS

7.023
The long-term impact of the proposed plant at Sheridan on local aesthetics will depend on the actions taken during decommissioning. Assuming all above-ground structures are removed, no long-term aesthetic impact will result. During the operational life of the plant and after, if the structures remain, the plant will dominate the rural landscape. The revegetated ash disposal facility will result in long-term changes in the site's appearance by providing relief in a relatively flat area.

CHAPTER EIGHT: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

INTRODUCTION

8.001
This chapter identifies unavoidable environmental impacts of the proposed action which irreversibly curtail the range of potential uses of the environment or result in the commitment of resources that are neither renewable nor recoverable. Thus, an irreversible commitment results in environmental changes which could not, at a future date, be altered to restore the environment to its pre-project state. For the purpose of this discussion the term "resource" is defined to include not only commitments of labor and materials, but also natural and cultural resources committed to loss or destruction as a consequence of the construction, operation, and maintenance of the proposed Lake Erie Generating Station and its appurtenant structures.

POMFRET SITE

MATERIAL RESOURCES

8.002
The construction and operation of the proposed Lake Erie Generating Station will involve both long and short-term commitments of natural resources. Some materials involved in the construction process (structural steel, aluminum, copper, tin, etc.) will be available for reclamation if, at the conclusion of the proposed plant's operating life, it is economically feasible to recycle these materials. The amount of these materials actually utilized in the construction of the proposed plant will comprise a very small fraction of U.S. and world production and should have an insignificant impact on the availability of these resources.

MINERALS

8.003
The generation of electrical power will require the consumption of 180,000,000 tons of low sulfur western coal over the thirty-year period. Additional nonrecoverable fuel losses will be incurred in the mining, construction, and transportation of materials and other associated facility support operations. These consumable resources will be irretrievably committed.

AGRICULTURAL PRODUCTIVITY

8.004
Construction of the proposed facility at the Pomfret site will remove 454 acres of land from active agricultural production. This acreage produces a yearly crop (grapes, hay, pasture, and truck farming) valued at $233,191. The land will remain inactive for the entire life span of the proposed power plant resulting in a loss of these agricultural commodities during a period of approximately thirty years. The agricultural potential of the site, therefore, will be irreversibly committed for the life of the plant.

HUMAN RESOURCES

8.005
The construction, operation, and maintenance of the proposed facility at Pomfret will require the irreversible and irretrievable commitment of human resources to design, build, and operate the plant as well as design, build, mine, and transport the necessary supplies and materials. Approximately, 6,000 man-years will be required for the construction of the facility, and 3,000 man-years for its operation over the projected 30-year operating life. These figures do not include the additional man-years required for ancillary operations such as mining and transportation of raw materials.

OTHER RESOURCES

8.006
Natural and cultural resources committed to loss or destruction as a consequence of the construction, operation, and maintenance of the proposed facility are difficult to quantify as a percent of available resources. Most are not irreversible or irretrievable commitments. When the plant is decommissioned, the land is again available, water consumption is ended and air is available as a dispersal medium for others. Archeological sites not identified during predictive and intensive surveys or during construction monitoring could be lost. This represents a potential impact that could be irreversible. Resources which might be considered irreversibly and irretrievably committed, such as terrestrial and aquatic habitat may, in fact, be reestablished after plant decommissioning depending on what future use is made of the site. Changes in the ecology and biology of the three altered streams will result in a long-term irreversible commitment since reestablishment of pre-project conditions depends on restoring the streams to their natural configurations and physical, biological, and chemical parameters. The reestablishment of these parameters is unlikely.

SHERIDAN SITE

MATERIAL RESOURCES

8.007
The construction and operation of the proposed Lake Erie Generating Station at Sheridan will involve both long and short-term commitments of natural resources. Some materials involved in the construction process (structural steel, aluminum, copper, tin, etc.) will be available for reclamation if, at the conclusion of the proposed plant's operating life, it is economically feasible to recycle these materials. The amount of these materials actually utilized in the construction of the proposed plant will comprise a very small fraction of U.S. and world production and should have an insignificant impact on the availability of these resources.

MINERALS

8.008
The generation of electrical power will require the consumption of 180,000,000 tons of low sulfur western coal over the thirty-year period. Additional nonrecoverable fuel losses will be incurred in the mining, construction, and transportation of materials and other associated facility support operations. These consumable resources will be irretrievably committed.

AGRICULTURAL PRODUCTIVITY

8.009
Construction of the proposed facility at the Sheridan site will remove 447 acres of land from active agricultural production. This acreage produces a yearly crop (grapes, hay, pasture, and truck farming) valued at $271,444. The land will remain inactive for the entire life span of the proposed power plant resulting in a loss of these agricultural commodities during a period of approximately thirty years. The agricultural potential of the site, therefore, will be irreversibly committed for the life of the plant.

HUMAN RESOURCES

8.010
The construction, operation, and maintenance of the proposed facility at Sheridan will require the irreversible and irretrievable commitment of human resources to design, build, and operate the plant as well as design, build, mine, and transport the necessary supplies and materials. Approximately 6,000 man-years will be required for the construction of the facility and 3,000 man-years for its operation over the projected 30-year operating life. These figures do not

include the additional man-years required for ancillary operations such as mining and transportation of raw materials.

OTHER RESOURCES

8.011
Natural and cultural resources committed to loss or destruction as a consequence of the construction, operation, and maintenance of the proposed facility are difficult to quantify as a percent of available resources. Most are not irreversible or irretrievable commitments. When the plant is decommissioned, the land is again available, water consumption is ended, and air is available as a dispersal medium for others. Archeological sites not identified during predictive and intensive surveys or during construction monitoring could be lost. This represents a potential impact that could be irreversible. Resources which might be considered irreversibly and irretrievably committed, such as terrestrial and aquatic habitat, may in fact, be reestablished after plant decommissioning depending on what future use is made of the site. Changes in the ecology and biology of the two altered streams will result in a long-term irreversible commitment since reestablishment of pre-project conditions depends on restoring the streams to their natural configurations and physical, biological, and chemical parameters. The reestablishment of these conditions is unlikely.

CHAPTER NINE: COORDINATION WITH OTHERS

INTERAGENCY COORDINATION

9.001
During the review of the Niagara Mohawk Power Corporation permit applications, it became apparent that a multidisciplinary evaluation would be required to identify and define the environmental impacts associated with the construction and operation of the proposed power generating station. In order to initiate such an evaluation, it was necessary to meet with a number of agency representatives with specialized training and experience in the various impact disciplines and with a thorough working knowledge of Federal, State, and local regulatory guidelines applicable to the proposed generating station. These coordination meetings resulted in the establishment of technical review and consultation procedures and the identification of standards which must be met by the facility to insure that the most environmentally acceptable design is achieved.

9.002
An interagency technical review of the applicant's environmental reports was established and during this period, the agencies have evaluated the data collection effort by the applicant to insure that there is sufficient information to analyze the overall impact of the proposed facility on the environment; identified areas where additional information was required; suggested mitigative measures; and commented on project impacts and alternatives.

9.003
Overall, the coordination meetings and technical review assisted in the development and analysis of the data contained in the Draft Environmental Impact Statement (EIS). Interagency coordination efforts will be continued up to the point a decision is made as to whether or not the Department of the Army permit should be issued.

9.004
The following Federal and State agencies either participated in the coordination meetings and technical review or supplied supplemental information:

- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Department of the Interior
- National Park Service
- New York State Public Service Commission
- New York State Department of Environmental Conservation
- New York Job Development Authority

During preparation of the Final EIS the U. S. Department of Agriculture, Soil Conservation Service provided technical information and assistance in identifying prime and unique farmlands. The Corps has also had meetings with the National Register Office (U. S. Department of the Interior) and the Advisory Council on Historic Preservation to insure that their concerns are adequately addressed in the Final EIS.

COORDINATION WITH THE GENERAL PUBLIC

9.005
In an effort to gain full public involvement in the review of the Niagara Mohawk proposal, the Corps public notices announcing the proposed work were given wide distribution. The public notices advertised the actual work requiring Department of the Army permits, mentioned that this work was ancillary to the establishment of the proposed Lake Erie Generating Station, advised that the Corps would prepare an Environmental Impact Statement on the entire generating facility, and requested comments on the proposal. Copies of the public notices were sent to Federal, State, regional and local officials, agencies, environmental groups, and private citizens. Additionally, news releases were transmitted to 50 newspapers and radio and television stations in the Buffalo Metropolitan area and the Dunkirk, New York vicinity.

9.006
During this public interest review period, issues and concerns relating to alternative modes of fuel transportation, air quality, groundwater and private wells, property rights and property values, aesthetics, and recreation, among others, were identified. This information was analyzed and evaluated during the assessment of the environmental impact and, where practicable, is presented in the environmental statement. A formal public meeting was held on 16 May 1978 in Dunkirk, NY to receive public input on the Draft EIS. The major concerns raised during the public meeting and the appropriate paragraphs of this Final EIS which address the issues are as follows: Use of a proposed Buffalo transshipment facility as an alternative to the onsite coal unloading facility (6.041-6.046), prevention of coal spillage during unloading operations (1.046), impacts on natural gas reserves on the sites (4.061), site selection procedures (Foreword), shore erosion as a result of thermal effluent effects on ice cover (4.146), impacts on property during tunnel construction (4.057a), and the use of Dunkirk Harbor to supply coal for the station (6.040).

COORDINATION WITH THE APPLICANT

9.007
Throughout the permit application processing period, the Corps of Engineers has met several times with representatives of the Niagara

Mohawk Power Corporation and their consultant, Envirosphere Company, 19 Rector Street, New York, New York to discuss coordination procedures and to clarify various issues that were identified during both the Corps review and interagency review of the applicant's environmental report and baseline data. This coordination resulted in timely responses by the applicant to issues and concerns and has insured that the most recent developments and changes in project design have been incorporated in this Environmental Impact Statement.

COORDINATION INITIATED BY THE NIAGARA MOHAWK POWER CORPORATION

9.008
Niagara Mohawk made a public announcement in early 1974 concerning the proposal to construct a coal-fired steam electric generating station in western New York State. Responses to the announcement were received from private parties and several local governments expressing an interest in either having the project located within their respective jurisdictions or in selling land for use as a power plant site. The applicant investigated all of these locations during the site selection process and compared them with established siting criteria.

9.009
After selection of the Pomfret and Sheridan sites for consideration and evaluation by the State under Article VIII of the New York State Public Service Law, meetings were held with all affected town and county government officials and a public announcement was made identifying the selected sites. At this point in time, a public meeting was held so that the Niagara Mohawk Power Corporation could answer questions from the local residents and address their concerns. Some of the major issues discussed at the public meeting were the effects of the thermal discharge on nearshore ice and shore erosion, and the impact of proposed stack emissions on the local grape crop. This resulted in the initiation of a two-year study designed to assess the impact of stack emissions on grapes.

9.010
The applicant has consulted with or held meetings with Dunkirk officials, local municipal representatives, law enforcement agencies, the Chautauqua County planning department, and the Agricultural Extension Service to discuss and develop plans for traffic studies, water use, sewage disposal, Dunkirk Airport studies, construction worker relocation patterns, land use and aesthetics.

9.011
Throughout the period of field data acquisition for the Article VIII application, Niagara Mohawk has had ongoing dialogue with the staffs of the New York Public Service Commission and New York State

Department of Environmental Conservation. These discussions resulted in some modifications to the data collection programs, inclusion of additional topics of concern, and alternatives to the proposed power plant design. During the extensive public hearings for Article VIII, which were open to the public, the applicant answered questions and provided clarification and additional information on all facets of the baseline environmental studies, engineering design, and associated environmental impacts. The applicant, the staff of the New York State Public Service Commission, and the staff of the New York State Department of Environmental Conservation have, independently, informed the Corps of all additional information generated during the Article VIII proceedings.

9.012
The Niagara Mohawk Power Corporation has also consulted directly with several Federal agencies. In correspondence with the Federal Energy Administration, Niagara Mohawk has committed to use coal as the primary fuel for the Lake Erie Generating Station. The Federal Aviation Administration has issued a "No Hazard" determination for construction at the Pomfret site. The Environmental Protection Agency was sent a copy of the Article VIII Application for their information. The U.S. Coast Guard was contacted for information concerning the location of shipping lanes in the vicinity of the two sites and the formation of ice on the eastern end of Lake Erie. Niagara Mohawk has also met with representatives of the U. S. Coast Guard and U. S. EPA to discuss the technical comments of these agencies on the draft EIS.

LAND USE PLANS

9.013
Federal, State, and local agencies responsible for land use planning were contacted to determine the relationship of the proposed action to land use plans or proposals. A letter, requesting such information, was sent to the following agencies: State of New York Office of General Services, New York State Public Service Commission, Division of State, Town of Sheridan Planning Board, Town of Portland Planning Board, Silver Creek Village Planning Board, Southern Tier Western Regional Planning-Development Board, Chautauqua County Planning Board, Dunkirk-Fredonia - Inter-Municipality Planning Board, Town of Pomfret Planning Board, Chautauqua County Planning and Development Agency, and the U.S. Department of Housing and Urban Development. Copies of these letters can be found in Appendix E. The concerns of the coordinating agencies are discussed in Chapter Three of this environmental statement.

CULTURAL RESOURCES

9.014
Cultural resources reports were sent to the National Park Service and

the New York State Office of Parks and Recreation for review and comment. The reports prepared for the Niagara Mohawk Power Corporation by Dr. J. Cynthia Weber of the Envirosphere Company, NY, NY, and Kathleen Miller, Archeological Resource Management Service of the New York Archeological Council through the State University of New York at Buffalo, NY, contained information on the archeological surveys that were performed, the survey results, archeological and historical background of the region, and recommendations for future study and compliance with applicable statutes. The concerns of the coordinating agencies are discussed in Chapter Four of this environmental statement. During review of the baseline data and the draft EIS, certain resources were identified as potentially eligible for inclusion in the National Register. On 23 June 1978, the Corps submitted requests for determinations of eligibility to the Keeper of the National Register. The eligibility of these resources for inclusion in the National Register is discussed in Chapter 2. Correspondence concerning cultural resources is contained in updated Appendix E which includes letters concerning comments on the draft EIS, and procedures to be followed.

STATEMENT COORDINATION

9.015
To insure full coordination, the draft environmental statement was sent to Federal, State, and local government agencies, private industries, citizen and environmental groups, and individuals for review and comment. A coordination list is presented below:

- U. S. Environmental Protection Agency
- U. S. Department of Agriculture
- U. S. Department of Interior
- U. S. Department of Housing and Urban Development
- U. S. Department of Commerce
- Water Resources Council
- Nuclear Regulatory Commission
- Federal Aviation Administration
- Federal Railroad Administration
- Advisory Council on Historic Preservation
- Federal Highway Administration
- U. S. Public Health Service
- Food and Drug Administration
- Great Lakes Commission
- Appalachian Regional Commission
- U. S. Coast Guard
- General Services Administration
- U. S. Department of Health, Education, and Welfare
- Interstate Commerce Commission
- National Endowment for the Arts

- St. Lawrence Seaway Development Corporation
- U. S. Fish and Wildlife Service
- Department of Energy
- New York State:
  - Public Service Commission
  - Department of Environmental Conservation
  - Office of General Services
  - Department of Health
  - Division of Budget
  - Office of Parks and Recreation
  - Sea Grant Program Office
  - Department of Commerce
  - Division of State
  - New York State Job Development Authority
  - New York State Agriculture Experiment Station
  - Office of State Archeologist
  - Department of Transportation
  - Department of Agriculture and Markets
  - Chautauqua County Board of Supervisors
  - Town of Portland Planning Board
  - Town of Sheridan Planning Board
  - Southern Tier Western Regional Planning-Development Board
  - Chautauqua County Planning and Development Agency
  - Dunkirk-Fredonia Inter-Municipality Planning Board
  - Town of Pomfret Planning Board
  - Silver Creek Village Planning Board
  - Mayor, City of Dunkirk
  - Supervisor, Town of Sheridan
  - Supervisor, Town of Pomfret
  - Administrator, Village of Fredonia
  - Supervisor, Town of Dunkirk
  - Supervisor, Town of Portland
  - Natural Resources Defense Council
  - Sierra Club
  - Protest Against Pomfret
  - Taylor Wine Company
  - New York State Grape Production Research Fund, Inc.
  - ORBA Corporation
  - Niagara Mohawk Power Corporation
  - New York State Power Pool Control Center

9.016
Comments on the draft environmental impact statement were received from those Federal, State, and local agencies, and interested parties listed in Item 5 of the Summary which precedes the main body of this report. Copies of the letters of comment and Corps responses to the comments are contained in Appendix F of this report.

APPENDIX A

SUMMARY OF COOLING WATER SYSTEM CONCEPTUAL DESIGN DATA AND WATER SUPPLY SYSTEM.

Table A-1

SUMMARY OF CONDENSER CONCEPTUAL DESIGN DATA
(Conceptual Design Parameters)

	Percent of Plant Operating Capacity		
	100%(*) (Design)	75% (Estimated)	50% (Estimated)
1. Heat Load - (10^6)Btu/hr	4,300	3,200	2,100
2. Back Pressure - in. Hg(**)	4.0	3.3	2.5
3. Inlet Water Temperature - ^oF	94	x x x	x x x
4. Temperature Rise - ^oF	26.9	20.2	13.5
5. Circulating Water Flow - gpm	316,000	316,000	316,000
6. Tube Velocity - ft/sec	7.5	7.5	7.5
7. Tube Length - ft (***)	72	x x x	x x x
8. Number of Passes	1	x x x	x x x
9. Heat Transfer Surface - ft^2	470,300	x x x	x x x

(*)Defined as valves-wide-open, 5% overpressure, expected throttle steam conditions as presented in Table 1-14.

(**)Based on conceptual cooling tower design conditions.

(***)Total tube length for two-shell condenser.

Table A-2

SUMMARY OF EVAPORATIVE COOLING TOWER CONCEPTUAL DESIGN DATA

(Conceptual Design Parameters)

1.	Type: Natural Draft Hyperbolic Cooling Tower(*)	
2.	Design Wet Bulb - °F	74 (Exceeded 2.5% of the time)
3.	Relative Humidity (%)	70
4.	Approach to Wet Bulb - °F	20
5.	Temperature Range - °F	26
6.	Heat Load (10^6) Btu/hr	8,600
7.	Flow - gpm	662,000
8.	Evaporation Loss - gpm	11,400
9.	Drift Loss - gpm	13
10.	Blowdown - gpm	5,700
11.	Annual Water Consumption - gal	$6.0(10^9)$
12.	Cost of Make-up Water - cents/1,000 gallons	22

Cooling Tower Dimensions (Estimates for Layout Purposes):

13.	Number of Towers	1
14.	Tower Dimensions:(**)	
	a) Bottom Diameter	480 ft (O.D.)
	b) Top Diameter	230 ft (O.D.)
	c) Height	500 ft
	d) Exit Velocity	17 ft/sec

(*)A single natural draft cooling tower will service both units.

(**)Based on a cross-flow tower design.

Table A-3

SUMMARY OF WATER SUPPLY CONCEPTUAL OPERATION

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Temperature of Water Withdrawn from Source °F	34	32	35	38	55	64	72	74	64	54	48	38
Total Quantity of Water Withdrawn from Waterway-Acre-ft/month	2130	1910	2250	2360	2600	2640	2790	2760	2600	2550	2300	2200
Temperature of Water(*) Returned to Source - °F	65	65	69	74	80	85	88	87	84	79	73	68
Total Quantity of Water Returned to Waterway - Acre-ft/month	710	640	750	790	870	880	930	930	870	850	770	740
Biocide Concentration in Returned Water - Milligrams/liter	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Note: Estimates are of average monthly conditions.

	Design Low Water Elevation	Extreme Low Water Elevation
Open area velocity through screens at maximum water withdrawal(**) ft/sec	0.6	0.6
Open area velocity through bar racks at maximum water withdrawal - ft/sec	0.3	0.3

(*) Temperature at point of discharge.

(**) Screens located within onshore pump structure.

Table A-4

MAKEUP, EVAPORATION AND BLOWDOWN MONTHLY FLOWS
OF THE NATURAL DRAFT COOLING TOWER
AT 3 CYCLES OF CONCENTRATION

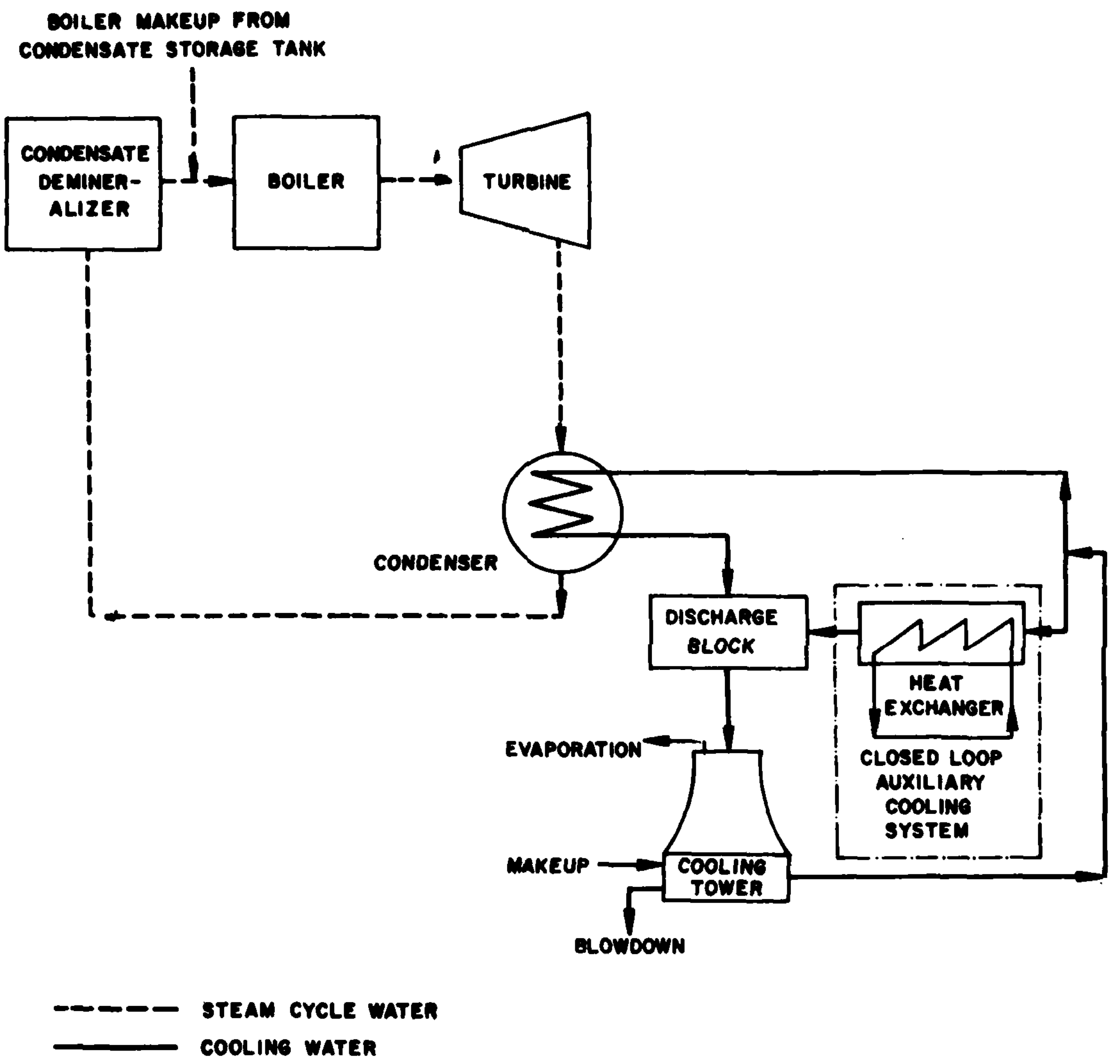
LEGS SITE

Month	Makeup (gpm)	Evaporation (gpm)	Blowdown (gpm)
Jan	14,640	9,760	4,880
Feb	14,565	9,710	4,855
Mar	15,525	10,350	5,175
Apr	16,875	11,250	5,625
May	18,060	12,040	6,020
Jun	18,975	12,650	6,325
Jul	19,440	12,960	6,480
Aug	19,275	12,850	6,425
Sep	18,735	12,490	6,245
Oct	17,715	11,810	5,905
Nov	16,410	10,940	5,470
Dec	15,180	10,120	5,060

NOTES

BASED ON:

1. Maximum facility capacity
2. 662,000 gpm CWS flow
3. Average monthly meteorology data
4. Negligible drift



BLOCK FLOW DIAGRAM
STEAM CYCLE AND
COOLING WATER SYSTEM
FIGURE A-1

APPENDIX B: ANTICIPATED BEHAVIOR OF THE THERMAL PLUME AND CHEMICAL DISCHARGES

POMFRET SITE

CURRENT MONITORING PROGRAM

B.001
A current monitoring program was established at both proposed Lake Erie Generating Stations sites to acquire information on the site specific lake circulation features. The program was planned to provide data needed in the design and location of the intake and discharge. Continuous monitoring of the local circulation started in May 1975, with the installation of an array of three current meters at each site. Each array consisted of two stations, one at the 20-foot (6.1 m) depth and the other at the 40-foot (12.2 m) depth. A single current meter was installed 10 feet (3.0 m) beneath the lake surface at the inshore station. Two meters, one at 10 feet below the surface and the other 30 feet (9.1 m) below, were installed at the offshore station. The two meters at 10 feet below the surface provided replicate data to assure adequate recovery of surface current data for each site. This arrangement also provided information on possible variability of horizontal circulation patterns. The deep-water current meter was included to obtain information on vertical variability of the local circulation.

B.002
The monitoring program was suspended in late November because of inaccessibility of the meters with winter ice on the lake. As soon as the sites became ice-free in the spring, the monitoring program was resumed to complete a year of data collection.

B.003
The percent data recovery for monthly surface current measurements at each site was as follows: 50 percent in May (program started 15 May) and 93 percent from June to October, except for 80 percent recovery in October at the Pomfret site. This percentage is considered sufficient to give reliable statistical analysis of the current distribution on a monthly basis and of seasonal trends for the monitoring interval, May through October.

DISCHARGE SITE DESCRIPTION

B.004
Surface currents in the area of the discharge were monitored and analyzed. Frequency distributions of current direction within 22-1/2

degree sectors and speed increments of 0.1 feet per second (fps) or three centimeters per second (cm/s) are summarized in Tables B-6 and B-7. Based on eight-month (April to November) averages of the surface current data, a bimodal direction distribution is characteristic at Pomfret. The primary modal direction, or prevailing flow, is oriented eastward along the bottom contours. At Pomfret 40.5 percent of the flow direction is in the 22-1/2-45 degree sector with 26.0 percent in the 45-67-1/2 degree sector. The secondary mode is 6.6 percent in the 202-1/2-225 degree sector with 5.0 percent in the 225-247-1/2 degree sector. Onshore flows within three adjacent sectors occur at a frequency of 2.3 percent and offshore flows in the opposite three adjacent sectors at 6.4 percent.

B.005
The surface current speed at Pomfret is 0.1 fps (3 cm/s) or less for 14.9 percent of the time and above 0.5 fps (15 cm/s) for 20.1 percent. The cumulative percentage up to 0.3 fps (9 cm/s) is 53.7 percent.

B.006
Stagnation conditions were investigated for the Pomfret site using hour-by-hour data from the inshore station only. During the 15 May to 3 September monitoring interval, stagnant flow (0 to 0.05 fps) (0 to 1.5 cm/s) was measured for one hour on 33 occasions; for two consecutive hours on nine occasions; for three consecutive hours on four occasions; and, for four consecutive hours in a single occurrence. The cumulative percentage of summertime stagnant conditions is almost four percent. Measurements during 4 September to 10 November indicate a total of 15 hours in 12 occurrences of stagnant flow for less than two percent of the time.

B.007
The large number of single hour stagnations was generally associated with significant changes in current direction exceeding 90 degrees. The prolonged durations of zero flow occurred mostly in July and August and are associated with seasonal calm wind and lake conditions.

B.008
Modal values of current speed and direction indicate seasonal trends and spatial variability of the nearshore lake current structure. The modal frequency distribution indicates a prevailing flow direction but with some variability during the April-November monitoring period.

B.009
The modal frequency at Pomfret varied in the range 36.1 to 67.8 percent. Onshore flow indicates a seasonal trend corresponding to

seasonal shift of frequent spring and summer southerly winds to frequent fall and winter northerly winds. Pomfret onshore flow increased from 0.8 percent during the late May interval to 5.3 percent in the September-October interval. Some occurrences of onshore flow appeared to coincide with locally strong lake breezes in early and mid-summer.

B.010
The seasonal trend of offshore flow is more evident than the onshore trend. At Pomfret, the frequency of offshore flow decreased from 6.5 percent in May to 1.2 percent in September-October. An exceptionally high occurrence of 14.9 percent offshore flow at Pomfret during early August corresponded with observed strong land breezes during cold nights.

B.011
The current speed decreases with depth and toward shore. The modal speed for the inshore station at Pomfret decreased from 0.25 fps (7.6 cm/s) in May to 0.05 fps (1.5 cm/s) in early September followed by an increase to 0.25 fps (7.6 cm/s) in October.

B.012
The net flow, i.e., integrated flow for Pomfret varied from 0.3 fps (9 cm/s) in May to 0.1 fps (3 cm/s) in July and August followed by an increase to 0.2 fps (6 cm/s) in early October. For both Pomfret stations, the net direction was northeastward. The offshore current speed indicates about 0.1 fps (3 cm/s) greater flow than the current measured inshore.

FIELD AND MODELING STUDIES

B.013
Discharge water from the multiport diffuser has a buoyant force in addition to an inertial force; therefore, it is termed a buoyant jet. Forced and natural heat convection through ambient water entrainment and turbulent rises to the lake surface. During the plume rise, most of the excess heat will disperse into the ambient eater. The residual heat will be lost through ambient turbulent diffusion and entrainment by the residual momentum. Only a small part of heat will be transferred to the atmosphere in near proximity of the diffuser.

B.014
The performance of the multiport diffuser will vary throughout the year. Some of the major parameters affecting a diffuser's performance are:

- diffuser discharge flow rate

- diffuser port size, number, angle, and spacing

- diffuser discharge depth, temperature, and density

- lake depth

- lake temperature and density

- ambient lake currents.

B.015
As the discharge flow rate is increased, the exit velocity through the discharge ports increases as well as the total heat discharged for a given temperature difference. Generally, this higher jet velocity produces greater entrainment of the ambient water. Yet, the higher volume of emitted water causes more heat energy to be released from the individual ports. Therefore, for a given discharge temperature, discharge velocity and the total discharged heat are closely related. Together they control the diffuser performance. The jet discharged from the diffuser ports near the lake bottom has an inertial as well as a buoyant force acting on it.

B.016
The jets, as they issue out, behave as single round jets and, after some distance (primarily governed by the spacing of ports and the size of the port), interfere with neighboring jets. Subsequently, the combined flow behaves as a two-dimensional slot jet.

B.017
Most thermal energy dispersion takes place outside of the zone of jet-flow establishment (after traveling about six port diameters from the point of jet exit). The thermal energy of the jet is transferred to the ambient water through convection due to water movement as well as turbulent diffusion. By the time the jet reaches the zone of impingement (near the surface), the plume's centerline velocity and temperature will have been reduced considerably.

B.018
Mathematical models were applied to predict the vertical temperature distribution from the jet exit to the surface and the horizontal

distribution of surface temperature. the vertical plume rise of the jet was modeled after the method of Koh and Fan (1970). Surface impingement effects were evaluated after Shin (1974), and surface spreading from a model developed by Prych, Davis and Shirazi (1974). Results from a series of hydraulic model tests were also used to evaluate the surface temperature increase due to diffuser operation.

Mathematical Model Analysis

Vertical Plume Behavior

B.019
The buoyant jet, as it travels towards the surface, entrains the ambient water. A temperature analysis was performed based on Koh and Fan's mathematical model. Entrainment coefficients used in this analysis were based on experimental studies of jets and were determined to be constant: 0.082 for a round buoyant jet and 0.16 for a slot jet (Rouse, et. al., 1952; Koh and Fan, 1970; and Fan, 1967).

B.020
The applicant's analyses were carried out using the Koh and Fan model. In the Koh and Fan Model, a set of differential equations is solved simultaneously. They are the equations of continuity, conversion of horizontal momentum flux, conservation of density deficiency flux, conservation of temperature deficiency flux, and conservation of vertical momentum. To enhance conservatism in the Koh and Fan analysis, a stagnant ambient condition is assumed. Since the lake temperatures during certain winter months are below 39.2°F (4°C), a negative buoyancy force will at times act on the plume near the surface. This negative buoyancy force will tend to keep the actual plume under the lake surface during those conditions. However, for conservatism in predicting temperature distributions (including surface temperatures) only jets with positive buoyance were considered.

B.021
Monthly vertical temperature distributions under average and extreme climate conditions were predicted. Extreme climatic conditions were chosen such that the temperature difference between the blowdown and the lake is a maximum. The month of the worst average climatic conditions is April, due to the maximum blowdown/lake temperature difference and coincident maximum waste heat discharge rate (see Tables 1-6 and 1-7). Figure B-2 shows the predicted vertical distribution of isotherms for April average climatic conditions. The isotherms for October typical average conditions, are plotted in Figure B-5. The isotherms for January, June, and August, under average climatic conditions, are shown in Figures B-1, B-3, and B-4, respectively. The predicted monthly maximum inducted lake surface temperatures

under the average and extreme climatic conditions are presented in Table 1-15. The maximum surface temperatures shown in Table 1-15 are the buoyant jet centerline temperatures at a height of 19.17 feet above the jet exit or 5/6 of the total depth above the jet exit. This is the maximum free buoyant jet height before surface impingement effects begin (Jirka and Harlemen, 1973; Jirka, et. al., 1975).

B.022
During extreme climatic conditions, the maximum surface temperature increase predicted by the mathematical model is 1.7°F.

B.023
Temperature rises at the jet exit (see Table 1-15) are actually slightly lower than the values presented in Tables 1-6 and 1-7 because approximately 0.4 cfs of treated waste water discharge (approximately at ambient lake temperature) is assumed to be added to the cooling tower blowdown pipeline prior to the diffuser discharge. Throughout this analysis, the 0.4 cfs of treated waste water has been included in the discharge flow estimates and in plume isotherm predictions. If this flow were to increase from 0.4 to 0.8 cfs, it would enhance the conservatism of the predictions herein. The April extreme climatic conditions yield the maximum surface temperature increase and the maximum heat rejection compared to other months (see Tables 1-5, 1-7, and 1-15). The isotherms for this case are shown in Figure B-6.

Surface Plume Behavior

B.024
After the jet reaches the surface, heat dissipation takes place in the surface impingement and far field zones. An approximate analysis of heat dissipation is presented below. When a buoyant jet impinges on the free surface, the impinged jet flow spreads on the surface due to residual momentum and buoyancy. Unlike the performance of subsurface jet flow, ambient current is a dominant factor in the behavior of the surface plume because of small residual jet momentum. According to Shin (1974), the plume's maximum velocity at the surface is the same as the buoyant jet's centerline velocity at 5/6 of the total depth above the jet exit. Since the surface spreading flow behaves as a surface discharge jet, the maximum surface temperatures given in Table 1-15 are assumed to be virtual surface jet temperatures. The maximum surface velocity is assumed as the virtual surface jet discharge velocity and the depth is assumed as 1/6 of the total depth. The surface jet width is determined by thermal energy conservation.

B.025
The surface spreading flow will act as a floating buoyant jet or a warm surface discharge jet. The performance largely depends on: discharge flow rate, velocity, density, and angle; ambient flow, density and turbulence level; jet aspect ratio; and, atmospheric conditions. This surface jet has inertia and buoyancy forces which cause the plume to float on top of the colder ambient water. Heat dissipation takes place through entrainment of colder water from beneath the plume and through surface heat transfer to the air above the plume. Generally, the effect of any high ambient lake current (i.e., nonstagnant conditions) is to reduce the centerline plume temperature by causing additional mixing.

B.026
In this analysis, the drag coefficient of the floating plume due to ambient current was assumed to be 1.0 (Shirazi and Davis, 1974), and an entrainment coefficint of 0.05 was used. A constant heat exchange coefficient, 120 Btu/ft^2-day-^{o}F, the approximate annual average value for Buffalo, New York, (Thackston and Parker, 1971), was used. The ratio of vertical to horizontal ambient turbulent diffusion was chosen to be 0.2 with a dimensionless horizontal ambient turbulent diffusion coefficient of 0.02 and a spreading coefficient of 1.4 (Shirazi and Davis, 1974).

B.027
Monthly surface temperature analyses for average and extreme climatic conditions were performed. The 0.5^{o}F surface isotherm for the worst average climatic conditon (i.e., April) is shown in Figure B-7, and the maximum induced surface temperature rise is also given. Similar information for a typical average month (i.e., October) is given in Figure B-9. The month of the worst extreme climatic condition resulting in maximum surface temperature rise is also April. In addition, stagnant ambient flow conditions have been assumed for conservation in this surface temperature analysis since this results in minimum heat dissipation and the longest detention time. Figure B-8 presents the 0.5^{o}F surface isotherm for the month of the worst average climatic conditions (i.e., April). The predicted surface areas enclosed by the 0.5^{o}F isotherm are approximately 2.2 acres, 1.2 acres, and 2.8 acres for April and October average climatic conditions, and for April extreme climatic conditions, respectively.

B.028
The applicant's mathematical model analysis shows that the surface temperature rise will be below 3^{o}F under all circumstances.

Dye Dispersion Study

B.029
Outside of the region characterized by mathematical modeling, heat dispersion may be characterized by the results of the dye dispersion study. A dye dispersion study was performed in Lake Erie at both the Pomfret and Sheridan sites to obtain information on the ambient dispersion features which would act upon a thermal effluent to define a mixing zone for the surface layer, and to provide comparative data for numerical modeling of the thermal plume. This information was needed to aid in the design and the location of the discharge structure.

B.030
Generally, the results of a dye dispersion study provide a conservative estimate of the size of a mixing zone and tend to maximize the radial distance travelled by a thermal plume. This is because the dye is effectively a conservative substance whereas waste heat is lost to the atmosphere. Furthermore, the lack of stratified spreading of a dye plume and the limited ambient turbulence associated with dye dispersion in this case lead to relatively high concentrations along the dye plume axis. The thermal plume will tend to spread laterally as a warm low density lens of water across the colder ambient lake water surface.

B.031
The results of the dye dispersion study reasonably simulate the expected thermal plume for the region beyond high dye concentration gradient. For this analysis, concentrations below 20 parts per billion (ppb) are considered to be outside of this region. Then concentrations less than 20 PPb can be defined as relative temperature in arbitrary units above ambient.

B.032
At Pomfret, the distance required for 10-dilutions increased from 450 feet (137 m) for prevailing flow at 0.28 fps (8.5 cm/s) or more to 1,350 feet (441 m) during opposite flow at 0.16 ips (4.9 cm/s). During one case with onshore flow at less than 0.15 fps (4.6 cm/s), the 10-dilution distance was 1,300 feet (396 m).

B.033
In conclusion, the dye dispersion study provides a conservative estimate of the range of a thermal plume and the size of a hypothetical mixing zone. The far-field dispersion, i.e., the region where ambient turbulence is significant in comparison to jet and convective turbulence, is directly influenced by ambient flow speed and direction. At low flow current speed, dispersion decreases because the

size of the far-field dilution region increases. For onshore flow, the dispersion decreases due to convergence at the shore boundary. The worst case occurred during onshore low flow conditions resulting in a distance of 1,300 feet (396 m) for 10-dilutions. For a diffuser located a minimum distance of 3,000 feet (914 m) from shore, the temperature rise above ambient for the hypothetical 2.5°F (1.4°C) case would be 0.26°F (0.14°C) at the 10-dilution distance and less than that at the shoreline.

B.034
The separation distance between the intended facility and the existing Dunkirk Station is nearly six miles (9.6 km), so that interaction between the two far-field discharge plumes is considered insignificant.

Subsurface Detention Time

B.035
Mathematical model analysis indicate that the subsurface detention time is less than 71 seconds for a neutrally buoyant particle traveling along the buoyant plume from the jet exit to the surface.

Local Velocity Zone

B.036
The exit axis velocity diminishes to one-foot per second within a vertical rise of six feet above the jet exit under average climatic conditions and within seven feet under extreme climatic conditions.

Recirculation Potential

B.037
Recirculation of discharged water to the intake (resulting in a temperature increase of the intake water) is insignificant. When the ambient current flow from the discharge towards the intake is of a duration approximately one-half hour or longer, the intake temperature increase during the month of the worst average climatic conditions (April) is predicted to remain below 0.03°F. The current measurement data indicate that the statistically modal current direction is parallel to the shoreline, which is almost perpendicular to the direction required for possible recirculation.

B.038
Based on eight months of current measurements, the possibility of recirculation is less than five percent for flow in the 22-1/2 degree sector radiating from the diffuser and enveloping the intake area. In order to consider the most conservative case, extreme climatic

conditions (also April) and the above current condition were assumed to occur simultaneously. The computed intake temperature increase is still below 0.05°F. Thus, under extreme climatic conditions, the blowdown will be diluted more than 1,100 times by the time it reaches the intake. No significant blowdown discharge temperature increase due to recirculation is predicted to occur.

Rate of Change of Surface Temperature

B.039
During emergency shutdown, the maximum resultant rate of temperature change at the water surface will be less than 0.2°F per hour. This is based on a minimum dilution factor of 33 and a maximum rate of temperature change at the jet exit of less than 3.6°F/hr. This rate was calculated, assuming a shutdown during April under extreme climatic conditions when the difference between the blowdown temperature and the ambient lake water temperature is greatest.

Evaporative Water Loss

B.040
According to Thackston and Parker (1971), evaporative water loss is proportional to wind speed and to the difference between the saturated vapor pressure of the air at the water surface temperature and the vapor pressure of the air. The saturated vapor pressure of the air at the water surface temperature is the only value which will change due to water surface temperature increase. Evaporative water losses were calculated by the method of Thackston and Parker. October, a typical month of average climatic conditions, was considered. Evaporative water loss was predicted to increase by about 7.1 percent over the 1.2 acres of the lake surface around the stagnation region (1.2 acres is the approximate area enclosed by the 0.5°F surface isotherm in Figure B-9) and 1.7 percent over the adjacent 3.2 acres of the lake surface (between 0.5°F and 0.25°F surface contours). Evaporative water loss in April under an average climatic condition was predicted to increase by about 17.4 percent over the 2.2 acres near the stagnation region (approximate area enclosed by the 0.5°F surface isotherm in Figure B-7) and 8.6 percent on the adjacent 3.4 acres of the surface. For April, under the extreme climatic conditions (the worst conditions), evaporative water loss was estimated to increase 31.2 percent on the 0.6 acres near the stagnation region (approximate area enclosed by the 1.0°F surface isotherm) and 17.3 percent on the adjacent 2.2 acres (area between the 1.0°F and 0.5°F surface contours). Evaporative water losses of the additional adjacent areas for each case will be reduced in a similar manner. Evaporative water losses under average and extreme climatic conditions have been tabulated in Tables 1-15 and 1-16.

Hydraulic Model Tests

B.041
A series of hydraulic model tests was performed to evaluate the conceptual design of the diffuser and to facilitate diffuser optimization. These tests were performed at the Iowa Institute of Hydraulic Research in a 12-foot by 26-foot test basin, using an undistorted 1 to 25 scale. Test conditions were specified to evaluate the near field dilution potential of a 70-foot long multiport diffuser with eleven alternating four-inch diameter nozzles spaced 76 inches apart. The nozzles make a positive angle of 20° with the horizontal. The diffuser performance was studied for various ambient current conditions. Results from these tests indicate that an alternating multiport diffuser would provide optimum performance. The hydraulic model tests show that the highest surface temperature rise during critical stagnant and extreme April climatic conditions is 2.6°F (jet exit temperature rise in this case is 56°F), which is slightly higher for this extreme case than is predicted by the mathematical model.

B.042
It should be pointed out that the experimental results for extreme April conditions are inherently conservative. Although the initial density difference between the effluent and the ambient water in the model is kept equal to that in the prototype, the density difference after some dilution along the jet trajectory in the model is larger than that in the prototype for the same dilution due to nonlinear relation of the water density with temperature at low temperatures. The jet trajectory will be longer and hence, the surface dilution will be higher in the prototype than that observed in the model. Results are also conservative in that it is assumed that there will be a coincident occurrence of maximum load, an ambient velocity of 0.2 fps (across the diffuser) and extreme meteorological conditions. Considering all these factors, it is considered that the resulting surface temperature rise will always be lower than 2.6°F, mentioned above. Therefore, it is concluded that the maximum surface temperatures rises are always below 3°F, or New York State Thermal Standards are always met. Despite the hydraulic model prediction of an induced surface temperature increase of 2.6°F under extreme climatic conditions, the results from both modeling approaches (mathematical and physical) indicate general agreement. Mathematical modeling predicts a plume temperature reduction of 54.3°F (from 56°F to 1.7°F at the surface) while the physical modeling indicates a temperature reduction of 53.4°F (from 56°F to 2.6°F). This is less than two percent difference between the two modeling methods.

Variations in Blowdown Temperature

B.043
The facility is intended to be base loaded, operating at/or near 100 percent facility capacity when in service. Since this could occur for extended periods in any month or season, the quantity of heat transferred to the cooling water was not estimated for conditions other than design capacity. For thermal analysis conservatism, the facility was assumed to reject a total of 8.6×10^9 Btu/hr when operating under base load.

B.044
Blowdown temperature may vary due to changes in meteorological conditions and due to changes in facility electrical output (load variations). With regard to meteorological changes (Maximum Rates of Change of Blowdown Temperature from Tables 1-6 and 1-7), the temperature difference between blowdown and ambient water will vary from month to month because of its dependence on both meteorological and ambient water temperature under normal operating conditions. With respect to monthly trends this would be less than 0.5°F per day.

Thermal Effect During Plant Shutdown

B.045
During plant shutdown, the temperature of the blowdown will decrease. The rate of decrease is dependent on several factors, including the rate of condenser heat load decrease, the shutdown duration, meteorological conditions, and the cooling tower performance during load reduction. The maximum rate of change of the blowdown temperature during emergency shutdown is estimated to be less than 3.6°F per hour at the discharge point and would occur if emergency shutdown took place during April extreme climatic conditions. This result is based on the assumption that it takes about 16 hours to release blowdown water from the cooling tower basin during emergency shutdown. Thus, for normal load changes of the facility, it can be concluded that the rate of change of blowdown temperature would be less than 3.6°F per hour.

B.046
Results of both mathematical and hydraulic modeling indicate that a multiport diffuser of the configuration previously described (Chapter 1) would provide the required dilution such that water temperature increases and affected surface areas are confined, with minimal environmental impact.

