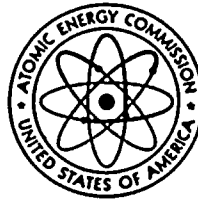


REGULATORY DOCKET FILE COPY

related to operation of
NINE MILE POINT NUCLEAR STATION
UNIT 1

NIAGRA MOHAWK POWER CORPORATION

DOCKET NO. 50-220



JANUARY 1974

REGULATORY DOCKET FILE COPY
UNITED STATES ATOMIC ENERGY COMMISSION
DIRECTORATE OF LICENSING

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431-02-0134
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SUMMARY AND CONCLUSIONS

This Environmental Statement was prepared by the U. S. Atomic Energy Commission, Directorate of Licensing.

1. This action is administrative.
2. The proposed action concerns the conversion of the current provisional operating license to a full-term license to be granted to the Niagara Mohawk Power Corporation for the Nine Mile Point Nuclear Station Unit 1 located on Lake Ontario in the State of New York (Docket No. 50-220).

Nine Mile Point Station Unit 1 employs a boiling-water reactor to produce up to 1850 megawatts thermal (MWt). A steam turbine-generator uses this heat to provide 610 MW (net) of electrical power capacity. This capacity is considered in the assessments contained in this statement. The exhaust steam is cooled by once-through flow of water obtained from and discharged to Lake Ontario.

3. Summary of environmental impact and adverse effects:

- Construction of the transmission lines required the use of approximately 1,640 acres for the right-of-way. Land use patterns in such rights-of-way have not changed in any major way but because of inadequate planning the line in many places may be considered by some as an aesthetic detraction.
- Fish will be impinged on the intake screen. Although it should have little or no noticeable effect on the fish population of the lake as a whole, the kill rate at Unit 1 is high. A program of monitoring the kill rate and of determining the local fish population has been implemented to determine the seriousness and extent of the problem.
- Entrained small fish, eggs, and fish larvae are not expected to survive passage through the plant cooling system and will add an incremental loss to the fish population, however, the overall effect on the fish population of the lake will be small. Entrained zooplankton and phytoplankton are expected to suffer high mortality during the summer. However, even if the rate of mortality were 100%, the impact of such mortality among organisms with a short generation time will not be measurable in the area.

- A thermal plume will be present at the discharge. Some juvenile fish may be drawn into it and may be killed; however, if this occurs their numbers are expected to be small. The 6°F isotherm extending to the shore is not expected to act as a barrier to free movement of fishes along the shore. However, the Applicant has initiated tagging or other appropriate studies to determine movement of fishes in the in-shore waters. No shifts in algal species from an abundance of diatoms and green algae to blue-green algae are expected. On the whole, the thermal discharge from Unit 1 is not expected to have any significant deleterious effect on the biota of the lake.
 - If Unit 1 were to be shut down suddenly in the winter, the thermal discharge would cease and the fishes in the plume would die. The impact of such mortality is not expected to have an adverse effect on existing fish populations.
 - Chemicals discharged to the lake will be limited to concentrations that will pose no threat to aquatic life.
 - The risk associated with accidental radiation exposure is very low.
 - No significant environmental impacts are anticipated from normal operational releases of radioactive materials within 50 miles. The estimated dose to the 1980 population within 50 miles from operation of Unit 1 will be 2.5 man-rem/yr after modification of the radwaste system (34 man-rem/yr, at present) which is less than the normal fluctuations in the 110,000 man-rem/yr background dose this population would receive.
4. Principal alternatives considered:
- Abandonment of the facility and construction of another nuclear plant on another site.
 - Fossil fuel as an alternative power source at the present site.
 - Purchase of power from outside sources.
 - Heat dissipation with natural-draft and forced-draft cooling towers or cooling ponds.
5. The following federal, state, and local agencies were requested to comment on the Draft Environmental Statement:

Federal Agencies

Advisory Council on Historic Preservation
Environmental Protection Agency
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Transportation
Federal Power Commission

New York State Agencies

Department of Environmental Conservation
Department of Public Service
Department of Commerce
Atomic Energy Council

Local Agencies

Oswego County Department of Planning

6. The Final Environmental Statement was made available to the public, to the Council on Environmental Quality, and to the agencies noted above in February 1974.
7. On the basis of the analysis set forth in this Statement, after weighing the environmental, economic, technical, and other benefits of Unit 1 against environmental costs and considering available alternatives, the Staff concludes that the action called for under NEPA and Appendix D to 10 CFR Part 50 is the conversion of the current provisional operating license to a full-term license for the facility subject to the following conditions for protection of the environment:
 - A. License Conditions
 1. The Applicant will complete construction of a new radwaste facility to be operational by late 1975.

B. Technical Specification Requirements

1. The Applicant will establish a revised and comprehensive environmental monitoring program as discussed below for inclusion in the Technical Specifications that is acceptable to the Staff for determining environmental effects which may occur as a result of the operation of Unit 1.
 - The Applicant will continue the revised and comprehensive ecological survey program to provide data from which to measure the impact of Unit 1 operation on the biota of Lake Ontario (Section 6.1).
 - The Applicant will continue the impingement monitoring and sampling program at the intake structure of Unit 1 as outlined in Sections 5.5 and 6.1 to determine the number, species, and size of fish killed and relate these data to the intake design and field-sampling program outlined above. This information is to be made available to the Staff by January 1976 to evaluate the significance of the fish-kill problem to determine whether modification of the existing intake and/or development and implementation of other preventive methods will be required.
 - The Applicant will continue the entrainment monitoring and sampling program at the intake and discharge structures and in the thermal plume as outlined in Section 6.1 to determine the extent of entrainment and the mortality of entrained organisms.
 - The Applicant will conduct such field investigations of the thermal plume as are necessary to correlate the data obtained from the aquatic environmental program. These investigations should be made for the different seasons under various hydrological and meteorological conditions. (Section 6.2).

- . The Applicant will conduct a radiological monitoring program considered by the Staff to be adequate to determine any radiological effects on the environment from operation of Unit 1 (Section 6.3).
 - . The Applicant will conduct a terrestrial monitoring program to determine the environmental effects of the use of herbicides for line maintenance. Particular attention should be given to vegetation which figures significantly in the life-cycle of valued wildlife-species which may occupy this right-of-way. The program should also include a field study to determine the presence and status of rare or endangered plants and animals at the site and along the transmission line right-of-way. If endangered species are present, steps should