Effects of Stratification

B.047
According to Section 652.11 of 6 NYCRR, "Thrmocline" is defined as the first seasonably stable layer of a stratified lake found between the epilimnion and the hypolimnion where the temperature drop equals or exceeds 1°C per meter. Since the thermocline defined above was not observed at the applicant's temperature monitoring stations (50-foot contour), a volume change between epilimnion and hypolimnion as a result of facility operation should not occur. (It is to be noted that intake and discharge are both located in depths of approximately 30 feet or less.)

Effects on Flow Patterns

B.048
When the buoyant jet reaches a vertical distance of about six feet above the jet exit, its speed is predicted to be less than one-foot per second under average climatic conditions. The elevation would be seven feet or less above the jet exit under extreme climatic conditions. Horizontal extent of this "local velocity zone" is estimated to be less than 17 feet in either direction of the diffuser. Outside of this small "local velocity zone" there will be an undetectable effect on ambient flow patterns. To increase conservatism, the preceding thermal analyses were based on two unit operation of the Lake Erie Generating Station. This mode of operation would lead to the maximum impact on ambient conditions.

CHEMICAL, BIOCIDAL, AND SANITARY WASTE DISCHARGES

B.049
All treated waste discharges are combined with cooling tower blowdown and the resultant effluent is discharged through the submerged multiport diffuser in Lake Erie. The concentrations of wastes in the discharge are presented in Table 1-13. The concentration of each constituent in the discharge regulated by the EPA Effluent Limitation Guidelines is below allowable maximum and average values.

B.050
The values of discharge concentration can be compared with the Lake Erie ambient quality presented in Table B-8. As can be seen, for most parameters, the concentration is approximately three times ambient concentration. This is because the cooling system operates at three cycles of concentration and represents practically the entire discharge flow (13.1 cfs of which 12.7 cfs is cooling tower blowdown), therefore diluting the other waste sources.

B.051
The multiport diffuser is used to maximize mixing of the plant effluent with lake water, thereby minimizing the impact on ambient water quality. The effectiveness of the diffuser to dilute this waste stream, estimated by the jet plume model by Koh and Fan (1970), is given by the surface dilution ratio, which is the ratio of the concentration increment above ambient lake levels at the stagnation point of the plume centerline (at the surface) to the concentration increment at the diffuser discharge. The Koh and Fan Model has been explained in the Vertical Plume Behavior section of this appendix. Monthly surface dilution ratios are given in Table 1-14; these reflect variations due to changes in conditions of the water body as well as plant operation.

B.052
To calculate the concentration of chemical parameters at the point where thermal plume centerline meets the surface of Lake Erie, the following formula was used:

$$C_S = \frac{C_D - C_L}{D_R} + C_L$$

where D_R = Surface Dilution Ratio

C_L = Ambient Lake Concentration

C_D = Concentration Found in the Discharge

C_S = Concentration at Intersect of Plume Centerline with Surface

B.053
The mixing time required to reach these concentrations at the surface is less than 11 seconds. It should be noted that the maximum resultant surface concentrations of most parameters are within ten percent of ambient lake levels and, therefore, will have an insignificant effect on lake water quality. The exceptions to this statement include the parameters sulfate and sodium. The increased sulfate concentration is due mainly to the addition of approximately 90 mg/l sulfuric acid to the recirculating cooling water for pH control while the sodium concentration is due to demineralizer regeneration with sodium hydroxide.

B.054
Based on the above results, it is anticipated that the discharge of chemical constituents from the Pomfret Generating Station will not alter the present water quality regime of Lake Erie after a short

period of near field plume mixing which takes place in less than 11 seconds.

B.055
New York State does not have a general mixing zone standard but a mixing zone is described on a site specific basis and has not been established for the Lake Erie Generating Station. The area enclosed by the 0.5°F increase isotherm is described in the previous section and may be considered the mixing zone. New York State water quality standards are not expected to be exceeded, except in cases where the ambient lake concentration exceeds the limit, since based on the mathematical model, ambient conditions exist very close to the diffuser and once a mixing zone is established it is expected ambient concentrations will exist outside of the zone.

SHERIDAN SITE

CURRENT MONITORING PROGRAM

B.056
The current monitoring program described in paragraphs B.001 to B.003 includes the program performed at the Sheridan Site.

DISCHARGE SITE DESCRIPTION

B.057
Surface currents in the area of the discharge were monitored and analyzed. Frequency distributions of current direction within 22-1/2 degree sectors and speed increments of 0.1 feet per second (fps) are summarized in Tables B-9 and B-10. Based on eight-month (April to November) averages of the surface current data, a bimodal direction distribution is characteristic at Sheridan. The primary modal direction, or prevailing flow, is oriented eastward along the bottom contours.

B.058
The directional frequency distribution at Sheridan shows a slight clockwise shift from that at Pomfret reflecting the change in topography east of Point Gratiot and Fletcher Point. The primary modal occurence is 37.2 percent in the 67 1/2-90 degree sector with 14.1 percent in the 45-67 1/2 degrees. Opposite flows toward the west occur at a frequency of 11.1 percent in the 270-292 1/2 sector and 8.2 percent in the 247 1/2-270 sector. Onshore flows within three adjacent sectors occur at a 2.0 percent frequency, and offshore flows at a 4.3 percent frequency.

B.059
The speed at Sheridan is slightly lower than at Pomfret with a flow of 0.1 fps or less 20.0 percent of the time. Relatively strong currents above 0.5 fps occur 11.8 percent of the time. At 0.3 fps, the cumulative percentile is 65.0, about 11 percent higher than at Pomfret.

B.060
Modal values of current speed and direction indicate seasonal trends and spatial variability of the nearshore lake current structures. The modal frequency distribution indicates a prevailing flow direction but with some variability during the April-November monitoring period. The modal frequency at Sheridan varied in the range between 19.4 and 50.0 percent.

B.061
Onshore flow indicates a seasonal trend corresponding to seasonal shift of frequent spring and summer southerly winds to frequent fall and winter northerly winds. Onshore flow at Sheridan increased from 0.1 percent in May to 1.5 percent in the September-October interval. Some occurrences of onshore flow appeared to coincide with locally strong lake breezes in early and mid-summer.

B.062
The seasonal trend of offshore flow is more evident than the onshore trend. At Sheridan the frequency of offshore flow decreased from 11.8 percent in May to 1.8 percent in October. The current speed decreases with depth and toward shore. A fall season increase was observed at Sheridan inshore and bottom offshore stations. The low current speeds during early summer at Sheridan are partially attributed to extensive algae growth found in vicinity of the current meter.

B.063
Net flow calculations for Sheridan indicate variable flow patterns with frequent occurrences of negligible net flow and westerly net flow during two intervals of summer measurements.

FIELD AND MODELING STUDIES

B.064
Information on the performance of field and modeling studies of thermal plume behavior is identical to that supplied in the corresponding discussion of the Pomfret site. Results and interpretations of these studies which specifically apply to Sheridan are discussed in the following paragraphs.

B.065
The range of 10 dilutions at Sheridan was 450 feet to an estimated 2,250 feet. The minimum distance corresponded to prevailing flow greater than 0.27 fps, and the maximum distance occurred during onshore flow toward Fletcher Point at less than 0.11 fps.

B.066
For a hypothetical discharge reaching the surface with a temperature difference 2.5°F above ambient, the mixing zone required for dilution to 0.5°F is equivalent to the radial distances for five-dilutions. Relative to an initial dye concentration of 20 ppb, the largest radial distance for a five-dilution mixing zone would be about 1,200 feet, coinciding with onshore flow. A radial distance of 500 to 700 feet would be more typical of prevailing flow conditions.

B.067
In conclusion, the dye dispersion study provides a conservative estimate of the range of a thermal plume and the size of a hypothetical mixing zone. The far-field dispersion, i.e., the region where ambient turbulence is significant in comparision to jet and convective turbulence, is directly influenced by ambient flow speed and direction. At low flow current speed, dispersion decreases because the size of the far-field dilution region increases. For onshore flow, the dispersion decreases due to the convergence at the shore boundary. The worst case occurred during onshore low flow conditions resulting in a distance of 2,200 feet for 10 dilutions. For a diffuser located a minimum distance of 3,000 feet from shore, the temperature rise above ambient for the hypothetical 2.5°F case would be 0.25°F at the 10-dilution distance, and less than that at shoreline.

CHEMICAL DISCHARGES

B.068
The discharge scheme at Sheridan is the same as that proposed for Pomfret. Table 1-21 shows the concentrations of wastes in the combined plant blowdown (including runoff). The concentration of each constituent in the discharge regulated by EPA Effluent Limitation Guidelines is below the allowable maximum and average values. The values of discharge concentration can be compared with Lake Erie ambient water quality at Sheridan presented in Appendix 4 Table B-11.

APPENDIX TABLE B-1

ESTIMATED WATER QUALITY OF COMBINED PLANT DISCHARGE OF COOLING TOWER BLOWDOWN, EQUALIZATION/NEUTRALIZATION BASIN AND OIL AND SOLIDS REMOVAL UNIT

Parameter		at Maximum CTBD Concentration (mg/l) at Maximum CTBD Flow (gpm) 2 Units	at Average CTBD Concentration (mg/l) at Maximum CTBD Flow (gpm) 2 Units
Copper	(mg/l)	0.0941	.0233
Cadmium	(mg/l)	0.0088	.0029
Lead	(mg/l)	0.1676	.0092
Iron	(mg/l)	0.9502	.2784
Nickel	(mg/l)	0.1264	.0224
Manganese	(mg/l)	0.1352	.0409
Chromium	(mg/l)	0.0999	0.0029
Zinc	(mg/l)	0.1352	.0496
TSS	(mg/l)	222	62.7
TDS	(mg/l)	816	639
Sulfate	(mg/l)	239	222
Sulfite	(mg/l)	5.9	5.8
pH		6-9	6-9

Note: 1) Concentrations are calculated by averaging monthly concentrations reported in Table P80.3-4 of the Article VIII Application.

APPENDIX TABLE B-1 a.

FLOOR DRAINAGE TREATMENT FACILITY AND EQUALIZATION/NEUTRALIZATION BASIN DISCHARGES POMFRET AND SHERIDAN SITES

Parameter	Discharge		Effluent Guidelines[1]	
	Average	Maximum	Average	Maximum
pH (Units)	6	9	6	9
TSS (mg/l)	<30	<100	30	100
Oil and Grease (mg/l)	<15	<20	15	20

Notes: (1) U S EPA Effluent Guidelines and Standards for Steam Electric Power Generating Point Source Category, 40 CFR 423.

APPENDIX TABLE B-1 b.

COOLING TOWER BLOWDOWN
POMFRET SITE

	Discharge		Effluent Guidelines[1]	
	Average	Maximum	Average	Maximum
pH (Units)	6	9	6	9
Free Available Chlorine (mg/1)	0	0	0.2	0.5
Zinc (mg/1)[2]	0.051	0.138	No Detectable Amount	
Chromium (mg/1)[2]	<0.003	0.102	No Detectable Amount	
Phosphorus (mg/1)[2]	<0.015	0.126	No Detectable Amount	
Other Corrosion Inhibiting Materials (mg/1)	0	0	No Detectable Amount	

Notes: (1) U S EPA Effluent Guidelines and Standards for Steam Electric Power Generating Point Source Category, 40 CFR 423.

(2) Concentration in the discharge is due to cycling up of intake water quality; net discharge is zero.

APPENDIX TABLE B-1 c.

COOLING TOWER BLOWDOWN
SHERIDAN SITE

Parameter	Discharge Average	Discharge Maximum	Effluent Guidelines[1] Average	Effluent Guidelines[1] Maximum
pH (Units)	6	9	6	9
Free Available Chlorine (mg/l)	0	0	0.2	0.5
Zinc (mg/l)[2]	0.054	0.128	No Detectable Amount	
Chromium (mg/l)[2]	$<$0.03	0.099	No Detectable Amount	
Phosphorus (mg/l)[2]	$<$0.015	0.099	No Detectable Amount	
Other Corrosion Inhibiting Materials (mg/l)	0	0	No Detectable Amount	

Notes: (1) U S EPA Effluent Guidelines and Standards for Steam Electric Power Generating Point Source Category, 40 CFR 423.

(2) Concentration in the discharge is due to cycling up of intake water quality; net discharge is zero.

TABLE B-2

ESTIMATED COAL PILE RUNOFF WATER QUALITY

Parameter	Concentration (mg/l)
Copper	0.073
Cadmium	0.0006
Lead	0.126
Iron	7.131
Nickel	0.142
Manganese	1.305
Chromium	0.065
Mercury	-
Zinc	0.333
pH	6.26
TSS	161.5
TDS	2,591
Sulfate	1,229.4
Sulfite	0.05

NOTE: 1) Based on one in ten year, 24 hour rainfall event runoff volume of 5.5 million gallons.

2) Data on runoff water quality was obtained by Ebasco Services at an existing power plant in the midwest. The data is obtained from three separate coal piles of western (Montana) coal with a sulfur content of 1.14 percent and an ash content of 9.26 percent. Each value listed in the concentration column is the average of the three coal piles.

TABLE B-3

ASH PILE RUNOFF WATER QUALITY

Parameter	Concentration (mg/l)
Copper	0.067
Cadmium	-
Lead	-
Iron	15.7
Nickel	0.094
Manganese	0.192
Chromium	0.009
Mercury	-
Zinc	0.09
TSS	50
TDS	372
Sulfate	148.3
Sulfite	-

NOTE: Based on one in ten year, 24 hour rainfall event runoff volume of 0.6 million gallons.

TABLE B-4

ESTIMATED CONTAMINANT PICK-UP FROM FLY ASH ALONE

Parameter	Concentration (mg/1)
Copper	0.007
Cadmium	-
Lead	-
Iron	0.33
Nickel	0.011
Manganese	0.044
Chromium	0.009
Zinc	0.030
TSS	-
TDS	295
Sulfate	142
Sulfite	-

Ref: EPA Development Document for Effluent Limitations Guidelines and the Source Performance Standards for the Steam Electric Power Generating Point Source Category, October 1974, Table A-V-9.

TABLE B-5

ESTIMATED METAL CLEANING WASTE CONTRIBUTION TO ASH PILE RUNOFF

Parameter	Concentration (mg/1)
Copper	0.06
Cadmium	-
Lead	-
Iron	15.3
Nickel	0.016
Manganese	0.148
Chromium	-
Zinc	0.06
TSS	-
TDS	77.5
Sulfate	6.3
Sulfite	-

NOTE: Based on one in ten year, 24 hour rainfall event runoff volume of 0.6 million gallons.

TABLE B-6

SUMMARY OF FREQUENCY DISTRIBUTION OF SURFACE CURRENT DIRECTION WITHIN 22½ DEGREE SECTORS

POMFRET

(Frequency in Percent Based on Hourly Averages)

	Monitoring Interval													
	End of Program 1976→		←Start of Program 1975→											
Sector	Apr 07-Apr 29	May 01-May 15	May 15-May 28	May 29-Jun 10	Jun 11-Jun 26	Jun 26-Jul 09	Jul 10-Jul 25	Jul 30-Aug 19	Aug 19-Sep 03	Sep 09-Sep 16	Sep 18-Oct 17	Oct 17-Nov 11	Nov 12-Nov 23	Eight Month Average
00 - 22½	0.0	0.3	4.5	6.5	4.4	1.5	8.7	4.0	3.5	1.0	3.4	2.4	3.7	3.3
22½- 45	3.6	42.5	52.1	48.0	52.4	19.8	47.8	40.4	36.1	47.9	37.8	59.9	59.9	40.5
45 - 67	67.8	43.6	29.6	22.6	16.2	36.2	14.0	12.4	15.5	14.5	27.1	11.8	11.2	26.0
67½- 90	2.9	1.9	2.9	2.7	2.5	7.4	1.9	2.1	2.6	1.7	2.3	1.5	1.5	2.6
90 -112½	0.6	0.0	0.3	0.3	0.7	2.6	0.7	0.6	1.1	1.0	1.2	0.5	0.0	0.7
112½-135	0.0	0.0	0.2	0.0	0.2	1.0	0.6	0.6	1.6	2.4	1.9	1.0	0.0	0.7
135 -157½	0.4	0.0	0.3	0.0	0.3	1.8	0.7	1.3	1.3	1.4	2.2	0.7	0.4	0.9
157½-180	1.1	0.0	0.6	0.0	0.3	6.9	0.6	1.7	1.2	3.1	2.6	0.0	0.0	1.3
180 -202½	9.0	0.6	0.0	0.3	1.2	5.8	2.6	1.7	4.3	9.7	3.3	0.8	0.0	2.9
202½-225	4.6	8.6	0.5	1.1	2.4	4.7	6.7	6.7	16.9	5.9	9.8	9.1	2.2	6.6
225 -247½	9.4	0.3	0.5	5.0	3.2	5.0	7.6	6.3	6.8	1.0	3.6	7.1	4.5	5.0
247½-270	0.4	0.6	0.8	1.5	1.1	2.6	4.5	2.9	5.0	1.0	2.2	0.8	1.1	1.9
270 -292½	0.2	0.3	1.2	1.1	1.3	0.9	1.2	1.7	1.1	0.7	1.4	2.5	6.7	1.5
292½-315	0.0	0.3	0.0	1.6	1.9	0.8	0.3	2.5	1.4	0.3	0.8	0.7	9.7	1.3
315 -337½	0.0	0.0	2.7	10.0	1.3	1.5	0.7	12.8	11.0	3.8	0.6	0.5	7.1	3.6
337½-360	0.0	0.0	3.8	2.3	0.7	1.6	1.2	2.1	0.4	4.5	0.6	0.3	0.4	1.1

TABLE B-7

SUMMARY OF FREQUENCY DISTRIBUTION OF SURFACE CURRENT SPEED

POMFRET

(Frequency in Percent Based on Hourly Averages)

	Monitoring Interval													
	End of Program 1976→		←Start of Program 1975→											
Speed Increment	Apr 07-Apr 29	May 01-May 15	May 15-May 28	May 29-Jun 10	Jun 11-Jun 26	Jun 26-Jul 09	Jul 10-Jul 25	Jul 30-Aug 19	Aug 19-Sep 03	Sep 09-Sep 16	Sep 18-Oct 17	Oct 17-Nov 11	Nov 12-Nov 23	Eight Month Average
0.0-0.1	12.6	8.1	6.2	5.0	4.8	31.5	15.3	28.4	20.0	27.2	15.6	16.2	4.1	14.9
0.1-0.2	18.6	5.3	10.8	11.6	8.3	26.0	25.2	31.4	33.6	26.2	22.4	12.3	8.6	18.8
0.2-0.3	14.9	5.8	24.0	21.0	12.9	17.5	31.6	20.8	21.2	19.3	26.1	20.2	22.5	20.0
0.3-0.4	14.2	2.5	18.8	19.3	18.3	6.8	16.0	6.9	9.1	11.0	17.8	16.7	15.7	13.7
0.4-0.5	11.9	4.2	16.9	22.5	23.0	6.8	8.6	6.1	5.2	12.1	11.0	19.4	12.4	12.3
0.5-0.6	14.0	2.5	12.4	11.9	20.1	7.1	2.4	2.3	2.5	2.4	3.9	6.2	11.2	7.4
0.6-0.7	10.0	6.9	8.1	5.6	10.0	3.9	0.6	1.1	1.4	0.3	2.0	4.9	7.9	4.8
0.7-0.8	2.5	9.4	2.9	1.0	1.9	0.3	0.2	1.3	2.7	1.0	0.8	1.7	4.5	2.2
0.8-0.9	1.0	10.0	0.15	0.6	0.7			0.4	2.1	0.3	0.3	0.3	1.5	1.3
0.9-1.0	0.0	8.1		1.0				0.2	1.1		0.1	0.2	2.2	0.9
1.0-1.1	0.2	8.9		0.3				0.2	1.1			0.8	1.9	1.00
1.1-1.2	0.2	7.5						0.2	0.3			0.3	1.1	0.7
1.2-1.3		6.7						0.4				0.0	2.6	0.7
1.3-1.4		4.2						0.0				0.0	1.1	0.4
1.4-1.5		3.6						0.2				0.2	1.9	0.3
1.5-1.6		2.5										0.2	0.4	0.2
1.6-1.7		1.4										0.0		0.1
1.7-1.8		1.4										0.2		0.1

TABLE B-8

POMFRET WATER QUALITY SUMMARY FOR 30 FT. AND 10 FT. CONTOURS, MEAN CONCENTRATIONS, SEPTEMBER 1974-SEPTEMBER 1975

Parameter	Unit of Measurement	30 FT. No. of Samples	30 FT. Min	30 FT. Max	30 FT. Mean	10 FT. No. of Samples	10 FT. Min	10 FT. Max	10 FT. Mean
Physical									
Color	mg/ℓ	26	<1	7	2**	26	<1	10	4**
Specific conductance	μmhos	455	200	380	308	281	240	380	309
Temperature	°C	809	0.0	24.7	12.4	586	0.0	25.2	12.7
Turbidity	FTU	26	<1	15	5*	26	<1	22	7*
Chemical									
Alkalinity	mg/ℓ-$CaCO_3$	26	60	101	87	26	73	102	90
Aluminum	mg/ℓ	25	0.02	1.06	0.32	26	0.02	1.19	0.27
Antimony	mg/ℓ	20	<0.001	<0.06	<0.06*	20	<0.001	<0.06	<0.06*
Arsenic	mg/ℓ	26	<0.0008	<0.0008	<0.0008*	26	<0.0008	<0.0008	<0.0008
Barium	mg/ℓ	26	0.004	6.33	1.21	26	0.002	6.14	1.26
Beryllium	mg/ℓ	20	<0.001	0.001	<0.001*	20	<0.001	0.001	<0.001*
Boron	mg/ℓ	20	<0.05	0.09	<0.05*	20	<0.05	0.10	<0.05*
Bromide	mg/ℓ	20	<0.1	<0.1	<0.1*	20	<0.1	<0.1	<0.1*
Cadmium	mg/ℓ	28	<0.001	0.003	<0.001*	28	<0.001	0.005	<0.001*
Calcium	mg/ℓ	26	16.50	40.44	33.62	26	19.75	40.46	34.49
Carbonates	mg/ℓ	4	<0.05	<0.05	<0.05	4	<0.05	<0.05	<0.05*
Chemical oxygen demand	mg/ℓ	26	2.6	15.6	6.2	26	4.0	13.9	6.5
Chloride	mg/ℓ-Cl	26	7.0	25.8	21.4	26	10.0	27.6	21.6
Chlorinated hydrocarbons	ng/ℓ	8	461	<1,000	<1,000*	8	63	1,294	<1,000*
Chlorine	mg/ℓ	30	<0.04	<0.04	<0.04*	30	<0.04	<0.04	<0.04*
Chromium	mg/ℓ	28	<0.001	0.034	<0.001*	28	<0.001	0.030	<0.001*
Cobalt	mg/ℓ	20	<0.005	<0.005	<0.005*	20	<0.005	<0.005	<0.005*
Copper	mg/ℓ	28	<0.001	0.032	0.008**	28	<0.001	0.045	0.009**
Cyanide	mg/ℓ	20	<0.005	<0.010	<0.010*	20	<0.005	<0.010	<0.010*
Dissolved oxygen	mg/ℓ	599	8.0	14.4	10.0	421	8.0	14.6	10.6
% O_2 saturation	%	599	69	136	100	420	80	132	99
Fluoride	mg/ℓ	26	0.10	0.23	0.16	26	<0.10	0.24	0.014*
Halogenated phenoxyacid herbicides	μg/ℓ	4	7.5	15.0	9.9	4	7.2	10.8	9.8
Iron	mg/ℓ	28	<0.001	0.323	0.095**	28	0.001	0.342	0.109
Lead	mg/ℓ	28	<0.001	0.057	0.010**	28	<0.001	0.074	0.013**
Magnesium	mg/ℓ	26	3.94	13.17	9.61	26	5.28	13.03	9.73
Manganese	mg/ℓ	28	0.001	0.046	0.014	28	0.002	0.052	0.013
Mercury	mg/ℓ	24	<0.0002	0.0025	<0.0002*	24	<0.0002	0.0027	<0.0002*
Molybdenum	mg/ℓ	20	<0.020	<0.020	<0.020*	20	<0.020	<0.020	<0.020*
Nickel	mg/ℓ	28	<0.001	0.043	0.008**	28	<0.001	0.028	0.007**
Nitrogen									
ammonia	mg/ℓ-N	102	0.004	0.063	0.024**	64	0.005	0.094	0.027**
nitrate	mg/ℓ-N	102	<0.04	0.49	0.14**	64	<0.04	0.48	0.14**
nitrite	mg/ℓ-N	26	<0.002	0.008	0.005**	26	<0.002	0.009	0.004
organic	mg/ℓ-N	102	0.07	0.35	0.20	64	0.08	0.57	0.20
TKN	mg/ℓ-N	102	0.11	0.36	0.23	64	0.11	0.66	0.23
Oil and grease	mg/ℓ	26	<1.0	11.8	<1.0*	26	<1.0	17.7	<1.0*
Organophosphorus	ng/ℓ	4	<10	19	<10*	4	<10	132	<10*
pH	units	455	7.6	8.8	8.2	281	7.4	8.8	8.0
Phenols	mg/ℓ	26	<0.001	<0.005	<0.005*	26	<0.001	<0.005	<0.005*
Phosphate									
ortho	mg/ℓ-P	102	<0.002	0.007	<0.002*	64	<0.002	0.010	<0.002*
total	mg/ℓ-P	102	<0.005	0.042	<0.005*	64	<0.005	0.080	<0.005*
Potassium	mg/ℓ	26	1.140	2.950	1.635	26	1.130	3.050	1.709
Selenium	mg/ℓ	26	<0.0008	<0.0008	<0.0008*	26	<0.0008	<0.0008	<0.0008*
Silica	mg/ℓSiO_2	26	<0.05	0.22	0.10**	26	<0.05	0.36	0.10**
Silver	mg/ℓ	20	<0.001	<0.001	<0.001*	20	<0.001	<0.001	<0.001*
Sodium	mg/ℓ	26	3.62	12.30	8.69	26	4.52	12.91	9.13
Solids									
dissolved	mg/ℓ	352	101	400	178	220	104	290	179
suspended	mg/ℓ	286	0.1	188.2	16.5	174	0.1	94.0	15.2
Sulfate	mg/ℓ-SO_4	26	19.0	27.1	24.3	26	20.8	28.9	25.3
Sulfide	mg/ℓ-S	26	<0.005	<0.005	<0.005*	26	<0.005	0.010	<0.005*
Sulfite	mg/ℓ-S	20	<1.0	<2	<2*	20	<1.0	<2	<2*
Surfactants	mg/ℓ	26	<0.01	<0.02	<0.01*	26	<0.01	<0.02	<0.01*
Thallium	mg/ℓ	20	<0.020	<0.020	<0.020*	20	<0.020	<0.020	<0.020*
Tin	mg/ℓ	20	<0.1	<0.1	<0.1*	20	<0.1	<0.1	<0.1*
Titanium	mg/ℓ	20	<0.001	<0.001	<0.001*	20	<0.001	<0.001	<0.001*
Vanadium	mg/ℓ	20	<0.001	<0.02	<0.02*	20	<0.001	<0.02	<0.02*
Zinc	mg/ℓ	28	0.003	0.046	0.017	28	0.002	0.058	0.019
Biological									
Bacteria -									
fecal coliform	MPN/100 mℓ	147	<3	120	7**	114	<3	≥2,400	64**
total coliform	MPN/100 mℓ	147	3	≥2,400	119**	114	9	≥2,400	302**
Biological oxygen demand	mg/ℓ	409	0.0	7.0	1.0	253	0.0	5.3	1.0

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the maximum detection limit concentrations with other higher values to produce a maximum yearly mean.

TABLE B-9

SUMMARY OF FREQUENCY DISTRIBUTION OF SURFACE CURRENT DIRECTION WITHIN 22½ DEGREE SECTORS

SHERIDAN

(Frequency in Percent Based on Hourly Averages)

	Monitoring Interval													
	End of Program 1976→		←Start of Program 1975→											
Sector	Apr 07-Apr 29	May 01-May 15	May 15-May 28	May 29-Jun 10	Jun 11-Jun 26	Jun 26-Jul 09	Jul 10-Jul 25	Jul 30-Aug 19	Aug 19-Sep 03	Sep 09-Sep 16	Sep 18-Oct 17	Oct 17-Nov 11	Nov 12-Nov 23	Eight Month Average
00 - 22½	2.1	0.0	0.8	1.5	0.1	0.0	0.1	0.5	0.3	0.0	0.0	0.2	0.0	0.5
22½- 45	0.0	0.0	6.2	3.1	5.9	2.2	3.5	2.3	0.0	0.1	1.0	5.2	4.5	2.6
45 - 67	0.2	0.0	34.6	15.9	20.5	7.5	15.6	13.7	0.8	5.3	8.5	29.5	36.9	14.1
67½- 90	49.0	14.2	42.4	50.0	47.3	20.8	46.5	34.3	19.4	31.7	42.4	33.2	47.7	37.2
90 -112½	22.6	37.2	1.6	4.1	2.1	10.8	4.5	8.6	16.1	15.5	11.0	2.0	2.8	10.8
112½-135	0.0	33.3	0.7	2.9	0.1	1.7	1.0	1.3	3.3	2.3	2.0	1.0	0.0	3.6
135 -157½	0.0	4.4	0.1	0.8	0.0	1.2	0.6	1.0	1.1	1.5	0.7	0.2	0.3	0.9
157½-180	0.0	0.3	0.0	0.3	1.0	1.4	0.8	0.7	1.4	1.2	0.6	0.0	0.0	0.6
180 -202½	0.0	0.0	0.0	0.3	0.2	1.2	0.0	1.3	1.9	0.7	0.2	0.0	0.3	0.5
202½-225	0.0	0.0	0.3	0.1	0.3	2.1	0.7	0.3	0.3	0.2	0.8	0.0	0.0	0.4
225 -247½	0.4	0.0	0.0	0.3	1.3	4.9	1.7	2.3	3.3	2.7	1.3	0.5	2.1	1.5
247½-270	1.9	0.0	0.4	2.1	1.4	17.2	5.8	15.5	36.3	9.3	8.8	5.2	2.4	8.2
270 -292½	16.7	0.3	0.3	7.9	8.1	15.9	7.5	13.1	10.0	20.7	16.9	15.5	1.0	11.1
292½-315	1.9	10.3	0.8	6.7	6.2	8.4	7.1	3.1	3.6	6.7	4.2	6.4	1.4	5.0
315 -337½	4.0	0.0	8.9	4.2	5.0	4.2	2.9	1.4	1.9	1.2	1.3	0.8	0.3	2.7
337½-360	1.1	0.0	2.9	4.2	5.0	0.2	0.4	0.4	0.3	0.5	0.5	0.0	0.0	1.1

TABLE B-10

SUMMARY OF FREQUENCY DISTRIBUTION OF SURFACE CURRENT SPEED

SHERIDAN

(Frequency in Percent Based on Hourly Averages)

	Monitoring Interval													
	End of Program 1976→		←Start of Program 1975→											
Speed Increment	Apr 07-Apr 29	May 01-May 15	May 15-May 28	May 29-Jun 10	Jun 11-Jun 26	Jun 26-Jul 09	Jul 10-Jul 25	Jul 30-Aug 19	Aug 19-Sep 03	Sep 09-Sep 16	Sep 18-Oct 17	Oct 17-Nov 11	Nov 12-Nov 23	Eight Month Average
0.0-0.1	12.5	45.0	11.7	19.5	20.9	21.1	17.5	14.1	15.8	21.2	18.7	17.0	37.6	20.0
0.1-0.2	18.8	10.8	27.1	20.0	17.1	27.0	26.8	30.8	34.9	37.3	24.7	25.3	11.1	23.8
0.2-0.3	17.2	8.3	23.0	23.4	18.4	18.3	28.0	28.5	24.1	20.0	25.7	20.5	14.3	21.2
0.3-0.4	16.9	10.0	13.2	16.7	15.7	9.3	16.1	11.4	12.2	12.8	16.0	15.3	10.5	13.9
0.4-0.5	14.9	12.8	12.0	12.0	13.5	6.5	7.0	4.6	6.1	3.3	9.2	9.3	9.4	9.5
0.5-0.6	10.3	8.3	7.3	5.8	7.9	6.1	3.4	4.4	3.9	2.2	4.4	7.1	7.0	6.2
0.6-0.7	6.7	4.2	2.7	1.5	4.3	3.7	0.8	2.5	2.8	0.5	2.0	3.2	3.8	3.1
0.7-0.8	2.1	0.8	1.6	1.2	1.0	3.7	0.15	2.0	0.3	0.35	0.6	0.7	2.8	1.3
0.8-0.9	0.6		0.5		1.0	3.0	0.15	0.9		0.15	0.2	0.3	2.4	0.7
0.9-1.0			0.3		0.3	0.6		0.65			0.35	0.2	1.0	0.3
1.0-1.1			0.5			0.0		0.1				0.2		0.1
1.1-1.2						0.3						0.3		0.1
1.2-1.3												0.2		0.0
1.3-1.4												0.2		0.0
1.4-1.5														
1.5-1.6														
1.6-1.7														
1.7-1.8														

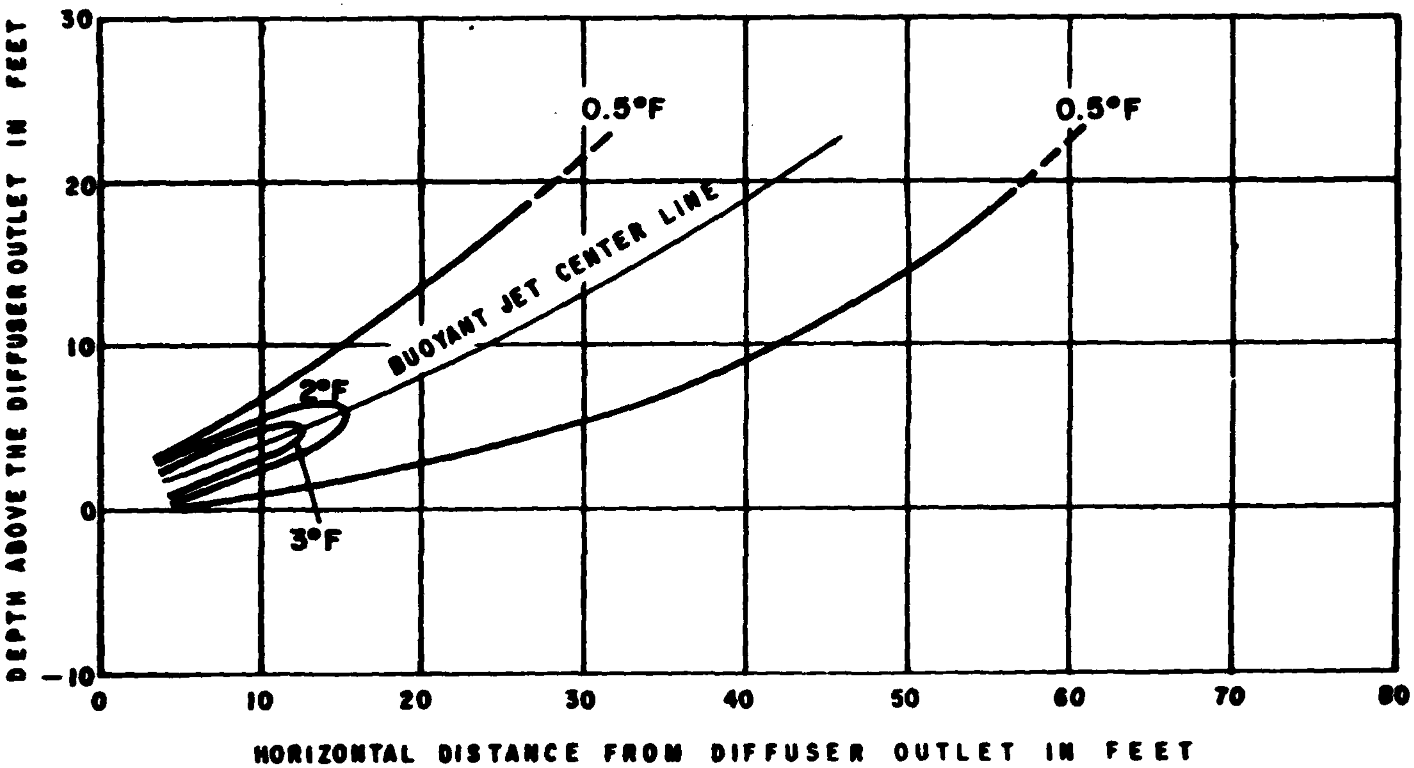
TABLE B-11

SHERIDAN WATER QUALITY SUMMARY FOR 30 FT. AND 10 FT. CONTOURS, MEAN CONCENTRATIONS SEPTEMBER 1974 - SEPTEMBER 1975

Parameter	Unit of Measurement	30 FT. No. of Samples	30 FT. Min	30 FT. Max	30 FT. Mean	10 FT. No. of Samples	10 FT. Min	10 FT. Max	10 FT. Mean
Physical									
Color	APHA	26	<1	6	2**	26	<1	7	2**
Specific conductance	μmhos	381	240	360	307	377	240	355	299
Temperature	°C	1,114	0.1	25.2	12.7	818	0.0	25.4	12.6
Turbidity	FTU	26	<1	10	4*	26	<1	15	4*
Chemical									
Alkalinity	mg/ℓ-$CaCO_3$	26	78	101	91	26	71	101	90
Aluminum	mg/ℓ	26	0.02	0.96	0.20	26	0.02	0.91	0.20
Antimony	mg/ℓ	20	<0.001	<0.06	<0.006*	20	<0.001	<0.06	<0.06*
Arsenic	mg/ℓ	26	<0.0008	<0.0008	<0.0008	26	<0.0008	<0.0008	<0.0008
Barium	mg/ℓ	26	0.001	6.80	1.39	26	0.005	6.80	1.29
Beryllium	mg/ℓ	20	<0.001	<0.001	<0.001*	26	<0.001	<0.001	<0.001*
Boron	mg/ℓ	20	<0.05	0.09	<0.05*	20	<0.05	0.10	<0.05*
Bromide	mg/ℓ	20	<0.1	<0.1	<0.1	20	<0.1	<0.1	<0.1
Cadmium	mg/ℓ	28	<0.001	0.005	<0.001*	28	<0.001	0.004	<0.001*
Calcium	mg/ℓ	26	22.02	41.66	34.33	26	20.56	40.64	34.14
Carbonates	mg/ℓ	4	<0.05	<0.05	<0.05*	4	<0.05	<0.05	<0.05*
Chemical oxygen demand	mg/ℓ	26	4.0	15.1	6.3	26	4.3	13.5	6.4
Chloride	mg/ℓ-Cl	26	19.6	22.5	21.7	26	19.5	25.2	22.1
Chlorinated hydrocarbons	ng/ℓ	8	463	1,735	<1,000*	8	247	<1,000	<1,000*
Chlorine	mg/ℓ	30	<0.04	<0.04	<0.04*	30	<0.04	<0.04	<0.04*
Chromium	mg/ℓ	28	<0.001	0.033	<0.001*	28	<0.001	0.031	<0.001*
Cobalt	mg/ℓ	20	<0.005	<0.005	<0.005*	20	<0.005	<0.005	<0.005*
Copper	mg/ℓ	28	<0.001	0.037	0.010**	28	<0.001	0.048	0.011**
Cyanide	mg/ℓ	20	<0.005	<0.010	<0.010*	20	<0.005	<0.010	<0.010*
Dissolved oxygen	mg/ℓ	792	7.6	14.5	10.4	540	6.8	14.9	11.3
% O_2 saturation	%	790	68	140	99	553	71	132	99
Fluoride	mg/ℓ	26	0.10	0.28	0.16	26	0.10	0.24	0.15
Halogenated phenoxyacid herbicides	μg/ℓ	4	<1.0	8.5	4.8**	4	4.7	8.4	6.5
Iron	mg/ℓ	28	0.001	0.344	0.103	28	<0.001	0.330	0.089**
Lead	mg/ℓ	28	<0.001	0.033	0.009**	28	<0.001	0.034	0.009**
Magnesium	mg/ℓ	26	7.71	13.33	9.92	26	7.84	13.20	9.89
Manganese	mg/ℓ	28	0.001	0.038	0.010	28	0.002	0.036	0.011
Mercury	mg/ℓ	24	<0.0002	0.0017	<0.0002*	21	<0.0002	0.0007	<0.0002*
Molybdenum	mg/ℓ	20	<0.020	<0.020	<0.020*	20	<0.020	<0.020	<0.020*
Nickel	mg/ℓ	28	<0.001	0.122	0.015**	28	<0.001	0.048	0.009**
Nitrogen									
Ammonia	mg/ℓ-N	126	0.003	0.105	0.037**	79	0.003	0.180	0.038**
Nitrate	mg/ℓ-N	126	<0.04	0.48	0.14**	79	<0.04	0.44	0.13**
Nitrite	mg/ℓ-N	26	0.002	0.008	0.005	26	0.002	0.010	0.005
Organic	mg/ℓ-N	126	0.08	0.38	0.20	79	0.12	0.43	0.21
TKN	mg/ℓ-N	126	0.12	0.45	0.24	79	0.15	0.54	0.25
Oil and Grease	mg/ℓ	26	<1.0	15.1	<1.0*	26	<1.0	21.9	<1.0*
Organophosphorus	ng/ℓ	4	<10	117	<10*	4	<10	453	<10*
pH	units	573	7.3	8.9	8.6	373	7.4	9.0	8.2
Phenols	mg/ℓ	26	<0.005	<0.005	<0.005*	26	<0.005	<0.005	<0.005*
Phosphate									
Ortho	mg/ℓ-P	126	<0.002	0.011	<0.002*	79	<0.002	0.011	<0.002*
Total	mg/ℓ-P	125	<0.005	0.033	<0.005*	79	<0.005	0.027	<0.005*
Potassium	mg/ℓ	26	1.110	2.870	1.702	26	1.130	2.820	1.720
Selenium	mg/ℓ	26	<0.0008	<0.0008	<0.0008*	26	<0.0008	<0.0008	<0.0008*
Silica	mg/ℓ SiO_2	26	<0.05	0.34	0.10**	26	<0.05	0.36	0.10**
Silver	mg/ℓ	20	<0.001	<0.001	<0.001*	20	<0.001	<0.001	<0.001*
Sodium	mg/ℓ	26	4.52	12.37	9.05	26	4.56	12.14	9.11
Solids									
Dissolved	mg/ℓ	394	80	332	173	261	105	305	178
Suspended	mg/ℓ	346	0.1	168.6	12.7	214	0.4	108.8	15.4
Sulfate	mg/ℓ-SO_4	26	18.9	27.5	24.9	26	20.2	27.5	24.2
Sulfide	mg/ℓ-S	26	<0.005	<0.005	<0.005*	26	<0.005	<0.005	<0.005*
Sulfite	mg/ℓ-S	20	<1	<2	<2*	20	<1	<2	<2*
Surfactants	mg/ℓ	26	<0.01	0.08	<0.01*	26	<0.01	0.02	<0.01*
Thallium	mg/ℓ	20	<0.020	<0.020	<0.020*	20	<0.020	<0.020	<0.020*
Tin	mg/ℓ	20	<0.1	<0.1	<0.1*	20	<0.1	<0.1	<0.1*
Titanium	mg/ℓ	20	<0.001	<0.001	<0.001*	20	<0.001	<0.001	<0.001*
Vanadium	mg/ℓ	20	<0.001	0.008	<0.02*	20	<0.001	<0.02	<0.02*
Zinc	mg/ℓ	28	0.003	0.046	0.018	28	0.003	0.046	0.018
Biological									
Bacteria									
Fecal coliform	MPN/100 mℓ	202	<3	460	14**	132	<3	460	30**
Total coliform	MPN/100 mℓ	202	4	≥2,400	259**	132	4	≥2,400	513**
Biological oxygen demand	mg/ℓ	530	0.0	6.1	0.9	346	0.0	5.6	0.9

*Due to the occurrence of concentrations below analytical detection limits in many samples, the representative yearly concentration has been derived from a yearly mode value.

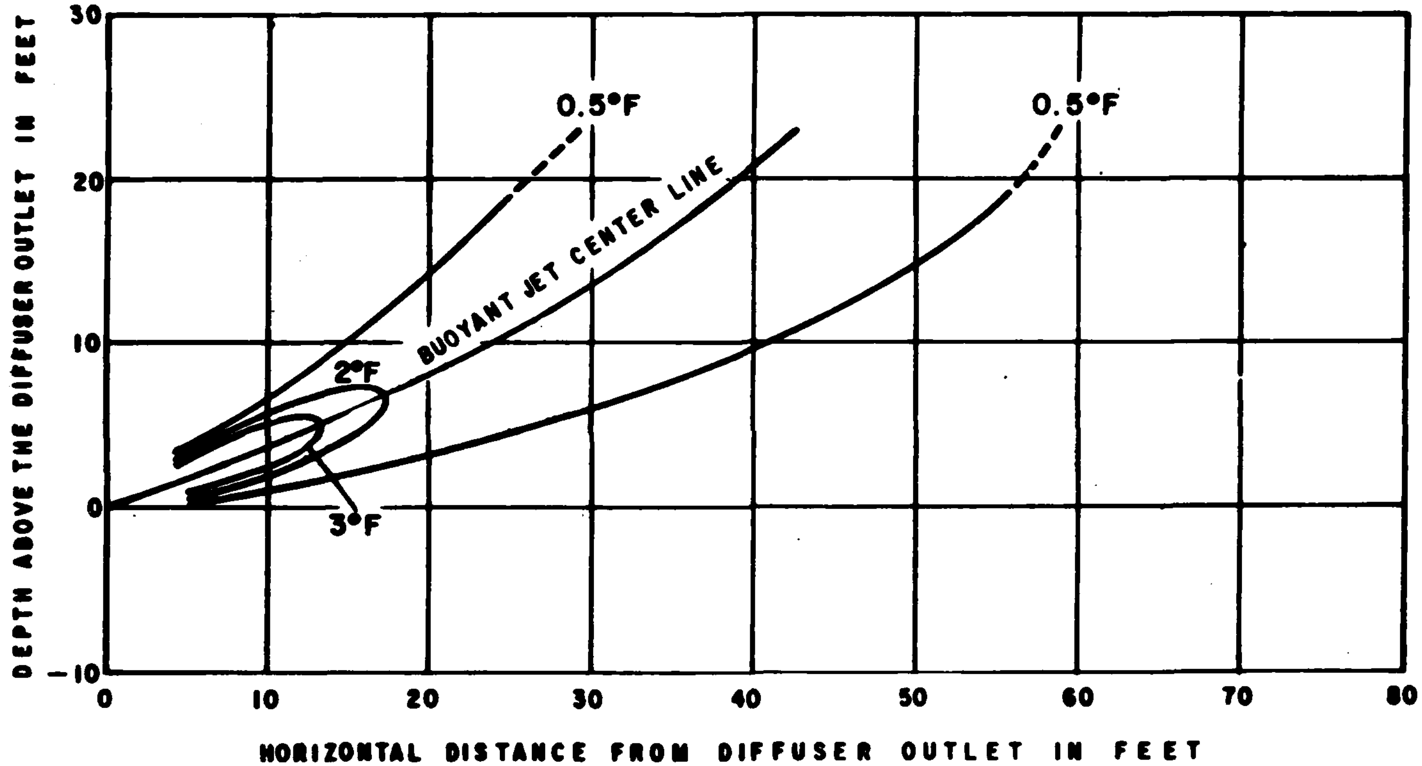
**Due to the occurrence of concentrations below analytical detection limits in certain samples, the average yearly concentration has been derived by averaging the maximum detection-limit concentrations with other higher values to produce a maximum yearly mean.



NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY	11.7 FPS
JET EXIT TEMPERATURE	64.2°F
AMBIENT TEMPERATURE	34.1°F
AMBIENT CURRENT	0FPS
DETENTION TIME TO REACH SURFACE	11SECS

JANUARY-ISOTHERMS OF AN AVERAGE CLIMATIC CONDITION
FIGURE B-1

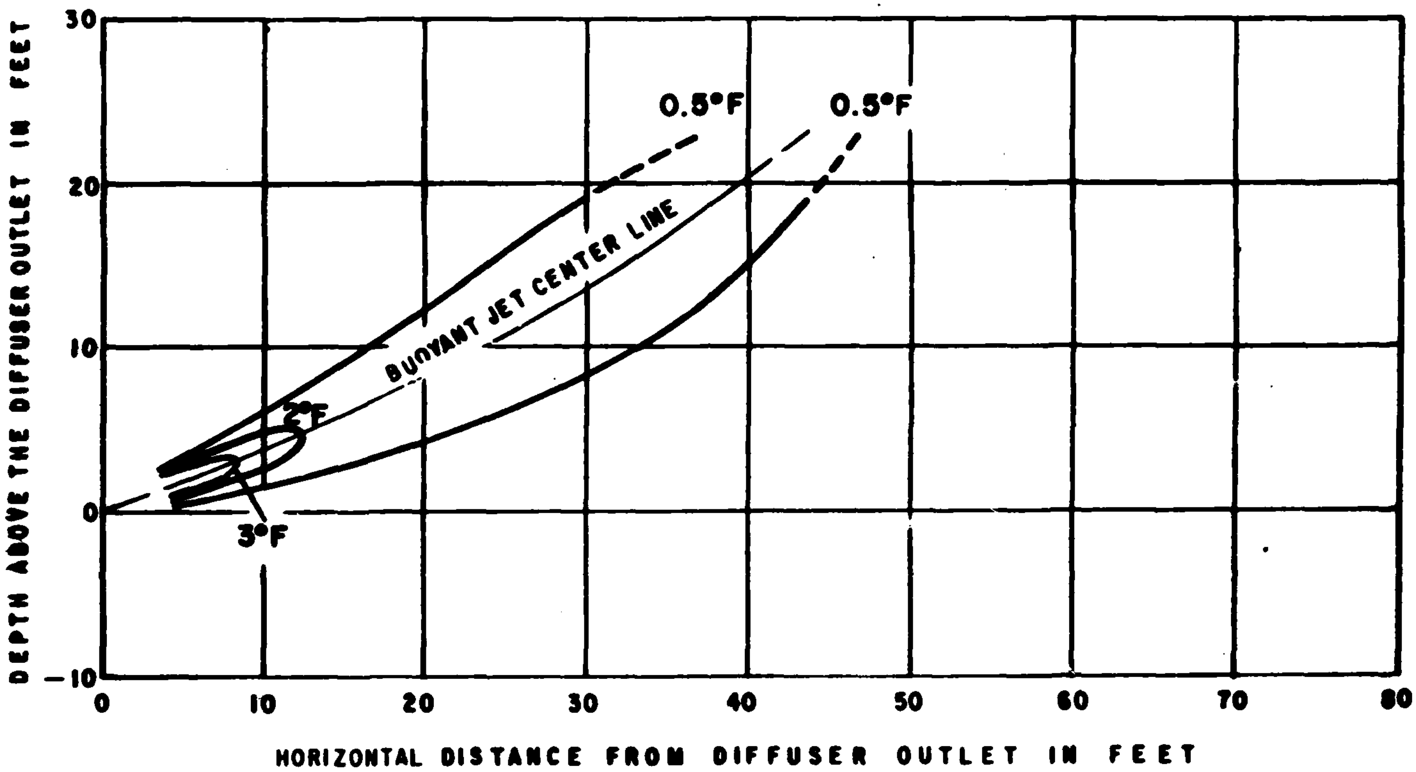


NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY	13.5 FPS
JET EXIT TEMPERATURE	72.9°F
AMBIENT TEMPERATURE	37.9°F
AMBIENT CURRENT	0 FPS
DETENTION TIME TO REACH SURFACE	9 SECS.

APRIL — ISOTHERMS OF AN AVERAGE CLIMATIC CONDITION

Figure B-2

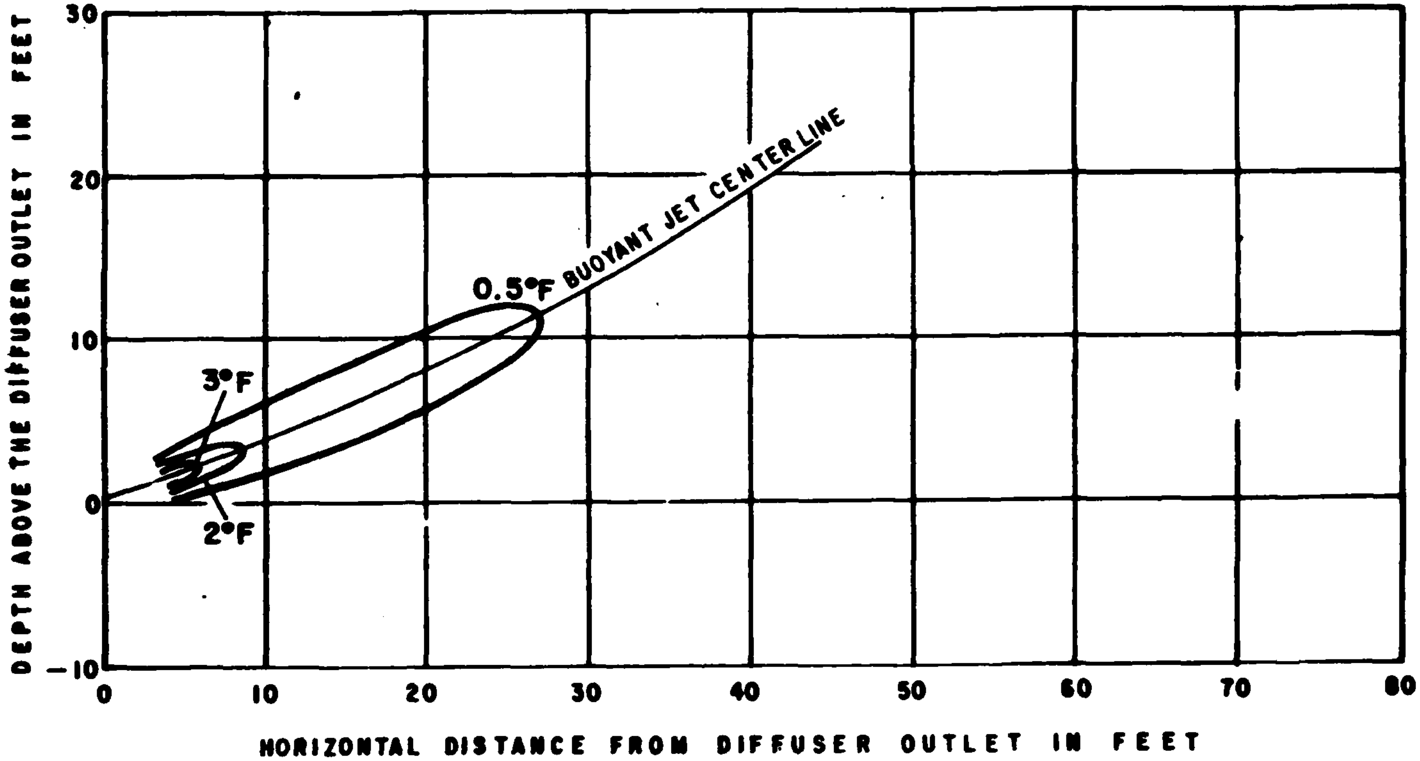


NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY	15.1 FPS
JET EXIT TEMPERATURE	84.1°F
AMBIENT TEMPERATURE	64.3°F
AMBIENT CURRENT	0 FPS
DETENTION TIME TO REACH SURFACE	8 SECS.

JUNE — ISOTHERMS OF AN AVERAGE CLIMATIC CONDITION

Figure B-3

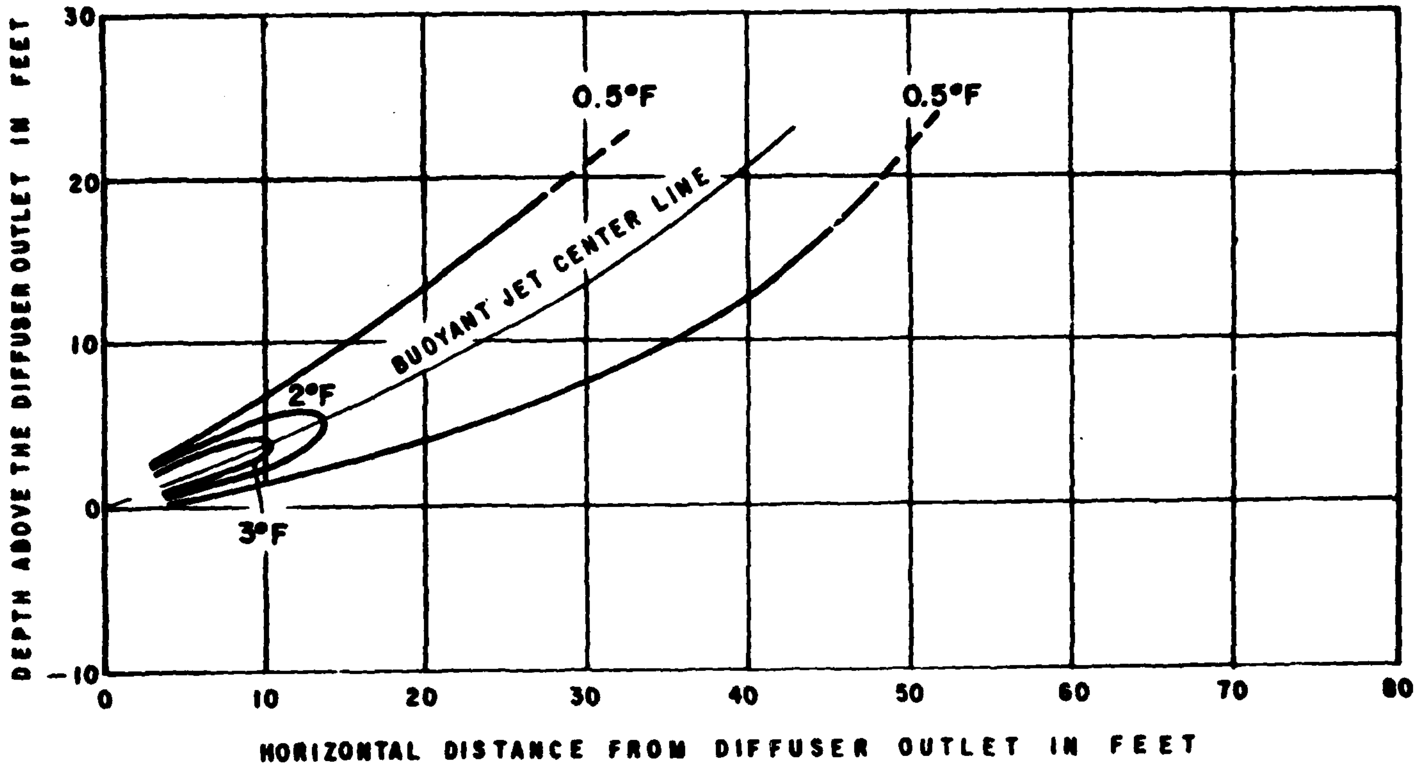


NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY	15.3 FPS
JET EXIT TEMPERATURE	86.9°F
AMBIENT TEMPERATURE	73.9°F
AMBIENT CURRENT	0 FPS
DETENTION TIME TO REACH SURFACE	9 SECS.

AUGUST ISOTHERMS OF AN AVERAGE CLIMATIC CONDITION

Figure B-4

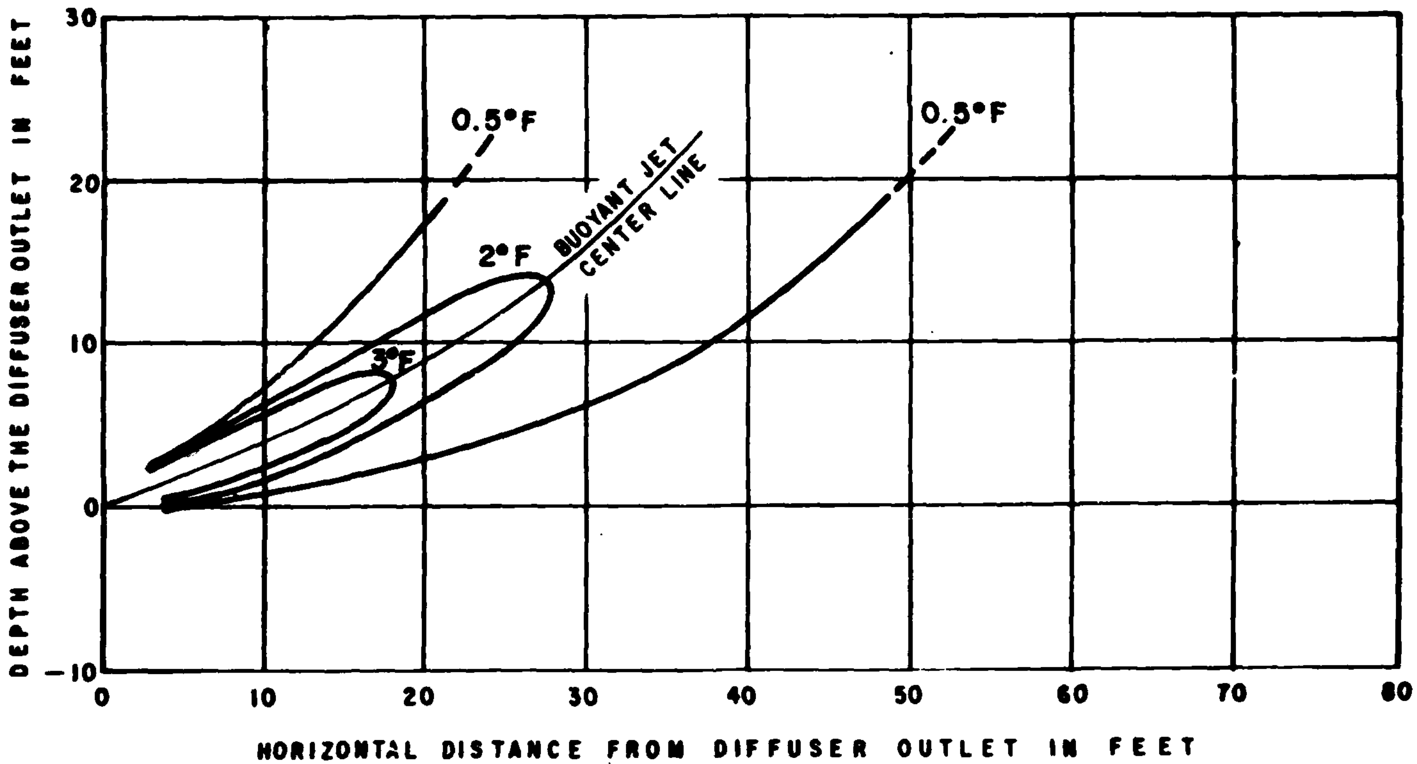


NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY:	14.1 FPS
JET EXIT TEMPERATURE:	77.9°F
AMBIENT TEMPERATURE:	53.7°F
AMBIENT CURRENT:	0 FPS
DETENTION TIME TO REACH SURFACE:	9 SECS.

OCTOBER — ISOTHERMS OF AN AVERAGE CLIMATIC CONDITION

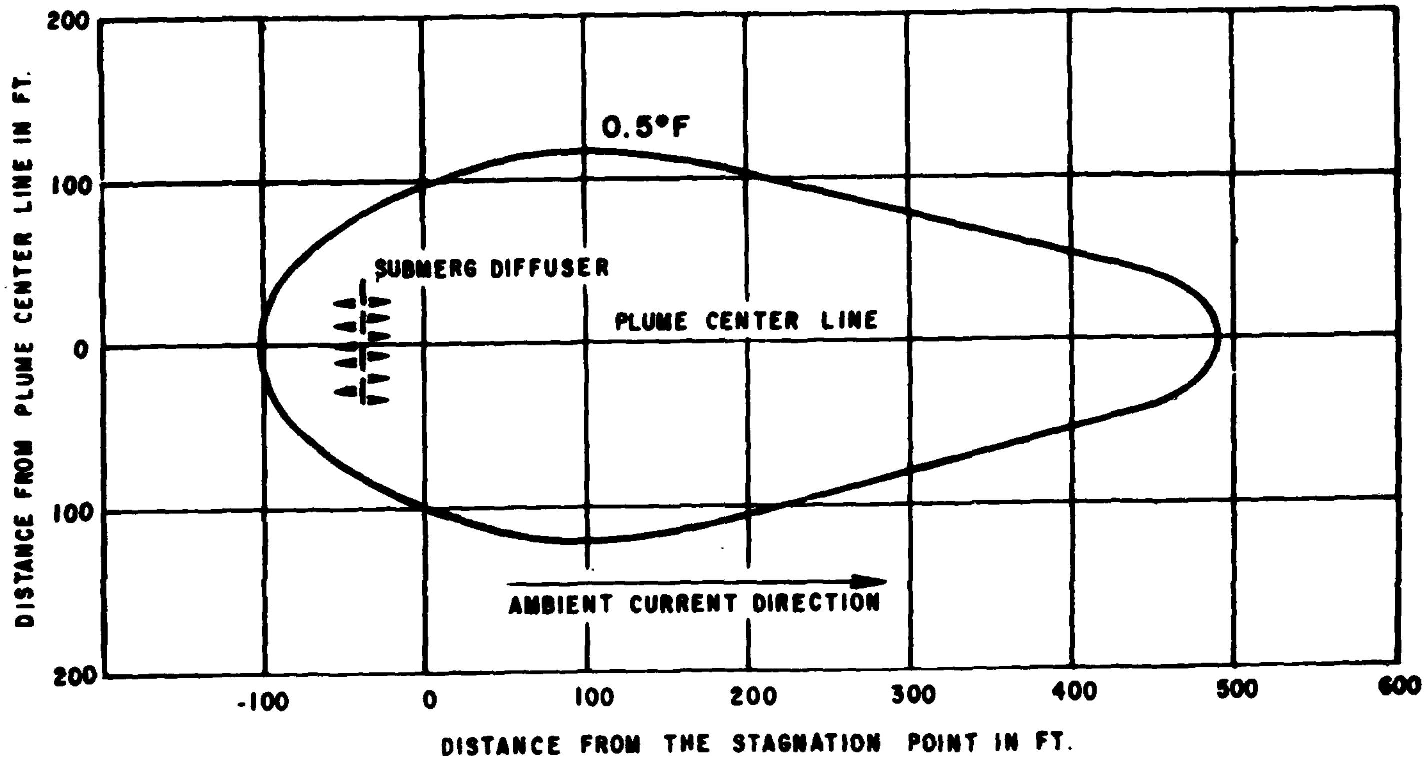
Figure B-5



NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

JET EXIT VELOCITY	16.1 FPS
JET EXIT TEMPERATURE	93.8°F
AMBIENT TEMPERATURE	37.9°F
AMBIENT CURRENT	0 FPS
DETENTION TIME TO REACH SURFACE	7 SECS.

APRIL — ISOTHERMS OF AN EXTREME CLIMATIC CONDITION
Figure B-6



NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

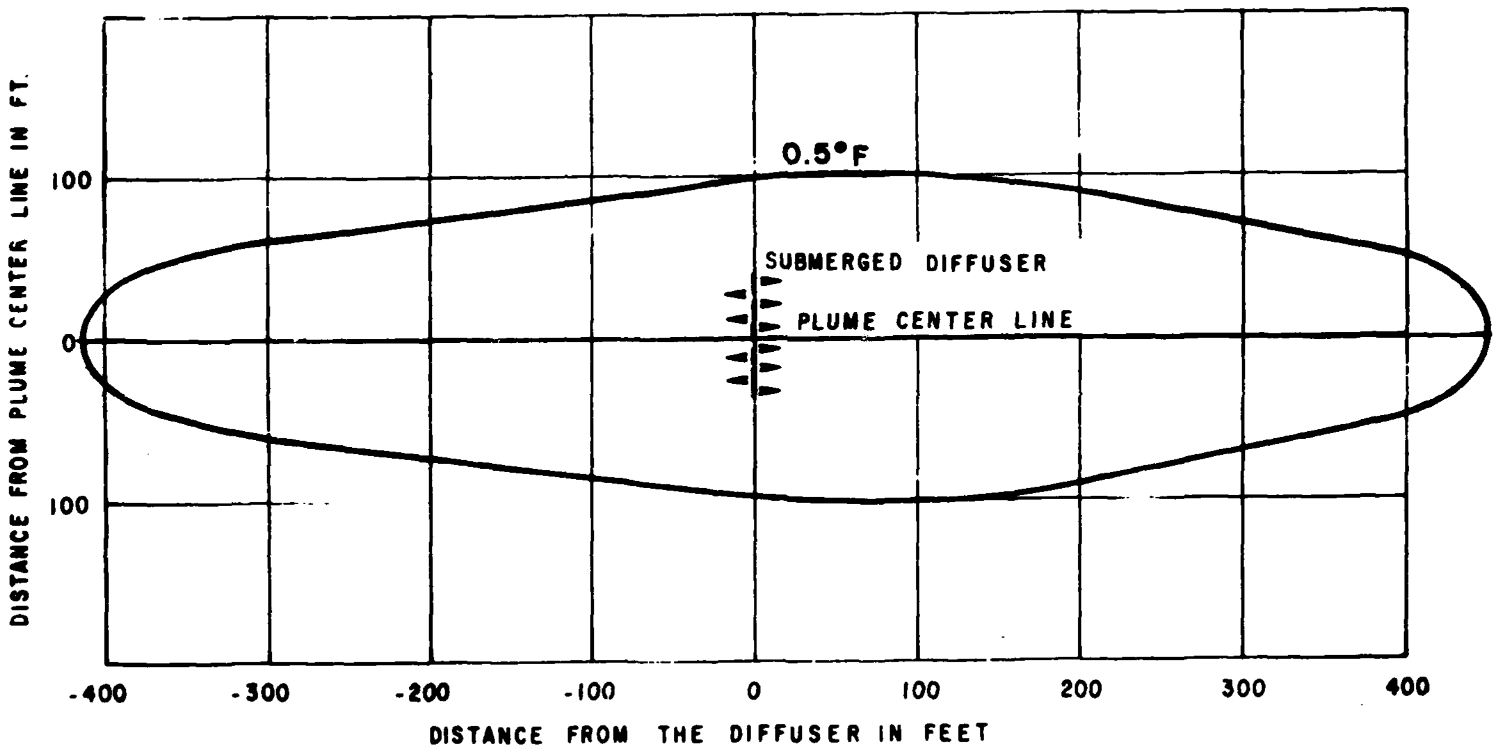
MAXIMUM SURFACE TEMPERATURE RISE · 1.01°F

AMBIENT CURRENT · · · · · · · · · 0.32FPS

DETENTION TIME TO PASS THRU 0.5°F ISOTHERM ALONG PLUME CENTER LINE FROM JET EXIT · · · · · · · 19.5 MINS.

APRIL SURFACE ISOTHERM OF AN AVERAGE CLIMATIC CONDITION

Figure B-7



NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

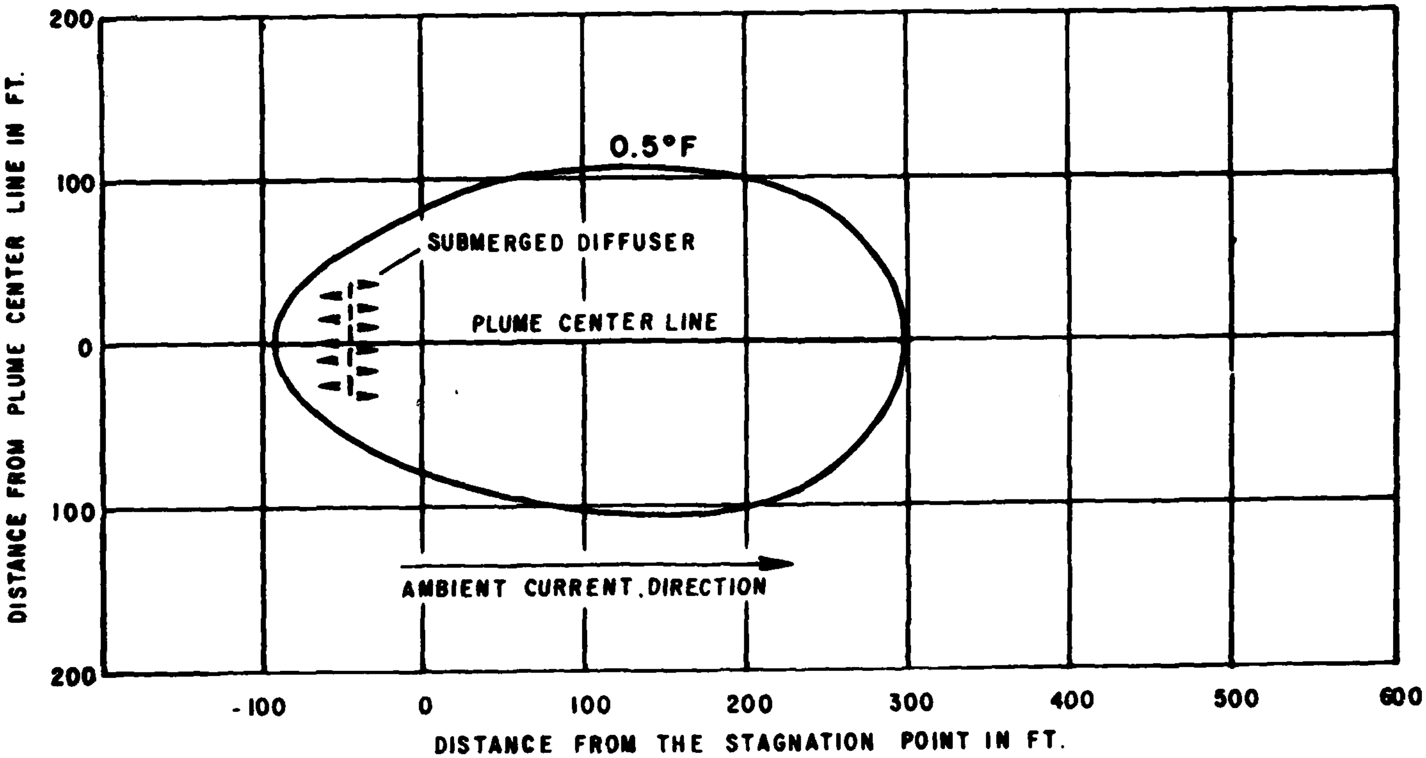
MAXIMUM SURFACE TEMPERATURE . . . 1.68°F
AMBIENT CURRENT . . . . . 0 FPS
DETENTION TIME TO PASS THRU 0.5°F ISOTHERM ALONG PLUME CENTER LINE FROM JET EXIT . . . . 23.5 MINS.

APRIL SURFACE ISOTHERM OF AN EXTREME CLIMATIC CONDITION
Figure B-8

AD-A079 395 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT. PERMIT APPLICATION BY NIA--ETC(U)
DEC 78 A K MARKS

UNCLASSIFIED NL

9 OF 11
AD A079 395



NOTE: PLUME SHOWN ISSUING FROM ONE SIDE OF DIFFUSER ONLY.
EQUIVALENT PLUME IN OPPOSITE DIRECTION

MAXIMUM SURFACE TEMPERATURE RISE 0,7°F
AMBIENT CURRENT 0.32FPS
DETENTION TIME TO PASS THRU 0,5°F
ISOTHERM ALONG PLUM CENTER LINE
FROM JET EXIT . . . . 11 MINS.

OCTOBER SURFACE ISOTHERM OF AN AVERAGE CLIMATIC CONDITION
Figure B-9

APPENDIX C: FLUE GAS DESULFURIZATION SYSTEM - CONCEPTUAL DESIGN

INTRODUCTION

C.001
The applicant has evaluated two flue gas desulfurization plans: Plan I utilizes high sulfur eastern coal (2.3 percent average sulfur content) with flue gas reheat; Plan II utilizes western coal (0.5 percent average sulfur content) with no flue gas reheat. Both plans are based on treatment of 100 percent of the flue gas and 90 percent removal of sulfur dioxide. In the following description, the two plans are discussed collectively for the sake of simplicity. Major design variations are pointed out wherever applicable.

GENERAL DESCRIPTION

C.002
The FGD system for each steam generator consists of two (2) booster ID fans, five (5) operating absorption modules and complete limestone preparation equipment. Common to Units 1 & 2 are the limestone handling and storage facilities. Plan I using flue gas reheat includes one (1) high velocity two liner stack common to both units. In Plan II (no reheat) each unit has its own low-velocity one-liner stack because the indicated liner diameters are too large to be included in one common stack serving both units. The system includes a certain degree of redundance for components which, based on past experience, have provided a lower than desired degree of reliability. A spare module is not provided in the proposed design. However, the five (5) modules are capable of handling 115 percent of MCR (maximum continuous rating conditions of the steam generator) gas flow. Thus, four (4) modules are designed to treat 92 percent of MCR gas flow and could be capable of handling a full MCR flow at a somewhat reduced SO_2 removal efficiency. In addition, the ductwork is arranged to permit any or all of the flue gas to bypass the absorption system and flow directly to the stack. The bypass is strictly for emergency purposes and as such is not intended to provide reheat during normal operation. Its inclusion in the design is contingent on future legislative requirements that may prohibit or restrict the usage of bypass. The following enclosures are provided: one, housing the entire absorption system; one, housing the limestone preparation equipment including the ball mills and the limestone storage tank, and one enclosure housing the waste stabilization facilities. The latter two are common to Units 1 and 2. Major design parameters and system performance are presented on Appendix Table C-1.

GAS SYSTEM

C.003
Hot flue gas at 270°F from the booster ID fans located downstream of the electrostatic precipitators (ESP), air heaters and boiler ID fans is fed at sufficient pressure to pass through the absorber system and into the stack. It is conceivable that in the final design, the booster ID fans may be deleted and the boiler ID fans will draft both the boiler and the absorber system. The flue gas entering the FGD system is essentially free of particulate matter which is removed in the ESP. The hot flue gas from the distribution plenum enters the absorber inlet duct section where the walls are continuously washed by concurrent spray of slurry in order to prevent wet-dry interface areas. The flue gas enters the lower portion of the absorption tower and passes upward, countercurrent to the flow of recycle slurry which contains the proper amount of limestone needed to absorb sulfur dioxide. The gas is then saturated and flows through three (3) spray zones of recycle slurry, where the absorption of sulfur dioxide takes place.

C.004
The absorber is a vertical spray tower equipped with three (3) spray banks with a series of spray nozzles designed to achieve proper atomization of liquid. One additional connected spray bank is included for operation as a spare or if higher L/G ratio is required to attain increased SO_2 removal (if required in the future). In the event of failure of the spray system, or failure of air heater resulting in an increase in inlet flue gas temperature, an emergency deluge system, capable of quenching the inlet flue gas as hot as 650°F, is provided. The flue gas then passes upward through a wash tray and a one-stage chevron type mist eliminator for efficient separation of any entrained particulate and liquor carryover. Both the wash tray and the mist eliminator sections are kept free of buildup and scale by means of wash sprays utilizing fresh makeup water combined with supernate return. The treated flue gas exits the spray tower at its saturation temperature (121°F for Plan I and 132°F for Plan II). In Plan I, the saturated gas is reheated to 160°F prior to discharge to the stack. The reheat is accomplished by recirculating a portion of the flue gas stream back through an in-line steam coil heat exchanger where the gas is reheated to 300°F (hot air injection is used during start-up). The reheated 300°F gas is recombined with the saturated gas in a mixing chamber raising the temperature of the saturated gas to 160°F. A fan is required in the recirculating gas stream to overcome the pressure drop across the in-line reheater. In Plan II the flue gas goes directly to the stack at its saturation temperature.

LIQUID SYSTEM

C.005
The liquid flow within the absorber system may be divided into three (3) main categories. These include the reagent feed slurry stream, the absorbent slurry recycle stream and the reaction product bleed stream. Ancillary flows include fresh make-up water, wash water and supernate water return. The flow of the absorbent slurry recycle to each spray tower is provided by three (3) operating recycle pumps (one spare), with each pump piped to its own individual spray zone. After passing through the absorber, the slurry drains to the recycle tank located below the spray tower. Makeup limestone slurry is added to the recycle tank. In order to obtain the proper degree of desupersaturation, the recycle tank is designed to provide eight (8) minutes of liquor residence time based on an L/G value of 100 for Plan I and 75 for Plan II. The slurry in the recycle tank is continuously agitated to prevent settling.

C.006
A bleed stream is taken from each of the recycle pumps and discharged to the waste slurry sump tank (alternative design would include an overflow directly from the recycle tank to the waste sump). The bleed stream, a slurry (15 percent solids) containing a mixture of excess calcium carbonate ($CaCO_3$), calcium sulfite ($CaSO_3 \cdot 1/2H_2O$), calcium sulfate ($CaSO_4 2H_2O$) and inerts, is pumped to the thickener where it is dewatered to approximately 30-35 percent by weight solids. The thickener overflow is returned to the reclaimed water tank for reuse in the FGD system. The thickener underflow is conveyed to the sludge stabilization system for further dewatering and processing.

C.007
The wash tray is washed from both the top-side and the under-side using a mixture of fresh makeup water and supernate return. A portion of the water stream is returned to the wash water recirculation tank while the remaining portion is drained into the recycle tank. A similar wash system is provided for the top-side of the chevron mist eliminator.

C.008
The system is designed to operate in a closed-loop manner with respect to water effluents. The fresh water makeup of the FGD system is restricted to account for water loss due to evaporative cooling of the gases, the water bound with the waste sludge and the water of hydration associated with the calcium salts.

LIMESTONE FEED SYSTEM

C.009
Limestone, nominally 3/4-inch, is fed from the day feed silo to the ball mill via a weigh feeder. Supernate return is used as source of makeup water for wet grinding and dilution of the limestone slurry. The ball mill is sized to produce slurry with a particle size such that approximately 80 percent will pass through 200 mesh. A wet cyclone classifier recycles larger particles back to the ball mill for remilling. The limestone slurry is fed to the limestone storage tank (16-hour capacity) from which it is pumped through a recycle loop to each operating absorption module as required.

LIMESTONE STORAGE AND HANDLING

C.010
Limestone is delivered to the plant site by rail and stored in an open pile. The limestone handling system includes a bottom unloading reclaim hopper, a belt conveyor system for delivery to the storage pile, a pile reclaim hopper and a conveying system from the pile to the day feed silos located in the ball mill area. A crusher may be required depending on the size of limestone purchased. In order to meet the limestone requirements, assuming that average sulfur coal is burned, the following train deliveries are anticipated:

Plan I - One 8,000 ton train every eleven (11) days;
Plan II - One 6,400 ton train every twenty-eight (28) days.

The storage piles are sized to hold approximately 40,000 tons (200 feet diameter and 75 feet high for Plan I and 15,000 tons (150 feet diameter and 55 feet high) for Plan II. The storage is adequate to meet a 24-day requirement assuming maximum sulfur coal is burned during that period.

SPECIAL DESIGN CONSIDERATIONS

C.011
There are various pressure losses associated with the flow of the flue gas through the FGD system. The total pressure drop across the spray tower, the wash tray, ductwork and including stack losses is estimated at nine inches W C. To overcome this pressure drop, a set of two (2) parallel booster ID fans is included in the design. These fans are upstream of the absorption systems and are in series with the main ID fans which draft the boiler, the air heater and the electrostatic precipitators (estimated pressure drop of 20 inches W C). In the fan design, a margin of 20 percent is applied on gas flow and 44 percent on static head.

C.012

The SO_2 design removal efficiency is 90 percent for both plans. In order to achieve the removal efficiency, the L/G ratio has been set at 100 for Plan I and 75 for Plan II which is consistent with the current designs based on spray tower absorbers. In the event the final design were to include some other absorption equipment, e.g. fixed bed, sieve tray or turbulent contactor, a lower L/G ratio could be used. However, the pressure drop across this type of equipment is higher by 3-5 inches W C which would be reflected in increased energy cost for driving the booster ID fans. Again, consistent with the current practices, the pH of the absorbing slurry is expected to be approximately 5.5 in order to optimize absorption efficiency and to minimize the formation of scale inside the spray tower and the spray headers. SO_2 emissions for each unit at 90 percent SO_2 removal efficiency and MCR gas flow are as shown below:

		Plan I Eastern Coal	Plan II Western Coal
1. Maximum Sulfur & Minimum HHV Coal			
	lbs/hr	4,140	1,579
	lbs/mB	0.51	0.19
	ppm by vol dry	228	83
2. Average Sulfur & Average HHV Coal			
	lbs/hr	3,085	1,019
	lbs/mB	0.38	0.12
	ppm by vol dry	170	53

C.013

Plan I based on worst case analysis and high sulfur coal requires a reheat system to meet the three hour SO_2 nondeterioration standard of 512 ug/m^3. The maximum predicted three-hour SO_2 concentrations expected during fumigation conditions associated with a stable onshore flow utilizing a maximum stack height credit of 625 feet and no reheat is 546 ug/m^3. Flue gas reheaters which use heat transfer surfaces exposed to the saturated flue gas stream have a record of experiencing corrosion and solids buildup. These factors eventuate downtime for cleaning and sometime total replacement of reheater tubing. In the proposed system, the reheaters are located in the recirculating gas stream where the temperature is approximately 40°F above its saturation temperature. This arrangement tends to overcome the aforementioned corrosion problems. About 92 million Btu/hr at MCR is required to reheat the flue gas stream from each steam generating unit. In order to meet this requirement, about 90,000 lbs/hr of extraction steam taken from the cold reheat line is consumed (steam at 656°F and 154 psig).

FGD SLUDGE STABILIZATION SYSTEM

C.014
The waste sludge generated by the FGD system can be either ponded or it can be dewatered and then disposed of as dry material with or without stabilization. FGD sludge can be stabilized by fly ash/lime addition or by chemical additives. A previous study, Niagara Mohawk Power-Lake Erie Generating Station - Ash Handling System Study, dated January 1977, recommended that a dry fly ash handling and disposal system be used. Since there are processes whereby dry ash, lime and/or chemical additives can be used for stabilizing the FGD sludge, a combined ash/sludge disposal system appears to be the logical approach to the overall disposal problem at the proposed site. Fly ash can also be combined for disposal with FGD sludge stabilized by use of an additive material. Stabilization is reported to make the waste material environmentally acceptable and suitable for land fill purposes. Under the conceptual system, the thickener underflow is conveyed to vacuum filters for further dewatering. The resulting filter cake contains approximately 55 percent solids by weight. The water overflow is returned to the thickener and thence to the FGD system consistent with the closed-loop operation concept. After the unstabilized sludge has been thickened and dewatered, it is susceptible to rewetting when exposed to moisture such as from rainfall. This causes a reduction in bearing capacity such that the material could not support trucks, bulldozers and other maintenance vehicles, or at times even the weight of a man. This makes landfill disposal of the solids difficult. The permeability of this untreated sludge is reported to be in the area of 10^{-4} cm/sec. This is not sufficient to prevent contaminated leachate water from penetrating groundwater. As a result, areas having unfavorable subsoil condiion will require lining with materials having permeabilities in the 10^{-6} cm/sec range.

C.015
Typically, water in the scrubber solids will not only contain a varying amount of sulfates and sulfites as dissolved solids, but also many other impurities and trace elements. It is, therefore, necessary that the FGD sludge filter cake be stabilized in order to make it environmentally acceptable and structurally suitable as land fill material. In order to accomplish this objective, the filter cake is conveyed to the pug-mill mixer having a 15-20 second mixing cycle where it is combined with dry fly ash and lime at predetermined ratios. The processed material containing approximately 70 percent

by weight solids is stockpiled via a radial stacker where it is allowed to cure for several days prior to being hauled to its ultimate disposal site. Stabilization has been reported to begin after about 30 minutes and the material will set up within 48 hours. For design purposes, the curing pile is designed to hold approximately 20,000 tons (3 days) of processed material for Plan I (eastern coal) and 7,000 tons (3 days) for Plan II (western coal). The stabilized waste material can be reclaimed from the curing area as processed material is being discharged into it from the waste stabilization system. The ash and lime additive rates are contingent on the reactivity of the materials being processed. For the purpose of this study, it has been assumed that the fly ash to waste sludge ratio should not be less than 1 to 1 (on dry solids basis) and the lime addition rate to be 0.02 tons of lime per ton of total dry solids processed. Major equipment associated with the process entails the following: sludge surge tank, vacuum filters, mixing tank, ash and lime silos, associated pumps, and conveyors.

C.016
The sludge stabilization equipment is designed with adequate capacity to handle combined Units 1 and 2 sludge. The design basis is shown in the table below.

		Units 1 & 2	
		Plan I Eastern Coal	Plan II Western Coal
Waste Sludge (unstabilized)	TPH*	92	35
Fly Ash Addition	TPH	136	35
Lime Addition	TPH	4.6	1.4
Operating Power Requirement	KW	720	370

*Tons Per Hour Dry Solids Basis

In the event the stabilization facilities become inoperable, an emergency pond with a 30-day full load capacity is provided as a reservoir for the waste generated in the FGD system. The waste slurry is diverted from the pond to the stabilization system as soon as the system becomes operable.

C.017
With the high sulfur eastern coal (2.3 percent average sulfur and average ash at 18.4 percent), the expected annual production of sludge and fly ash is 380,000 tons per year (TPY) and 544,000 TPY respectively. Although the production of fly ash is approximately 43 percent higher than that of fly ash in the stabilization system. The lime additive requirement of 18,500 TPY is indicated.

C.018
With western coal (0.5 percent average sulfur and average ash at 8.0 percent) significantly greater quantities of fly ash compared to sludge are generated: 126,000 TPY sludge and 368,000 TPY fly ash. While it would be feasible to use all the fly ash for the stabilization, the cost of the lime additive (which is based on the total solids processed) would appear to be prohibitive. For this reason, the conceptual design in this study considers processing all the sludge generated and an equivalent amount of fly ash for stabilization (126,000 TPY). Lime additive consumption at these rates is approximately 5,000 TPY. An in-depth economic evaluation will have to be made to optimize the final design and size of the stabilization system.

TRANSPORTATION OF SOLID WASTE

C.019
Rear dump trucks will be used to haul dry bottom ash and stabilized SO_2 sludge/fly ash material from temporary storage areas at the plant island to the ultimate solid waste disposal area. At the Pomfret site, this area is approximately 4,500 feet (average distance) from the plant island. Approximately four (4)-100 cubic yard rear dump trucks, each making three trips per hour to the disposal site will be required. Additionally, approximately seven trucks per hour will arrive at the Pomfret disposal site with Niagara Mohawk's Dunkirk SES bottom and fly ash. Dunkirk SES ash will not be stored at the Sheridan site to avoid operating ash trucks through well populated areas of Dunkirk. Two spare 100 cubic yard trucks will also be required.

C.020
At the disposal area, three bulldozers are sufficient to place the daily volume of solid wastes (650 cubic yards bottom ash and 7,030 cubic yards stabilized waste) and Dunkirk SES waste. One operating spare is also provided to handle the maximum production of Lake Erie Station solid wastes (730 cubic yards bottom ash and 7,910 cubic yards stabilized waste material) and Dunkirk SES ash. Also required at the disposal site is one 1,500 gallon tank truck. This truck is used to spray water on the solid waste pile working face for dust control if necessary. At the plant island, one front end loader is required to load stabilized SO_2 sludge/fly ash material into dump trucks from the curing pile located directly east of the stabilization facility. Bottom ash is loaded into dump trucks from bottom ash dewatering bins.

C.021
With western coal, the average and maximum operating criteria for determining the number of dump trucks are the same as described for Plan I with the exception of ash and sulfur content. The average ash and sulfur contents are 8 and 0.5 percent, respectively. Maximum ash and sulfur con-tents are 18 and 0.7 percent, respectively. Based on the average criteria, four (4) - 70 cubic yard rear dump trucks, each making three trips per hour to the disposal site are required. Similar to Plan I, approximately seven trucks per hour will arrive at the Pomfret disposal site with Dunkirk SES ash. Two (2) operating spare 70 cubic yard dump trucks, each making three trips per hour, are required to handle the proposed station's solid waste under maximum conditions. At the disposal site, two bulldozers are sufficient to place the daily volume of Lake Erie Station solid waste to average conditions and Dunkirk SES ash. One operating spare is required to handle the maximum production of Lake Erie Generating Station wastes and Dunkirk SES ash. The following table summarizes the daily quantities of wastes to be handled from the proposed facility under average and maximum conditions.

	Average	Maximum
Bottom Ash - cubic yards/day	470	880
Fly Ash - cubic yards/day	1,250	2,620
Stabilized Waste - cubic yards/day	2,020	2,850

One 1,500 gallon tank truck will also be required at the disposal area for dust control, if necessary. Also, one front end loader will be required at the stabilization facility.

ULTIMATE WASTE DISPOSAL FACILITY DESCRIPTION

C.022
The average yearly quantities of fly ash, bottom ash, and sludge from the FGD system at the Lake Erie Generating Station (LEGS) Units 1 and 2, as well as bottom and fly ash from the Dunkirk Station are shown on Table C-2. The combined LEGS, Unit 1 and 2, and Dunkirk Station ash quantities would apply to the Pomfret Site operation. In the case of the Sheridan Site, there will be no Dunkirk Station ash disposal. The average scrubber solids quantities are shown on a dry weight basis. The quantities of generated waste products are based on 2.3 percent sulfur eastern coal (Plan I) with an average heating value of 12,000 Btu/lb and average ash content of 18.4 percent; and 0.5 percent sulfur western coal (Plan II) having an average heating value of 8,300 Btu/lb and average ash content of 8.0 percent. These quantities are also based on the proposed units operating at a 69 percent capacity factor.

Solid Waste Quantities

C.023

Where fly ash is used as a stabilizing ingredient in Plan I (eastern coal), an average of 1,350,000 TPY or 773 acre-feet/yr of stabilized water solids would be discharged by Units 1 and 2. Essentially all of the LEGS Units 1 and 2 fly ash could be used for stabilization. In Plan II (western coal) on the average, 367,000 TPY or 211 acre-feet/yr of stabilized waste solids would be discharged. These quantities are based on the dewatered and stabilized material having a water content of 30 percent and take into account the addition of stabilizing chemicals. In the case where only western coal is burned, a portion of the fly ash discharged from LEGS Units 1 and 2 would be required for stabilization. This would leave a residual of 484,000,000 lb/yr of fly ash to be handled along with LEGS Units 1 and 2 bottom ash and Dunkirk Station ash in the case of the Pomfret Site.

Characteristics of Stabilized Waste

C.024

In this section, the environmental and engineering properties anticipated from the stabilized waste solids are reviewed with respect to land disposal. The capability of stabilized scrubber solids to prevent water in contact with this material from passing through it and entering the groundwater table is determined by its permeability. The permeability values for sludges stabilized using fly ash/lime addition technology are reported to be in the range of 10^{-5} to 10^{-6} cm/sec for freshly prepared compositions. During the curing or hardening process, the permeability decreases to the 10^{-6} to 10^{-7} cm/sec range. Data collected on permeability changes with time of stabilized sludge from a Midwest power plant are shown in the following table.

PERMEABILITY OF STABILIZED SLUDGE MIXTURES
SHOWING THE EFFECT OF AGING

	Mix #1	Mix #2
Immediate	2.27×10^{-6}	8.78×10^{-7}
7 Days	3.95×10^{-7}	2.64×10^{-7}
14 Days	3.45×10^{-7}	2.53×10^{-7}

C.025

For scrubber sludges stabilized by using just a chemical additive, permeabilities have been found to range from 10^{-4} cm/sec for remolded material to 10^{-8} cm/sec for the undisturbed material. The permeability is reported to be high during the initial hardening period and decreases sharply after 1 to 15 days. After four weeks, the permeability comes down to the 10^{-6} cm/sec range and continues to decrease, but at a much slower rate. In tests run to determine the effects of percent solids and percent addition on stabilized sludge permeability, it was found that both the initial solids content of the sludge and the amount of additive introduced were factors in reducing the permeability. Because low permeablities achieved by the stabilized scrubber wastes are in the 10^{-6} to 10^{-7} cm/sec range required in seepage control limits it is feasible to use this material as a liner for waste disposal areas. Stabilized scrubber sludge is currently used for lining wastewater ponds. The only drawback to using stabilized scrubber sludge to line the solid waste disposal areas at the LEGS site is the two to four weeks of curing or recurring time needed to develop permeabilities in the 10^{-6} to 10^{-7} cm/sec range. This could be dealt with by installing an inexpensive liner to cover the temporary recurring period. An alternative would be to apply for a variance to cover the two to four week period needed to achieve the 10^{-6} to 10^{-7} cm/sec permeabilities.

Control of Contaminated Drainage Water
C.026
The primary source of water in contact with the piled stabilized sludge is rainfall. Tests have been made by others to determine the effect on rainfall water quality in contact with stabilized scrubber sludge. The purpose was to establish an improvement in water quality when compared to runoff water in contact with untreated sludge. An impermeable mass can only leach from the upper surface, and the degree of leaching depends on its solubility. Shake tests have been run on samples of fly ash-lime stabilized scrubber sludge. In this test, deionized water and stabilized sludge were contacted in a shake apparatus for 48 hours. The water was removed for analysis and the material was exposed to freshwater. The process was repeated for a total of five shakes. Each sample of water was analyzed for total dissolved solids (TDS). The results of such a test on stabilized sludge from the A's Shawnee Station are tabulated below:

LEACHATE FROM SUCCESSIVE SHAKE TESTS

Wash Number	TDS (ppm)	Grams Leached
1	974	1.948
2	338	.676
3	268	.536
4	194	.388
5	214	.428

Surface Area = 42.4 in.^{2}
Dilution Ratio (in.$_2$/L) = 21.2:1

C.027
The stabilized sludge shake test results show a significantly lower TDS when compared to the TDS present in supernatant water in contact with unstabilized sludge as reported earlier. Runoff tests were also run to get an indication of what degree of contamination rainfall in contact with waste materials would pick up. The waste material is placed in a box one-foot long by six inches wide by one-foot deep. The surface of the material to be tested can be exposed to various degrees of simulated rainfall. The runoff water is then collected and analyzed. The comparative results of such a runoff test are shown in the following table.

RUNOFF TEST RESULTS
AS TOTAL DISSOLVED SOLIDS - PPM

	Unstabilized Sludge Filter Cake	Unstabilized Sludge Filter Cake & Fly Ash	Stabilized Scrubber Sludge
Immediate	685	2,482	2,240
7 Days	584	2,296	588
28 Days	2,138	1,800	439

Appendix Table C-3 shows the IV Conversion Systems, Inc., runoff tests results for unique chemical constituents from established sludge.

C.028
Leachate tests and analyses have also been conducted on scrubber sludges stabilized using a chemical additive process. A typical leachate analysis from a sludge which had been cured for four weeks is listed below. Five hundred (500) grams of the material were slurried with 2000 ml of distilled water and agitated for 48 hours using a Phipps-Bird stirrer. The slurry allowed to settle for 48 hours and the supernatant was decanted for analysis. The results are as follows:

pH	- 11.6
Dissolved Salts	- 590 mg/l
Dissolved SiO_2	- Not detectable
Hardness, $CaCO_3$	- 430 mg/l
Fe^{++}	- Not detectable

Total Iron	- Not detectable
Ca^{++}	- 172 mg/l
Mg^{++}	- 0.05 mg/l
Mn^{++}	- 0.03 mg/l
Na^{+}	- 4 mg/l
Al^{+++}	- 4 mg/l
Alkalinity as $CaCO_3$	- 140 mg/l
Cl^{-}	- 66 mg/l
SO_4^{--}	- 100 mg/l
SO_3	- 92 mg/l
PO_4^{---}	- Not detectable

Although the results of the leachate tests on stabilized sludges show an improvement in water quality when compared with that from unstabilized sludges, further treatment would still be needed if discharged to a receiving stream to ensure that quality standards are met. The applicant does not intend to discharge leachates or runoff from stabilized sludge. All runoff and leachate would be collected using an impermeable collection system. After collection, all of this water would be used as makeup to the scrubber system, thus obviating any liquid discharges.

Load Bearing Capacity

C.029

Untreated scrubber sludge has been shown to lack any appreciable degree of compressive strength. Unstabilized limestone sludge at the Shawnee Station at a 44 percent water content was found to be able to support a load of only 0.45 pounds per square inch (psi). Untreated sludge dried to a 40 percent water content exhibited a higher compressive strength of 2.2 psi. This, however, is still less than the stress of three psi needed to support the weight of a normal person. Stabilized scrubber sludge is reported to have a higher compressive strength that increases with time, particularly during the early period of the curing process. The compressive strength characteristics of sludge stabilized by the fly ash-lime addition method is reported below.

CHARACTERISTICS OF FLY
ASH-LIME STABILIZED SLUDGE

Age of Stabilized Mixture Cured at 73°F (Days)	Compressive Strength (PSI)
3	40
7	80.5
14	140

C.030

Penetrometer tests run on scrubber sludges stabilized by adding a chemical additive have shown that at compressive strength of 4.5 tons per square foot (63 psi) could be achieved in curing times ranging from under five days to under twenty-five days. The curing time needed to achieve the 4.5 tons per square foot (TSF) compressive strength is reduced by increasing the solids content of the sludge and increasing the percent additive. A stabilized sludge at a 50 percent solids content with a 10 percent additive could achieve the 4.5 TSF compressive strength in less than five days. With a five percent additive addition, slightly over five days of curing time was needed to achieve the 4.5 TSF compressive strength. A stabilized sludge having a 38 percent solids content would reach the 4.5 TSF strength value in 10 days of curing with the 10 percent additive. With a five percent additive slightly under 25 days of curing time were needed to achieve the 4.5 TSF value. The increase in compressive strength of the stabilized scrubber sludge will facilitate the land disposal of this material in that it could support the weight of operating the maintenance vehicles.

Volume Reduction Potential

C.031

In the case of combined fly ash and stabilized sludge disposal in a land disposal area, the potential or minimizing the disposal volume is reported. The sludge and fly ash combine, mutually filling the interstices of the mixture, and a portion of the surface moisture is combined as water of hydration, reducing the volume. Further reduction is obtained through compaction.

Aging Characteristics

C.032

As the preceding discussion has shown, aging is reported to improve certain characteristics of the stabilized sludge. This includes a reduction in permeability values and an increase in bearing capacity. These values change rapidly during the initial days and weeks of curing, and then gradually during the extended succeeding time periods. These characteristics can be temporarily impeded by reduction in temperature to below 40 or 45°F. However, when the temperature increases the improvement in strength and permeability characteristics continues. The improvement in the quality of runoff water passing over stabilized scrubber sludge is also reported during the aging process. Inspection of these data indicate an improvement in the quality of runoff water after the 14 day curing period.

DEVELOPMENT OF THE SOLID WASTE AREA

C.033

It is proposed to dispose of the stabilized FGD scrubber sludge in a land disposal pile in combination with dry fly ash and dewatered bottom ash. When fly ash is used as a FGD sludge stabilizing ingredient, the following solid waste loading combinations are possible at the Pomfret and Sheridan sites.

<u>Pomfret Site</u>

<u>Plan I (Eastern Coal)</u>

Stabilized Waste (LEGS Units 1&2)

Bottom Ash (LEGS Units 1&2)

Bottom Ash (Dunkirk Station)

Fly Ash (Dunkirk Station)

<u>Plan II (Western Coal)</u>

Stabilized Waste (LEGS 1&2)

Fly Ash Excess (LEGS Units 1&2)

Fly Ash (Dunkirk Station)

Bottom Ash (LEGS Units 1&2)

Bottom Ash (Dunkirk Station)

Bottom Ash (Dunkirk Station)

Sheridan Site

Plan I (Eastern Coal)

Stabilized Waste (LEGS Units 1&2)

Bottom Ash (LEGS Units 1&2)

Plan II (Western Coal)

Stabilized Waste (LEGS Units 1&2)

Bottom Ash (LEGS Units 1&2)

Fly Ash Excess (LEGS Units 1&2)

C.034
With LEGS Units 1 & 2 operating at a 69 percent capacity factor and including the ash loading from the Dunkirk Station, the total combined waste volume would occupy approximately 286 acres for Plan II western coal, and approximately 512 acres for Plan I (eastern coal) at the Pomfret site. In the case of the Sheridan site, taking only the combined wastes from LEGS Units 1 & 2 operating at a 69 percent capacity factor, the disposal area would occupy approximately 246 acres for Plan II (western coal) and 455 acres for Plan I (eastern coal). These acreages are based on taking the wastes over the 30 year life of Units 1 & 2 at a combined unit weight of 80 lb/ft^3 and piled to a height of 60 feet above grade, and using a side slope of three horizontal to one vertical. A 10-foot terrace would be placed half way up the slope.

C.035
The combined waste pile would be developed at grade. An initial area of about nine acres for western coal usage and about 16 acres for eastern coal usage would be cleared for accepting wastes at the commencement of Unit 1 operation. This area would be prepared and lined. It is proposed to use stabilized waste solids as a lining material for succeeeding disposal area segments. A lined peripheral

trench would surround the sloped base of the disposal area in operation. This would allow runoff water to be collected and routed to a holding basin from which the water would be pumped to the limestone scrubber system. As the active area moves, the trench and lined runoff pond will be altered or relocated as required. The disposal pile would be developed first along the side facing the Thruway and then back toward the railroad tracks along the western perimeter of the ash pile area. The solid wastes would be placed in 460-foot-wide strips in these locations. The initial layer would consist of a 1 to 1-1/2 foot thick compacted stabilized scrubber sludge. In cases where excess fly ash is present, this material would be placed above the stabilized FGD solids layer and compacted. Fugitive dust control for this fly ash would be accomplished by placing compacted stabilized scrubber sludge over the fly ash layer at the end of the daily disposal activity. The waste pile would be developed to its 60-foot height above grade in such a layered fashion. Compacted stabilized scrubber sludge would be used as the final covering layer of the external sloped sides and top of the completed waste disposal pile. Topsoil and plantings would be placed above this layer.

C.036
After the first three segments have been developed, the fourth segment will be developed in a similar manner in a strip abutting the first and third segments and filled up in the direction of Berry Road. The fifth segment would be placed adjacent to the second segment and developed from the eastern perimeter in the direction of Berry Road. As the fourth and fifth segments are joined in a continuous strip they will cover a small portion of Berry Road. In a similar manner segments six and seven and all additional segments will be developed from segment three and the eastern perimeter in the direction of Berry Road, with succeeding segments of Berry Road being abandoned as the combined solid waste pile is developed. In these latter segments, the final covering of stabilized FGD solids and topsoil for plantings will be applied to the top of the strip and the sloped side that will form the final perimeter of the total disposal area. A similar program of combined waste pile development would be followed at the Sheridan site along Chapin Road.

C.037
At the Pomfret site where eastern coal is burned an additional combined waste disposal pile will be developed in the 226 acre area bounded by Van Buren Road on the west and the railroad tracks on the south. In this case a 460-foot-wide strip would first be developed northward along Van Buren Road. The second 460-foot strip would be developed from east to west along the railroad tracks. As significant portions (several hundred feet) of this waste pile area are built up to their 60-foot height, the top area and side areas forming the final perimeter would also be permanently covered with soil and revegetated.

C.038
A minimum of three groundwater monitoring wells will be placed around each waste landfill pile area to allow monitoring of groundwater quality. Groundwater samples shall be collected before, during, and after active operations of the landfill area.

C.039
When the combined waste disposal pile has been completely developed, the sides and top will be covered with a minimum depth of 24-inches of cover including six inches of topsoil to allow the planting of grass. This, along with the layer of stabilized scrubber sludge below it, should insure the prevention of rain water intrusion. The vegetated soil layer will permit an adequate quality of runoff water such that the runoff water trenches and collection basin can be abandoned. The phased-out disposal areas will be inspected at least on a semi-annual basis to check on the condition of the site. Any remedial maintenance work will be accomplished as needed.

APPENDIX TABLE C-1

FLUE GAS DESULFURIZATION SYSTEM
DESIGN AND PERFORMANCE
UNIT 1 (UNIT 2 IDENTICAL)

		Plan I (Eastern Coal-A)	Plan II (Western Coal-B)
1 - **Design Basis**			
No. of Modules		5	5
Inlet Flue Gas Flow Rate/Per Module	lbs/hr	9 050 000/1 810 000	9 832 000/1 966 400
	ACFM @270 F & 10 in. W C	2 712 000/ 542 400	3 001 000/ 600 200
Inlet SO_2 (maximum)	lbs/hr	41 400	15 800
	lbs/MBTU	5.14	1.87
	ppm by volume dry	2 228	825
Reagent (purity)		Limestone (95%)	Limestone (95%)
Reheat	F	40	0
SO_2 Removal Efficiency	percent	90	90
Stack Exit Velocity	Ft/sec	90	25
2 - **Performance**			
Outlet SO_2	lbs/hr	4 140	1 580
	lbs/MBTU	0.51	0.19
	ppm by volume dry	228	83
Liquid to Gas Ratio (L/G)	gpm/1000 ACFM	100	75
Retention Time in Recycle Tank	minutes	8	8
Limestone Consumption	tons/hr	33	13
Molar Stoichiometry	mole $CaCO_3$/mole SO_2 removed	1.1	1.1
Overall Pressure Drop	inches W C	9	9
Reheat Steam Consumption	lbs/hr	89 900	0
Fresh Make-up Water	gpm	879	805
Waste Sludge Production (unstabilized)	tons/hr dry solids	46	17.5
Operating Power Requirement	kW	14 040	11 600

Basis: *Gas Flow at 100 percent MCR; Coal Sulfur at maximum*

APPENDIX TABLE C-2

NIAGARA MOHAWK
LAKE ERIE UNITS 1 & 2
ASH & SLUDGE LOADING
LEGS UNITS 1 & 2 AVERAGE YEARLY ASH & SLUDGE LOADING @ 69% C F

	Dunkirk Ash	LEGS Units 1 & 2 Ash		LEGS Units 1 & 2 + Dunkirk Ash		LEGS Units 1 & 2 Limestone Scrubber Sludge	
		Western Coal	Eastern Coal	Western Coal	Eastern Coal	Western Coal	Eastern Coal
Bottom Ash lb/yr	70,000,000	184,000,000	276,000,000	254,000,000	346,000,000	-	-
Fly Ash lb/yr	280,000,000	736,000,000	1,088,000,000	1,016,000,000	1,368,000,000	-	-
Total Ash lb/yr	350,000,000	920,000,000	1,364,000,000	1,270,000,000	1,714,000,000	-	-
Dry Sludge Solids lb/yr	-	-	-	-	-	252,000,000	760,000,000

APPENDIX TABLE C-3

RESULTS OF RUNOFF TESTS
ON A STABILIZED UTILITY SLUDGE SAMPLE*

Constituent	CONCENTRATION (PPM, except pH) Immediate	After 14 Days
pH	9.8	7.6
'thn. Alkalinity	10.	0.
MO Alkalinity (Total)	150.	20.
Hardness	250.	20.
SO_3	30.	5.
SO_4	196.	16.
Cl	10.	6.
Total Dissolved Solids (Meter)	330.	60.
Al	3.	< .1
As	.035	< .002
Ca	100.	8.5
Cd	.005	< .01
Cr	< .05	< .05
Cu	< .02	.07
Fe	< .1	< .1
Hg	ND	ND
K	.20	.74
Mg	.08	.04
Mn	< .02	< .02
Na	1.00	.63
Pb	< .05	< .05
Sn	< 1.	< 1.
Ti	< 1.	< 1.
Zn	< .02	.05
Total Solids	400.	110.

*IU Conversion Systems Laboratory data obtained from IUCS standard runoff test procedure for a combined fly ash and sludge sample. Runoff volume is equivalent to a two inch rainfall in 60 minutes. Data show water quality improvement with age of sample.

ND - No Data

REFERENCES - FGD STUDY

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2. L. John Minnick, "Fixation and Disposal of Flue Gas Water Products: Technical and Economic Assessment" presented at EPA Flue Gas De-Sulfurization Symposium, New Orleans, Louisiana, May 14-17, 1973.

3. William B. Beer and William H. Lord, "Disposal of Wastes from Air Quality Control Systems, Phillips Power Station, Duquesne Light Company", prepared for presentation to the Power Generation Committe, Pennsylvania Electric Association, Pittsburgh, Pennsylvania, February 22, 1973.

4. J.G. Selmeczi and H.A. Elnaggar, "Properties and Stabilization of SO_2 Scrubbing Sludges", Presented at: Coal and the Environment Meeting, National Coal Association, Louisville, Kentucky, October 22-24, 1974.

5. William H. Lord, "FGD Sludge Fixation and Disposal" Dravo Corporation, Pittsburgh, Pennsylvania.

6. Rossoff, J. Rossi, R.C. Bornstein, L.J., and Jones J.W., Disposal of By-Products from Non-Regenerable Flue Gas Desulfurization Systems," presented at the EPA Control Systems Laboratory Symposium on Flue Gas Desulfurization, Atlanta, Georgia, November 4-7, 1974.

7. Robert C. Freas, "The Stabilization and Disposal of Scrubber Sludges - The Dravo Process", presented at the American Petroleum Institute Committee on Refinery Environmental Control, Salt Lake City, Utah, September 1975.

8. I.U. Conversion Systems, Inc., "Poz-O-tec Process for Economical and Environmentally Acceptable Stabilization of Scrubber Sludge and Ash".

9. Steven I. Taub, "Treatment of Concentrated Wastewater to Produce Landfill Material", Presented at International Pollution Engineering Exposition and Congress, Anaheim, California, November 10, 1976.

10. Hugh Mullen, Louis Ruggianc, and Steven I. Taub, "The Physical and Environmental Properties of Poz-O-tec," presented at the Engineering Foundation Conference on Disposal of Flue Gas Desulfurization Solids, Hueston Woods State Park, Ohio, October 19, 1976.

REFERENCES - FGD STUDY (Cont'd)

11. Hugh Mullen and Steven I. Taub, "Tracing Leachate From Landfills: A Conceptual Approach", presented at National Conference on Disposal of Residues on Land, St. Louis, Missouri, September 14, 1976.

APPENDIX D: DESCRIPTION OF DIFFUSION MODELS

INTRODUCTION

D.001
Three diffusion models were used to assess the impact of SO_2, NO_x and particulate emissions on the air quality in the vicinity of the proposed Pomfret plant site. Two are based on the Gaussian plume equation and the third is based on the numerical solution of the diffusion equation.

D.002
The ERT multi-source diffusion model, called ERT Air Quality (ERTAQ), is a regional model including both area and point sources. The emissions data input included sources in Niagara, Erie, Cattaraugus and Chautauqua Counties in New York State, Erie and Allegheny Counties in Pennsylvania and ten counties in northeastern and north central Ohio. This model is used to compute annual averages and short-term background pollutant concentrations for various weather conditions at receptor locations in the environs of the proposed Pomfret site location.

D.003
The Point Source Diffusion Model (PSDM) was used to analyze the effect of pollutant emissions from the proposed Pomfret plant site on a receptor grid with a detailed spatial resolution. This model was used primarily to calculate the impact of the plant on 1-hour, 3-hour and 24-hour average pollutant concentrations, to which the pertinent background values for the appropriate weather conditions were added.

D.004
The general form of the Gaussian plume equation is described below. The discussion includes a list of the important assumptions upon which the general equation is based and summarizes how the various emission and meteorological data are used to compute pollutant concentrations. The basic features of the two models (PSDM and ERTAQ) are summarized in Appendix Table D-1.

D.005
The FUMIG model, based on the numerical solution of the diffusion equation for a fluid, was used to calculate 1-hour and 3-hour pollutant concentrations due to emissions from the proposed Pomfret plant site during fumigation conditions. FUMIG has been validated using observed air quality and meteorological data.

DESCRIPTION OF GAUSSIAN PLUME MODELS

D.006
The fundamental equation used in both the ERTAQ and PSDM models is the Gaussian plume equation which estimates ground-level pollutant concentrations from an elevated point source (a typical stack) (Turner, D.B.,

1970). The general form of the equation for the coordinate system presented in Appendix Figure D-1 is:

$$\chi(0,0,z) = \frac{q(x,-y,H)}{2\pi\sigma_y\sigma_z u} \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right]$$

$$\left[\exp-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2+\exp-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right]\left\{e^{-t/\lambda}\right\}$$

The source base is set at z = 0 in the coordinate system, and the plume centerline reaches the equilibrium height H at some distance downwind from the source.

D.007
The meteorological data and emissions inventory information and other data which were gathered for this study have been used in the basic Gaussian Equation 1 in the following manner:

The variable q in Equation 1 represents source strength (mass/time). The factors which are used in computing the source strength of a single point source include the sulfur content of the fuel used and the total amount of fuel burned. These factors are, in turn, influenced by the loading characteristics over various averaging times, legal and practical restrictions on sulfur content, meteorological conditions, and population and economic growth assumptions.

The variable H in the basic equation represents the effective stack height (length) of the emissions -- the height at which the plume becomes essentially level. Effective stack height is the sum of actual stack height and plume rise. The distance a plume will rise vertically as it leaves the stack depends upon a combination of exit gas velocity, exit gas temperature, stack diameter, flue gas rate, and such meteorological factors as wind speed, air temperature, and atmospheric stability.

Variables σ_y and σ_z (the dispersion coefficients) are measures of cross-wind and vertical plume spread (length), respectively. Both parameters are functions of downwind distance and atmospheric stability.

The variable u is average wind speed (length/time). In both models, wind speed was made to vary with height, and the vertical variation in wind speed was treated using a power law formulation of vertical wind shear; that is, the wind speed used was that calculated at the physical height of each source.

The term χ is the pollutant concentration (mass/length^3) resulting from a continuous source where the effluent rate is constant and where the meteorological parameters determining plume geometry (wind speed, direction and stability) are constant.

The elements x, y, and z are the upwind, cross-wind, and vertical components of a Cartesian coordinate system, such that the receptor point is located at or vertically above the origin (expressed in units of length) and the source is at point (x, -y, H), Appendix Figure D-1.

The element λ is the pollutant decay rate in the atmosphere (time).

The element t is the travel time from the source to a receptor and is equal to x/u (time).

D.008
Appendix Table D-1 compares the basic features of the two models. In general, the basic assumptions (plume rise and dispersion) are the same, but PSDM contains features appropriate for a more detailed assessment of power plant impact. ERTAQ is calibrated against actual monitoring data, and in a sense serves to interpolate between monitor locations on the ground and to project in time from the available monitoring data records.

THE CALCULATION OF POLLUTANT CONCENTRATIONS EXPECTED DURING PLUME FUMIGATION.

D.009
In addition to the spectrum of five stability classes listed in Appendix Table D-1, pollutant values due to plume fumigation at the proposed Pomfret plant site were calculated. A computational model, which numerically solves the diffusion equation throughout a two-dimensional grid system, was used for this purpose.

D.010
The numerical model, FUMIG, estimated the impact of the power plant during the break-up of a nocturnal inversion, i.e. fumigation. This situation usually occurs during the morning after sunrise, when the ground is heated by solar radiation. Pollutants previously emitted into the stable layer from elevated sources are rapidly mixed when the thermal turbulence reaches the height of the stable layer, and ground-level concentrations usually increase rapidly for a short period of time (on the order of 15 minutes). As this mixing process proceeds, the inversion is usually completely destroyed so that typical daytime conditions prevail.

D.011
FUMIG can also be used to calculate ground-level pollutant concentrations during lake-induced fumigation conditions. During such conditions, as the onshore flow penetrates inland, the stable air adjacent to the land surface is modified by convective heating from the land surface. The dispersive character of the air near the ground is quickly transformed from stable to unstable. This alone does not affect air quality; however, when stack emissions from a near-shoreline power plant first diffuse in the stable air mass and then encounter the stable-unstable air interface (called a thermal internal boundary layer, TIBL), they "fumigate" to ground level in the unstable air. This fumigation is similar to inversion break-up fumigation. However, the height of the thermal internal boundary layer varies with inland distance and is a complex function of lake breeze strength and local terrain factors. In addition, lake breeze-induced fumigation can persist for a period of up to eight hours, although it is unlikely to do so continuously at the same location.

D.012
Only the "worst case" onshore flow situation was of concern in this study. Therefore, the approach taken was to make reasonable assumptions of the flow characteristics and to identify the maximum concentration to be expected.

D.013
The worst case occurs when the plume has sufficient buoyancy to enter the stable air and is transported under conditions of minimum dispersion for a short distance before encountering the TIBL. At the point of encounter, the plume is fumigated to ground level. If the TIBL height increases with distance from the shoreline at a very rapid rate, the plume may be trapped below the TIBL and disperse only in unstable air. If the TIBL height is too low at the site of the LEGS stack, the plume may be transported for a long distance inland before encountering the TIBL. In this case, concentrations will not exceed those produced by steady onshore winds (such as analyzed by PSDM).

D.014
The plume centerline was assumed to persist in the same direction throughout the duration of the lake breeze, although observations indicate that a plume turns continuously during the phenomenon due to the influence of the Coriolis force. A persistent wind direction gave peak concentrations which were averaged over one hour for the individual downwind receptor at distances to 15 miles.

APPENDIX TABLE D-1

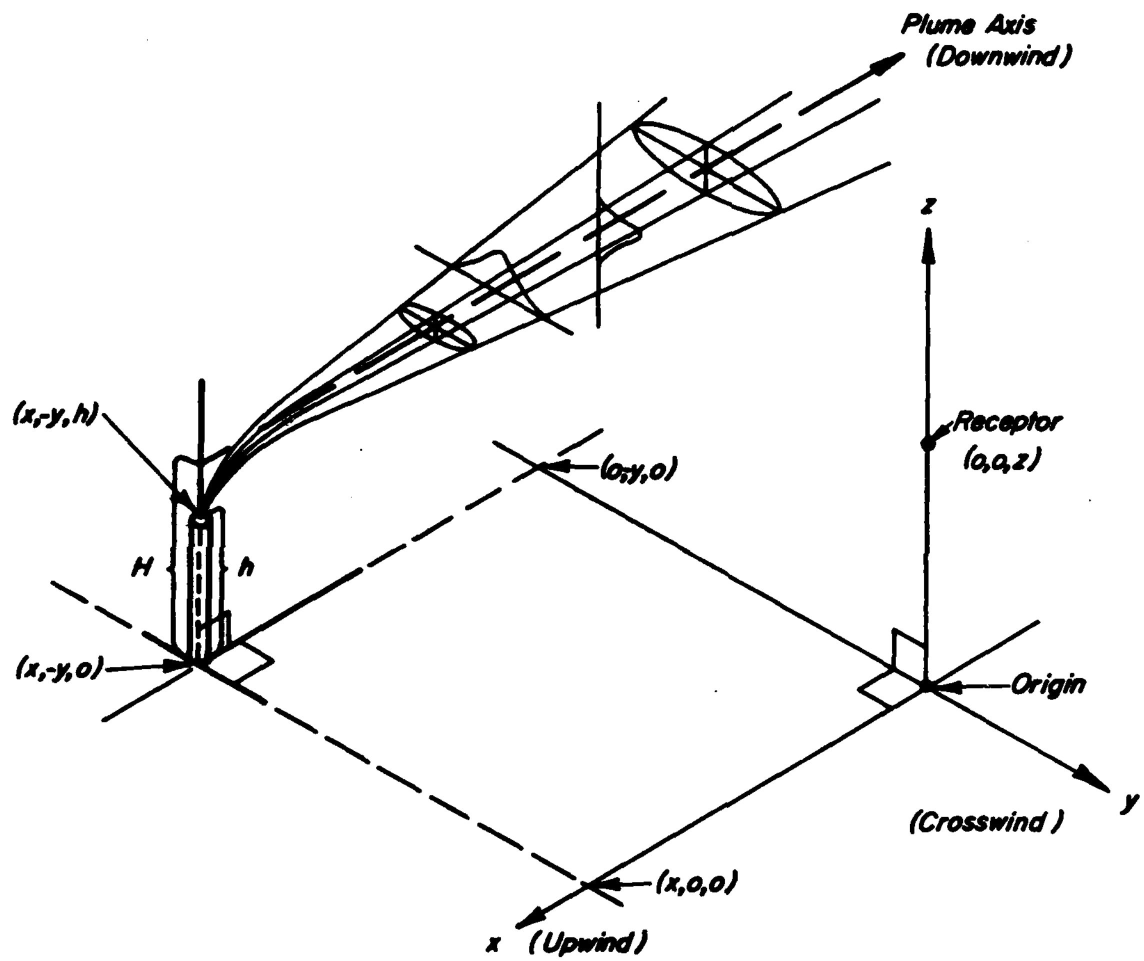
COMPARISON OF MODEL CHARACTERISTICS

	ERTAQ	PSDM
Calibration	Yes	No
Plume Rise	Briggs (1970) Final Rise Only	Briggs (1970) Transitional and Final Rise
SO_2 Decay Factor	24-Hour Half Life	None
TSP "Decay" Factor	12-Hour Half Life	None
Point Source Dispersion Coefficients	ASME (1968)	ASME (1968)
Area Source Dispersion Coefficients	Calder (1971)	Not Used
Terrain Correction	Not Used	Plume Lifted by 50% of Elevation Difference and the plume is always at least half the height above the ground as if there were no topography.
Crosswind Distribution	Annual: Triangular Distribution over a 45° Sector (linear interpolation between adjacent sectors); 1-hour and 3-hour: Uniform Distribution over a 22-1/2° Sector	1-Hour: Gaussian Approximation; 3-hour and 24-hour: Uniform Distribution over a Sector whose width is dependent on Stability Class: 45° - very unstable 33-3/4° - unstable 22-1/2° - neutral and stable

	ERTAQ	PSDM
Trapping Model (Mixing Heights)	Annual and Winter Seasonal Average for each Stability Category; Derived from Buffalo Radiosondes taken over the four years 1961 - 1964	Five Mixing Depth Categories - 6,000 m, 1,200 m, 900 m, 600 m, 300 m - whose frequency distribution was derived from Buffalo Radiosondes taken over the four years 1961 - 1964
Stability Classes	1) Very Unstable 2) Unstable 3) Slightly Unstable 4) Neutral 5) Stable	1) Very Unstable* 2) Unstable 3) Slightly Unstable 4) Neutral 5) Stable
Vertical Wind Speed Profiles: $U = U_o(Z/Z_o)^\delta$	CDM Manual (1974):	DeMarrais (1959):

Stability	δ (CDM Manual, 1974)	Stability	δ (DeMarrais, 1959)
1	0.10	1	0.09
2	0.15	2	0.11
3	0.20	3	0.14
4	0.25	4	0.14
5	0.30	5	0.20

*When no mixing depth information is available, PSDM simulates three limited mixing stability categories by placing the mixing height at the height of final plume rise.



APPENDIX FIGURE D-1
Coordinate system showing--Guassian Distributions in the Crosswind and Vertical Directions.

APPENDIX E

PRE-DRAFT AND POST-DRAFT EIS COORDINATION LETTERS

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 76-472-26 14 September 1977
Applicant: Niagara Mohawk Power Corp.

Marden E. Cobb, Chairman
Southern Tier Western Regional
Planning-Development Board
Chautauqua County Planning Board
Dunkirk-Fredonia Inter-Municipality
Planning Board
Town of Pomfret Planning Board
14 Reese Parkway
Fredonia, NY 14063

Dear Mr. Cobb:

We are currently preparing a draft environmental impact statement on a permit application by the Niagara Mohawk Power Corporation to construct an offshore coal unloading facility; a coal conveyor tunnel; a cooling water intake and discharge system in Lake Erie; and, to perform the dredging needed to facilitate the construction of the structures. The work is ancillary to the establishment of a 1700 megawatt, coal-fired steam electric generating station which is planned for either a 986-acre tract of land at Sheridan, New York or a 1,054-acre site at Pomfret, New York.

In order to fully assess the relationship between the proposed project and the plans of other agencies, we would appreciate knowing whether or not the subject project will conform or conflict with the objectives and specific terms of existing or proposed land use plans, policies, and controls, if any, that your agency may have reviewed or formulated for the project area. An evaluation of master plans, zoning regulations, plans developed in response to the Clean Air Act and the Federal Water Pollution Control Act Amendments of 1972, or other related land use proposals of your agency, would be helpful in this respect.

Copies of the public notices No. 76-472-25 (Pomfret Site) and No. 76-472-26 (Sheridan Site), issued by the Corps of Engineers, Buffalo District, on 6 April 1977, are enclosed for your information.

NCBCO-S
Re: 76-472-25 & 76-472-26

We would be most pleased if you would reply by 7 October 1977. If additional information is needed, please contact Mr. Arthur K. Marks of my staff. He can be reached by calling A/C, 716, 876-5454, extension 2329.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

Incls
as stated

c.c. See attachment, all letters mailed on 14 September 1977

Mailing list: Land Use Letter

Mr. Marden E. Cobb, Chairman — 679-4076 (home)
Southern Tier Western Regional Planning-Development Board
Chautauqua County Planning Board
Dunkirk-Fredonia Inter-Municipality Planning Board
Town of Pomfret Planning Board
14 Reese Parkway
Fredonia, NY 14063

Mr. John R. Luensman, Director — 753-4271 (work), 753-7451 (home)
Chautauqua County Planning & Development Agency
County Office Building
Mayville, NY 14757

Silver Creek Village Planning Board
Mayor's Office
Muncipality Building
Silver Creek, NY 14136

Mr. Harold E. Travis, Chairman
Town of Portland Planning Board
West Webster Road
Brocton, NY 14716

Mr. Albert Cransto, Chairman
Town of Sheridan Planning Board
RD#1
Dunkirk, NY 14048

Mr. Hank Williams
Division of State
162 Washington Avenue
Albany, NY 12231

Mr. Marty Cummings
NY Department of Public Services
Agency Building #3
Empire State Plaza
Albany, NY 12223

Commission James C. O'Shea
State of New York
Executive Department
Office of General Services
Tower Building
Empire State Plaza
Albany, NY 12242

VILLAGE OF SILVER CREEK

OFFICE: MUNICIPAL BUILDING • 172 CENTRAL AVENUE • SILVER CREEK, NEW YORK 14136 • 716-934-3240

October 7, 1977

Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Attention: Mr. Daniel D. Ludwig,
Colonel, Corps of Engineers
District Engineer

In Re: NCBCO-S RE: 76-472-25 & 76-472-26
Applicant: Niagara Mohawk Power Corp.

Dear Mr. Ludwig:

With reference to your letter of September 14, 1977, this is to advise that the subject project will not conflict with the objectives and specific terms of existing or proposed land use plans, policies and controls in our Village.

Very truly yours,

VILLAGE OF SILVER CREEK

Edward F. Prowse

EDWARD F. PROWSE, Chairman
Silver Creek Village Planning Board

EFP:gp

STATE OF NEW YORK
EXECUTIVE DEPARTMENT
OFFICE OF GENERAL SERVICES
TOWER BUILDING
EMPIRE STATE PLAZA
ALBANY, N. Y. 12242

HUGH L. CAREY
GOVERNOR

JAMES C. O'SHEA
COMMISSIONER

October 12, 1977

Colonel Daniel D. Ludwig
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in reply to your letter of September 14, 1977, relative to the proposed construction by the Niagara Mohawk Power Corporation of an offshore coal unloading project in Lake Erie at Sheridan or Pomfret, New York.

A grant of easement will be required for the underwater land occupied by the proposed work, which involves the coal unloading facility, a coal conveyor tunnel, a cooling water intake, and a discharge system. Permission will be furnished to the corporation for the necessary dredging work on State land on receipt of an official request.

Application forms for the required grant of easement and instructional pamphlet were recently made available to the Niagara Mohawk Power Corporation. This office has no objections to the proposed installation, providing an easement is obtained.

We appreciate being contacted with reference to the proposed project on State underwater land.

Sincerely,

James C. O'Shea

mld

NCBCO-S Re: 76-472-25 & 76-472-26 26 September 1977
Applicant: Niagara Mohawk Power Corp.

U. S. Housing and Urban Development
Environmental Clearing House
Buffalo Area Office
Grant Bldg.
560 Main Street
Buffalo, NY 14202

Gentlemen:

We are currently preparing a draft environmental impact statement on a permit application by the Niagara Mohawk Power Corporation to construct an offshore coal unloading facility; a coal conveyor tunnel; a cooling water intake and discharge system in Lake Erie; and, to perform the dredging needed to facilitate the construction of the structures. The work is ancillary to the establishment of a 1,700 megawatt, coal-fired steam electric generating station which is planned for either a 986-acre tract of land at Sheridan, New York, or a 1,054-acre site at Pomfret, New York.

In order to fully assess the relationship between the proposed project and the plans of other agencies, we would appreciate knowing whether or not the subject project will conform or conflict with the objectives and specific terms of existing or proposed land use plans, policies, and controls, if any, that your agency may have reviewed or formulated for the project area. An evaluation of master plans, zoning regulations, plans developed in response to the Clean Air Act and the Federal Water Pollution Control Act Amendments of 1972, or other related land use proposals of your agency, would be helpful in this respect.

Copies of the public notices No. 76-472-25 (Pomfret Site) and No. 76-472-26 (Sheridan Site), issued by the Corps of Engineers, Buffalo District, on 6 April 1977, are enclosed for your information.

We would be most pleased if you would reply by 14 October 1977. If additional information is needed, please contact Mr. Arthur K. Marks of my staff. He can be reached by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

Incls
as stated
CF: NCBCO-S

Marks
Leuchner
Gaume
Hair
DDE
DE

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
107 DELAWARE AVE., STATLER BLDG., SUITE 800
BUFFALO, NEW YORK 14202

REGION II
26 Federal Plaza
New York, New York 10007

October 21, 1977

IN REPLY REFER TO:
2.2CM/RM

Colonel Daniel D. Ludwig
Corps of Engineers
District Engineer
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This in reply to your letter of September 26, 1977, concerning the permit application by Niagara Mohawk Power Corporation for construction of an offshore coal unloading facility.

A review of the documentation submitted indicates no apparent conflict with HUD programs at this time.

In order to more definitively assess the impact of this project, we would be interested in reviewing a copy of the draft environmental impact statement when available.

Sincerely,

Martha Dmuchoski

Frank D. Cerabone
Area Director

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

7 April 1977

Mr. Dave Clark
National Park Service
North Atlantic Region
150 Causeway Street
Boston, MA 02114

Dear Mr. Clark:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station on Lake Erie, towns of Portland and Pomfret, Chautauqua County, New York, or alternatively, on Lake Erie in the town of Sheridan, Chautauqua County, New York.

As a part of the data input for the EIS, we have requested Niagara Mohawk to perform cultural resource inventories at both project sites. These studies were recently completed and a copy of their findings is enclosed for your review and evaluation. In addition, Niagara Mohawk has contracted to have an architectural and historical structures inventory performed. When this study is completed, a copy will be forwarded to your office for review and evaluation.

Please forward your comments to Mr. Arthur K. Marks, of my Regulatory Functions Branch, as soon as possible, so that they may be incorporated into the EIS. If you have any questions, please contact Mr. Marks by calling A/C 716 876 5454, extension 2329.

Sincerely yours,

Byron G. Walker
BYRON G. WALKER
Lt Col, Corps of Engineers
Acting District Engineer

Incl
as stated

United States Department of the Interior
NATIONAL PARK SERVICE
SOUTHEAST REGIONAL OFFICE
1895 Phoenix Boulevard
Atlanta, Georgia 30349

IN REPLY REFER TO:

JUN 3 1977

Mr. Arthur K. Marks
Regulatory Functions Branch
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Marks:

The report entitled A Cultural Resource Survey of the Pomfret and Sheridan Power Plant Sites by Kathleen Miller, has been transmitted to us for review and comment by the North Atlantic Region, National Park Service. We find the report acceptable with respect to the treatment of prehistoric resources, however, the treatment of historic resources seems to be inadequate. There is only passing mention of potentially significant historic resources, e.g. the Reed House as well as the "historic loci" mentioned on p. 53 and these will have to be fully considered under the Advisory Council's procedures for the Protection of Cultural Properties (36CFR800). We presume that the Corps will follow through the appropriate stages of the compliance process.

We appreciate this opportunity to comment and if you have any questions please do not hesitate to call our office at 404-996-2520 ext. 346, or on FTS 260-9346.

Sincerely yours,

Wilfred M. Husted

Wilfred M. Husted
Acting Chief, Interagency
Archeological Services-Atlanta

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

United States Department of the Interior

NATIONAL PARK SERVICE

NORTH ATLANTIC REGION
150 CAUSEWAY STREET
BOSTON, MA. 02114

IN REPLY REFER TO:

L-7619-NAR-(PE)
ER-77/519

June 28, 1977

Mr. Paul G. Leuchner
Regulatory Functions Branch
Buffalo District
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Leuchner:

Our Departmental Office of Environmental Project Review has asked us to respond directly to you upon our review of the draft environmental assessment (3 volumes) for Lake Erie Generating Station, Sheridan and Pomfret Sites, Chautauqua County, New York.

We understand that this 3-volume assessment has been submitted by the Niagara Mohawk Power Corporation in support of its application (76-474-25 & 76-472-26) for a Corps' permit. Further, we understand that an environmental impact statement will be prepared on this project. You should understand that the following comments are conveyed as technical assistance upon review of the assessment by the National Park Service only and they do not predispose a consolidated Departmental position upon future review of the environmental impact statement.

Our concerns lie largely with the protection of cultural resource values. The 3-volume assessment basically defers to Appendix 77-A of Article VIII which was not supplied with the assessment. However, the Service (in April) received a copy of your applicant's "Cultural Resource Survey of the Pomfret and Sheridan Power Plant Sites (final report)," which we understand to be an element of Appendix 77-A of Article VIII. In need for a second copy, we contacted your Arthur Marks who in addition supplied us with these other portions of Article VIII:

- Part 77, Interrogatories pertinent to the Daniel Reed Historic Site;

- the testimony of Dr. J. C. Webb, Archeologist for your applicant's impact evaluation consultant (Envirosphere Co.);

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

- Part 77, Appendix 77-A entitled "Systematic Sample Survey of Archeological and Historic Resources at the Pomfret and Sheridan Sites"; and

- selected portions P77.4(d) and S77.4(d).

These materials were forwarded to our Interagency Archeological Services (IAS) unit in Atlanta, Georgia for review and on June 3 a letter of comment (copy enclosed) was sent direct to Mr. Marks. We agree with our IAS unit's view that consideration for historic resources has been insufficiently covered. We note on page 2-30 of Volume II of the assessment that the National Register of Historic Places was consulted through contact with the State Historic Preservation Officer and that an historic district in Fredonia was being considered for inclusion in the Register. We suggest that a more thorough consideration be given to this aspect of cultural resources protection and that any sites in question be presented to the Chief, Office of Archeology and Historic Preservation, National Park Service, Washington, D. C. 20240 for a determination of eligibility for listing on the National Register. Also, the environmental impact statement should display and discuss the State Historic Preservation Officer's commentary regarding all factors of this project such as the major fuel supply conduit structures running from the sites out under Lake Erie to supply vessel tie-ups, any borrow or other off-site operations which could affect cultural resource values--not only the selected power plant site itself.

With regard to archeological aspects, we strongly support the recommendation of Dr. T. F. King in K. Miller's "Cultural Resources Survey of the Pomfret and Sheridan Power Plant Sites (final report)" and Dr. J. C. Webb in her testimony. Both called for intensive site investigations within the boundaries of the selected power plant site prior to commencement of physical works. In addition, we would recommend that any areas of surface to substratum construction activities outside the specific plant site also be given intensive archeological investigations. This would include areas of off-site borrow or storage, tunnel/vent portals and lake bottom disturbance. In addition to the assurance of cultural resources protection through adequate NEPA compliance, we will likely recommend that the Corps' permit(s) stipulate the archeological recommendations mentioned above as specific conditions.

While it appears that protection of cultural resource values is off to a good start with the involvement of qualified archeologists and contact established with the State Historic Preservation Officer, there remains more to be done (as indicated above) in order to present an adequate environmental impact statement. We look forward to reviewing that document and appreciate the opportunity to provide technical assistance.

Sincerely yours,

Denis P. Galvin
Acting Regional Director

Enclosure

jr/2314

NCBCO-S Re: 76-472-25 & 76-472-26

25 August 1977

John W. Keib, Esq.
System Attorney
Niagara Mohawk Power Corporation
300 Erie Boulevard West
Syracuse, NY 13202

Dear Mr. Keib:

Enclosed is a copy of a letter dated 28 June 1977 from the National Park Service, Boston, Massachusetts, which contains comments on the Lake Erie Generating Station Environmental Assessment. The concerns of this agency were included in our letter to you dated 2 August 1977 and were the subject of a telephone conversation on 11 July 1977 between Mr. Michael Murphy, Esq. of your office and Mr. Arthur Marks of my Regulatory Functions Branch.

You are requested to review this correspondence and to coordinate with the National Park Service. Please keep us informed of your progress and all agreements made between the Niagara Mohawk Power Corporation and the National Park Service.

Sincerely yours,

DANIEL D. LUDWIG
Colonel, Corps of Engineers
District Engineer

Incl NP
as stated

CF: NCBCO-S

1530 Hrs 25 Aug
Marks
25 Aug 77
Leuchner
Gauss
Hall B
Counsel
DDE
DE

certified No. 563488

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S

7 April 1977

Orin Lehman, Commissioner
NYS Office of Parks & Recreation
Agency Building #1
Empire State Plaza
Albany, NY 12238

Dear Mr. Lehman:

We are currently preparing an Environmental Impact Statement (EIS) on the proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station on Lake Erie, towns of Portland and Pomfret, Chautauqua County, New York, or alternatively, on Lake Erie in the town of Sheridan, Chautauqua County, New York.

As a part of the data input for the EIS, we have requested Niagara Mohawk to perform cultural resource inventories at both project sites. These studies were recently completed and a copy of their findings is enclosed for your review and evaluation. In addition, Niagara Mohawk has contracted to have an architectural and historical structures inventory performed. When this study is completed, a copy will be forwarded to your office for review and evaluation.

Please forward your comments to Mr. Arthur K. Marks, of my Regulatory Functions Branch, as soon as possible, so that they may be incorporated into the EIS. If you have any questions, please contact Mr. Marks by calling A/C 716 876 5454, extension 2329.

Sincerely yours,

Byron G. Walker

BYRON G. WALKER
Lt Col, Corps of Engineers
Acting District Engineer

Incl
as stated

United States Department of the Interior
GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-ER-77/519
Mail Stop 760

JUN 27 1977

Mr. Paul G. Leuchner
Department of the Army
Corps of Engineers
Regulatory Functions Branch
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Leuchner:

We submit the following suggestions as technical assistance toward development of an environmental statement for the Lake Erie Generating Station in Chautauqua County, New York.

The only major omission related to geology in the environmental assessment is a detailed analysis of the impacts of construction of transmission lines in corridors approximately 160 miles long.

It would also be advisable to be more specific about required rerouting of streams in the case of the Sheridan Site. Reference has been made on page 4-188 (last par.) to the need to alter a small stream during construction, whereas later it seems evident that several streams may need to be rerouted (for example, p. 5-24, last par.).

It was stated on page 1-17 (lines 7-8) that the Pomfret Site "also includes a small amount of wetlands (33 acres, 3 percent)", whereas it is stated later that "Wetlands have not been identified on the plant site and therefore are not addressed in this report" (p. 4-28, lines 1-2).

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

We suggest that at least minimal monitoring of ground water downgradient from the waste storage ponds should be considered to verify the efficiency and integrity of the liners. Effects on ground-water resources from the anticipated construction dewatering should be evaluated, and impacts on ground-water resources of the destruction of ponds (p. 5-25) and changes in local recharge should be addressed.

Thank you for the opportunity to provide technical assistance.

Sincerely yours,

Henry W. Coulter

Acting Director

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

29 JUN 1977

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

We have reviewed the draft environmental assessment statement (EAS) prepared by Niagara Mohawk Power Corporation as input to your office for preparation of an environmental impact statement (EIS) in connection with the proposed construction of a 1700 MW coal-fired steam electric generating station on Lake Erie. Two sites are considered, one in the Towns of Pomfret and Portland, and one in the Town of Sheridan, Chautauqua County, New York.

In general, we have no objections to the proposal. Water quality impacts on Lake Erie are expected to be minimal; on-site ponds and streams are small, even ephemeral. Water intake location and design, however, require further evaluation. Air quality impacts at either site are consistent with ambient air quality standards for SO_2 and total suspended particulates (TSP), as well as with EPA's Prevention of Significant Deterioration (PSD) requirements. However, additional information is necessary in order to evaluate the adequacy of the PSD analysis and to permit an emissions offset analysis for hydrocarbons. Detailed comments follow.

AIR QUALITY IMPACT

The proposed electric generating station consists of two 850 MW boilers to burn low sulfur (0.5%) sub-bituminous Western coal. An auxiliary boiler will burn distillate fuel oil for an average of 40 hours per month in order to start up either boiler after shutdown for maintenance. The applicant proposes to meet federal new source emission standards by burning low sulfur coal, instead of adding on flue gas scrubbers.

Adequacy of Air Quality Analysis

The air quality impact projections in the draft EAS employ state of the art dispersion modeling techniques. Appropriate special-case meteorological conditions (fumigation, terrain, land-sea interaction and persistent winds conditions) are incorporated into the modeling. The use of these models and the validity of the projections are acceptable to this office.

Prevention of Significant Deterioration

A PSD analysis for the proposed plant was prepared by Environmental Research and Technology (ERT). The results, summarized in Table 1, indicate that the plant's emissions should not, by themselves, cause violations of the allowable PSD increments for Class II areas.

TABLE 1

SO_2 (ug/m^3)

Averaging Time	Peak Plant Contribution	Allowable Increment
3 hr.	520	700
24 hr.	65	100
Annual	3.7	15

TSP (ug/m^3)

Averaging Time	Peak Plant Contribution	Allowable Increment
24 hr.	5.6	30
Annual	0.3	10

It is not clear whether the predicted PSD concentrations relate to the vicinity of the Pomfret or the Sheridan site. A PSD analysis should be prepared for both sites with appropriate tables. Clarification is also needed as to whether the PSD analysis includes the contribution of other new sources that have begun operation since January 1, 1975 or that are expected to be operational by the time the proposed plant is operational, and might impact on the area in question. If this aspect of the PSD program was not considered, it should be included in the draft EIS. In addition, no PSD analysis was included for the Sheridan site, although Table 1-41 of the draft EAS was to contain such an analysis.

Emission Offset Policy

The EPA's interpretative rulemaking contained in the December 21, 1976 Federal Register applies to any area which is non-attainment for primary ambient air quality standards. For non-methane hydrocarbons the non-attainment geographical area depends on the population of the urban area.

In the case of the proposed sites, the non-attainment area extends 50 miles in all directions from Buffalo; this includes the Pomfret and Sheridan sites. Therefore, these sites are regulated by EPA's emission offset policy for hydrocarbons. An emission offset analysis for hydrocarbons should be included in the final EAS.

Impact Upon Ambient Air Quality Standards

The ERT's analysis shows that the proposed plant would not cause violations of the primary or secondary ambient air quality standard for SO_2 or TSP. Table 2 shows the predicted peak ambient air quality concentrations, including the power plant contribution.

TABLE 2

SO_2 (ug/m^3)

Averaging Time	Plant + Ambient	Standard
3 hr.	1123	1300
24 hr.	164	365
Annual	34	80

TSP (ug/m^3)

Averaging Time	Plant + Ambient	Standard
24 hr.	211	260
Annual	44	75

NO_x (ug/m^3)

Averaging Time	Plant + Ambient	Standard
Annual	8	100

In addition to these analyses, the applicant should estimate the SO_2 and particulate matter air quality impact of the proposed plant upon the nearest non-attainment area, undoubtedly the Niagara-Buffalo area.

WATER QUALITY IMPACT

The water intake and discharge related impacts of the proposed plant will be minimized because of the low intake velocity (0.25 fps) and makeup water velocity (45 cfs maximum) associated with the closed-cycle condenser cooling system, natural draft evaporative cooling

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

tower. The proposed discharge of a relatively low velocity (14.5 cfs) blowdown through a multiport diffuser will limit the thermal plume to a very small area. A coal unloading facility with breasting and mooring dolphins for lakeships will be constructed 5000 ft. offshore with coal delivery and makeup water flow through a sublakebed tunnel. Dredging for the dolphins will cover an area of 20,000 ft^2 with a spoils volume of 500 yd^3, not a highly significant operation. Measures proposed to control coal dust during offloading appear adequate. Runoff from coal piles will be settled before discharge to an onsite stream, and the pile bottom will be compacted to prevent ground water contamination. We agree that pneumatic (dry) sluicing is preferable to hydraulic (wet) sluicing of flyash from the precipitators because the dry method would eliminate discharges from settling ponds.

On either site a number of ponds will be filled and streams re-routed. At Pomfret, for example, 5 permanent ponds (1.1 acres) will be filled, and 5 streams will be rerouted through culverts. We recommend that, to the extent possible, alterations of ponds and streams be kept to a minimum.

Section 5 of the draft EAS mentions depletion of coal reserves. Since Western coal will be used at the proposed plant, strip mining is of more concern than coal reserves with respect to resources consumption. This might be considered in preparing the draft EIS.

Section 316(a) of the Federal Water Pollution Control Act, Amended (FWPCAA) is not applicable to the proposed plant since its closed-cycle design would be in compliance with the effluent guideline limitations regarding thermal discharges for the steam electric generating industry. It should be understood, however, that the proposed intake system is, nevertheless, subject to Section 316(b) of FWPCAA, i.e., "...the location, design, construction and capacity of cooling water intake structures reflect the best technoligy available for minimizing adverse environmental impact." While closed-cycle cooling is the most effective method of minimizing capacity related impacts, it does not affect location, design, or construction impacts. Since both proposed plant sites are used relatively heavily as fish spawning and nursery areas, the draft EIS should discuss compliance of the proposed intake system with Section 316(b), particularly regarding location and design alternatives.

Specifically, the draft EIS should evaluate and compare both the absolute and relative entrainment and impingement potentials between sites (Pomfret versus Sheridan), as well as within each site (various intake positions at each site). The assessment should locate the intake in the least biologically productive area. In addition, the draft EIS should evaluate the potential for a fish-return system to be installed in the event impingement levels necessitate backfit of such a system. The rationale presented in Section 1.111 of the draft EAS that lake icing conditions in winter is not conducive for a fish return system, is, in our opinion, mistaken. The seasons expected to produce high impingement mortality in the Great Lakes system, i.e. spring and fall, would not coincide with a winter freeze.

SOLID WASTE IMPACT

Although disposal methods for most of the proposed plant's solid wastes appear acceptable, disposal sites for flyash, bottomash and rejected pulverized coal are not specified. We recognize that note 20 to Chapter 1 of the Contents Guide mentions this fact. It is requested that the draft EIS specify the disposal sites and the impacts of disposal at the sites.

Sincerely yours,

Charles W. Zafonte
EIS Review Coordinator
Environmental Impacts Branch

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 76-472-26
Applicant: Niagara Mohawk Power Corp.

26 October 1978

Dr. Barbara Metzger
Chief, Environmental Impact Branch
ATTN: Charles W. ZaFonte
U.S. EPA, Region II
26 Federal Plaza
New York, NY 10007

Dear Dr. Metzger:

This letter concerns our Draft Environmental Impact Statement entitled, "Permit Application by Niagara Mohawk Power Corporation, Proposed Lake Erie Generating Station, Pomfret and Sheridan, NY," which was filed with U.S. EPA, Washington, DC on 17 March 1978.

The applicant, in providing technical input relative to comments I received on the Draft EIS, advised me of an agreement made with your office. Essentially, the applicant agreed to supply you with a discussion of the proposed facility's contribution to local and regional acid precipitation and a summarization of the studies being conducted to assess the effects of sulfur dioxide and ozone on grapes. Inclosure One contains the information that is the subject of the agreement.

Inclosure One includes the applicant's summary of results obtained from a 1976 experiment. As indicated in our Draft EIS, my staff concurs with the New York State Department of Environmental Conservation, the New York State Department of Public Service, and the New York State Grape Production Research Fund, Inc. that errors in experimental procedure and design of the 1976 study negate the applicant's conclusion regarding grape damage. The applicant's 1976 study stressed acute injury occurring from short-term exposure to high concentrations of pollutants rather than assessing the possibility of chronic damage from season long exposure to low concentrations of pollutants. Inclosures Two and Three provide more detailed information on the subject.

NCBCO-S
Dr. Barbara Metzger

My staff intends to provide an expanded discussion on the grape issue in the Final EIS. This discussion will summarize the applicant's 1976 study and will indicate the primary inadequacies of the study. The text will also advise of ongoing and future studies to be performed by the applicant. These long-term studies, if they are properly designed and performed using standard viticultural research techniques, would provide meaningful results on grape damage potential by late 1981. The results should be available on a timely basis such that design or operational modifications to the plant could be accomplished, if necessary, prior to commercial operation of proposed Unit 1, presently targeted for commercial operation in the winter 1987-1989 time frame.

If you should have any questions concerning the above, please contact Mr. Arthur K. Marks of my staff by calling FTS 473-2329.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incls
as stated

NCBCO-S Re: 76-472-25 & 76-472-26 (Niagara Mohawk Power Corp.) 76-484-29 (New York State Electric & Gas Corp.)

17 October 1978

Dr. Barbara Metzger
Chief, Environmental Impact Branch
ATTN: Charles W. ZaFonte
U.S. EPA Region II
26 Federal Plaza
New York, NY 10007

Dear Dr. Metzger:

This letter concerns the U.S. Environmental Protection Agency comments on our Draft Environmental Impact Statements (EIS) for the Niagara Mohawk Power Corporation's proposed Lake Erie Generating Station and the New York State Electric and Gas Corporation's proposed Cayuga station at Somerset. Specifically, you requested an assessment of the impact of power plant emissions on soils, visibility, growth, and vegetation in accordance with revised Prevention of Significant Deterioration (PSD) regulations for both of these proposed generating stations.

Mr. Arthur K. Marks of my staff discussed this issue with you by telephone on 4 October 1978 and again on 13 October 1978. During these telephone conversations an agreement was reached regarding the manner in which the Corps will respond to the subject comment in the Final Environmental Impact Statements for the proposed Lake Erie Generating Station and the proposed Cayuga Station. Essentially, it was agreed that the Corps will respond by stating that the subject assessment is to be provided by the applicant to the U.S. EPA prior to any approval of a Prevention of Significant Deterioration (PSD) permit application and that future interaction will occur between the applicant and the U.S. EPA regarding revised PSD requirements and other requirements or regulations promulgated in accordance with the Clean Air Act Amendments of 1977. The Corps response will also state that any approval of Department of the Army permits does not negate the need for the applicant to obtain other necessary Federal, State, or local approvals for the proposed project.

NCBCO-S
Dr. Barbara Metzger

If you should have any questions concerning this matter, please contact Mr. Marks by calling FTS 473-2329. I am looking forward to your continued coordination.

Sincerely yours,

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

CF: NCBCO-S

Marks ___ 17 Oct. 78
Leuchner ___ 17 Oct 78
Gaume ___
Hair ___
Counsel ___
DDE ___
DE ___

Advisory Council On Historic Preservation

1522 K Street N.W.
Washington D.C.
20005

October 23, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer, Buffalo District
Corps of Engineers
U.S. Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in response to your letter of October 4, 1978, concerning two Department of the Army applications from the Niagara Mohawk Power Corporation associated with the construction of a 1700 megawatt coal-fired power plant to be located at either Pomfret or Sheridan, New York.

We have reviewed your suggested procedure for complying with section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800). We are satisfied that the proposed compliance timetable and your commitment to ensure complete compliance with all applicable historic preservation requirements will adequately provide for the protection and preservation of cultural resources in the project area.

We look forward to working with the Corps in the resolution of all outstanding compliance issues following publication and circulation of the Final Environmental Statement for this project.

Please feel free to contact me if the Council may be of any further assistance to you.

Sincerely,

for Jordan E. Tannenbaum

Myra F. Harrison
Assistant Director
Office of Review and Compliance

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 26 4 October 1978
Applicant: Niagara Mohawk Power Corp.
Proposed Lake Erie Generating Station

Orin Lehman, Commissioner
NYS Office of Parks and Recreation
ATTN: State Historic Preservation Officer
Agency Building No. 1
Empire State Plaza
Albany, NY 12238

Dear Mr. Lehman:

I am currently processing two Department of the Army permit applications from the Niagara Mohawk Power Corporation associated with the construction of a 1,700-megawatt coal-fired power plant to be located at either Pomfret, New York or Sheridan, New York. On 17 March 1978 I issued a draft Environmental Impact Statement (EIS) addressing both sites of the proposed Lake Erie Generating Station.

The advisory Council on Historic Preservation commented on our draft EIS by letter dated 25 May 1978. The Council advised that certain properties near the Sheridan site, Daniel Reed House, and Sheridan School No. 3, could be eligible for inclusion in the National Register of Historic Places. The U.S. Department of the Interior, by letter dated 28 April 1978, also indicated the possible eligibility of the Reed House and Sheridan School House but included the Frost Farm and Dubert House (both at Pomfret, NY) as possible candidates for inclusion in the National Register. In addition to the properties mentioned above, the applicant advised that the Preston Dedrick House in Pomfret may be eligible for inclusion.

In accordance with Section 800.4(a) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), I prepared the necessary documentation for these five properties and submitted a request for determinations of eligibility to the Keeper of the National Register by letter dated 23 June 1978. The documentation including photographs was also sent to your office on 23 June 1978. The Keeper of the National Register, by letter dated 20 September 1978, advised me that all five properties have been determined eligible for inclusion in the National Register. Inclosure One is a copy of the determination of eligibility.

NCBCO-S
Orin Lehman, Commissioner

In accordance with the requirements of Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation Procedures contained in 36 CFR Part 800, I must proceed with the remaining steps of Section 800 (36 CFR 800) prior to a decision on permit issuance. I am, therefore, requesting your opinion in accordance with 36 CFR Part 800, Sections 800.4, 800.8, and 800.9 regarding the effect of the proposed Lake Erie Generating Station on these five properties listed as eligible for inclusion in the National Register. Should your opinion advise of adverse effects as indicated in 36 CFR Part 800.9, I would appreciate your recommendations regarding alternatives that would avoid and/or mitigate any adverse effect. To facilitate your review I have enclosed appropriate sections of the our Draft EIS along with some updated information (Inclosure Two). A copy of the entire Draft EIS is also enclosed.

I consider this energy related project important and would like to avoid delays which would prevent a timely decision on this permit application. Therefore, I would appreciate a written response from you on or about 27 October 1978.

If you should have any questions, please contact Mr. Arthur K. Marks of my staff by calling A/C 716, 876-5454, extension 2329. I appreciate your cooperation and coordination in this matter.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incls
as stated

INCLOSURE TWO

Update of Cultural Resource Information contained in the Draft EIS entitled, "Permit Application by Niagara Mohawk Power Corporation, Proposed Lake Erie Generating Station, Pomfret, and Sheridan, New York"

1. Documentation concerning the Calvin J. Dubert House, George Frost Farm, Preston Dedrick House, Knox-Reed House, and Former Sheridan School District No. 3 Schoolhouse was submitted to the Keeper of the National Register along with a request for Determination of Eligibility for Inclusion in the National Register on 23 June 1978.

2. By letter designated H32-NR, dated 20 September 1978, the Keeper of the National Register advised that all five properties are eligible for inclusion in the National Register.

3. The following information supplements sections of the Draft EIS:

a. Paragraph 2.027:

(1) The murals on the kitchen wall of the Frost House have been paneled over by the present occupant of the house. The panels appeared to be nailed to the wall. The extent of damage to the murals is unknown.

(2) The Preston Dedrick House should be added to this paragraph. The Dedrick House is a two-story Greek Revival structure, likely constructed between 1830 and 1860, with later additions. The interior retains original paneling and architectural details of the style and period. A Victorian hip-roofed barn, and garage, and shed complete the structure complex. The barn is no longer present and only the foundation remains. It was given to the Amish by Mr. Dedrick and the new location of the barn is not known. The Dedrick House may be considered to embody the special characteristics of style and later elaboration which is typical of the upper New York State region and may be considered for eligibility to the National Register of Historic Places under criteria (3) in that it does "embody the distinctive characteristic of type." The Dedrick House and the Frost House were constructions by brothers, John P. and Ralph H. Hall, respectively. The Dedrick House remains in the Hall family, being owned by Preston Dedrick, son of Verona Dedrick, grandaughter of J.P. Hall.

b. Paragraph 4.046:

(1) The Preston Dedrick House should be added to those recommended for inclusion in the National Register.

c. Paragraph 4.047:

(1) The Dedrick House will be within the plant site boundaries and will be destroyed under all current options as to sources of coal and modes of ash disposal if the State certifies the Pomfret site.

d. Paragraph 4.192:

(1) The Calvin J. Dubert House will experience visual but no noise impact from station operation.

e. Paragraph 4.348:

(1) The Reed House will experience visual impact during station operation if the State of New York certifies the Sheridan site. The impact will be the visual intrusion of the ash disposal area on the house's visual backdrop. During operation some intermittent adverse noise impact will occur, during daylight hours on weekdays. The Former Sheridan School District No. 3 Schoolhouse will be affected in the same manner as that described for the Reed House.

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DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 26 4 October 1978
Applicant: Niagara Mohawk Power Corporation
SUBJECT: Lake Erie Generating Station Final EIS

Mr. Jordan Tannenbaum
Advisory Council on
Historic Preservation
1522 K. Street N.W.
Washington, DC 20005

Dear Mr. Tannenbaum:

I am currently processing two Department of the Army permit applications from the Niagara Mohawk Power Corporation associated with the construction of a 1,700-megawatt coal-fired power plant to be located at either Pomfret, New York, or Sheridan, New York. On 17 March 1978 I issued a draft Environmental Impact Statement (EIS) addressing both sites of the proposed Lake Erie Generating Station.

The advisory Council on Historic Preservation commented on our draft EIS by letter dated 25 May 1978. The council advised that certain properties near the Sheridan site, Daniel Reed House and Sheridan School No. 3, could be eligible for inclusion in the National Register of Historic Places. The U.S. Department of the Interior, by letter dated 28 April 1978, also indicated the possible eligibility of the Reed House and Sheridan School House but included the Frost Farm and Dubert House (both at Pomfret, NY) as possible candidates for inclusion in the National Register. In addition to the properties mentioned above, the applicant advised that the Preston Dedrick House in Pomfret may be eligible for inclusion.

In accordance with Section 800.4(a) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), I prepared the necessary documentation for these five properties and submitted a request for determinations of eligibility to the Keeper of the National Register by letter dated 23 June 1978. The Keeper of the National Register, by letter dated 20 September 1978, advised me that all five properties have been determined eligible for inclusion in the National Register. A copy of the determination of eligibility is enclosed. The Keeper of the National Register also stated that his determination had been complicated by a negative determination by the

NCBCO-S Re: 76-472-25 & 26
Mr. Jordan Tannenbaum

State Historic Preservation Officer. This complication delayed the determinations of eligibility and consequently resulted in slippage of the Final EIS schedule.

To avoid further delays in this energy related project, I am proposing the following procedure which will allow for a timely decision on the permit actions and compliance with Advisory Council procedures contained in 36 CFR part 800 and with Section 106 of the National Historic Preservation Act of 1966. Mr. Arthur K. Marks of my staff discussed this matter with you on 20 September 1978 by telephone. My proposal is to issue the Final EIS with a statement indicating that prior to any approval of Department of the Army permits, I will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council's Procedures (36 CFR 800) are completed. This statement will be contained in the Cultural Resource Section of the Final EIS, Chapter 4, and in response to the Advisory Council's 25 May 1978 letter of comment (FEIS, Appendix F).

I believe that sufficient time exists for compliance with the above stated requirements prior to a decision on permit issuance since this decision is scheduled for early 1979.

I would appreciate a written response from you, at the earliest possible date, regarding your views on this matter.

If you should have any questions, please contact Mr. Marks by calling FTS 473-2329.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Incl
as stated

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 76-472-26 29 September 1978
Applicant: Niagara Mohawk Power Corporation

SUBJECT: Final EIS - Lake Erie Generating Station, Pomfret and Sheridan, NY

Dr. William J. Murtagh
Keeper of the National Register
ATTN: Ms. Sarah Bridges
Office of Archaeological and
Historic Preservation
Heritage Conservation and
Recreation Service
U.S. Department of the Interior
Washington, DC 20240

Dear Dr. Murtagh:

On 23 June 1978, I submitted the necessary documentation along with a request for determinations of eligibility for inclusion in the National Register in regard to two properties at Sheridan, NY, and three properties at Pomfret, NY. The Sheridan properties (Knox-Reed Farm and Sheridan School No. 3) and the Pomfret properties (Calvin Dubert House, George Frost Farm, Preston Dedrick House) are located at the proposed sites of the Lake Erie Generating Station and were discussed in our draft Environmental Impact Statement (EIS) which was issued on 17 March 1978.

By letter designated H32-NR, dated 20 September 1978, you advised me that all five properties are eligible for inclusion in the National Register and that your determination review had been complicated by the State Historic Preservation Officer's negative determinations. Unfortunately, this complication delayed the eligibility determinations and consequently resulted in slippage of our final EIS schedule. I had originally scheduled the final EIS for early September 1978.

To avoid further delays in this energy related project, I am proposing the following procedure which will allow for a timely decision on the permit actions and compliance with Advisory Council Procedures contained in 36 CFR part 800 and with Section 106 of the National Historic Preservation Act of 1966. Mr. Arthur K. Marks of my staff discussed this matter with you on 20 Septmber 1978 by telephone. My proposal is to issue the final EIS with a statement indicating that prior to any

NCBCO-S
Applicant: Niagara Mohawk Power Corporation

approval of Department of the Army permits, I will insure that the requirements of Section 106 of the National Historic Preservation Act of 106 are met and the remaining steps of Section 800 of the Advisory Council's Procedures (36 CFR 800) are completed. This statement will be contained in the Cultural Resource Section of the final EIS, Chapter 4, and in response to the Advisory Council's and U.S. Department of the Interior's letters of comment on the draft EIS.

I believe that sufficient time exists for compliance with the above stated requirements prior to a decision on permit issuance since this decision is scheduled for early 1979. I would appreciate a written response from you, at the earliest possible date, regarding your views on this matter. I have already transmitted a letter to the Advisory Council on Historic Preservation explaining my proposal and requesting their views.

If you should have any questions, please contact Mr. Marks by calling FTS 473-2329.

Sincerely yours,

Lt. Colonel, Corps of Engineers
Deputy District Engineer
for and in the absence of

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

United States Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
H32-NR

SEP 20 1978

Mr. Daniel D. Ludwig, P.E.
Colonel, Corps of Engineers
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

On June 27, 1978, your office requested that the National Register evaluate five properties at proposed project sites for the Lake Erie Generating Station, Chautauqua County. As documented in the attached notification sheets, we have determined that these properties do meet the National Register criteria. Because the State Historic Preservation Officer's opinion does not concur with these determinations we would like to elaborate on our enclosed comments.

Review of these properties has been complicated because the significance of these structures resides in their illustration of the settlement and development of the Southern Tier region and in their representation of the vernacular Greek Revival style. These structures are characteristic of the evidences of early nineteenth century settlement of many areas of the Northeast. As you may know, consultation with the State Historic Preservation Officer is part of the determination process under our regulations. In cases where properties may be eligible for their local significance, the National Register relies on guidance from the State historic preservation office. The New York State historic preservation office provided its opinion to the National Register on July 27, 1978. In this case that opinion did not provide sufficient guidance to aid the National Register in placing the buildings in a regional historical and architectural context. As a result, we sought additional assistance from a second consultant familiar with the Southern Tier region and the National Register criteria. On the basis of that consultation, your consultant's evaluation, and a National Register staff conference, we determined the properties to be eligible.

We hope that this information and the enclosed notification sheets are useful to you in the development of a plan for the management of these cultural resources. If you have any questions about this determination of eligibility, please consult Mr. Bill Brabham (202-523-0412) at the National Register.

Sincerely,

Robert B. Rettig

for William J. Murtagh
Keeper of the National Register

Enclosure

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: Daniel Ludwig DOD-COE

Date request received: 6/27/78; additional information received 7/27/78

Name of property: Calvin J. Dubert House State: New York

Location: 5553 Martin Road, Portland

Opinion of the State Historic Preservation Officer:

( ) Eligible (X) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(X) Eligible Applicable criteria: A,C

Comments: The Dubert House is significant for its association with the development of the Chautauqua County region. The house is also representative, despite alterations, of Greek Revival vernacular design. The acreage for which the determination was requested, 63.5 acres, appears to be unnecessarily extensive. We recommend a smaller parcel which would encompass the house and its immediate environment.

( ) Not eligible

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Robert B. Rettig

Acting Keeper of the National Register

Date: 9/20/78

WASO-185
9/75

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: Daniel Ludwig DOD-COE

Date request received: 6/27/78; additional information 7/27/78

Name of property: Knox-Reed Farm State: New York

Location: vicinity of intersection of Center and Chapin Road, Sheridan

Opinion of the State Historic Preservation Officer:

( ) Eligible (X) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(x) Eligible Applicable criteria: B

Comments: The property is locally significant, despite alterations, for its associations with both Melvin Knox, a nineteenth century inventor, and his cousin Daniel Reed, prominent local politician and leader who served in the U.S. House of Representatives for fifty years.

( ) Not eligible

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Robert B. Rettig

Acting Keeper of the National Register

Date: 9/20/78

E-37

WASO-105 9/78

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: Daniel Ludwig DOD-COE

Date request received: 6/27/78; additional information received 7/27/78

Name of property: George Frost Farm State: New York

Location: Van Buren Road, Pomfret

Opinion of the State Historic Preservation Officer:

( ) Eligible (X) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(X) Eligible Applicable criteria: A,C

Comments: The Frost Farm is representative of the agrarian development of Chautauqua County during the nineteenth century. The farm complex is also significant for the vernacular Greek Revival style of the residence and the Victorian barn and other outbuildings which contribute to the complex. The acreage for which the determination was requested, 151.2 acres, appears to be unnecessarily extensive. We recommend a XXXXXXXXXXXXXX smaller parcel, perhaps 12 acres, which would encompass the complex and its immediate setting.

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Robert B. Rettig

Acting Keeper of the National Register

Date: 9/20/78

E-38

WASO-185
9/75

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: Daniel Ludwig DOD-COE

Date request received: 6/27/78; additional information received 7/27/78

Name of property: Preston Dedrick House State: New York

Location: 5057 Van Buren Road, Pomfret

Opinion of the State Historic Preservation Officer:

( ) Eligible (X) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(X) Eligible Applicable criteria: A,C

Comments: The Dedrick House is a good example of a vernacular Greek Revival farmhouse with later additions, and is significant for its association with the development of Chautauqua County during the nineteenth century.

( ) Not eligible

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Robert B. Rettig
Acting Keeper of the National Register

E-39 Date: 9/20/78

WASO-165
9/78

E.O.11593

DETERMINATION OF ELIGIBILITY NOTIFICATION

NATIONAL REGISTER OF HISTORIC PLACES

OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

HERITAGE CONSERVATION AND RECREATION SERVICE

Request submitted by: Daniel Ludwig DOD-COE

Date request received: 6/27/78; additional information received 7/27/78

Name of property: Former Sheridan School District #3 Schoolhouse State: New York

Location: vicinity of intersection of Chapin and O'Brien Road, Sheridan

Opinion of the State Historic Preservation Officer:

( ) Eligible (X) Not eligible ( ) No response

Comments:

The Secretary of the Interior has determined that this property is:

(X) Eligible Applicable criteria: A

Comments: This structure is significant at the local level for its associations as a rural schoolhouse.

( ) Not eligible

Comments:

( ) Documentation insufficient (see accompanying sheet explaining additional materials required)

Robert B. Rettig

Acting Keeper of the National Register

E-40 Date: 9/20/78

WASO-185
9/75

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: 76-472-25 & 76-472-26 23 June 1978
Applicant: Niagara Mohawk Power Corp.

Dr. William Murtagh
Keeper of the National Register
Office of Archaeological
and Historic Preservation
Heritage Conservation and
Recreation Service
ATTN: Ms. Sarah Bridges
Department of the Interior
Washington, DC 20240

Dear Dr. Murtagh:

I am currently processing two Department of the Army permit applications from the Niagara Mohawk Power Corporation requesting authorization to perform certain work in Lake Erie that involves two potential sites for a 1700-megawatt coal-fired steam electric generating station located near the City of Dunkirk, Chautauqua County, New York. One site occupies 986 acres and is located in the Town of Sheridan, New York, while a second site, comprising some 1054 acres, is situated in the Town of Pomfret, New York.

The work requiring a Department of the Army permit is basically the same for both sites and involves the construction of a raw water intake and effluent discharge system and an offshore unloading facility for coal. These activities are subject to regulation under Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972. Although the work proposed is rather limited in scope, I decided to prepare an environmental impact statement since issuance of the Corps permit would ultimately lead to the construction and operation of a large power generating complex.

During the preparation of the draft EIS, the applicant was directed to perform a cultural resources survey at both the Sheridan and Pomfret sites. This work was completed and a report summarizing the findings was sent to the following individuals for review and evaluation during April 1977:

NCBCO-S
Dr. William Murtagh

- Orin Lehman, Commissioner, NYS Office of Parks and Recreation, Albany, New York

- David Clark, National Park Service, Boston, Massachusetts

Comments on the technical accuracy of these data or the eligibility of certain sites for inclusion in the National Register were not received from the New York State Historic Preservation Officer.

On 17 March 1978 the draft EIS, covering both the Sheridan and Pomfret sites, was filed with the U.S. Environmental Protection Agency in Washington, DC. During the 45-day review period comments were received regarding the potential eligibility of certain sites for inclusion in the National Register. The properties identified are as follows:

Sheridan

a. Former Sheridan School District No. 3 Schoolhouse
b. Former Daniel Reed House

Pomfret

a. Calvin J. Dubert House
b. Former George Frost House, carriage house and barn
c. Preston Dedrick house, barn, garage, and shed

In accordance with Title 36 Code of Federal Regulations Part 800.4(a)(2) of the Advisory Council Procedures, I am requesting that you determine the eligibility of each of the above properties for inclusion in the National Register. To assist you in this task, I have enclosed the necessary documentation for each potentially eligible site.

I am also sending a copy of this documentation and cover letter to the New York State Historic Preservation Officer and a copy of the cover letter to the Advisory Council on Historic Preservation.

If you have any further questions regarding this request or the accompany-documentation, please contact Mr. Arthur Marks of my staff by calling FTS 473-2329 or Commercial A/C 716, 876-5454, extension 2329.

Sincerely yours,

Daniel D. Ludwig

Incls
as stated

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: No. 76-472-25 & 76-472-26 18 May 1978
Subject: Proposed Lake Erie Generating Station

Mr. Glenn Loomis
Office of the Secretary
U.S. Department of Agriculture
Washington, DC 20250

Dear Mr. Loomis:

This letter concerns a proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station in the vicinity of Dunkirk, New York. Two sites, one in Pomfret, New York, and the other in Sheridan, New York, have been identified as viable locations for this power plant. A draft Environmental Impact Statement which covers both sites is enclosed for your information.

Construction of the proposed power plant would result in the permanent conversion of 454 acres of agricultural land at the Pomfret site to industrial usage, while at the Sheridan location 447 acres would be committed for this purpose. Both project sites are located within the Lake Erie coastal plain which is used extensively for the cultivation of grapes. In addition, the secondary impact of plant emissions on air quality may also have an adverse impact on agricultural production in the area surrounding the plant site.

On 30 August 1976 guidelines were issued by the Council on Environmental Quality requiring Federal agencies to assess the impact of their actions on prime and unique farmlands. Prime farmlands are defined as those that are valuable in terms of soil and water conditions. Unique farmlands are those that are valuable from the standpoint of specialty crop production. A copy of this guidance is attached to this letter (Incl. 2).

NCBCO-S Re: No. 76-472-25 & 76-472-26
Subject: Proposed Lake Erie Generating Station

In view of this requirement, I request your assistance in determining whether or not prime or unique farmlands are located within or adjacent to the Pomfret and Sheridan sites. When making this determination, please indicate the effect the proposed action will have on these resources.

If you have any questions regarding this request, please contact Mr. Arthur Marks of my staff by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: No. 76-472-25 & 76-472-26 18 May 1978
Subject: Proposed Lake Erie Generating Station

Robert L. Hilliard
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
Midtown Plaza, Room 400
700 East Water Street
Syracuse, NY 13210

Dear Mr. Hilliard:

This letter concerns a proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station in the vicinity of Dunkirk, New York. Two sites, one in Pomfret, New York, and the other in Sheridan, New York, have been identified as viable locations for this power plant. A draft Environmental Impact Statement which covers both sites is enclosed for your information.

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NCBCO-S Re: No. 76-472-25 & 76-472-26
Subject: Proposed Lake Erie Generating Station

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If you have any questions regarding this request, please contact Mr. Arthur Marks of my staff by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
771 Federal Building, 100 So. Clinton St., Syracuse, N.Y. 13260

June 7, 1978

Colonel Daniel D. Ludwig, P.E.
District Engineer
Buffalo Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

As requested in your recent letter and further discussed by telephone with your staff, attached is soil survey information for the Pomfret and Sheridan, New York sites, which are alternative sites for the Lake Erie Generating Station proposed for construction in the vicinity of Dunkirk, Chautauqua County, New York.

Included are:

1) A number of soils maps for each site

2) Prime Farmland Mapping Unit Lists which key to the appropriate map for the specific sites.

You will note some green lines on a number of the maps. These lines are meant to delineate unique farmlands. This delineation holds only if the outlined areas are not prime farmlands. Where farmlands qualify for either prime or unique, the prime delineation takes precedence.

We appreciate your concern for the farmland resources of the state.

Sincerely,

Robert L. Hilliard
State Conservationist

cc: Glen H. Loomis, Director, Environmental Services Division, SCS, Washington, D.C.

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: No. 76-472-25 & 76-472-26 18 May 1978
Subject: Proposed Lake Erie Generating Station

Roger J. Barber, Commissioner
Dept. of Agriculture and Markets
State Office Campus
999 Washington Avenue
Albany, NY 12235

Dear Mr. Barber:

This letter concerns a proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station in the vicinity of Dunkirk, New York. Two sites, one in Pomfret, New York, and the other in Sheridan, New York, have been identified as viable locations for this power plant. A draft Environmental Impact Statement which covers both sites is enclosed for your information.

Construction of the proposed power plant would result in the permanent conversion of 454 acres of agricultural land at the Pomfret site to industrial usage, while at the Sheridan location 447 acres would be committed for this purpose. Both project sites are located within the Lake Erie coastal plain which is used extensively for the cultivation of grapes. In addition, the secondary impact of plant emissions on air quality may also have an adverse impact on agricultural production in the area surrounding the plant site.

On 30 August 1976 guidelines were issued by the Council on Environmental Quality requiring Federal agencies to assess the impact of their actions on prime and unique farmlands. Prime farmlands are defined as those that are valuable in terms of soil and water conditions. Unique farmlands are those that are valuable from the standpoint of specialty crop production. A copy of this guidance is attached to this letter (Incl. 2).

NCBCO-S Re: No. 76-472-25 & 76-472-26
Subject: Proposed Lake Erie Generating Station

In view of this requirement, I request your assistance in determining whether or not prime or unique farmlands are located within or adjacent to the Pomfret and Sheridan sites. When making this determination, please indicate the effect the proposed action will have on these resources.

If you have any questions regarding this request, please contact Mr. Arthur Marks of my staff by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

Daniel D. Ludwig

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

NCBCO-S Re: No. 76-472-25 & 76-472-26 18 May 1978
Subject: Proposed Lake Erie Generating Station

Mr. John R. Luensman, Director
Chautauqua County Planning and
Development Agency
County Office Bldg.
Mayville, NY 14757

Dear Mr. Luensman:

This letter concerns a proposal by the Niagara Mohawk Power Corporation to construct a 1700 megawatt coal-fired steam electric generating station in the vicinity of Dunkirk, New York. Two sites, one in Pomfret, New York, and the other in Sheridan, New York, have been identified as viable locations for this power plant. A draft Environmental Impact Statement which covers both sites is enclosed for your information.

Construction of the proposed power plant would result in the permanent conversion of 454 acres of agricultural land at the Pomfret site to industrial usage, while at the Sheridan location 447 acres would be committed for this purpose. Both project sites are located within the Lake Erie coastal plain which is used extensively for the cultivation of grapes. In addition, the secondary impact of plant emissions on air quality may also have an adverse impact on agricultural production in the area surrounding the plant site.

On 30 August 1976 guidelines were issued by the Council on Environmental Quality requiring Federal agencies to assess the impact of their actions on prime and unique farmlands. Prime farmlands are defined as those that are valuable in terms of soil and water conditions. Unique farmlands are those that are valuable from the standpoint of specialty crop production. A copy of this guidance is attached to this letter (Incl. 2).

NCBCO-S Re: No. 76-472-25 & 76-472-26
Subject: Proposed Lake Erie Generating Station

In view of this requirement, I request your assistance in determining whether or not prime or unique farmlands are located within or adjacent to the Pomfret and Sheridan sites. When making this determination, please indicate the effect the proposed action will have on these resources.

If you have any questions regarding this request, please contact Mr. Arthur Marks of my staff by calling A/C 716, 876-5454, extension 2329.

Sincerely yours,

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

chautauqua county
department of planning and development
county office building mayville, new york 14757 phone 716 - 753-4271

May 26, 1978

Mr. Daniel D. Ludwig, P.E.
Colonel, Corps of Engineers
District Engineer
Dept. of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Re: No. 76-472-25 & 76-472-26 -
Proposed Lake Erie Generating Station

Dear Colonel Ludwig:

In response to your letter of May 18, 1978 dealing with the above mentioned project and the withdrawal of "prime" or "unique" farmland, the following is noted. The Lake Erie Grape Belt is an area which, because of the climatic effect of Lake Erie which moderates temperature extremes in the spring and fall of the year, has been identified as an unusually good area in which to operate vineyards.

The primary and secondary site of the proposed Lake Erie Generating Station (LEGS) have 90 and 153 acres respectively in vineyards. Representatives of the United States Department of Agricutlure, Soil Conservation Service, and the Chautauqua County Agricultural Extension Service have concluded that, "the two sites have almost no acreage of the moderately well-drained soil best suited to grape production." In using a scale from I to VII with I being the best, they rated the Pomfret study area west of Little Canadaway Creek as II with the remainder of the site rated IV (LEGS Application: Case 80007 NYSPSC, page P-79.2-6). They rated the Sheridan site as follows: the area bounded by the Penn Central and Norfolk and Western Railroad and Waite Road as IV or V. The area bounded by the Norfolk and Western Railroad, Aldrich Road and Chapin Road was rated as III. The remaining area is considered more desirable for grape growing but was not given a numerical rating (LEGS Application: Case 80007 NYSPSC, page S-79.2-5). Based upon this information, the withdrawal of the lands necessary to locate LEGS is not withdrawal of "prime" or "unique" farmland. It is noted in the draft environmental impact statement that references made to a series of planning documents that designate the area as prime agricultural land, specifically the New York State Development Plan, the New York Appalachia Development Plan, and the Dunkirk-Fredonia Regional Master Plan Update.

The use of the term "exceptional" or "prime" in any of the above documents does not imply the same definition being used in your documents and in the memorandum noted in your letter of May 18. Nor are the New York State or Appalachia Development Plans at sufficient scale to realistically show the variation and the exceptions that exist within the areas given agricultural designations.

Attached hereto you will find two maps which are sector maps of the new land utilization plan completed for Chautauqua County and recently released (May 22, 1978). You will note that neither the term "exceptional" nor "prime" are terms used in the plan statement, rather we deal with the concept of viable agricultural areas and small farms and/or open rural areas. We are not dealing with the "prime" or the "unique" agricultural land definitions as stated in your Inclosure 2 from the Council on Environmental Quality.

Again, I stress neither site is withdrawing "prime" or "unique" farmlands from Chautauqua County's farmland inventory.

The second item for which you requested comment was concern for secondary impact of the LEGS emissions and an adverse impact on agricultural production. It is a topic that does not have a clear-cut answer. The applicant, Niagara Mohawk Power Corporation, in its application and additional testimony and response to cross-examination has taken the position that LEGS emissions of a noncontinuous nature of somewhere between 25 and 50 hours in a growing season will subject limited areas (not always the same area) of less than one square mile to certain concentrations, which when combined with ambient levels, may damage some portion of the exposed grapevines. However, it is the position of Niagara Mohawk witnesses that the concentrations and the time period exposure (dose) for any vineyard or vine is not sufficient to cause an economic loss.

Conversely, Dr. Nelson Shaulis, as witness on behalf of the New York State Grape Production Research Fund, Inc. (Fund) has presented evidence to show that there has been experimentation and recording of affects of certain chemicals upon grapevines under certain dosing procedures that raises the issue as to whether or not Niagara Mohawk's witnesses, Dr. Lavery and Dr. Edmunds are correct in a "no economic loss" conclusion. The Grape Production Research Fund has recommended additional investigation in this area.

Chautuaqua County has taken the following position: because of the Clean Air Act of 1977 with its anticipated requirement for flue gas desulphurization in the design of LEGS, LEGS with such a system would cause the facility to have the least possible impact upon its environment.

Based upon the evidence presented, there is a question concerning secondary impact on grapes. The Fund has not disputed the analysis of the area of impact, only the issue of dosage and that harm could come to some of the vineyards of Chautauqua County that would be subject to the debated dosage.

It should be pointed out that the Grape Fund and the applicant have entered into negotiations to carry on a further detailed investigation to clarify this issue.

I hope that the preceding information is of use to the Corps of Engineers in completing its Environmental Impact Statement.

Respectfully,

John R. Luensman, Director
Planning & Development

JRL:mjs
Enclosures

PNC

NCBCO-S Re: 76-472-25 & 76-472-26 2 October 1978
Subject: Lake Erie Generating Station

John Keib, Esq.
Niagara Mohawk Power Corp.
300 Erie Blvd. West
Syracuse, New York 13202

Dear Mr. Keib:

This letter pertains to comments I received from the Advisory Council on Historic Preservation and the U.S. Department of the Interior on our Draft Environmental Impact Statement entitled "Permit Application by Niagara Mohawk Power Corporation, Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York". Essentially, these agencies stated that certain properties at Sheridan and Pomfret should be evaluated to determine if they are eligible for inclusion in the National Register.

In compliance with Advisory Council procedures contained in Title 36 Code of Federal Regulations part 800, Section 800.4 (a), I submitted the necessary documentation to the Keeper of the National Register by cover letter dated 23 June 1978. On 20 September 1978 the Keeper of the National Register advised me by letter designated H32-NR that the Calvin J. Dubert House, Knox-Reed Farm, George Frost Farm, Preston Dedrick House, and the former Sheridan School District #3 Schoolhouse are all determined eligible. A copy of this letter is attached as Inclosure One.

In order to comply with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) and the Advisory Council's "Procedures For the Protection of Historic and Cultural Properties" (Title 36 Code of Federal Regulations, Part 800), I must complete the remaining steps in 36 CFR 800 prior to any Department of the Army permit decision. This will require some technical input from the Niagara Mohawk Power Corporation and it's cultural resource consultant along with recommendations and analyses from the State Historic Preservation Officer and my environmental analysis staff. Inclosure Two is a copy of 36 CFR 800 which outlines the procedures which must be followed. Mr. Arthur K. Marks of my

NCBCO-S Re: 76-472-25 & 76-472-26
Subject: Lake Erie Generating

staff will contact you by telephone to explain the input needed from Niagara Mohawk.

I am proposing to issue the Final EIS prior to completion of the remaining steps in 36 CFR 800. I have advised the U.S. Department of the Interior and the Advisory Council on Historic Preservation of my proposal and requested that they present their views to me in writing. Should they have no objection to my proposal, I believe that matters pertaining to historic resources could be completed in a manner which would not further delay decisions on the subject permit actions.

If you should have any questions regarding the above, please contact Mr. Marks.

Sincerely yours,

Incls
as stated

Lt. Colonel, Corps of Engineers/
Deputy District Engineer
for and in the absence of

DANIEL D. LUDWIG, P.E.
Colonel, Corps of Engineers
District Engineer

Marks ________
Leuchner ________
Gaume ________
Hair ________
Counsel ________
DDE ________
DE ________

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (oan)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 293-3992

16518
Ser 541
2 November 1978

From: Commander, Ninth Coast Guard District
To: District Engineer, Buffalo District, U. S. Army Corps of Engineers

Subj: Niagara Mohawk Power Corporation, Lake Erie Generating Station

Ref: (a) Corps of Engineers Buffalo letter of 5 September 1978

1. The information provided to you by the Niagara Mohawk Corporation is not completely factual and may be somewhat misleading. It should be made clear that at no time did the Coast Guard consider the subject unloading facility to be a deepwater port as defined in 33 CFR §148.3. Our comment was that "The Coast Guard will prescribe aids for the protection of marine navigation under Title 33 of the Code of Federal Regulations §66.01-35. Actual markings requirements for the offshore structures will be in accordance with the specifications for marking deep water ports as set forth in Part 149, Subpart E, §149.701 through §149.799 of Title 33 of the Code of Federal Regulations." It is our intent to use the specifications for marking deep water ports as a guideline for prescribing aids to navigation for this facility although it cannot be classified as a deep water port as defined in §148.3 of Title 33, Code of Federal Regulations.

2. The fog signal that must be provided at the facility is solely to warn water craft of the existance of the facility and is not related to the presence of any shoals.

3. The shoals just north of the Pomfret site are a natural potential hazard to large coal carrying vessels that will use the facility. To warn those vessels of the presence of the shoals, Niagara Mohawk may wish to mark the area with warning buoys.

J. H. HOBAUGH
By direction

APPENDIX F

LETTERS OF COMMENT ON THE DRAFT EIS
AND CORPS RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

Class. ER-2

21 APR 1978

Colonel Daniel D. Ludwig
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

We have reviewed the draft environmental impact statement (EIS) issued by your office in connection with the permit application by Niagara Mohawk Power Corporation for Lake Erie Generating Station. Proposed for construction in either the Town of Pomfret or Sheridan, Chautauqua County, New York, the two units would burn low-sulfur Western coal to generate 1700 MW of electrical power. Exhaust steam would be condensed in a natural draft cooling tower; exhaust combustion gases would pass through electrostatic precipitators before release to a 700-foot stack. Approximately 16,000 tons of coal would be unloaded offshore daily. The coal and lake makeup water would travel under the lake bed to the generating units.

The following comments, submitted for your consideration in preparing a final EIS, express environmental reservations (ER) regarding potential atmospheric, aquatic and solid waste impacts, and indicate our need for additional information to complete an EPA review (2). Accordingly, the draft EIS has been rated ER-2.

<u>Atmospheric Impacts</u>

Construction of the proposed power plant requires a permit pursuant to EPA's Prevention of Significant Deterioration (PSD) regulations (CFR Pt. 52.21). Our review of the applicant's submission under PSD concludes that, subject to two conditions, the proposed plant meets all air quality requirements.

1 First, in order to minimize the aerodynamic effects associated with the proposed cooling tower, the height of the exhaust gas stack must be increased another fifty (50) feet to a total height of 750 feet. The applicant was informed of this requirement at the time the PSD was reviewed.

Corps Response to U.S. EPA Comments

1 Pursuant to the analysis performed by the U.S. EPA, the applicant will increase the exhaust stack height an additional 50 feet to a total height of 750 feet in order to minimize the aerodynamic effects associated with the proposed cooling tower. The final EIS has been updated to reflect a total stack height of 750 feet.

2A The assessment referred to in this comment (impact on population growth, visibility, soils, and vegetation) is to be provided by the applicant to the U.S. Environmental Protection Agency prior to any approval of a Prevention of Significant Deterioration (PSD) permit. Future interaction will occur between the U.S. EPA and the applicant regarding revised PSD requirements and other requirements or regulations promulgated in accordance with the Clean Air Act Amendments of 1977. Essentially, the assessment is interrelated with and highly dependent on the results of ongoing and future U.S. EPA air quality reviews such as Best Available Control Technology and New Source Performance Standards, and thus an assessment at this time may be premature. Additionally, any approval of Department of the Army permits does not negate the need for the applicant to obtain other necessary federal, State, or local approvals for the proposed project. (See correspondence in Appendix E relating to this comment and response).

Section 4.149 of the draft EIS cited a 1970 study by Dr. Takashi Fujiwara entitled "Sensitivity of Grapevines to Injury by Atmospheric Sulfur Dioxide." The six grape varieties studied by Fujiwara (1970) do not coincide with the varieties occurring in the vicinity of the proposed Lake Erie Generating Station sites, with the exception of "Delaware" and "Fredonia".

Approximately 85% of the grapes raised in the vicinity of the proposed sites are of the Concord variety, which variety is one of the more sensitive to SO_2. This is the variety the applicant is using in its long term field studies simulating the Lake Erie Station SO_2 emissions. Niagara, Catawba and Delaware (sensitive-Fujiwara, 1970) constitutes more than 10% of the crop with thirteen other varieties making up the
2B remainder.

A Second, the Clean Air Act amendments of November 3, 1977 have revised the PSD requirements for an air emission source that has not received a construction permit by March 1, 1978. Because Lake Erie Generating Station is subject to these revised PSD regulations, the applicant must assess the impacts of the proposed power plant on population growth (particularly, the air quality impacts of such growth), visibility, soils and vegetation.

2 Of particular concern are the effects on vegetation that has significant commercial or recreational value. As stated on page 2-142 of the draft EIS, the soils and microclimatic conditions found generally in the Chautauqua Grape Belt region make vineyards a unique and irreplaceable agricultural resource. Chapter 4 of the draft EIS indicates that grapes,

B as well as other crops, exhibit a range of sensitivity to SO_2. Of six grape varieties studied, it was found that the Fredonia grape is "highly sensitive." The final EIS should indicate the degree of sensitivity of the grape varieties to be impacted by the power plant's emissions. In looking over the site location map it was found that the Village of Fredonia is within only eight miles of both power plant sites.

3 On page 4-54 of the draft EIS projected ground level SO_2 concentrations at the power plant site are cited in a discussion of plant sensitivity. Because the tall stack is expected to disperse emissions widely, ground level concentrations will probably be greater off site.

Aquatic Impacts

The proposed closed-cycle cooling system is expected to cause acceptable impacts on the Lake Erie fishery. Velocities of intake and makeup water flows would be low; blowdown through a multiport diffuser would incur negligible thermal impacts.

4 The draft EIS mentions possible use of Ristroph traveling screens, and a fish return system, should operating experience demonstrate a need to mitigate fish losses. It is requested that the final EIS also consider the alternative of screening the intake ports on the breasting dolphin.

5 Construction of the power plant at either location involves alterations of several on-site ponds and streams. Because the draft EIS indicates high organism diversity in these streams, we recommend that alterations be minimized.

6 Although section 2.240b, states that no lake sturgeon were caught in the Pomfret Lake Erie study areas, Table 2-27 indicates that lake sturgeon were captured in the 1974-75 season. The final EIS should clarify this inconsistency.

Corps Response to U.S. EPA Comments

The Fujiwara study is the only known publicly available study which examines season long exposure of grapevines to low concentrations of SO_2. While the study included only two of the varieties grown in Chautauqua County, it did demonstrate that grape varieties vary in their susceptibility to SO_2. At the present time the actual relative sensitivity to SO_2 of other grape varieties in Chautauqua County is unknown. However, some literature indicates that while grape sensitivity to SO_2 is not precisely known, grapes exposed to 0.5 ppm of SO_2 for 4 to 8 hours exhibit typical SO_2 leaf marking injury.

2B Studies performed by the applicant were not restricted to the effects of SO_2 alone but rather they evaluated exposure of grapevines to SO_2 in combination with ozone. A discussion of grape sensitivity to ozone has been added to section 4.151. A description of the studies performed by the applicant in 1976 and 1977, and the applicant's proposed 1978-81 studies are summarized in a new section, 4.151a. Related to SO_2 effects, the contribution of the proposed facility to local and regional acid rain has been added to section 4.153.

In regard to the proximity of Fredonia to the proposed facility, the "Fredonia" variety grape is not necessarily more abundant in that particular area. Fredonia variety, identified as highly sensitive to SO_2 (Fujiwara, 1970) constitutes less than 1% of the area crop.

3 The maximum projected ground level SO_2 concentrations cited on page 4-54 result from a plant situated at Pomfret but are not on-site values. The values given are the maximum concentrations received by any receptor in the vicinity of the site taking into account the tall stack proposed for the facility. Paragraph 4.150 has been modified to indicate that these maximum levels will occur in the Pomfret area and not necessarily on the site itself.

Solid Waste Disposal

7 Uncertainty regarding the toxicity of power plant solid wastes precludes determination of the applicability of Subtitle C of the Resource Conservation and Recovery Act (RCRA) until the end of 1978. However, because RCRA is scheduled for implementation in 1979 (some six years before power plant startup), we believe ample time will be available for any required site modifications. If Subtitle C is inapplicable, the sanitary landfill criteria of section 4004 of RCRA would apply. A copy of these proposed criteria is attached.

Specific comments regarding solid waste impacts follow:

8 1. Section 1.033 of the draft EIS discusses the use of power transformers. In view of EPA's PCB (polychlorinated biphenyl) Rule requiring special marking and disposal methods for items containing PCB, the final EIS should identify the transformer oil and any special conditions proposed for its use and disposal.

9 2. Section 1.040 does not discuss the adequacy of design for the coal pile. The final EIS should evaluate the proposed liner's thickness and permeability, the depth to high groundwater, a runoff collection system and a monitoring system.

10 3. The off-site sanitary landfills proposed for use should be identified in the final EIS and compliance with section 4004 of RCRA indicated.

11 4. Section 1.121 should identify the disposal site for intake screening wastes.

12 5. The discussion of pyrite disposal in section 1.124 should characterize the proposed cap material, e.g. artificial liner, compacted clay, etc.

13 6. It is requested that the discussion of on-site ash disposal (section 1.128) consider installation of a leachate collection system, and indicate the depth and permeability of the initial liner.

14 7. In section C.028, the leachate test on the stabilized scrubber sludge using a chemical additive process should include tests for cadmium and mercury. Also, it is not clear that the test results are applicable to the lime-fly ash stabilization scheme. If they are not, then leachate results should be given for this stabilization method.

Corps Response to U.S. Environmental Protection Agency Comments

4 A new section, 6.096a, which addresses the alternative of screening the intake ports has been added to Chapter Six of the EIS. The use of fine mesh stainless steel screens or uniform flow screens such as those manufactured by Johnson UOP, Inc. would reduce fish impingement. Problems associated with clogging of stainless steel mesh by debris and ice could be solved using presently available technology. However, maintenance and equipment costs needed to solve these problems would be high and may not be warranted in light of the low predictions of fish impingement. Uniform flow screens appear promising but due to the lack of operational data at power plants, staff cannot conclusively state that those screens would protect aquatic organisms while reliably providing a source of makeup water at a reasonable cost. Staff believes that effective demonstration programs at operating power plant intakes are needed to adequately assess uniform flow screens.

5 Alteration to all on-site ponds has been minimized consistent with other environmental and engineering constraints. Minimization of impact to on-site water bodies was an environmental factor, among others, leading to the selection of the proposed facility location. Only three of the 21 Pomfret area ponds will be eliminated by the placement of plant structures, while four of the 29 Sheridan area ponds will be eliminated.

Corps staff has reviewed the baseline studies performed at Pomfret and we find that at least two of the ponds to be eliminated (p-7 and p-25) are devoid of fish. Paragraph 4.026 has been expanded to discuss the organism diversity in these ponds. The high degree of diversity of organisms in the water bodies is typical of the water bodies in the area. Accordingly, there will be a minimal regional impact due to removal of those on-site ponds. In reviewing the current plant layouts at both sites and the applicant's stream modifications as proposed prior to Corps involvement in this project, staff finds that the applicant has modified both the plant layout and the stream alteration plans to reduce the impact to streams.

In addition to the consideration given to the placement of the facilities so as to minimize impact on on-site ponds, a sediment and erosion control plan will be implemented during construction to minimize water body impact due to rainfall runoff.

15 8. In section C.035 stabilized waste is suggested as a liner material. Considering the need for leachate tests, the final EIS should investigate the depth to high groundwater below the pile segments and the possibility of hydraulic connection with a usable aquifer. In addition, the runoff collection system should be described in detail.

16 9. It is indicated in section C.038 that circling a 200 or more acre waste disposal site there are to be three monitoring wells, one upgradient and two downgradient. According to EPA's Procedures Manual for Ground Water Monitoring at Solid Waste Disposal Facilities (EPA/530/SW-611, August 1977), at least two monitoring wells should be established for each 460-foot wide segment, not for each pile, downgradient of the disposal area. This is particularly valid in light of the statement in section 2.058 of the draft EIS that groundwater is present in fractures and openings which could cause a leachate plume to go undetected.

In our opinion, the draft EIS is very comprehensive and quite accurate in describing the proposal and its environmental impacts. It is our intent that these comments assist you in preparing an even better document. Please contact this office at 8-264-8556 if you have any questions regarding this letter.

Sincerely yours,

Barbara M. Metzger
Chief
Environmental Impacts Branch

Enclosure

Corps Response to U.S. Environmental Protection Agency Comments

6 One lake sturgeon was caught by the applicant's consultant in the 1974-1975 season with the 1-m fish egg and larvae gear. It was immediately released. This lake sturgeon was estimated to be about 6 feet long and weigh about 150 pounds. Table 2-27 has been modified to indicate that only one specimen was caught and this fact has also been added to paragraph 2.240.b.

Additionally, paragraphs 2.240a through 2.240c of the Draft EIS were in error by stating that lake sturgeon (Acipenser fulvescens) is an endangered species. It is the shortnose sturgeon (Acipenser brevirostrum) which New York State (NYCRR Section 182.6) lists as an endangered species. Likewise, the Federal endangered species listings (50 CFR §17.11) indicate that it is the shortnose sturgeon which is endangered rather than the lake sturgeon. The approrpiate paragraphs have been corrected in the Final EIS.

7 An introductory paragraph explaining the Resource Conservation and Recovery Act of 1976 and its implications has been added to the section in Chapter One pertaining to solid wastes. Table 1-19 has also been updated to reflect possible future permit requirements in accordance with RCRA. Corps staff concurs that ample time will be available for any required site modifications.

8 The applicant will not use transformer oil containing PCB's. Section 1.033 has been modified to indicate this fact. The applicant has advised the Corps that if for some reason traformers containing PCB's were to be used, they would comply with EPA's regulations concerning special marking and disposal methods for items containing PCB's. The Final EIS cannot identify the exact transformer oil to be used since no power transformers have been purchased by the applicant. Two viable transformer oils are Exxons Univolt 60 and Westinghouse's WEMCO-C. The ultimate choice of power transformers and PCB less transformer oils will be accomplished as the result of the applicant's final engineering design and the bidding specifications along with attendant costs.

Since the applicant intends to use transformer oil which does not contain PCB's, there are no proposed special conditions being attached to the selected transformer oils use or disposal.

9 The coal pile base will be specially prepared to ensure groundwater protection from any rainfall runoff. Depending on results of detailed soil analyses, the upper two to three feet of soil may be reconstituted and compacted, and additives such as bentonitic soils combined with the native soil to form a liner with a maximum permeability of 10^{-6} cm/sec. The base of the pile will be sloped to direct any water which runs through the coal pile to the collection system which surrounds the coal pile. The collection system will consist of a number of lined ditches (similar to the pile base, paragraph 1.041) which will convey rainwater to a lined treatment pond. A soil-type liners will have a maximum thickness of six inches with the actual thickness dependent upon the soil conditions in place at the time of construction. These will all have a maximum permeability of 10^{-6} cm/sec. Preliminary geological investigations indicate that there would not be occurrences of groundwater within fifteen feet of the surface in the vicinity of the proposed coal pile location. A groundwater monitoring system will be established in compliance with the mandates of the Siting Board, which has jurisdiction over the SPDES permit program.

10 According to the Director of Planning for Chautauqua County, there are six sanitary landfill operations in Chautauqua County at this time. It is anticipated that by the mid 1980's, there will be only a single sanitary landfill in the County. The County is currently designing and licensing this single sanitary landfill which will be located in the Town of Ellery. This facility is scheduled to be in operation within the next two years. It will be in compliance with RCRA mandates. The other five (one recently closed) existing sites will be closed when the new one becomes opeational. Since only the one sanitary landfill in the Town of Ellery is expected to be opurational during the time period of Lake Erie Generating Station construction, it is anticipated that sanitary landfill would be utilized. As indicated in response number 7, RCRA compliance has been added to Chapter One of the EIS.

11 Since the schedule commerical operation date for the first unit is October 1987, more than nine years away, it is impossible to identify the specific licensed sanitary landfill which will be used to dispose of intake screening wastes. As stated, Chautauqua County plans to have a licensed landfill operating in the county. This site would be subject to the sanitary landfill criteria of Subtitle D, Section 4004 of RCRA.

Corps Response to U.S. Environmental Protection Agency Comments

12 The State Pollutant Discharge Elimination System (SPDES) draft permit specifies that the cap above the pyrite disposal trenches shall have a maximum permeability of 10^{-7} cm/sec. It is anticipated that the cap will consist of compacted bentonitic soil with at least a six inch thickness. If the required permeability cannot be achieved with the bentonitic soil by itself, an artificial liner will be used in conjunction with the soil to affect the desired result. The discussion in Section 1.124 has been expanded to include this information.

13 Paragraph 1.128 has been modified to include a discussion of the leachate collection system. Essentially, the base of the ash disposal pile will be prepared by reconstituting and compacting the upper two to three feet of native soil and adding bentonitic material to the soil. A maximum allowable permeability of 10^{-6} cm/sec is expected. Leachate and surface runoff will be collected in lined trenches and directed to a lined treatment pond.

14 Due to the relatively new technology of sludge stabilization, *little information is available* pertaining to leachate tests on stabilized scrubber sludge using a chemical additive process. The data on leachate quality presented on page O-12 of the Draft EIS are applicable to tests run by the Dravo Corporation which did not include any test results for cadmium and mercury. The Dravo process utilizes gravity thickened sludge without further dewatering, adds lime for pH adjustment and calcilox as a stabilizing agent. As an option, ash can also be added. Thus, the Dravo test results are probably not identical to results which would be obtained using the IU Conversion Systems, Inc. process or other fixation methods which use the lime-fly ash stabilization schemes. While leachate results are not available for the I.U. Conversion Systems, Inc. process, runoff tests indicate cadmium concentrations of less than 0.01 ppm after 14 days stabilization. No values were reported for mercury. The results of the IU Conversion Systems runoff tests have been added to Section C.027 of the EIS. A report entitled "EPRI 202 - Environmental Effects of Trace Elements from Ponded Ash and Scrubber Sludge," Radian, 1975, indicates concentrations of cadmium in the range of 0.002 - 0.009 mg/l and mercury concentration of 0.001 mg/l in typical FGD scrubber liquor. After an initial first flush of process liquors, the concentrations in any drainage, leachate or decant coming from the waste would approximate equilibrium concentrations.

AD-A079 395 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 5/5
FINAL ENVIRONMENTAL IMPACT STATEMENT. PERMIT APPLICATION BY NIA--ETC(U)
DEC 78 A K MARKS

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10 OF 11

AD A079 395

Corps Response to U.S. Environmental Protection Agency Comments

14 It is not expected that there will be any substantial leachate formation from stabilized sludge due to the low to negligible permeability (10^{-6} to 10^{-7} cm/sec). Since an impermeable mass can leach only from the surface, runoff is probably of greater significance than leaching. Both Dravo and IU Conversion Systems, Inc. are successfully operating disposal facilities in several states. It is assumed that they had to obtain licenses and meet conditions pertaining to liquid discharges for those facilities. This is a general indication of the acceptability of the fixation processes. The applicant will collect all runoff and leachate using an impermeable collection system. After collection, all of this water will be used as makeup to the scrubber system, thus obviating any liquid discharges. In addition, the draft SPDES permit includes effluent limitations to account for systems with and without FGD systems, using eastern or western coal with any range of sulfur, and recognizes that discharges may occur at various times even if total recycle is planned.

15 Borings on various portions of both the Pomfret and Sheridan sites indicate that ground water will not be closer than fifteen feet below the surface in the vicinity of the proposed disposal areas. Since all surface water will be directed away from the disposal area, using the collection system described in the above response (14), there will not be any mechanism for surface water to try to penetrate the liner and proceed to connect with the groundwater. There have been no indications that any groundwater would contact the liner from beneath. No continuous groundwater aquifers are known to exist at or near the site which transmit large quantities of water. Furthermore, groundwater was not under sufficient pressure to rise above the ground surface in any of the borings. If future tests should indicate that the stabilized material was not suitable for liner use, as determined by the Resource Conservation and Recovery Act (RCRA) testing regulations, the applicant will install an appropriate liner to satisfy the RCRA requirements.

16 As indicated in response 15 above, there is no indication that there would be groundwater movement which would cause a leachate problem. Results of future leachate tests will be judged against Resource Conservation and Recovery Act regulations to determine if the solid wastes are hazardous. This determination will influence the applicant's and State's decision as to the extent of ground water monitoring wells for the waste disposal area.

Advisory Council on
Historic Preservation
1522 K Street NW
Washington, D.C. 20005

[illegible] 2 5 [illegible]

Daniel D. Ludwig, PE
Colonel, Corps of Engineers
District Engineer
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Thank you for your recent request for comments on the environmental statement for the proposed issuance of a permit for the Lake Erie Generating Station, Pomfret and Sheridan, New York. We note on page 2-144 that this undertaking may have an effect upon the Daniel Reed House and Sheridan School #3, properties that appear to possess historical and cultural significance and therefore may be eligible for inclusion in the National Register of Historic Places.

17 Section 800.4(a) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800) sets forth the method of evaluating the historical and cultural significance of such properties. A copy of these procedures is enclosed. We request that you evaluate the significance of Reed House and Sheridan School and inform us of your findings. If this evaluation results in a determination by the Secretary of the Interior that the property is eligible for inclusion in the National Register, you should follow the remaining steps in Section 800.4 to evaluate the effect of the undertaking on the property and, if appropriate, to obtain the Council's comments. Please be advised that until the requirements of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) and the Council's Procedures are complied with, as appropriate, we consider the draft environmental statement incomplete in its treatment of historical, archeological, architectural and cultural resources.

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

Corps Response to Advisory Council on Historic Preservation Comments

17 On 23 June 1978, the District Engineer, Buffalo District, Corps of Engineers, submitted a request in regard to determinations of eligibility for inclusion in the National Register to the Keeper of the National Register. This request included documentation on the Reed House and Former Sheridan School District No. 3 schoolhouse, and three properties located at Pomfret (Preston Dedrick Farm, Calvin Dubert House, and George Frost Farm). The documentation was prepared in accordance with Section 800.4 (a) of the Council's "Procedures for the Protection of Historic and Cultural Properties." The Keeper of the National Register, by letter dated 20 September 1978, determined that all five properties are eligible for inclusion in the National Register. In regard to the remaining steps in Section 800.4 of the Council's procedures, the District Engineer will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council's Procedures (36 CFR 800) are completed prior to any approval of Department of the Army permits. Coordination letters pertaining to the issuance of this Final EIS, based on the above stipulation, may be found in Appendix E.

Should you have any questions or require additional assistance, please call Jordan Tannenbaum at 202-254-3967.

Thank you for your cooperation.

Sincerely yours,

Myra F. Harrison
Assistant Director
Office of Review and Compliance

Enclosure(s)

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
U. S. Courthouse and Federal Building, Syracuse, New York 13260

June 13, 1978

Colonel D. Ludwig, P. E.
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The Draft Environmental Statement for the Permit Application by Niagara Mohawk Power Corporation Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York, which you sent to USDA in Washington, has been referred to this office for comment.

We have reviewed the statement and submit the following comments:

Page 1-46 - SEDIMENT AND EROSION CONTROL - paragraph 1.080

18 This paragraph can better satisfy the concern of erosion if it included a statement that the topsoil was stripped, stockpiled, protected and respread to assist with vegetative measures. Also state that revegetating measures will be done promptly and areas disturbed in construction will be kept to a minimum and vegetated promptly.

General Comment

In many places throughout the impact statement there are discussions on prime agriculture, agricultural districts and agricultural land, including mention of crops, vineyards, pasture land, etc.

19 We cannot find any paragraphs which discuss prime and unique farmlands. The statement should document whether prime and unique farmlands will be impacted by the project.

Just a few days before this letter was prepared, this office sent to the Buffalo District maps with appropriate legends and interpretations which should assist in identifying prime and unique farmland.

Corps Response to U.S. Department of Agriculture (Soil Conservation Service) Comments

The stripping and stockpiling of topsoil will occur as required by the construction schedule. The applicant intends to adhere to the proper procedure to insure that the stripped and stockpiled soils do not contribute to the area runoff during periods of precipitation. The procedure during the growing season will consist of reseeding the stockpiled topsoils; during other seasons, mulch or equivalent will be applied to minimize erosion of topsoils.

18 Soil erosion control practices will consist of applying controls such as soil stabilizing measures and the control of construction development sequence to keep areas disturbed by construction to a minimum, in terms of area and duration, without unreasonable demands on other activities at the site. Soil stabilization will be accomplished by utilizing either permanent or temporary vegetation and various mulch or ground covering materials. However, areas where construction traffic or other activity is expected to be continuous are not suitable for vegetative covers. These areas can be covered with stone, gravel, woodchips, mulch or an equivalent. Any cleared area where activity has already been completed, or has temporarily stopped, will be seeded promptly, as soon as weather permits, with fast-growing grass to minimize soil erosion.

The applicant will periodically review site area management practices to insure that erosion control measures are effective. Properly trained personnel will routinely inspect the effectiveness of soil stabilizing measures. This will insure that any measure which is implemented is effective for the duration of construction activity.

19 An analysis of the proposed facility's impact on prime and unique farmland has been performed utilizing soils maps and prime farmlands mapping units supplied to the Corps by the Soil Conservation Service, U.S. Department of Agriculture. New paragraphs 2.019a and 2.260a have been added to the EIS. These paragraphs describe prime and unique framlands and indicate the on-site acreages. Paragraphs 4.005 and 4.220 have been expanded to include facility impact on prime and unique farmlands. Essentially, the analysis was performed by juxtaposition of the plant layouts on soils maps. Attempts to quantify the individual soils units (eg percentage of 42B, Galen fine sandy loam, 3-8% slopes) to any degree of accuracy were not successful, even through use of a point grid.

Colonel D. Ludwig, PE June 13, 1978

18 A tabular list of the farmlands for both sites would assist reviewers of the statement.

We appreciate the opportunity to review and comment on this statement.

Sincerely,

Paul A. Dodd /for

Robert L. Hilliard
State Conservationist

cc: R. M. Davis, Administrator, SCS, Washington, D. C.
Director, Office of Federal Activities, EPA, Washington, D.C. (5)
Barry R. Flamm, Coordinator, Office of Environmental Quality Activities, Office of the Secretary, USDA, Washington, D.C.
Cletus J. Gillman, Director, NETSC, SCS, Broomall, Pa.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377-3111

April 18, 1978

Colonel Daniel D. Ludwig
Buffalo District, Corps of
Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

This is in reference to your draft environmental impact statement entitled, "Permit Application by Niagara Mohawk Power Corporation Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure: Memo from Dr. Eugene J. Aubert
Director, GLERL, RF24

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
ENVIRONMENTAL RESEARCH LABORATORIES

Great Lakes Environmental Research Laboratory
2300 Washtenaw Avenue
Ann Arbor, Michigan 48104

APR 13 1978

April 11, 1978

TO : Dr. William Aron
Director, Office of Ecology and Conservation, EC

FROM : Dr. Eugene J. Aubert
Director, GLERL, RF24

SUBJECT: DEIS 7803.05 - Permit Application by Niagara Mohawk Power Corp Proposed Lake Erie Generating Station, NY

The subject DEIS prepared by the Corps of Engineers, Buffalo District, on construction of Lake Erie Generating Station has been reviewed and comments herewith submitted.

20 The Niagara Mohawk Power Corporation decided to use coal-fired plant for the proposed Lake Erie Generating Station although nuclear fission is a viable alternative. That selection was made in order to maintain a diversity of fuel usage in the base load units and because a nuclear plant has a projected lead time of approximately ten years (Paragraph 6.017). Data in Table 1-1 indicates that at the present time, Niagara Mohawk fuel usage is: oil 41%, coal 29%, and nuclear 12%. Considering that in the future, the oil will be replaced by coal, the present power plants will use 70% coal and 12% nuclear fuel. With the proposed power plant in operation, coal usage will increase to 77% and nuclear fuel will drop to 9%. These percentages do not indicate that the diversity in fuel usage will be maintained. New York State Public Service Commission predicts a need for Unit 1 in the winter of 1988 (Paragraph 1.021) which date would provide sufficient lead time for a nuclear power plant. It appears that the reasons given for selection of a coal-fired power plant are not very strong.

21 The Lake Erie Generating Station will require six million tons of sub-bituminous western coal annually. Delivery is planned by rail to Lake Superior and then by lake ship to an offshore docking and unloading facility in Lake Erie. Precautions will be taken to prevent coal dusting or spilling during the transfer of coal from lake vessel to the unloading silo. It can be assumed that the precautions will be sufficient during calm lake conditions although some accidents might happen. However, during storms on Lake Erie, open lake exposure of large vessels will be difficult to handle and definitely will cause accidents with possible loss of life, property damage, and pollution of the lake. During the eight month operation period, three months (April, October, and November) are known to be stormy. Some infrequent storms occur also during the usually calm summer months. From the standpoint of safety, damage loss, and lake pollution, open lake unloading involves many risks and is not acceptable. Unloading in a sheltered harbor should be planned.
22 Three harbors are mentioned in the report - Ashtabula, Erie, and Buffalo.

Corps Response to U.S. Department of Commerce Comments

Corps staff agrees that the applicant's argument regarding insufficient lead time for nuclear power facility construction may not be very strong. This is particularly true in light of the reduced demand projections contained in the 1978 149b report and the applicant's revised on-line date of November 1987 for Unit One. However, staff would like to point out that utilities in New York State consider ten years lead time to be marginal, and that the longer lead time for a nuclear facility should be given some consideration.

20 The comment pertaining to diversity in fuel usage is based on present mix in the applicant's system and the assumption that all oil fired units will be converted to coal. The applicant's argument for fuel diversity accounts for future additions of nuclear power, future retirements and reduced dependence on oil in the early 1990's. These factors were considered on a power pool wide basis as well as within the applicant's own system. Combining the data from Table 1-1 (present mix) with those in paragraph 1.017 (future additions) indicates that there will be approximately 22 percent coal and 20 percent nuclear prior to the addition of the subject units in the Niagara Mohawk System. On a state-wide basis, there will be a greater percentage of nuclear capacity as compared to coal capacity prior to the installation of the Lake Erie units. According to the 1978 149-b long-range forecast of the New York Power Pool, on page 380, the mix in 1993 will contain 15.6 percent coal and 28.6 percent nuclear. These figures assume installation of the two Lake Erie coal units.

While the long-range power pool plan does not specifically mention conversion of oil fired units to coal, it does consider an overall decrease in dependence on oil. The 1978 mix contains 46.8 percent oil and this decreases to 30.9 percent in 1993. The conversion of all oil-fired units to coal may not be a realistic assumption. Any conversion order issued will consider the technical feasibility of the conversion as well as the economics of installing all necessary equipment to achieve compliance with appropriate
20 emission regulations. An additional consideration in conversion orders is the availability of coal transportation facilities.

Corps staff agrees with the applicant and the New York York State Department of Public Service that coal is the preferred fuel choice for the proposed Lake Erie Generating Station based primarily on fuel diversity.

22 Considering that the owner is planning to spend 90 million dollars on an offshore facility, an investigation should be made to adapt the nearby Dunkirk Harbor for coal unloading. As reported, usage of this harbor by Lake Erie commerce has declined since 1964 while recreational small craft usage has increased only slightly. Comparison of coal shipment costs should be made for various harbors; however, no comparison should be made between harbors and offshore facility.

23 Lake Erie water loss by evaporation and drift is estimated at a rate of 26.7 cubic feet per second. As compared to Niagara River flow, the loss can be considered insignificant.

21 The conceptual design of the offshore unloading facility has been reviewed by Pickands and Mather and Co. and the American Steamship Co., two experienced Great Lakes shipping firms. They have both stated that the offshore system is workable and that there would be no trouble in either docking or unloading coal at the proposed facility. The ships would not attempt to dock and unload during stormy conditions, but would wait until the weather improved to allow safe unloading. If during unloading a storm came up, the unloading operation would be terminated and the ship would leave the unloading area until the storm passed.

The weather conditions have been analyzed and their impact on shipping delays and the concomitant cost increase has already been accounted for in determining the per ton shipping rate. Accordingly, the proposed offshore unloading facility is considered a viable and economic method to supply coal for the proposed station, and in terms of safety, property damage and lake pollution, there are no significant foreseeable operational benefits accruing to harbor unloading versus unloading at the offshore facility. Compliance with U.S. Coast Guard requirements will also minimize safety hazards.

The Dunkirk Harbor alternative has been added to the text in Chapter Six of the EIS. Use of the Dunkirk Harbor is not considered viable due to the shallow depth of water in the harbor and the approach to the harbor. The harbor has a water depth of less than twenty feet and the ships need thirty feet. Staff would expect significant environmental impact if a dredging operation were proposed to deepen the harbor, and develop it for coal handling.

22 Preliminary investigations by the applicant revealed that existing harbors at Ashtabula, Ohio, Erie, PA, and Buffalo, NY could be utilized to transship coal. The actual charges associated with using any of these sites would depend mainly on the rail cost needed to finish the delivery. The extent of the existing facilities would have a lesser influence on the selection.

Qualitatively, it is expected that Erie would be the most economic harbor to use. Con Rail has quoted the applicant a rate of $2.00/ton for delivery to Pomfret from either Buffalo or Erie. The ship delivery rate should be approximately $0.20/ton cheaper at Erie due to the shorter distance from Lake Superior. There are some existing harbor facilities at Erie, while Buffalo would need new facilities. Even if those costs were equal, the lower ship rate would still prevail. Ashtabula would probably be the most expensive since the rail haul is almost twice as long as from either Erie or Buffalo. All existing harbors would be evaluated by the applicant if it is determined that western coal is still desirable assuming that the offshore facility is not constructed.

Corps Response to U.S. Department of Commerce Comments

23 Staff concurs.

Department of Energy
Washington, D.C. 20545

MAY 8 1978

Colonel Daniel D. Ludwig
Corps of Engineers
Department of the Army
Buffalo District
1776 Niagara Street
Buffalo, NY 14207

Dear Colonel Ludwig:

This is in response to your transmittal dated March 6, 1978, in which you invited the Department of Energy (DOE) to review and comment on the Corps of Engineer's draft environmental impact statement concerning the proposed permit application by Niagara Mohawk Power Corporation proposed Lake Erie Generating Station, Pomfret and Sheridan, New York.

We have reviewed the statement and have determined that the proposed action will not conflict with current or known future DOE programs. Staff comments are enclosed, which you may wish to consider in the preparation of the final statement.

This is also to inform you that since the Energy Research and Development Administration and the Federal Energy Administration were merged into the Department of Energy on October 1, 1977, along with the power regulating functions of the Department of the Interior (Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, Western Area Power Administration, and Alaskan Power Administration), draft environmental impact statements previously sent to NEPA contacts at headquarters, field, or regional offices of these organizations should be immediately discontinued. In the future, impact statements that your agency requests the Department of Energy to review should be sent to:

Director
Office of NEPA Affairs
U. S. Department of Energy
Mail Station E-201, GTN
Washington, DC 20545

Those statements formerly sent to the Federal Power Commission should now be sent to the Federal Energy Regulatory Commission.

In order to provide a timely DOE agency-wide review of draft environmental impact statements, a minimum of six copies should be transmitted. We require two copies of final environmental impact statements.

Thank you for the opportunity to review and comment on the draft statement.

Sincerely,

W. H. Pennington, Director
Office of NEPA Coordination

Enclosure:
DOE Staff Comments

DEPARTMENT OF ENERGY
STAFF COMMENTS

NIAGARA MOHAWK POWER CORPORATION
PROPOSED LAKE ERIE GENERATING STATION, POMFRET AND SHERIDAN, NEW YORK

A. Summary

This environmental impact statement (EIS) addresses the environmental impacts associated with the Niagara Mohawk Power Corporation's proposed 1700-megawatt (MW) coal-fired generating station to be located near Lake Erie in New York State. The station would be comprised of two 850-MW units, the first to be operative in October, 1985, the second in April, 1987. The power company is considering locating the station in one of two sites, Pomfret or Sheridan, New York. Niagara Mohawk proposes to construct an offshore coal unloading facility (and associated tunnel leading from the unloading facility onshore to the coal storage area) as well as a cooling water intake and discharge system. The unloading facility would consist of three 50-foot diameter mooring dolphins and two 80 feet by 80 feet docks, spaced 520 feet apart. A 30-foot diameter coal silo would be located in one of the mooring dolphins; coal would be unloaded into the silo and transported through a conveyor tunnel beneath Lake Erie to the coal storage area onsite. The Army Corps of Engineers requires permits for the construction of the unloading facility, conveyor tunnel, and cooling water system and for the placement of lighted buoys along the shipping lane approachment. The Army Corps of Engineers also requires permits for dredging and tunneling associated with the facility. The Corps has determined that the approval of the permit applications associated with the coal unloading facility and cooling water intake/discharge system is a major Federal action significantly affecting the environment and thus has prepared this EIS.

B. Comments

CHAPTER ONE: PROJECT DESCRIPTION

24 pp 1-7-17: Energy demand is projected for the time frame 1978-1990. Since units 1 and 2 will not be operating commercially until October, 1985, and April, 1987, respectively, the discussion in this chapter applies only to

Corps Response to U.S. Department of Energy Comments

Load requirements shown in the draft EIS are those which have been projected and published for the 1978-1990 time frame to conform with requirements of New York State law. Public Service Law Section 149-b requires major New York electric utilities (i.e., members of the New York Power Pool) to annually prepare and submit, for Public Service Commission scrutiny, a comprehensive long range plan for future operations. The comprehensive long range plan is to include:

- a forecast of demand for the next ten years specifying anticipated load duration;

- identification of the generating capacity to be utilized in meeting such demands.

24 Implementing regulations require each New York electric utility to project summer and winter peak loads for its franchise territory for the 10 years preceding and the 20 years following the current year. The 1978 149-b latest forecasts indicate a 2.9% rate of growth in the New York Power Pool peak load forecast during the early 1980's, declining to a growth rate of 2.6% by the late 1990's. Niagara Mohawk as an individual utility indicates a projected 3% growth rate for system peak demand during the period 1977-1990. The final EIS reflects the results of the 1978 149b report.

The applicant had an actual 1977 winter peak load of 5284 MW and a summer peak load of 4878 MW. The 1978 report predictions for similar loads in 1998 are 9560 MW and 8940 MW, respectively. The New York Power Pool experienced a winter peak load of 18921 MW and a summer peak load of 21214 MW in 1977. The corresponding figures being predicted for 1998 are 36330 MW and 36530 MW.

Lake Erie Units 1 and 2 are currently targeted for service in winter, 1987-1988 and winter 1989-1990 to accommodate demand projected as of those dates and thereafter.

Apart from the annual increase in peak demand, the applicant will in the future be retiring existing units which will be reaching the end of their useful life. The nominal life span of a generating unit has been approximately 40 years. Niagara Mohawk has on its system units having a total capacity of 420 MW, which will be 40 years or older in the 1987-1989 time frame. The proposed facility will aid in this regard also.

24 the first 3 to 5 years of these units' lifetime [although the text does state the units will meet projected energy demands of the early 1990's (p. 1-14, section 1.019)]. Since these units have a 30-year operating life (p 1-18, section 1.025), the text should discuss how well these units will meet energy demands for the 30-year period, or at least a longer period than the 3 to 5 years discussed.

25 pp 1-15: The text (sections 1.020, 1.022) discusses the differences between the State's and Niagara Mohawk's energy demand projections (e.g., the State used a lower customer growth rate, lower growth rate in sales per customer, and included some hydroelectric capacity Niagara Mohawk did not), but does not account for the different data inputs. Since the State's analysis indicates that the proposed units will not be needed until 1988 and 1992, respectively (based on Niagara's needs alone), or until 1990 on a State-wide power pool basis, the reasons for the discrepencies between the State and Niagara Mohawk energy demand projections should be presented in more detail. As the text now stands, the reader must assume that Niagara Mohawk's projections are accurate, but cannot validate this assumption independently.

26 p. 1-17: Similarly, the text compares the Federal Energy Administration's (FEA) energy forecasts with its year-to-year projected increases and states that "The applicant's projections appear to coincide with the lower rates projected by the FEA. However, economic and demographic conditions in the applicant's service area are different from those on a national level and thus projections are not directly comparable" (section 1.022a). The degree to which these two energy forecasts can be compared should be stated more specifically. It is difficult to know whether results that are not "directly comparable" are comparable at all.

CHAPTER TWO: ENVIRONMENTAL SETTING WITHOUT THE PROJECT

27 pp 2-1, 2-136: The Pomfret site will take up 1054 acres (section 2.001). The Sheridan site will utilize only 986 acres (section 2.241), a difference of 68 acres. The text should discuss the reason for this difference.

CHAPTER THREE: RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS

28 pp 3-5, 3-7: The proposed generating station does not conform with local or regional land use plans at either Pomfret or Sheridan (sections 3.013,

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Corps Responses to U.S. Department of Energy Comments

24 Niagara Mohawk, under a separate provision of the Public Service Law, must prove the public need for the proposed facility, the consistency of the facility with long-range planning objectives for electric power supply in the State, and that the facility will serve the public interest, convenience and necessity. Such a demonstration is necessary in order for the applicant to receive a Certificate of Environmental Compatibility and Public Need, a necessary precondition to construction.

Consequently, the Lake Erie Generating Station units form an integral part of the long range generation plan in Niagara Mohawk's system and in New York State as a whole, on a threshold or initial need basis as of 1987 and 1989, and thereafter, on an ongoing basis throughout their useful life, in light of capacity retirements and annual load growth.

The econometric models used by both the Public Service Commission (PSC) and the applicant are complex models utilizing numerous data inputs. To incorporate a full detailed discussion of these inputs into the text would be beyond the scope of the EIS and we, therefore, attempted to summarize the major differences between the analyses. Additionally, inclusion of the data inputs would be meaningless without a detailed model description since the parameters used in the two models are not identical. All forecasts are probabilistic in nature and a degree of error or inaccuracy exists in any forecasting methodology, especially a forecast some nine to ten years in the future. Corps staff believes that both the applicant and the PSC have utilized current "state of the art" methodologies and that the predictions obtained should be used as guidelines to load planning not as absolute values.

25 Subsequent to the preparation of the Draft EIS, the applicant updated its long-term electric load forecast. The revised forecast is now slightly lower than that originally predicted by the PSC. The text of the Final EIS includes a discussion of the applicant's updated forecast (1.015, 1.019, 1.020). The PSC (1.021) is now in the process of reevaluating the need for the facility. A comparison of the applicant's revised forecast with the PSC original forecast is shown below:

	Energy Requirements (GWH)		Peak Demand (MW)	
	NMP	PSC	NMP	PSC
1980	33,973	34,700	5700	5800
1985	39,248	40,272	6640	6731
1990	45,372	46,758	7710	7815

28 3.017, 3.018). In both cases, the text states that, if certified by New York under Article VIII, these land use/zoning conflicts will be resolved. The process by which these zoning conflicts are resolved should be described, in particular emphasizing the potential impact of the changed zoning on local and regional land use plans.

CHAPTER FOUR: THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

1. Aquatic Ecology (Pomfret Site, Construction Impacts)

29 p 4-10: The text states that Lake Erie bottom sediment will be disrupted and benthic habitat altered; however, the environmental significance of these changes is not discussed in detail. The text states that zooplankton production may increase and phytoplankton productivity could increase, but no "significant impacts are projected beyond the immediate, short-term impacts" (section 4.021). The text should state the significance of zooplankton production and phytoplankton productivity on aquatic ecology.

30 p 4-12: Table 2-8, p. 2-34, already presented a chemical analysis of bottom sediment in Lake Erie at Pomfret. The discussion in Section IV (section 4.027 and Table 4-5) should refer back to Section II so that the reader can see that the two tables relate to the same issue. In addition, a reference to Section II would make the data presented there more relevant to the environmental impacts discussion. Similarly, with the Sheridan site (Table 4-25, p 4-96) the sediment analysis discussion should be cross-referenced with that in Section II (Table 2-40, p. 2-157).

31 p. 4-13: The text states that several of the 21 ponds on the Pomfret site will be altered by construction activities and that 6 ponds will be eliminated (section 4.026). However, the environmental impact of these changes is not discussed. The text should include a description of the impact of these changes.

2. Water Quality (Pomfret Site, Construction Impacts)

32 p. 4-17: Sanitary wastes will be discharged to an onsite creek, possibly increasing nutrient and organic loadings in the creek during extended dry weather, low stream flow periods, or when dilution from sedimentation basin water is a minimum (section 4.032). The text should state the significance

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Corps Response to U.S. Department of Energy Comments

25 The differences between the two are quite small, especially when one considers the long-term nature of the forecasts.

It may be reasonable to assume that the PSC will revise the figures shown above in light of the failure of predicted load growth to materialize in recent years.

26 The discussion contained in Section 1.022a has been expanded to include a comparison of New York State, Niagara Mohawk, and National Energy Forecasts, taking into consideration the variations in economic and demographic factors.

27 The reason that the Pomfret site encompasses some 68 more acres than the Sheridan site is that Pomfret site provides for disposal of fly ash and bottom ash from the existing 640 MW Dunkirk Generating Station in a common waste disposal area. This fact has been added to paragraph 2.001 of the EIS.

28 A description of the process by which zoning and land use conflicts are resolved in accordance with Article VIII of the Public Service Law has been added to Chapter Three of the EIS. Any rezoning which would occur is only applicable to those zoned areas within the plant boundaries. It is possible that site rezoning might occasion review of and revisions to local zoning classifications but such an activity is speculative and within the discretion and powers of the local governmental entities.

29 The sentence which states that bottom sediment will be disrupted and benthic habitat altered refers to dredging and the loss of habitat by placement of offshore structures. The detailed effects of this work are presented in paragraphs 4.020 through 4.023. This sentence has been modified to indicate the above. Additionally, we have added to paragraph 4.020 the ecological significance of phytoplankton, zooplankton, and benthic invertebrates and have indicated whether or not the expected impacts are significant (4.020 to 4.023).

32 of these increased loadings as well as the adjacent water bodies possibly affected. Again (sections 4.033 and 4.034), chemical wastes (oil, grease, paint, and solvents) may be released to natural waters onsite or to Lake Erie. Although the text states that the power stations will minimize the leakage of these wastes to water bodies, it does not go further to discuss the potential effects of these leaks on water quality.

33 p. 4-18: Liquid wastes may result from concrete batch plant operations at the site (section 4.036), and untreated process wastewaters and runoff could contain 2000-5000 mg/1 of suspended solids. The text states that the treated (settling basin) solids, when discharged, will not affect water quality significantly, since the ambient suspended solids concentration of these streams varies greatly. Earlier (section 4.027, p. 4-13), the text stated that ambient suspended solids concentrations onsite range from less than 1.0 mg/1 to greater than 200 mg/1. The text should state that wastewaters and runoff will be treated to a level within this 1-200 mg/1 range if compliance is intended.

3. Social and Economic Impacts (Pomfret Site, Construction Impacts)

34 p. 4-24: The text states that "during the workday when the construction workers are at the site, the support facilities and services required from the local communities are anticipated to be minimal" (section 4.059). However, Table 4-8 (p. 4-26) shows a peak construction force of 1947 persons in 1983 and 1927 persons in 1984. Support services for this many people over a 1½-year period likely will be more than "minimal." The impacts of this temporary but substantially increased demand should be addressed in more detail.

4. Air Quality and Use (Pomfret Site, Operation Impacts)

35 p. 4-41: All NO_2 levels should be shown in both parts per million (ppm) and $\mu g/m^3$ concentrations (section 4.100 gives only the $\mu g/m^3$ level; section 4.101 gives only the ppm level). In addition, the threshold levels of human irritation from NO_2 are not given in terms of duration, i.e., "effects occur around 10 to 40 ppm," but how long is the exposure period? The projected NO_2 emissions

Corps Response to U.S. Department of Energy Comments

30 Footnotes referring back to the appropriate Chapter Two tables have been added to Tables 4-5 and 4-25. Paragraphs 4.023 and 4.239 have been cross-referenced in accordance with the comment.

31 Paragraph 4.026 has been expanded to include the significance attributable to the loss of on-site ponds.

32 It has been determined that the municipal sewer system will be completed prior to the construction of the proposed Lake Erie Generating Station. As part of its SPDES permit compliance, Niagara Mohawk must tie into that system within thrity days of its availability. Therefore, there will be no sanitary waste discharges to streams. Paragraph 4.031 has been updated to include this information.

The proposed SPDES (402 Permit) Section IA limits the discharge of oil and grease in construction rainfall runoff to 15 mg/1. Compliance with these limitations will obviate adverse environmental impacts. Administrative controls and monitoring efforts will be designed to keep the actual discharges of these substances to a minimum. Potential effects of oil and grease on aquatic organisms have been added to Section 4.023. Possible water quality effects have also been added to the EIS (4.034).

33 Sedimentation basins will be designed for 24-hour retention of all water prior to discharge. The only time the total suspended solids (TSS) concentration in the basin effluent will exceed 50 mg/1 will be when the TSS levels in the streams are already carrying higher TSS levels. When the streams would have low values of TSS, 1-50 mg/1, resulting from light rainfall events, there would most probably be no discharge from the basins. Even if there was a discharge at these times, the basin effluent would be less than 50 mg/1. The maximum permissible suspended solids concentration from the basins is 380 mg/1. as specified in the draft 402 discharge permit. A discharge of greater than 380 mg/1 is not allowed, except when the 10 year, 24 hour storm runoff is exceeded.

35 from the powerplant and human irritation levels of NO_2 should be presented so that they can be compared easily.

36 p. 4-42: "Hydrocarbons were predicted to be released at a rate of 900 tons per year based on an estimated emission rate of 0.3 lbs of non-methane hydrocarbons per ton of coal and combustion of 6 million tons of coal per year" (section 4.102). This release rate is well above the 100 tons or more per year that defines a "major source" requiring emissions offsets. The text explains that a new factor of 0.01 lbs per ton "is expected to be implemented." This new factor would reduce the emissions to 30 tons per year, thus removing the facility from the major source category. The text should explain why this new factor is expected to be used.

37 pp. 4-42-43: Twenty-four hour and annual total suspended particulate (TSP) emissions from the proposed facility are presented for 1985, assuming both units are operating (sections 4.104, 4.108). However, unit 2 is not scheduled to operate until April, 1987 (p. 1-14, section 1.019). The text should explain why unit 2 TSP emissions are included in the 1985 concentration level.

38 p. 4-45: The State has challenged the applicant's prediction for fugitive dust emissions, indicating they could violate the annual non-deterioration standard of 19 $\mu g/m^3$ and the 24-hour standard of 37 $\mu g/m^3$. The text states that the State "did admit that their evaluation technique is highly conservative and uncertain" (section 4.115). This statement does not add credence to the applicant's projections of fugitive dust emissions and should be eliminated or rewritten to indicate how the State's technique is more conservative.

5. Water Quality and Use (Pomfret Site, Operation Impacts)

39 p. 4-50: The concentrations of sulfate and sodium discharges to Lake Erie will be greater than 10 percent of ambient levels. Whereas those under 10 percent "will have an insignificant effect on water quality" (section 4.134), these two parameters are "exceptions." The text should indicate the percentage increase over ambient levels of the sodium and sulfate discharges, as well as their impact on the water quality of Lake Erie in the vicinity of the discharge.

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Corps Response to U.S. Department of Energy Comment

34 The text on page 4-24 correctly states that support facilities and services required from the local communities are expected to be minimal during the work week when the construction workers are at the site. The document entitled "A Projection of Construction Worker Location Patterns and Impacts, Lake Erie Generating Station" incorporated a state-of-the art assessment of these anticipated impacts. This document was reviewed and analyzed by Corps staff and was utilized as baseline data during preparation of the draft EIS. The support facilities and services assessment depends, in large part, upon the percentage of the construction work force which will be hired from the regional labor force (local construction workers), and the resulting percentage of the work force which must immigrate into the region. Local construction workers are regarded as those workers within a 90 minute driving distance from the site(s). They are in sufficient proximity to the construction site so as to not require relocation.

At both the Sheridan and Pomfret sites in the peak construction years there will not be a large influx of immigrant construction workers. The regional work force will provide at least 80 percent of the total work force.

Local construction workers will commute primarily from the Buffalo area and about a quarter of the local construction work force, or about 500 workers, could be hired from Chautauqua County. Of approximately 490 immigrant construction workers, about 50 percent will locate inside Chautauqua County, mostly in towns close to the sites. In the case of Pomfret, this influx would occur in the Pomfret-Fredonia vicinity, in Portland, and Dunkirk. At Sheridan the influx of immigrant workers would take place in the Silver Creek vicinity. The analysis included representative services including hospitals, schools, public water supplies, law enforcements, public sewer systems, housing, and transportation facilities. Thus, while table 4-8 shows a peak construction work force approaching 2,000 persons, most of these workers are expected to commute and will require services mostly in the form of retail conveniences such as food items, gasoline, etc.

40 p. 4-51: Chlorine will be discharged at a maximum rate of 0.2 mg/l for a period not to exceed 2 hours per day (section 4.138). The surface concentration of chlorine in Lake Erie is approximately 0.008 mg/l. The text states that, because of the decay or conversion of free chlorine, the surface concentrations resulting from the discharge are likely to be less than 0.2 mg/l. The text should indicate the ambient concentration increase and its potential impacts.

6. Property Damage From Emissions (Pomfret Site, Operation Impacts)

41 p. 4-82: The text states that SO_2 emissions may limit the normal service life for building accessories such as gutters and downspouts as a result of corrosion (section 4.206). The normal service life of materials in the vicinity of the generating station will be limited only "where the annual average SO_2 concentration is greater than 24 µg/m^3." The text should go further and indicate where SO_2 levels will exceed this concentration in the vicinity of the generating station.

7. Air Quality and Use (Sheridan Site, Operation Impacts)

42 pp. 4-105-118: Many of the air quality impacts from the Sheridan site are lower than those from Pomfret. For example, the highest one-hour SO_2 level for Sheridan is 0.190 ppm (494 µg/m^3) (section 4.271), while that for Pomfret (p. 4-31, section 4.072) is 0.2265 ppm (588 µg/m^3). Similarly, the 3-hour and 24-hour SO_2 levels are lower for Sheridan. One-hour SO_2 emissions from the oil-fired auxiliary boiler are 0.045 ppm (117 µg/m^3) at Sheridan (section 4.291), while at Pomfret they are 0.062 ppm (163 µg/m^3) (p. 4-39, section 4.093). The text should explain why many of the air impacts expected from operations at Sheridan are lower than those at Pomfret (e.g., differences in meteorology).

43 p. 4-113: Again, section 4.299, hydrocarbon emissions first are calculated to be 900 tons per year and then 30 tons per year without adequate explanation for the difference (see comment for p. 4-42).

44 p. 4-115: 1985 emissions levels include both units (see comment for pp. 4-42-43).

Corps Response to U.S. Department of Energy Comments

35 Paragraph 4.101 has been updated to include more recent information on the threshold of human irritation (including exposure time) from exposure to NO_2. The information contained in the Draft EIS did not represent the most recent scientific evidence and has been deleted. In paragraph 4.100, 1.9 ug/m^3 has been equated to .001 ppm.

36 According to an October 31, 1977 EPA memo from Research Triangle Park, to EPA regional offices, the old emission factor, 0.3 lbs of non-methane hydrocarbons per ton of coal, "is inappropriate for continued use at the present time for several reasons. First, it is based on a very few data points. Secondly, it is based on total hydrocarbon measurement and, therefore, contains an unspecified methane fraction that would tend to bias it on the high side."

The memo further states, "We don't feel enough new data exists to justify a specific revision of AP-42. However, we believe that the current data base allows the conclusion that no new coal-fired power plant in the size range now being built or planned will produce more than 100 tons/year of NMVOC emissions." (non-methane volatile organic compounds)

Although the official policy did not use the value of 0.01 as predicted by EPA staff members, the result is the same in that the emissions are not predicted to cause coal-fired power plants to be classified as major NMVOC emission sources.

37 Although it is true that there will be only one unit operating during 1985, the two units will be operating together for many years except for the initial two-year span when Unit 2 is being constructed. Since the two unit total suspended particulate (TSP) values are higher than the one unit values, it was felt that, for the long term, the values presented give a more representative indication of the expected TSP levels with Units 1 and 2 operating.

38 Since the issuance of the draft EIS, the applicant and the staff of the Public Service Commission have resolved problems associated with possible violations of the non-deterioration standards for TSP. A berm will be constructed to a height of 45 feet along the NYS Thruway side of the Pomfret site to eliminate this potential. In areas where the berm is less than 45 feet in height, dense vegetation and plantings should be utilized. Corps staff has rewritten section 4.114 to indicate the differences between the two analysis and to advise that violations are no longer expected.

C. General Remarks

45 While this EIS is extremely long (650 pages single-spaced) and detailed, the environmental impacts section often does not discuss the impact of pollutants associated with the facility, but simply lists the pollutants expected. Thus the reader who is unfamiliar with the environmental impacts of certain pollutants or activities cannot determine the severity/benignity of the impacts associated with this action. The EIS should be revised to show the significance of the information presented.

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Corps Response to U.S. Department of Energy Comments

38 The sodium concentration prior to discharge is 6.9 times the ambient and the sulfate concentration is 9.1 times the ambient. Diffuser design studies have indicated that approximately 75 dilutions would be achieved by the time the 0.75°F isotherm is reached. By the time the 0.5°F isotherm is reached, encompassing an area of less than three acres, the plume concentration of both of these parameters will be less than ten percent above the ambient levels. The region of highest concentration is also the region of highest velocity, thus making it impossible for any fish to be exposed to the high concentrations for more than a few seconds. It is therefore concluded that because of the rapid mixing and the resultant small area affected by the discharge that there will be no significant adverse impact resulting from the plant discharge.

40 The State Pollutant Discharge Elimination System (SPDES) draft discharge permit requires that free available chlorine discharges be limited to 0.2 mg/l for a period not to exceed two hours per day per unit. To be sure that the time restriction is adhered to, the cooling tower blowdown will pass through a holdup pond having four hours detention time. With this additional control measure, no free available chlorine is predicted to be discharged.

The SPDES permit further requires that a program be developed to determine the minimum amount of chlorine needed to achieve condenser cleaning for all periods of the year. This will minimize the discharge of all chlorine compounds. Paragraphs 1.065 and 4.138 have been modified to reflect this fact.

41 The maximum annual average SO_2 increment due to operation of the proposed facility is 3.7 ug/m^3 which is below the threshold of 24 ug/m^3. There are areas of relatively high concentrations of SO_2 in the area now. The highest value is 35 ug/m^3, however, the Lake Erie Generating Station contribution at that receptor is only 0.26 ug/m^3. It can, therefore, be concluded that the proposed facility will not significantly exacerbate corrosion problems in the vicinity of the site. The highest annual average concentrations were monitored at the Chapin Road Station (Sheridan). The major problem associated with SO_2 damage to property in the region is not the proposed facility itself but rather the ambient concentrations in certain areas.

Corps Response to U.S. Department of Energy Comments

42 The reason for the higher ground level concentrations occurring at Pomfret lies with the topography in the vicinity of the two sites. There is an inland ridge running along the shore of Lake Erie. As one proceeds from Buffalo toward Erie, PA, the ridge gets closer to the shore of the lake. Since the Pomfret site is in an area which is closer to Erie, PA, than is the Sheridan site, it is closer to the inland ridge. Under the proper meteorological conditions, high wind speeds and a shallow mixing depth, the plume impacts on the inland ridge. Since the Pomfret site is closer to the ridge, the plume has less distance to disperse before it impacts on the ridge than is the case when the plume from the Sheridan site would impact on the ridge.

43 See response No. 36.

44 See response No. 37.

45 Atmospheric emissions and chemical discharges from the proposed facility, as indicated in the draft EIS, are expected to meet Federal and State standards and thus no significant impacts on air quality or water quality are anticipated. Probable and postulated effects of air emissions on terrestrial ecology and public health are contained in paragraphs 4-147 through 4.164 and paragraph 4.200, respectively. No significant impacts on aquatic biota are expected since the chemical constituents of the discharge are basically concentrated lake water and ambient concentrations are reached after a relatively rapid mixing time within a small area of the lake. In the case of many pollutants, the present state of the art does not allow for accurate determinations of the severity or benignity of long term exposure. Staff has modified Chapter Four of the EIS to include some additional information pertaining to known effects of certain pollutants and has clarified compliance with standards when applicable to this extent, the following paragraphs have been revised: 4,020, 4.022, 4.023, 4.027, 4.031, 4.033a, 4.091, 4.101, 4.114, 4.138, 4.152a, 4.157, 4.160, 4.161, 4.200, and 4.201.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333
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April 10, 1978

Colonel Daniel D. Ludwig
District Engineer
U.S. Army Engineer District
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

We are responding to the Draft Environmental Impact Statement entitled, "Permit Application by Niagara Mohawk Power Corporation, Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York," on behalf of the Public Health Service.

Our review of this statement indicates that this project is unlikely to cause any significant vector problems, and we have no further comments to offer on subsequent developments.

We appreciate the opportunity to have reviewed this statement.

Sincerely yours,

William H. Foege, M.D.
Assistant Surgeon General
Director

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
107 DELAWARE AVE., STATLER BLDG., SUITE 800
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April 27, 1978

IN REPLY REFER TO:
2.2CH/RM

Daniel D. Ludwig
Colonel
Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Subject: Draft Environmental Statement, Niagara Mohawk Power Corp., Lake Erie Generating Station, Pomfret and Sheridan, New York

In response to your letter of March 6, 1978, the following are comments concerning subject project.

48 In considering alternatives and the potential environmental impacts of this project, close coordination with affected local communities should be maintained, particularly for those units of Government implementing community development and housing programs.

The proposed undertaking should be planned in full coordination with area-wide comprehensive planning for the area.

Sincerely,

for James Patterson
Frank D. Cerabone
Area Director

Corps Response to U.S. Department of Housing & Urban Development

48 Throughout the permit processing period and development of the Environmental Impact Statement, the Corps has actively solicited and utilized input from those units of government implementing community development and housing programs. The Corps intends to continue coordination efforts up to the point a decision is made as to whether or not the Department of the Army permit should be issued. Additionally, the New York State Article VIII proceedings take into account local and area-wide comprehensive planning prior to any certification. Pursuant to Article VIII of the Public Service Law, an application review and hearing process has been conducted before the New York State Board on Electric Generation Siting and the Environment, which review process is prefatory to state approval of the proposed facility. John R. Luensman, the Director of Planning and Development for Chautauqua County has actively participated in the hearing process as a party to the proceedings, representing Chautauqua County and the local governments of Chautauqua County. Chautauqua County and local municipal governments were awarded some $21,000 plus a fund posted by the applicant to fund municipal participation. Consequently, applicant coordination with Chautauqua County and local municipalities in the consideration of alternatives, environmental impacts and area-wide comprehensive planning has also been accomplished throughout the proposed project. The applicant intends to continue such coordination.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

ER 78/214

APR 28 1978

Daniel D. Ludwig, PE
Colonel, Corps of Engineers
U.S. Department of Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Thank you for your letter of March 6, 1978, transmitting copies of the U.S. Army Corps of Engineers' draft environmental impact statement for the proposed coal-fired Lake Erie Generating Station, Chautauqua County, New York.

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

Fish and Wildlife Coordination

We find that the draft statement provides an adequate description and discussion of existing fish and wildlife resources and potential project impacts on these resources.

47 We note that project implementation will require Federal permits issued pursuant to Section 10 of the 1899 River and Harbor Act, as amended, and Section 404 of the Federal Water Pollution Control Act, as amended. Our comments on this environmental statement do not preclude additional and separate evaluation and comments by Fish and Wildlife Service on more detailed project information on such forthcoming permits in accordance with the Fish and Wildlife Coordination Act, as amended. However, based on our knowledge of the aquatic resources involved in the project area, the Service does not, at this time, anticipate objecting to the issuance of the needed permits.

Corps Response to U.S. Department of the Interior Comments

47 The U.S. Fish and Wildlife Service is advised that paragraphs 1.042 through 1.050, 1.054 through 1.060, and 1.183 describe the work being considered under Department of the Army permit applications No. 76-472-25 (Pomfret) and 76-472-26 (Sheridan). In response to the Corps 6 April 1977 public notices relating to this work, the Service declined comment until completion of the NEPA statement. The only project change which has occurred since the 6 April 1977 public notices is that the intake port centerlines have been raised from 6 feet above the lake bottom to 13.5 feet above the lake bottom in order to reduce entrainment of fish eggs and larvae. The U.S. Fish and Wildlife Service is invited to submit comments on these permit applications after review of the Final EIS.

48 This comment is accurate in stating that the project proposal does not, at this time, directly impact on Indian Trust lands. At present, the Stolle Road segment is only a preliminary proposal not a final route, having been interposed in the application to allow conceptual review of prospective transmission routings. When proposed, the actual transmission line routing and alternatives will be the subject of State of New York Public Service Commission review and approval, pursuant to Article VII of the Public Service Law of the State of New York. Conceptual plans indicate that transmission line segments will not cross the Cattaraugus Reservation.

The major transportation arteries in the region passing through the Cattaraugus Reservation: The New York State Thruway, New York Route 5 and U.S. Route 20 will experience increased traffic as the result of construction workers commuting to work. Since the construction force will approximate 2,000 workers, it is anticipated that employment opportunities would be available to the skilled craftsmen of the Cattaraugus Reservation. Some of the construction workers migrating to the Pomfret-Sheridan site area may desire to locate in the northern Chautauqua County and southern Erie County area which contains the Cattaraugus Reservation. Those areas are within easy commuting distance of either site. Should housing or rental property be available on the Cattaraugus Reservation, construction personnel may so locate. Power plant siting at Sheridan is not expected to adversely affect Indian Trust lands.

Indian Lands

48 At the present time, the project proposal does not directly impact upon Indian trust lands. However, as discussed in the draft statement on page 1-69, the Lake Erie to Stolle Road transmission segment is proposed to be routed south and west of the Cattaraugus Indian Reservation. In addition, the alternate Sheridan site is about 10 miles from the reservation.

We suggest that the final statement should provide consideration of possible impacts on the Indian people of the Cattaraugus Reservation from both the generating station site at Sheridan and the Stolle Road transmission segment.

Groundwater

49 We believe that the final statement should consider the typical composition of the blowdown as discussed on page 1-54 of the draft statement. The residual chlorine concentration to be expected should be given along with an assessment of the impacts on groundwater from the dissolved and/or suspended constituents of the blowdown. The assessment should include an analysis of the potential for the production of organic chemical contaminants as a result of the possible escape of residual chlorine into groundwater.

Cultural Resources

50 The draft statement indicates that the Dubert House and Frost Farm at the proposed Pomfret project site have the potential to be listed on the National Register of Historic Places. Also, the potential exists for listing the Reed House and Schoolhouse No. 3 at the alternate Sheridan site. The probable adverse effects that could occur to these potential historic sites depends upon selection of the project site and any enlargement of the project area (for handling alternative coals). Since these inventoried properties are eligible and are within the area of impact of the proposed project, we believe that the Corps is obligated to request the necessary National Register eligibility determinations for the above potential sites under the requirements of E.O. 11593 and procedures in 36 CFR 800.4(a) and (b), 800.8, and the Preamble to 36 CFR 63. We strongly recommend that the Corps should proceed now to request eligibility determinations for these properties from the Chief, Office of Archaeology and Historic Preservation, Heritage Conservation and Recreation Service, Washington, D. C.

Corps Response to U.S. Department of Interior Comments

49 Typical cooling tower blowdown is merely Lake Erie water with three times the concentration of solid constituents resulting from the evaporation process. As such, there is nothing contained in the blowdown which would be a threat to ground water quality.

Chlorine addition to keep condenser surfaces clean will be limited to the minimum amount possible as required by the State Pollutant Discharge Elimination System (SPDES) permit. The actual release from the tower basin to the holding pond will be less than 0.2 mg/l of free available chlorine, and will be limited to about two hours per day per unit. During those seasons of the year when any chlorine will be needed, it is planned to apply a chlorine dose for approximately fifteen minutes during each 8 hour operating shift. Since the holdup pond has a retention time of four hours, the entire volume of the pond will be chlorine free and available for dilution when the current dose is applied.

Although the pond is classified as unlined, it will have been used as a sedimentation pond during the entire construction phase. During that time, it is expected that a significant layer of particles will have settled on the bottom of the pond and, in effect, will constitute a reasonably effective liner.

The net result is that there will be minimal potential seepage from the pond, and that the chlorine concentration will be very low even before decay occurs.

The applicant is required to comply with New York State Water Quality Standards, parts 700-704, Title 6, New York State Codes, Rules, and Regulations (NYCRR). Part 703 (6 NYCRR 703) is entitled Ground Water Classification and Standards and covers wastes which could have an effect on ground water quality. The applicant is required to comply with Part 703 which is an effluent standard applicable to any leachate or other discharge onto or into the ground. Therefore, any discharges, at the point that they contact the earth, must have effluent characteristics consistent with Part 703.

It is, therefore, concluded that no measurable transport of chlorine or other substances into the groundwater will be allowed and, thus, no adverse impact on the groundwater.

51 While we agree with the State Historic Preservation Officer's acceptance of the archeological work to date as stated on page 4-21 of the draft statement, we believe in keeping with technical assistance provided by the National Park Service (see letter of June 28, 1977, p. E-10) that the following language should be used as a stipulation in the Corps' permit:

> Material collected from permittee's sponsored archeological surveys or mitigation activities will be subjected to appropriate professional analyses. The results of such analyses will be included in reports to be prepared on the surveys or mitigation activities. The material collected during the field investigations and copies of all archeological data, results of analyses, and reports deriving from these excavations will be deposited in a suitable public repository and possession of the material and accompanying documents will be transferred to the repository. Copies of all reports prepared under permittee's sponsorship will also be filed with the New York State Archeologist and the New York State Department of Historic Preservation.

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

Sincerely,

Larry E. Meierotto
Deputy Assistant SECRETARY

Corps Response to U.S. Department of Interior Comments

50 On 23 June 1978, the Corps submitted requests for determinations of eligibility to the Keeper of the National Register. The Corps, along with the request, transmitted the appropriate documentation on the Reed House, former Sheridan School District No. 3 Schoolhouse, the Dubert House, G. Frost Farm, and Preston Dedrick Farm. The Keeper of the National Register, by letter dated 20 September 1978, advised that all five properties have been determined eligible for inclusion in the National Register. Prior to any approval of Department of the Army permits, the Corps will insure that the requirements of Section 106 of the National Historic Preservation Act of 1966 are met and the remaining steps of Section 800 of the Advisory Council on Historic Preservation Procedures (36 CFR 800), are completed. Correspondence concerning this matter is contained in Appendix E. Additionally, sections of Chapter 2 and 4 pertaining to cultural resources have been updated to include the above information.

51 Department of the Army regulatory jurisdiction over the proposed Lake Erie Generating Station is restricted to the construction of offshore structures and dredging in Lake Erie. Department of the Army permits can be conditioned to respond to effects (primary effects) which will occur directly as a result of the issuance of a permit. The resultant development of upland property will create secondary effects such as impacts on archeological resources. Although secondary effects are part of the overall public interest review, the District Engineer has no jurisdiction over these areas and it would be inappropriate to condition the permit with respect to these areas. In addition, the applicant has already entered into agreements with the appropriate state agencies which will insure the cultural resources. The applicant has advised us in writing that the referenced stipulation is "acceptable and akin to a stipulation executed in the New York State siting hearings." Corps staff believes that, if necessary the wording conveyed in this comment could be the subject of a Memorandum of Understanding rather than a permit condition which cannot reasonably be enforced.

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

EASTERN REGION
FEDERAL BUILDING
JOHN F. KENNEDY INTERNATIONAL AIRPORT
JAMAICA, NEW YORK 11430

March 14, 1978

Colonel Daniel D. Ludwig, PE
Corps of Engineers, District Engineer
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

We have reviewed the Draft Environmental Statement entitled, "Permit Application by Niagara Mohawk Power Corporation Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York", and have no comments to offer.

Sincerely

Walter D. Kies

WALTER D. KIES
Chief, Planning Staff

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (oan)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 293-3992

16502
Ser 229
17 April 1978

From: Commander, Ninth Coast Guard District
To: District Engineer, Buffalo District, U. S. Corps of Engineers

Subj: Draft Environmental Statement for the Niagara Mohawk Power Corporations Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York; Comments on

Ref: (a) NCBCO-S dated 6 March 1978

52 1. The Coast Guard will prescribe aids for the protection of marine navigation under Title 33 of the Code of Federal Regulations §66.01-35. Actual marking requirements for the offshore structures will be in accordance with the specifications for marking deep water ports as set forth in Part 149, Subpart E, §149.701 through §149.799 of Title 33 of the Code of Federal Regulations.

53 2. A controlled fog signal with an operational range of about 2 miles will be required. Since sound signals are a source of noise pollution, the statement should include data on the affects this aid will have on the local environment.

54 3. The shoals just north of the Pomfret site are a potential hazard to vessels approaching or departing the offshore facility.

55 4. Under paragraph 1.046, item 3, it appears that conveyor system should be changed to communications system.

H. H. KOTHE
By direction

Corps Response to U.S. Department of Transportation - U.S. Coast Guard

52, 53, 54 Paragraphs 1.048 and 4.144 have been updated to reflect the presence of potentially hazardous shoals about one mile northeast of the proposed facility at Pomfret and to cite the appropriate Coast Guard regulations and recommendations applicable to the proposed facility. The Corps has been advised of the following resolution concerning the issues raised in comments 52, 53, and 54: While the U.S. Coast Guard does not consider the proposed unloading facility to be a deepwater port as defined in 33 CFR 148.3, the actual marking requirements will be in accordance with the specifications for marking deepwater ports as set forth in part 149, subpart E, section 149.701 through 149.799 of Title 33 of the Code of Federal Regulations. Thus, these regulations will be used as a "guideline" for prescribing aids for the protection of marine navigation. The Ninth District Coast Guard Commander has discretion as to the type, if any, and operational characteristics of the fog signal necessary for the protection of both commercial and pleasure vessels during periods of low visibility. This signal is solely to warn water craft of the existence of the facility not shoals.

The offshore unloading facility is proposed to be located approximately 2.3 statute miles (Pomfret) or 2.9 statute miles (Sheridan) from the commercial shipping lanes and, at Pomfret, in an area approximately one mile southwest of existing shoals. The U.S. Coast Guard recommends that the applicant may wish to mark this area with warning buoys for the protection of large coal carrying vessels that will use the proposed facility.

52, 53, 54 Although commercial vessels have radar and navigation charts and would already be avoiding the general area because of the shoals, the warning buoys would provide additional protection. The practical function of an audible fog signal would be for the protection of small pleasure craft. Small pleasure craft are very maneuverable to the point that a far-reaching fog signal is unnecessary. Therefore, an initial noise impact analysis would be conducted based on using a signal with a one-half mile effective range, which signal would be operated whenever the visibility is less than one mile. The fog signal would sound two seconds out of 20 seconds unless otherwise authorized by the District Commander of the Coast Guard.

Corps Response to U.S. Department of Transportation - U.S. Coast Guard Comments

Climatological data from the Buffalo airport for the months of April 1977 - December 1977 show that on portions of twenty-five days the visibility was less than one mile. It was assumed that there would be no navigation during January-March. Of these, eleven days have instances of restricted visibility between 10 P.M. and 7 A.M., a time when the fog signal would be of greatest annoyance to local residents. It is also significant that only two of the eleven nighttime occurrences were during the June-August period when the summer vacation community would be residing in the Van Buren Point area, the area of closest proximity to the offshore facility at Pomfret.

A noise analysis predicts that a one-half mile effective range fog
signal with an operating frequency of 300 Hz would produce a sound
52 pressure level of 59 dB at the shoreline, a distance of 4500 feet
from the source. That noise level would be a source of annoyance
53 especially when it occurred during the nighttime (eleven times
during the year). The Coast Guard has indicated that it is
54 possible to muffle the sound emanating from the signal in selected
directions and thereby mitigate the noise impact on residents
should it prove unreasonably annoying in its operations. The
Coast Guard has used this technique to reduce noise complaints
resulting from certain existing fog signals. Due to the concern
for marine safety and the limited number, and timing of expected
fogging occurrences necessitating operation of the signal, the
applicant agreed to perform a noise impact analysis, assuming a
fog signal with a half mile effective range, which signal would be
operated whenever the visibility diminished to less than one mile
and thereafter the Coast Guard would consider mitigative action if
the operation of the fog signal were producing unacceptable noise
impacts.

Item 3, paragraph 1.046 in the Draft EIS contained a typographical
55 error. The phrase "conveyor system" should have read "conveyor
monitoring system." This has been corrected in the Final EIS.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
New York Division Office
Leo W. O'Brien Federal Building
Clinton Avenue and North Pearl Street
Albany, New York 12207

April 27, 1978

IN REPLY REFER TO

HD-NY

Colonel Daniel D. Ludwig
District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

Re: Draft Environmental Impact Statement
Power Corp. - Proposed Lake Erie
Generating Station

We have completed our review of the subject DEIS as requested in your March 6, 1978 memorandum and have no comment on this proposed action.

Sincerely yours,

Victor E. Taylor
Division Administrator

UNITED STATES OF AMERICA
GENERAL SERVICES ADMINISTRATION
Public Buildings Service
Washington, DC 20405

APR 6 1978

Colonel Daniel D. Ludwig, PE
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The General Services Administration has reviewed the draft environmental impact statement for the Proposed Lake Erie Generating Station, Pomfret and Sheridan, New York, and have no substantive comments to make.

Thank you for the opportunity to comment.

Sincerely,

ANDREW E. KAUDERS
Environmental Affairs Division

Keep Freedom in Your Future With U.S. Savings Bonds

NATIONAL ENDOWMENT FOR THE ARTS

WASHINGTON D.C. 20506

A Federal agency advised by the National Council on the Arts

May 12, 1978

Mr. Daniel D. Ludwig, P.E.
Department of the Army
Buffalo District Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Mr. Ludwig:

Thank you for sending me the Draft Environmental Impact Statement for the proposed Lake Erie Generating Station, Pomfret and Sheridan, New York for my review. I am pleased to see that aesthetics has been taken into account in the evaluation of this plant. As an architect and advocate for the design professions, I feel that aesthetics should be a major factor in the decision regarding this proposal, on a par with more traditionally defined economic factors.

As you undoubtedly know, the American Institute of Architects (AIA) has recently issued guidelines on Energy and the Built Environment. The AIA estimates that the built environment consumes at least one-third of the nation's energy. Thus public and private policy toward the use of our non-renewable natural resources, such as coal, oil, gas, and uranium, is of critical concern to the design professions. The way we approach the question of energy production and consumption has broad ramifications at all levels of the construction industry. It is important, then, that our plans concerning new facilities for energy production be made in the context of current and future policies regarding the most effective utilization of our natural resources.

56 While the EIS under consideration enumerates in detail the possible effects of the proposed construction on the natural environment, it treats the aesthetic factor in a limited and piecemeal fashion, ignoring the larger economic context within which the final decision must be made. For example, the EIS predicts future energy consumption by extrapolating from past growth rates. Furthermore, it assumes that the utility and the other public agencies involved will continue to play a relatively passive role in guiding future energy consumption patterns. Both of these assumptions are open to question at a time

Corps Response to National Endowment of the Arts Comment

56 Corps staff concurs with the statement which indicates that energy conservation in buildings as well as active conservation programs and policies will reduce future energy consumption possibly reducing need for new capacity at some point in the future. The section in Chapter Six entitled "Conservation and Demand Reduction" has been expanded to include the effects of energy efficient buildings and active conservation measures and policies. While the Draft EIS used past growth rates as a basis for future projections, the projected demands were not simple extrapolations. Both the applicant's and Public Service Commission's projections incorporate numerous variables including conservation effects. Although the models do not specifically relate to energy efficiency in buildings, they do include future reductions in energy consumption based on energy conservation. This fact was inadvertently omitted in the discussion contained in the Draft EIS. Additionally, Corps staff has analyzed the projected energy requirements and finds that they are in close proximity to those projected by the Federal Energy Administration's conservation case (para. 1.022a). The energy requirements projected by the applicant in paragraph 1.022a of the Draft EIS compute to an average compound growth rate of 3.3 percent from 1978 to 1990. The applicant has revised these forecasts and is now projecting an average compound growth rate of 2.8 percent (1978-1991). This lowered forecast is partially due to conservation effects in the applicant's service area. The lowered forecast results in a two year slippage in the scheduled capacity addition but does not necessarily eliminate the need for future capacity. While it is possible, and highly probable, that active conservation programs and building efficiencies will eventually reduce the need for new capacity nationwide, there may also be substantial shortfalls in achieving theoretical potentials because of economic, political, and technological performance considerations. In addition, conservation measures which may reduce consumption but not peak demand will have little impact on the need for maximum capacity.

58 when there is a strong commitment on the part of the federal government to energy conservation, and to the development of alternative energy sources. The AIA estimates that a consistent policy of energy conservation in buildings would save the equivalent of 12.5 million barrels of petroleum per day by 1990, or roughly as much as the projected 1990 production capacity of any one of the prime energy systems (see attachment). These savings are sizeable and deserve the same amount of attention as the production of greater quantities of energy. Much of the energy used to heat and cool buildings is lost through inefficiency. Yet this waste could be reduced by the renovation of older buildings and the use of new design techniques in future construction. A consistent policy of energy conservation would promote communication and cooperation between those in the field of energy production and the members of the design professions. This approach would reduce the need for new facilities and would further the awareness of energy costs within the design professions.

57 Another area where the aesthetic factor has been too narrowly defined concerns alternative forms of energy production. The development of good designs for alternative energy sources is a challenging field, one which will create new jobs throughout the construction industry and related fields. Architects, planners, and construction workers are in the process of learning the new skills necessary for the production of alternative energy sources which will alleviate some of the projected need for new facilities.

Along these same lines, the AIA recommends decentralizing energy production and placing smaller production units as close as possible to the local demand area. Various alternative sources of energy discussed in Chapter VI of the EIS, such as solar power, wind energy, and solid waste combustion, would be consistent with this recommendation of decentralization. The advantage of such an approach would be the elimination of energy loss through long-distance transmission.

58 If the final decision is to build the plant, rather than to pursue the alternative measures outlined above, then I recommend making the design of the plant as compatible as possible with the agricultural region within which it would be located. This could be done by adequate landscaping and by doing all possible to avoid high structures which would intrude on the visual environment of the local inhabitants of the region. From the aesthetic point of view, two smaller cooling towers, 50 or 75 feet high, would be preferable by far to one 500 foot tower. If necessary, fans could be incorporated into this design to cut down on possible fogging on the nearby interstate highway.

Corps Response to National Endowment of the Arts Comment

57 The section in Chapter Six pertaining to alternative power sources has been expanded to include decentralized systems. While future developments in alternative energy sources will alleviate some of the projected need for new facilities, these sources must be available and technologically feasible to be considered as viable alternatives to the proposed station. After reviewing both future potential sources and conventional sources, Corps staff concurs with the applicant and the New York State Department of Public Service that nuclear power is the only viable alternative capable of providing 1700 MW of power within the timeframe required. The selection of coal would provide a better fuel diversity (generation mix) for the applicant and the power pool, and would be consistent with current national energy policy which stresses the increasing development of the nation's abundant coal resources. Although natural gas and oil are commercially proven alternatives, they are not considered preferable to coal in light of national energy policy and the uncertainty about availability of these fuels in quantities sufficient for life-time operation of the plant. Potential energy sources, energy conversion processes, and decentralized systems are not likely to be in sufficient use at the time of scheduled operation to reduce the energy needs required from the proposed facility.

58 Aesthetics is one of the important factors to be considered when evaluating the possible effects of the proposed Lake Erie Generating Station construction on the natural environment, as are air quality, meteorology, aquatic ecology, noise, geology, seismology, land use, terrestrial ecology, water quality, water quantity, cost, need and engineering design. Aesthetic considerations, in instances, have governed the applicant's choice as to design proposed. Facilities components (e.g., the ash disposal area) have been located to take advantage of the naturally existing stands of trees. A coal conveyor tunnel was proposed rather than a trestle-conveyor because of aesthectic considerations. Likewise, the facility was located approximately one mile inland so that the facility would be recessed from the Lake Erie Shoreline, once again for aesthetic considerations.

The applicant has detailed landscaping plans for the primary site at Pomfret. In developing this plan consideration was given to the following areas: aesthetics (visual screening, aesthetic and visual interest), terrestrial ecology (preservation and creating of habitat, use of suitable plant species), soil conservation and erosion control, construction practicability (schedule, optimization of existing vegetation), and cost.

Ludwig - 3 - May 12, 1978

If you have any questions about these comments, please don't hesitate to call.

Sincerely,

Roy F. Knight, AIA
Acting Director
Architecture,
Planning, and Design

REGULATORY FUNCTIONS
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Corps Response to National Endowment for the Arts Comments

The plants used in these planting plans were selected for use at this site because of their value to wildlife for food and shelter, which was determined by consultations with terrestrial ecologists, and for their aesthetic interest and character. They are of proven hardiness in the ecological zone of the Pomfret site, and many of them are native to that area.

The applicant will attempt to preserve as much of the natural habitat as possible within the constraints set forth in a major construction project. A particular joint effort was made to place the ash disposal area so that they interfered with natural stands of vegetation as little as possible. It is the intention of the applicant to plant the peripheral areas, which will not be affected by construction operations, as soon as possible after State certification has been obtained. These areas include groups of planting and grass areas along Van Buren Road, around the rear of the drive-in-theater, along the frontage of State Route 5, the evergreen plantings along Lake Road, and the plantings around the electrical switchyard.

58 The basic design for the windbreak-berm between the ash disposal area and the NYS Thruway is that of a 25-45 foot high earthern embankment with evergreen trees placed so as to maintain an effective height of 45 feet.

In addition to this basic design, which will serve both as a windbreak and as a screen for aesthetic purposes, plantings of woody vegetation and ornamentals will be established on the slopes and at the toes of the slopes to further enchance the looks of this area and to provide seasonal color and some habitat and refuge for wildlife in the region.

The plantings for the slopes are of three broad categories: needle evergreen plants, deciduous plants - both shade trees and ornamental (flowering) plants and shrubs. The applicant has also formulated a landscape plan for use in the event that flue gas desulfurization is required.

Corps Response to National Endowment for the Arts Comments

58 The selection of a single natural draft cooling tower was the end result of an Alternative Cooling System Study, undertaken by the applicant. The following systems were evaluated: single natural draft tower, two natural draft towers, rectangular mechanical draft towers, round mechanical draft towers, plume abatement towers, wet-dry mechanical draft towers, spray canal cooling pond, and dry cooling towers and two once-through systems: one with a shoreline discharge, and the second with a submerged offshore diffuser discharge. A comparison of the results of the several cooling systems shows that the single, natural draft tower is most economical, with the round mechanical draft tower being slightly more costly. The principal advantage of the natural draft tower was the absence of tower-induced fogging and icing on the New York State Thruway, State highways and the railroad adjoining the site. The advantage of the round mechanical draft towers was that they mitigate the visual impact associated with the hyperbolic tower. However, the Thruway safety, noise and economics factors override the aesthetic advantage of the mechanical draft towers. The natural draft tower was selected as the cooling system for the proposed facility.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Peter A. A. Berle,
Commissioner

April 28, 1978

Colonel Daniel D. Ludwig
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig: Ref: NCBCO-S
76-472-25 &
76-472-26

In reply to your letter of 6 March 1978, I am enclosing copies of staff memoranda commenting on the "DRAFT ENVIRONMENTAL IMPACT STATEMENT, Permit Application by Niagara Mohawk...etc." The draft was reviewed by about a dozen staff members, almost all of whom indicated concurrence. The few comments we do offer contain details of some importance.

Sincerely yours,

Kernan W. Davis
LEGS Project Coordinator
Office of Environmental Analysis

KWD:pd
Enc.

cc: P.J.Mergee
J.M.Leonard
T. Ross
A. Geisendorfer

15 (12/73)

New York State Department of Environmental Conservation

Duplicate

MEMORANDUM

TO: Kernan Davis
FROM: Allan Geisendorfer
SUBJECT: Corps Draft EIS - LEGS

DATE: April 5, 1978

The draft EIS for LEGS is generally consistent with the comments and recommendations of the Public Service Commission and this Department concerning water quality. Following are minor comments on the document.

59 1. Page 1-47, Section 1.082. The document indicates that the plant island construction runoff pond will be utilized during operation as the coal pile runoff settling pond, and that the remaining ponds will be covered and revegetated. It is also possible that an additional construction runoff pond will also be utilized during operation as the cooling tower blowdown reservoir.

2. Page 4-13, Section 4.027. Water Quality-Runoff

60 a) The document states that "The effluent is expected to exceed 380 mg/L TSS during the ten year, 24 hour storm event." (from the construction runoff ponds). The errata to the Section 402 permit states that the maximum permissable suspended solids concentration from the construction runoff ponds is 380 mg/L. Therefore, the quoted discharge would not be allowed under this permit, except when 10 year, 24 hour storm runoff is exceeded.

61 b) The document states that, "the discharge from the control basins to these streams is expected to have a minor impact on their water quality." It is unclear whether this statement refers to untreated or treated construction runoff. It should apply to the treated construction runoff. Untreated runoff would have a major impact on water quality. By meeting the limitations of the Section 402 discharge permit, the discharge of construction runoff should have a minor impact on water quality.

3. Page 4-18, Section 4.037. The document states that, "Some of the streams where appropriate, will be channeled through culverts under proposed structures such as fly ash and bottom ash ponds."

62 a) The applicant has indicated that no streams will be relocated beneath disposal areas.

63 b) Fly ash and bottom ash is no longer proposed to be disposed of in ponds.

Corps Response to New York State Department of Environmental Conservation (NYSDEC) Comments

59 This comment accurately reflects a commitment made by the applicant during the Article VIII hearings that one of the large construction phase sedimentation ponds would be used as a chlorine decay pond during plant operation to minimize chlorine discharges to Lake Erie. Section 1.082 has been updated in accordance with this comment.

60 The discharge quoted in section 4.027 of the Draft EIS was in error. The effluent is expected to exceed 380 mg/l TSS only when the storm event is greater than the one in ten years 24-hour storm. The pond effluent will always be at or below 380 mg/l for all storms up to and including the design event. Section 4.027 has been modified accordingly and the maximum permissible suspended solids concentration has been cited in the text.

61 The statement in question refers to treated runoff that complies with effluent limitations. This has been clarified in the Final EIS.

62 Figure 1-12 shows the applicant's proposed stream modifications at Pomfret. The streams will be rerouted around proposed structures via channels rather than under them as indicated in paragraph 4.037. Only at existing railroads and roads will the streams be channeled underneath via culvert. Paragraph 4.037 was in error and has been updated. Paragraph 4.037 appears as 4.036 in this FEIS.

63 Although the applicant originally proposed a wet disposal system utilizing ponds, this comment is correct in stating that a wet disposal system is no longer proposed. The word "ponds" has been deleted from Section 4.037 of the EIS. Should an FGD system be installed, stabilized FGD scrubber sludge, in combination with excess dry fly ash and dewatered bottom ash, will be deposed in a layered land disposal pile.

Keenan

18 (12/73)

New York State Department of Environmental Conservation

Duplicate

MEMORANDUM

TO: Mr. K. Davis - Environmental Analysis
FROM: Mr. Ross - Division of Air Resources TR
SUBJECT: Lake Erie Generating Station Draft Environmental Impact Statement Pomfret (V), Chautauqua (Co)
DATE: March 29, 1978

I have reviewed the DEIS for LEGS and have the following comments:

64 1. The old New York State Ambient Air Quality Standards were used. We no longer have a one hour SO_2 standard and a standard has to be exceeded more than once per year to constitute a violation. Also, the 84% (or 16%) standard no longer applies to total suspended particulates. Table 2-10 on page 2-45 should be revised accordingly.

65 2. Paragraph 4-191 on page 4-74 and paragraph 4.347 on page 4-130 refer to noise regulations which were never promulgated. DEC has no noise regulations at present, and regulations being proposed are not referred to in the DEIS. To our knowledge, the State does not, and never has had a requirement that shifts in the sound level be less than 5 dB(A) at existing noise sensitive points outside the site boundary.

3. Table 1-9 on page 1-72 should read;

66 (c) opacity must be less than 40% for any time period. Opacity must be less than 20% for 3 or more minutes in any continuous 60 minute period. *

67 4. The auxiliary boiler description on page 1-21 gives its capacity as 250 million BTU's per hour. No discussion of this size unit requiring "Best Available Control Technology" under the Prevention of Significant Deterioration requirements of the Clean Air Act is included.

68 5. A proposed draft of New Source Performance Standards is being circulated internally at EPA which places stricter limits on all emissions. This should be considered in the final EIS.

69 6. Paragraph 4.045, page 4-20 should read "monitored test burns witnessed by PSC and DEC," not conducted.

70 7. Paragraph 4.044, page 4-20 states that 2300 cars are anticipated during peak construction employment but that impacts will be less than allowable State standards.

* Federal New Source Performance Standards require opacity to not be greater than 20 percent except that a maximum of 40 percent opacity is acceptable for not more than two minutes in any hour.

Corps Response to New York State Department of Environmental Conservation (NYSDEC) Comments

64 Table 2-10 has been replaced by a new Table 2-10 which shows the New York State Ambient Air Quality Standards in effect as of March 1977.

65 The Department of Environmental Conservation is correct in stating that the referenced regulations are not operative. Sections 4.191 and 4.347 have been modified to state that the NYS DEC has no noise regulations at present, but that noise regulations are being proposed. The 5 dB(a) shift mentioned in the referenced sections pertain to the Public Service Commission's Rules of Procedure 16 NYCRR 75, "Environmental Noise." Part 75, requires that sound level data be reported with a class interval of five decibels or less (16 NYCRR 75.2 (b)(1)) and that the area of noise impact be determined as that area in which the plant noise would probably cause an ambient sound level increase of five decibels or more (16 NYCRR 75.1 (a)(5).

66 The footnotes in Table 1-8 and 1-9 which relate to opacity have been modified in accordance with this comment.

67 The auxiliary boiler was conceptually sized at 250 million BTU/hr. If the final version of the regulations implementing the 1977 Clean Air Act Amendments uses the 250 million BTU/hr. figure as a break point in deciding whether or not special equipment must be added to meet the regulations, the applicant could use a smaller auxiliary boiler. Such a decision by the applicant would consider the economics of adding special equipment as opposed to the cost of changing other facets of the conceptual design to allow for a smaller auxiliary boiler.

The auxiliary boiler is currently sized based on the assumption that it will supply steam to run the turbine driven boiler feed pumps during startup conditions. The steam requirements could be reduced by adding a separate motor drive feed pump for startup. This change would reduce the boiler capacity to a range of 50-100 million BTU/hr. to primarily supply building heat.

70 First, if 2300 cars are assumed to leave by two exits, State and Federal one-hour carbon monoxide standards may be violated. Second, 2300 cars is a worst case number used by the applicant's consultant. The applicant does not intend to build parking capacity in excess of 2000 cars and will not violate standards.

71 9. In paragraph 4.068 page 4-30 it should not be inferred that a 700 foot stack will tend to minimise the release of pollutants into the atmosphere. Tall stacks disperse pollutants, but do not minimise their release.

TR/sb

Corps Response to NYSDEC Comments

68 On 19 September 1978, revised New Source Performance Standards (NSPS) appeared in the Federal Register. The regulations set forth revised NSPS for SO_2, particulates and NO_x. The applicant had previously assessed the impact of the expected Clean Air Act Amendments of 1977 on the Lake Erie Generating Station design in its "Fuel Supply Study - 1977 Update." That study details the general design changes which would be necessary to comply with revised NSPS, and was used in preparing Appendix C of the draft EIS.

The U.S. Environmental Protection Agency will determine the applicability and consequences of the revised NSPS in regard to the proposed *Lake Erie Generating Station*. The applicant must comply with the revised NSPS, if determined applicable, unless this applicability is successfully challenged in the courts.

With respect to NSPS for SO_2, EPA has advanced SO_2 emission control alternatives, with a final decision on the ultimate standard for SO_2 to remain undecided for the next few months. In the interim EPA has directed that the alternative of 85% reduction in potential SO_2 emissions, with a maximum allowable emission of 520 ng/J (1.2 lbs/MBtu) heat input, and down to a maximum control level of 86 ng/J (0.20 lbs/MBtu) heat input, be utilized. This interim NSPS for SO_2 may or may not be the standard chosen in final rulemaking.

69 The word "conducted" has been changed to "witnessed" in the Final EIS. Paragraph 4.045 appears as 4.044 in the FEIS.

70 Niagara Mohawk will build a two exit parking lot with a capacity of less than 2000 cars. Consequently, State and Federal one-hour carbon monoxide standards will not be violated.

Although the maximum labor force at the proposed facility is conservatively estimated to approximate 2300 workers, it is anticipated that the maximum daily number of construction worker vehicles would be 1720 vehicles or less. Consequently, the statement on page 4-20, paragraph 4.044 has been changed to read: "During peak construction employment, 1720 cars are anticipated." Paragraph 4.044 is 4.043 in this Final EIS.
(Also, refer to Niagara Mohawk Comment No. 83).

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Peter A. A. Berle,
Commissioner

4 May 1978

Colonel Daniel D. Ludwig
Department of the Army
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Ref: NCBCO-S
76-472-25 & 76-472-26

Dear Colonel Ludwig:

Enclosed is the second page of Allan Geisendorfer's Memo to me, dated 5 April 1978, in which he expressed some comments on the "DRAFT ENVIRONMENTAL IMPACT STATEMENT, Permit Application by Niagara Mohawk..." Through some oversight it was missing from my files and from my 28 April letter to you, for which I apologize.

Sincerely,

Kernan W. Davis
LEGS Project Coordinator
Office of Environmental Analysis

KWD:pd
cc: P.J. Merges
J.M. Leonard
T. Ross
A. Geisendorfer

Corps Response to New York State Department of Environmental Conservation (NYSDEC) Comments

71 We concur. The appropriate changes have been made in the Final EIS.

72 The subject paragraphs have been modified to state that a mixing zone has *not yet been approved by the Siting Board. The Final EIS* also indicates the mixing zone established in the draft SPDES permit.

73 Section 4.138 has been entirely rewritten to reflect the reduction of chlorine concentrations which will occur in the cooling tower blowdown reservoir.

72 4. Page 4-51, Section 4.136 and Page 4-120, Section 4.326. The document states that the State has not established a mixing zone. Staff testimony establishes a mixing zone in the draft permit as "a radius of 300 feet from the point of discharge or equivalent area". This mixing zone is applicable to chemical parameters.

73 5. Page 4-51, Section 4.138. In addition to the decay of chlorine in the discharge pipe, chlorine concentrations will also be reduced, prior to discharge, because plant design includes a cooling tower blowdown reservoir which will provide four hours detention for cooling tower blowdown.

ANG:ks

New York State Department of Environmental Conservation
584 Delaware Avenue, Buffalo, New York 14202
842-5828

Peter A. A. Berle,
Commissioner

March 20, 1978

Col. Daniel D. Ludwig, P.E.
District Engineer
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Re: DEIS for Lake Erie Generating Station
Chautauqua County, New York

Dear Colonel Ludwig:

The Region 9 Office of the Department of Environmental Conservation is reviewing the indicated document and will provide comments to our Albany office. Those comments will be screened for compatibility with the position of the department at hearings before the New York State Public Service Commission and forwarded to you.

Thank you for the opportunity to comment on the matter.

Respectfully,

Ralph Manna, Jr.
Ralph Manna, Jr.
Regional Permit Administrator
Office of Environmental Analysis
Region 9

RMJ:mjr
cc: Kernan Davis
Lawrence Nelson
(Attn: K. Taft), w/enclosure

STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE

EMPIRE STATE PLAZA, ALBANY 12223

PUBLIC SERVICE COMMISSION

May 9, 1978

Colonel Daniel D. Ludwig
District Engineer
Buffalo District Corps of Engineers
Department of the Army
1776 Niagara Street
Buffalo, New York 14207

Dear Colonel Ludwig:

The Staff of the Public Service Commission has reviewed the Draft Environmental Impact Statement (DEIS) on the permit application filed by Niagara Mohawk Power Corporation (Niagara Mohawk or the applicant) for construction of the facilities at its proposed Lake Erie Generating Station (LEGS) to be located near Lake Erie in the vicinity of Dunkirk, New York. We believe the Corps has produced a comprehensive and useful document which deals with the applicant's primary proposal, as well as the several alternative designs and technologies, which have been considered.

Our comments on the draft DEIS are attached. As you know, an extensive record has been compiled during the course of the State's proceeding under Article VIII of the Public Service Law.

Our Initial Brief in the Article VIII proceeding, filed May 2, 1978, contains a complete assessment of Staff's position on the many issues in this proceeding, and we recommend that you consider it in your review of comments on the DEIS.

Very truly yours,

Richard C. King

RICHARD C. KING
Staff Siting Counsel

Attachment

Public Service Commission Staff's Comments on Draft Environmental Impact Statement Prepared by U.S. Army Corps of Engineers, Buffalo District, on Niagara Mohawk's Lake Erie Generating Station Permit Application

74

1) Our first comment relates to the need issue (DEIS, §§ 1.019 - 1.022a). Niagara Mohawk's projections of energy growth have been revised downward several times since the time of its original application. In the most recent 149-b Report, filed with the Public Service Commission on April 1, 1978, Niagara Mohawk has announced a two-year delay in its proposed in-service dates of the LEGS units, to 1987 and 1989, respectively. In addition, its new load forecast and analysis of available capacity show that the company, without LEGS, first experiences a reserve deficiency, in an amount of only 74 MW, in winter, 1988. It is unclear now when the LEGS facility fits logically in the electric power system of Niagara Mohawk and the State. In view of these facts, and in recognition of the customarily assumed period of five years for construction of a coal-fired unit, we have recommended that the Siting Board refrain, for the time being, from making a finding on need and direct the applicant to update and justify its need presentation.

You should also be aware that the State Board on

Corps Response to NYS Department of Public Service Comments

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Sections 1.010 through 1.022a have been updated to include the projections contained in the 1978 149-b report. The original figures presented in the Draft EIS have been designated in the Final EIS as "1976 projections." Sections of the EIS pertaining to NYS Department of Public Service analyses have been modified to reflect the uncertainties surrounding the subject of need as conveyed in this comment.

Corps staff concurs that in-service date requirements have been complicated by recent trends such as the failure of actual demand to meet projected demand and the lowering of forecasts in the 1978 149-b report. However, while we believe it is possible that some slippage may occur in the scheduling of the proposed units, the appropriate forum for this decision is the New York State Article VIII proceedings. Additionally, the Board on Electric Generation Siting and the Environment will not certify the facility unless the need, along with other constraints, is justified. In regard to ultimate need for capacity additions, exclusive of actual in-service date requirements, Corps staff believes that two important factors should be given considerable weight. The first involves the substitution of electricity for scarce fuels. Consumers substitution of electrical energy for fuels such as oil or gas may take several years to show substantial impact on the need for power. We believe that this substitution may accelerate because of the uncertainty of oil and natural gas supplies. Additionally, the price of electricity because of increasing use of coal and nuclear fuels for power generation, is expected to become lower relative to the price of oil and gas. Should these factors increase the rate of conversion to electric heat, there could be a substantial offset in the current trend of reduced energy requirements. Secondly, and related to the above factor, is the high dependence on oil and gas by the New York State utilities. The New York Power Pool generation mix (page 380, 1978 149-b report) in 1978 includes 46.8 percent oil-fired and 12.0 percent gas turbine generation. Although this is projected to decrease to 30.9 percent oil and 9.3 percent gas the decrease is premised on nuclear and coal-fired additions including the Lake Erie Generating Station.

74 Electric Generation Siting and the Environment in the SNUPPS proceeding* has recently reopened the proceeding in order to reexamine the applicants' (Central Hudson Gas & Electric Corporation, New York State Electric & Gas Corporation, Rochester Gas and Electric Corporation and Niagara Mohawk) projections of need in light of the dramatic declines in projected load growth shown in the new 149-b reports**. In particular, the Board stated that Niagara Mohawk should discuss its need for Sterling capacity vis-a-vis its pending application for the LEGS facilities within essentially the same time frame (Mimeo, at 11). A copy of the Board's Order is enclosed.

Accordingly, we believe that a persuasive need case for LEGS has yet to be established and we have recommended that the applicant supplement its need case in the future.

75 2) Our second comment relates to the imposition of design features required to control stack emissions and the effect on other facility features (§ 6.101 et seq.). Based on recent interpretations of the Clean Air Act Amendments of 1977 by the Environmental Protection Agency and recent correspondence sent by EPA Region II to the

* Case 80005, Application to Construct a 1150 MW Standardized Nuclear Power Plant, in the Town of Sterling, Cayuga County, New York.

** Order Granting In Part And Denying In Part Petitions For Rehearing, issued May 4, 1978.

Corps Response to NYS Department of Public Service Comments

74 In regard to the need for Sterling as opposed to the proposed Lake Erie units, the ultimate resolution and appropriate forum for such decisions lies with the siting Board. The applicant has stated that based on its 1978 149b projections, the need for the proposed Unit #1 was set forth as winter of 1987, following the completion and initial commercial operation of the Sterling nuclear facility.

Sterling nuclear facility was previously targeted for service in summer 1986. However, the Sterling nuclear facility, as set forth in the Sterling Report, has been scheduled for assured operation in the summer of 1988. Niagara Mohawk believes that it is consistent with its previous position to construct and place proposed Unit #1 in commercial operation following the completion of Sterling. Thus, based upon the above, the proposed Lake Erie Generating Station is now proposed for assured commercial operation in the winter 1989. The applicant feels that the timing is consistent with the schedule developed in the 1978 149b report wherein the target date for Unit #1 was set at winter 1987 and the slipped (or assured commercial operation) date was set at winter 1989. The applicant has also stated that the 1989 date could well move forward in time if for any reason Sterling is discontinued or postponed beyond the 1987-1989 window.

75 The comment raises several issues centered around the possible installation of a flue gas desulfurization system (FGD). Corps staff anticipated the probable requirement for an FGD system and therefore addressed the issue in detail in the Draft EIS. The actual mandate to install such a system is the ultimate responsibility of the U.S. Environmental Protection Agency. We are in agreement that should FGD installation be required a careful balancing between eastern and western coal would be necessary. In view of the different opinions between the applicant and the Department of Public Service as to which fuel will be the most economical if an SO_2 removal system is ultimately required, the applicant intends to solicit proposals from both eastern and western coal suppliers in order to establish the "marketplace" economics of eastern vs. western coal. The final resolution of the eastern vs. western coal supplier issue will probably come in 1980-1981. The Final EIS reflects the views of the Department of Public Service regarding the choice of coal based on economics (sec. 6.159). Corps staff concurs that western coal would probably result in fewer adverse environmental effects.

applicant, it appears that a flue gas desulfurization system (FGD) will be required at LEGS. These matters are more fully discussed at pp. 124-128 and Appendices VII-IX of our Initial Brief in the Article VIII proceeding.

The probable requirement of an FGD system raises questions on the applicant's preference for western coal. Our analysis showed that use of eastern coal would result in lower costs but that western coal would probably produce fewer adverse environmental effects.

Since the choice between eastern and western coal involves a careful balancing between economic and
75 environmental impacts, and in view of declining load growth, ultimate fuel selection will probably be postponed. In addition, the extent to which the applicant will be required to control emissions under new EPA regulations, which are expected to be issued shortly, is unclear and this uncertainty also affects fuel choice. Of course, the selection of eastern or western coal affects the mode of delivery - eastern coal would be delivered to the site by rail and the offshore unloading facility would not be constructed.

In view of these uncertainties, the specific design of the LEGS facility will be affected by future events. It is recommended that any permit issued by the Corps include sufficient flexibility to modify its terms

Corps Response to NYS Department of Public Service Comments

The draft EIS discussed impacts associated with a velocity cap intake which would be installed if the applicant utilized eastern coal with an FGD system (sec. 6.117-6.120). The major differences in construction impacts associated with possible Department of the Army authorization of a velocity cap intake vs. the offshore proposal are those resulting from additional dredging and dredged material disposal. While Department of the Army permits are flexible to a certain extent the degree of modification allowable under 33 Code of Federal Regulations, Chapter II, part 325.7 depends on many considerations which at the present time cannot be
75 assessed. If the final design is certified for an FGD System with eastern coal and a velocity cap intake, the applicant will be required to submit the modified plans to the District Engineer. At that time, a decision regarding disposition of the subject permit would be made.

75 and conditions, as needed.

76 3) At pp. 1-32 of the DEIS, it is indicated that the maximum intake velocity will be 0.3 feet per second. On the other hand, the intake velocity proposed by the PSC-DEC Staff and incorporated in the Section 402 discharge permit proposed for either the Pomfret or Sheridan sites is 0.25 feet per second. This figure was chosen so that if two additional units are installed at the site at some future date the velocity would not exceed 0.5 fps, the intake velocity generally considered to be desirable to minimize entrainment of juvenile and adult fish. We concur in the desirability of planning ahead to assure that the intake velocity will be kept at or below 0.5 feet per second in the event of a future enlargement of the facilities and therefore concurred in the present intake velocity requirement of 0.25 feet per second.

While we have no objection to a 0.3 fps velocity for two-unit operation, we believe that the 0.25 fps intake velocity should be provided for in order to avoid imposing expensive changes in the intake structure or accepting an intake velocity exceeding 0.5 feet per second in the event two additional generating units are later proposed for the site selected.

It is our understanding that Niagara Mohawk is

Corps Response to NYS Department of Public Service Comments

76 The applicant has agreed to design the intake ports with a slightly greater area than the three 7' by 7' ports indicated in paragraph 1.054 of the Draft EIS so that the maximum velocity would be 0.25 fps. Section 1.054 has been modified accordingly.

willing to design its intake to assure that the 0.25 fps intake velocity provided in the draft SPDES discharge permit will not be exceeded. The modification would have little, if any, effect upon the environmental impact of the two units for which the present request has been made
76 but would be expected to reduce the effect of the intake on aquatic organisms if the third and fourth units are subsequently constructed at the site. The cost of maintaining a 0.25 fps intake velocity at this time would be quite modest compared to the cost of altering the intake if additional units are installed.

4) The reduction of pH (to 5.0 for about 8 hours once weekly) to control excessive calcium carbonate deposit on condenser tubes, as set forth in § 1.064 (pp. 1-42), could result in discharges below the pH range specified in
77 our draft Section 402 permit. To avoid violation of our permit condition, neutralization of the discharge before it leaves the detention basin will be necessary.

In addition, Niagara Mohawk should also consider application of chlorine for bacterial growth control concurrent with its reduction of pH for calcium carbonate descaling. Application of chlorine concurrently with the lowered pH would reduce the amount of chlorine required for effective control of biological growth (<u>See</u>, for example, Fair, Gordon M., and Geyer, John C., <u>Water Supply</u>

Corps Response to NYS Department of Public Service Comments

77 The degree and duration of pH suppression will be controlled and coordinated with chlorine application to ensure that the actual discharge from the blowdown retention pond will comply with the SPDES pH limits of 6.0 to 9.0. Paragraph 1.064 of the Final EIS clarifies this point.

77 <u>and Waste-Water Disposal</u>, John Wiley & Sons, New York (1956), pp. 793ff.), and, by destruction of biological growth on the surfaces of the condenser tubes (and cooling tower fill), would probably increase the effectiveness of the reduced pH in controlling calcium carbonate deposit build-up.

By combining pH control and chlorine application, the amount of chlorine required for bacterial control and the concentration of chlorine oxidation products discharged would be reduced.

78 5) On pp. 4-51, the DEIS states that "New York State does not have a general mixing zone but a mixing zone is described on a site-specific basis and has not been established for the proposed facility." While this statement is ostensibly correct, it should be noted that our draft discharge permit specifies a surface mixing zone of six acres (an area equivalent to a circle with a radius of 300 feet). This recommendation is unopposed in the State Article VIII proceeding and, upon Siting Board approval and issuance of a final Section 402 permit, the mixing will have been established. The area enclosed by the 0.5°F isotherm is expected to be significantly smaller than our proposed mixing zone. Thus, we agree that the discharge will not violate the applicable temperature criteria under any expected operating conditions.

Corps Response to NYS Department of Public Service Comments

78 Paragraph 4.136 has been modified to state that a mixing zone has not yet been approved by the Siting Board. The paragraph now specifies the proposed mixing zone and the fact that the 0.5°F isotherm is expected to be significantly smaller than this zone.

79 6) Because of the continuous warm water condition attendant to the closed cycle cooling system, we expect that greater efforts will be required to control biological growth in the condenser tubes to maintain the design level of heat transfer than would be required for a once-through cooling system. We anticipate that this will necessitate more frequent applications of chlorine.

The control of free available chlorine to an average of 0.2 mg/l for a period not to exceed two hours per day is required by Federal effluent limitations which must be applied by the State (40 C.F.R. §423.15). While achievement of this limitation should be possible with the direct discharge of cooling tower blowdown, as indicated in the DEIS (p. 4-51), the lower reaction rate of chloramines appears likely to result in the discharge of total residual chlorine for longer than the allowed two hours.

While it is not expected that the very short periods of low concentrations of chloramines which will result after rapid mixing through the high velocity discharge ports would have a serious effect upon aquatic life entrained in the discharge plume, Niagara Mohawk has proposed to pass the cooling tower blowdown through a pond, providing about four hours of detention prior to discharge. With this addition we would expect no discharge of either free available or total

Corps Response to NYS Department of Public Service Comments

79 Please refer to revised paragraph 4.138 and the response to NYSDEC comment No. 73 which advise that direct discharge is no longer proposed by the applicant. Cooling tower blowdown will now flow to a holdup reservoir providing about four hours detention time prior to discharge to Lake Erie.

7B residual chlorine. Therefore we believe this proposal will comply with federal and state chlorine effluent limitations.

7) Section B.035 displays an apparent inconsistency in that the subsurface detention time is said to be less than 11 seconds and yet §B.036 states that "the exit axis velocity diminishes to one foot per second within a vertical rise of six feet above the jet exit under average climatic
8B conditions and within seven feet under extreme climatic conditions." The vertical discharge velocity vector would be less than one foot per second from a depth of 18 feet to the surface (or, from a depth of 17 feet to the surface under extreme climatic conditions), indicating that the detention time should exceed that figure plus the short time required to reach eight feet off the bottom (or, nine feet for extreme climatic conditions). It would appear that these two figures should be reviewed and at least one of them corrected.

Corps Response to NYS Department of Public Service Comments

8B The "11 seconds" appearing in paragraph B-035 is a typographical error and should be 71 seconds. Paragraph B-035 has been corrected.

New York State Grape Production
Research Fund, Inc.
Thomas G. Davenport - President
% National Grape Co-operative
Association, Inc.
2 South Portage Street
Westfield, New York 14787

May 9, 1978

District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Dear Sir:

This is to provide comments of the New York State Grape Production Research Fund, Inc. (Fund) regarding the Corps of Engineers draft Environmental Impact Statement relating to the proposed Niagara Mohawk Power Corporation Lake Erie Generating Station (LEGS).

The Fund is an industry organization made up of New York State grape processors and growers. The objectives of the Fund are to promote research on the growing, harvesting and processing of commercial grape varieties in the State, and the dissemination of the information gained from these efforts.

Because of our concern over the potential hazard of increased air pollution and the possible effects on grape vines and grape crops from LEGS, the Fund formally intervened in the Public Service Commission Article VIII hearings regarding licensing of LEGS. We have presented testimony in the proceedings concerning: (1) the current impact of the grape industry on the economy of New York State, (2) the economic consequences of increased air pollution to the grape industry and (3) the need to establish a research program to study the effects of air pollutants on grape vines. The Fund does not oppose the location or construction of LEGS in the areas proposed. We do, however, know that there is now proven damage to grape vines and grape crops due to air pollutants. Further diminution in the air quality of this area due to LEGS or other sources could seriously endanger an important agricultural industry, the grape industry of New York State.

Our comments regarding the Draft LEGS Environmental Impact Statement are, as follows:

1. We concur with the statements on pages 4-81 (4.203 and 4.204) and 4-134 (4.354), with respect to the major problem which is the long-term chronic and synergistic effects of LEGS emissions on grape productivity; that there is the need for sufficient studies to determine what these long term chronic and synergistic effects might be; that both pre and post constructional monitoring of air pollutants must be made; and, that engi-

neering changes may be necessary to insure that adverse impacts on the grape industry do not occur.

81 2. One area not addressed by the Corps in the Draft Statement is the possible frost-freeze damaging effects to vineyards as a result of the solid waste berm. It is our understanding the berm will be approximately forty feet in height and about one mile in length. Dr. Nelson J. Shaulis, leading viticulturist in New York State with Cornell University, has testified in the Public Service Commission Article VIII proceedings that the berm would impede the drainage of cold air generated at the site directly south of the berm to a distance of several thousand feet. This could result in serious freeze damaging effects to grape vines under radiation type frosts. We believe that the berm can be constructed so as to reduce the hazard from such frosts.

A copy of our Brief in the LEGS Public Service Commission Article VIII proceedings referred to above is enclosed for your information and use in this matter.

Very truly yours,

The New York State Grape
Production Research Fund, Inc.

By: Thomas G. Davenport
President

Corps Response to NYS Grape Production Research Fund, Inc. Comments

81 A discussion of possible frost-freeze damage effects to vineyards as a result of the solid waste berm has been added to section 4.203. The berm itself is necessary to insure that the total suspended particulate level does not exceed Prevention of Significant Deterioration increments. Thus, the degree of berm alteration necessary to reduce the hazard from such frosts may not be available. The U.S. Environmental Protection Agency would have to evaluate and approve any proposed changes which would affect TSP levels.

NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

May 11, 1978

Colonel Daniel D. Ludwig
District Engineer
U.S. Army Engineer District, Buffalo
1776 Niagara Street
Buffalo, New York 14207

Re: Notice of Availability
Draft Environmental Impact Statement
Department of the Army Permit
Application No. 76-472-25 & 76-472-26
Proposed Niagara Mohawk Power Corporation, Lake Erie Generating Station, Pomfret and Sheridan, New York

Dear Colonel Ludwig:

The Corps of Engineers has requested comments on the above-referenced Draft Environmental Impact Statement (DEIS). Niagara Mohawk Power Corporation is pleased to transmit to you their technical comments on the DEIS. The compilation and translation of materials submitted to the Corps into the DEIS has been accurate and the Corps is to be complimented on their thoroughness in compiling a factually correct document. However, a small number of specific comments are in order to correct some inaccuracies contained in the Draft EIS. To that end, the following technical comments are tendered:

82 <u>Page 1-18, paragraph 1.023:</u> Tabulated acreages on the Pomfret site in this paragraph indicate that 33 acres of wetlands occur on the site. In response to interrogatory 9 provided to the Corps October 19, 1977, it was stated that the wetlands no longer exist as a result of airport landing strip improvements. This change should be reflected in DEIS.

83 <u>Page 1-45, paragraph 1.078:</u> Construction worker traffic impact presented in <u>Traffic Impact Study Engineering Analysis</u> December 1976 and offered in testimony (Tr. 2305-2306) by John May of Wallace Champagne Associates indicates that a rate of 1.5 persons per vehicle was assumed in their analysis. This would be equivalent, therefore, to 1721 cars, a number substantially less than the 2310 cars which was presented in this paragraph. The lower number which represents the more realistic basis for impact assessment should be utilized in paragraph

Corps Response to Niagara Mohawk Power Corporation Comments

82 Field investigations by Corps staff biologists confirm the absence of wetlands in the subject area. Reference to 33 acres of wetland at Pomfret has been deleted from paragraph 1.023.

83 Staff has reviewed the subject document and initial brief of the Public Service Commission staff which indicate construction of a car parking lot with a capacity of less than 2,000 cars and with a minimum of two exits. This parking lot is expected to serve approximately 1,720 cars during peak construction employment. The appropriate paragraphs have been revised.

Colonel Daniel D. Ludwig
Page Two
May 11, 1978

83 1.078 and in paragraph 4.044 on page 4-20 in which it is stated that 2300 cars are anticipated.

84 <u>Page 1-86, Table 1-15</u>: This table should be revised to read exactly like Table 4-28 on page 4-119 of the DEIS. The discrepancy results from inadvertant omission of the recalculated Table P80.4-1 in Modification 4.

85 <u>Page 1-94, Table 1-19</u>: The status of the Article VIII Certification Process should state that Public Hearings pursuant to certification have been completed.

86 <u>Page 2-1, paragraph 2.001</u>: The latitude of the main plant buildings should be changed from 42° 26' 26" N to 42° 26' 6" N.

87 <u>Page 2-12, paragraph 2.027</u>: This section should include information provided to the Corps on January 6, 1978 concerning the Preston Dedrick Farm which appears eligible for inclusion to the National Register of Historic Places. In addition paragraph 4.046 and 4.047 on page 4-20 should reference the Preston Dedrick Farm and impact on it as described in the same interrogatory response.

88 <u>Page 2-112, paragraph 2.172</u>: In the tabulation of acreages, 110 acres of northern hardwood forest compress 12 percent of the "on-site" acreages of natural vegetation, rather than 8 percent as shown. This change should also be made in paragraph 2.175. It should be noted also that the listed acreages refer only to natural vegetation and therefore the statements in paragraph 2.173-2.180 should be amended to read that percentages are based on "<u>natural vegetation</u>" and not of the total study area acreage.

89 <u>Page 4-22, paragraph 4.053</u>: Berry Road will be rerouted, rather than closed to public use.

90 <u>Page 4-62, paragraph 4.173</u>: The last statement in this paragraph is not quite accurate. It should be indicated that while epibenthic sled data were singled out from the Article VIII phase (1974-1975 data) because of proximity to the proposed intake and because the data produced <u>conservatively</u> high estimates of losses for entrainment. However, 1975-1976 data were examined for a variety of contour and depth conditions ultimately leading to selection of mid-depth for the location of intake ports.

91 <u>Page 4-74, paragraph 4.191</u>: On line 5 of this paragraph, "100 Hertz" should be changed to "1000 Hertz".

92 <u>Page 4-91, paragraph 4.227</u>: On line 4, "Table 4-24" should be changed to "Table 4-23".

Corps Response to Niagara Mohawk Power Corporation Comments

84 Table 1-15 has been modified accordingly.

85 Reference to Article VIII proceedings has been updated. We note that additional hearings on need have been scheduled.

86 The referenced typographical error has been corrected.

87 A discussion of the Preston Dedrick Farm has been added to the appropriate cultural resource sections of the Final EIS.

88 The referenced changes have been made in the Final EIS.

89 The rerouting rather than closing of Berry Road is indicated in the Final EIS.

90 Paragraph 4.173 has been clarified to indicate how the two-year ichthyoplankton study was utilized in selecting the intake location.

91 The typographical error has been corrected.

92 The table reference in paragraph 4.227 has been changed to read "Table 4-23."

Colonel Daniel D. Ludwig
Page Three
May 11, 1978

93 __Page 4-82 to 4-84, paragraphs 4.207 to 4.210:__ This section contains a discussion of probable impact of the project on the western coal mining region. Although no precise area in Montana or Wyoming has been identified by NMPC or the Corps for the supply of low-sulfur coal, generalizations are made, especially with respect to socio-economics that imply specific and extreme locational impacts. Further, these descriptions cover the widest range of impacts occurring to a pristine and unique area and dramatic changes to life styles and socio-economics of a yet to be identified community. The broad generalizations of impact described in paragraph 4.209 should be prefaced by a statement indicating that the severity of impacts are not necessarily associated with the LEGS project.

Should you have any questions with respect to these comments, please inform me.

Very truly yours,

Michael W. Murphy

Michael W. Murphy
System Attorney

MWM:pst

93 Corps staff realizes that the applicant has not contracted with a specific supplier of coal and thus the extent of impact and the mining area itself is not known. We agree that those impacts discussed in the Draft EIS are rather severe and would usually occur in pristine areas where a new mine could create a boom town economy. The Final EIS clarifies the fact that the discussion on coal mining impacts is generic and that the severity of these impacts should not necessarily be attributed to the proposed project.

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GLOSSARY

A-weighted Decibel - a measure of sound, similar to the decibel, which takes into account the insensitivity of the human ear to high and low sound frequencies.

Aerobic Digester - a facility employing oxygen-using microscopic organisms to digest solid wastes.

Ambient Turbulent Diffusion Coefficient - an empirical mathematical expression for the change in volume of a jet as it flows away from the discharge.

Anion Exchange - the removal of undesired negative ions from a fluid and replacement, on a one for one basis, with other negative ions (such as OH^- in water); exchange is accomplished by passing the fluid through a solid, but permeable, chemical substance (resin) containing the replacement ions and having a relatively strong affinity for the ions to be removed.

GLOSSARY (Cont'd)

Biovolume - the amount of space occupied by living matter within a standard reference volume.

BOD_5 - five-day biological oxygen demand; the decrease in oxygen demand in a sample of water kept in a darkened state at a reference temperature for a period of 5 days.

Breakpoint Reaction - a chemical reaction in which chloramines are broken down to form chloride ion, nitrogen gas, nitrates, and some free chlorine residual; the reaction will occur if the ratio of total chlorine residual to nitrogen exceeds a certain value and can reduce chloramine concentrations.

Cation Exchange - process which deals with positive ions, but is otherwise identical to anion exchange (listed previously).

Cenospheres - bead-like structures formed by the combustion of coal which may contain air pockets and, thereby, float.

GLOSSARY (Cont'd)

Chloramines - any nitrogen-based compound (particularly ammonia - based compounds) in which a hydrogen atom has been replaced by a chlorine atom.

Credits - bookkeeping adjustments to actual generating capacity to account for the influence of exceptionally reliable units (such as hydroelectric plants) on the need for reserves; presence of a 1000 MW hydroelectric plant may entitle a system normally needing 18% reserves to a credit of 180 MW, in effect eliminating the need for a reserve for that plant.

Critical Pollutant - the pollutant requiring the most dilution to achieve ambient air quality standards for a given stack and averaging time.

Critical Year of Meteorological Record - as used herein, the calendar year 1963; the year chosen from available data which produced the most significant air quality impact.

GLOSSARY (Cont'd)

Decibel - a logarithmically scaled measure of sound intensity; 50 decibels is 10 times louder than 40 decibels; 60 decibels is 10 louder than 50 decibels, or 100 times louder than 40 decibels.

Demineralizer Regenerant - a liquid chemical substance which, when passed through an ion exchange resin, supplies new replacement ions to the resin and absorbs the undersirable ions which have collected in the resin, thereby restoring the resin for further use.

Density Deficiency Flux - the product of the difference between ambient density and jet density and the rate of flow across any cross-section of the discharge jet perpendicular to the jet axis.

Devonian - period from approximately 400 to 350 millions years ago.

Drag Coefficient - the empirically determined ratio of the drag force exerted by a fluid on a body (or stream of fluid) in relative motion with the fluid to the product of the dynamic pressure of the free stream (defined as the kinetic energy per unit volume) and the affected area of the body (or stream of fluid).

Eddy Diffusion - the mixing of chemicals in the atmosphere by atmospheric turbulence.

Electrogasdynamics - a technology for generating electric current by the interaction of an electric field with an electrically insulating, or nonconducting fluid carrying charged particles or ions.

Electrostatic Precipitator - a device used primarily for the removal of particulate matter from stack emissions by electrostatic attraction.

Entrainment Coefficient - the ratio of the rate of flow of entrained ambient water to the product of the jet velocity and the jet boundary circumference.

GLOSSARY (Cont'd)

Epilimnion - the portion of a lake above the thermocline (in which temperature are relatively uniform.

Equation of Continuity - an equation expressing the fact that the change in the amount of water contained in a volume of space must equal the net flow of water through the boundaries of that space.

Exclusion Area - the area immediately surrounding a nuclear power station in which the owners must be able to limit public access to a degree set by Federal regulation.

Fumigation Conditions - atmospheric conditions in which stack emmissions are unable to spread upward away from the ground, leading to abnormally high ground-level pollutant concentrations.

Free Available Chlorine - chlorine released in the plant effluent as elemental chlorine (Cl_2), hypochlorous acid (HOCl), or hypochlorite ion (OCl^-).

GLOSSARY (Cont'd)

Guassian Plume - a close approximation, based on the mathematically important Guassian, or "normal" function, of the way in which a power plant plume grows laterally and vertically as it moves downwind of the stack; the approximation becomes generally valid once the plume's motion is controlled predominantly by atmospheric conditions (particularly turbulence) and decreases in validity at greater and greater distances from the plant.

Heat Exchange Coefficient - the rate at which heat is transferred from the water surface to the air per unit area per unit temperature above ambient.

Homogeneous Acoustic Region - a region wherein the long-term sound level statistics observed at any point are representative of the entire region; a suburban residential neighborhood well removed from major roadways or other prominent sound sources is a typical example of a homogeneous acoustic region; similarly, a region bordering a straight, level highway may be defined as a homogeneous acoustic region because the sound level a fixed distance from the highway is presumed to be independent of location along the highway, though the sound level in such a region still diminishes with distance away from the highway, and is contoured as such.

Horizontal Momentum Flux - the product of the rate of flow of mass and the velocity at any vertical cross-section of the discharge jet.

Hypolimnion - the portion of a lake below the thermocline in which temperatures are relatively uniform.

Hypsometric Formula - a formula for correcting barometric pressure to sea level and computing height on the basis of a measured barometric pressure at that height.

Ichthyoplankton - fish eggs and early larval forms having little self-mobility.

IEEE - Institute of Electrical and Electronics Engineers.

Illinoian Glacial Stage - an "ice age" preceeding the Wisconsin glacial stage.

Lake Breeze Circulation - a pattern of on-shore and off-shore breezes which tend to develop in the vicinity of large lakes due to the differing rates at which land and water surfaces are capable of changing temperature.

Langelier's Saturation Index - a measure of the tendency of a particular water sample to produce scale or corrosion which considers total solids content, temperature, pH, calcium hardness as calcium carbonate, and alkalinity as $CaCo_3$; a positive index indicates scale tendencies, and a negative index indicates corrosion tendencies.

Load Factor - The ratio of actual annual energy demand to the energy demand which would occur if annual peak power demand occurred continuously.

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GLOSSARY (Cont'd)

Loss of load probability index - The expected number of days per year on which system load will exceed available generating capacity neglecting extraordinary load relief.

Magnetohydrodynamics - a technology for generating electric current by the interaction of an electrically conducting fluid, such as a plasma, and a magnetic field.

Mixing Depth - the vertical distance above the ground in which an airborne plume is free to disperse; generally, the extent above ground in which temperatures continue to decline with height or increase with height only weakly, i.e., the height between the ground and the first strong temperature "inversion".

Modified Mercalli Intensity - a classification of earthquake intensity on the basis of potentially observable damage (See Table P76.3-2 of the Applicant's Article VIII application).

Molecular Absorption - the conversion of sound energy to heat, with resultant loss of sound intensity, as sound propagates through air or other materials.

Multiplier Effects - the increased impact of economic outputs such as wages or tax revenues as they are recirculated again and again through the economy; for example, wages paid to a power plant employee may be spent at a fast-food outlet, passed from there to a produce trucking firm, etc.

Natural Draft Cooling Tower - a tall cooling tower, generally hyperbolic in shape, which relies on natural buoyancy effects rather than mechanical means to induce a flow of air through the tower.

NEMA - National Electrical Manufacturers Association.

Neutral Stability - a condition of the atmosphere in which the existing differences of atmospheric density with height will act neither to amplify nor suppress vertical motions of air parcels.

Once-in-10-year-24-hour-rainfall-event - a storm producing the amount of rainfall in a single 24 hour period which would be expected to be equalled or exceeded only once, on the average, every 10 years.

Ordovician - period from 500 to 430 million years ago.

Paleozoic - period from approximately 570 to 225 million years ago.

Periphyton - organisms adhering to submerged plants.

Photovoltaic Collectors - solid state devices made of 2 materials placed in close contact and carefully chosen so that one has an excess and one a deficiency of electrons; absorption of light supplies energy enabling electrons to jump from one material to the other, producing an electric current.

Piezometer - a device for measuring underground water pressure by drilling into an aquifer and observing the rise of water in the drill hole.

Pleistocene - period from approximately 2.5 million years ago to the end of the most recent ice age.

Precambrian - period previous to 570 million years ago.

Reading Scales - a method of determining the age of some species of fish analogous to determining the age of a tree by counting annual growth rings.

Runoff Co-efficient - the ratio of the amount of water running off a unit area to the total precipitation falling on that same area.

Secondary Sewage Treatment - a level of sewage treatment characterized by achievement of the following water quality conditions:

1) the average BOD_5 and suspended solids of samples taken for 30 consecutive days shall not exceed 30 milligrams per liter;

2) the average BOD_5 and suspended solids of samples taken for 7 consecutive days shall not exceed 45 milligrams per liter;

3) 85% of BOD_5 and suspended solids shall be removed by the treatment, and

4) pH shall be between 6.0 and 9.0.

Except under special conditions defined by the Environmental Protection Agency.

Sector - as used herein in relation to Lake Erie current studies, one of a set of 16 generalized directions, each subtending 22.5 degrees of the circumference of a circle; e.g., the 0-22.5° sector refers to a direction lying between north and 22.5° east of north, while the 90-112.5° sector refers to a direction lying between east and 22.5° south of east.

Silurian - period from 430 to 395 million years ago.

Spreading Coefficient - an empirical mathematical expression for the change in width of a jet as it flows away from the discharge.

Synergism - This is the phenomenon where two or more substances together can cause greater change than the sum of each substance individually. Thus lower levels of a substance in the presence of another substance can cause as much change as the higher level of one substance alone.

Tandem Compound Four Flow Turbine - a device for using the flow of steam to rotate a single shaft connected to a single generator (tandem compound) and exhausting the steam from the turbine in four separate flows.

Taxa - groups of biologically similar organisms.

GLOSSARY (CONT'D)

TDS - total dissolved solids.

Temperature Deficiency Flux - the product of the difference between jet temperature and ambient temperature and the rate of flow across any cross-section of the discharge jet perpendicular to the jet axis.

Thermionic Devices - devices which use energy supplied as heat to cause electrons to escape from a material, thereby producing an electric current.

Total Residual Chlorine - chlorine released in the plant effluent either as chloramines or free available chlorine.

Town - in New York, a political subdivision of a county, analogous to the townships of mid-western states, and not necessarily a specific area of concentrated population, such as a village or city.

GLOSSARY (CONT'D)

Virtual Surface Jet Temperature - the temperature of a hypothetical surface jet whose behavior would be the same as that of the actual submerged jet following impingement on the surface.

VORTAC - a v y high-frequency radio navigation aid enabling pilots to accurately locate their direction of flight.

Wet-Bulb Temperature - the temperature a given parcel of air would assume if water were gradually evaporated into the air (technically, evaporated "adiabatically") at constant pressure until the parcel could hold no more water (i.e., until saturation occurred); alternatively, the lowest temperature to which the air can be cooled by evaporating water into it.

Wind Rose - a pictorial representation of wind statistics showing the percentages of the time that the wind comes from each particular range of directions (usually a 22.5° sector) at each particular range of speeds.

GLOSSARY (CONT'D)

Wisconsin Glacial Stage - the most recent "ice age", beginning perhaps 70,000 years ago, and ending about 10,000 years ago.

Zooplankton - small, relatively non-motile animals that live suspended in the water column.

METRIC CONVERSION TABLE

TO CONVERT	MULTIPLY BY	TO OBTAIN
Acres	4.047×10^{-1}	hectares or sq hectometers
Acres	4.047×10^{-1}	sq meters
Atmospheres	7.6×10^{2}	Millimeters of mercury (at $0^{\circ}C$)
Atmospheres	1.0333	kgs/sq cm
Atmospheres	1.0333×10^{4}	kgs/sq meter
BTU	1.0550×10^{10}	ergs
BTU	2.52×10^{2}	gram - calories
BTU	1.055×10^{3}	joules
Cubic Feet	2.8320×10^{4}	cu cms
Cubic Feet	2.832×10^{-2}	cu meters
Cubic Feet	2.832×10^{1}	liters
Cubic Feet/Min	4.72×10^{2}	cu cms/sec
Cubic Feet/Min	4.720×10^{-1}	liters/sec
Cubic Inches	1.639×10^{1}	cu cms
Cubic Inches	1.639×10^{-5}	cu meters
Cubic Inches	1.639×10^{-2}	liters
Cubic Yards	7.646×10^{5}	cu cms
Cubic Yards	7.646×10^{-1}	cu meters
Cubic Yards	7.646×10^{2}	liters
Feet	3.048×10^{1}	centimeters
Feet	3.048×10^{-4}	kilometers
Feet	3.048×10^{-1}	meters
Feet	3.048×10^{2}	millimeters
Feet/Min	1.829×10^{-2}	kms/hr
Feet/Min	3.048×10^{-1}	meters/min
Feet/Sec	3.048×10^{1}	cms/sec
Feet/Sec	1.097	kms/hr
Feet/Sec	1.829×10^{1}	meters/min
Gallons	3.785×10^{3}	cu cms
Gallons	3.785×10^{-3}	cu meters
Gallons	3.785	liters
Gallons/Min	6.308×10^{-2}	liters/sec

(Cont'd)

TO CONVERT	MULTIPLY BY	TO OBTAIN
Horsepower	1.068×10^{1}	kg - calories/min
Inches	2.540	centimeters
Inches	2.540×10^{-2}	meters
Inches	2.54×10^{1}	millimeters
Miles (Statute)	1.609	kilometers
Miles (Statute)	1.609×10^{3}	meters
Miles/Hr	4.470×10^{1}	cms/sec
Miles/Hr	1.6093	kms/hr
Miles/Hr	2.682×10^{1}	meters/min
Ounces	2.8349×10^{1}	grams
Pounds	4.448×10^{5}	dynes
Pounds	4.5359×10^{2}	grams
Pounds	4.536×10^{-1}	kilograms
Pounds/Sq Ft	4.882	kgs/sq meters
Pounds/Sq In	7.031×10^{2}	kgs/sq meters
Pounds/Sq In	7.03×10^{-2}	kgs/sq cm
Revolutions/Sec	6.238	radians/sec
Square Feet	9.29×10^{2}	sq cms
Square Feet	9.29×10^{-2}	sq meters
Square Feet	9.29×10^{4}	sq millimeters
Square Inches	6.452	sq cms
Square Inches	6.452×10^{2}	sq millimeters
Square Miles	2.590	sq kms
Square Miles	2.590×10^{6}	sq meters

(Cont'd)

TO CONVERT	MULTIPLY BY	TO OBTAIN
Temperature (°F) - 32	5/9	temperature (°C)
Tons (Short)	9.0718×10^{2}	kilograms
Tons (Short)	9.078×10^{-1}	tons (metric)
Watts	1.433×10^{-2}	kg-calories/min
Watts (Abs)	1.0	joules/sec
Yards	9.144×10^{1}	centimeters
Yards	9.144×10^{-4}	kilometers
Yards	9.144×10^{-1}	meters
Yards	9.144×10^{2}	millimeters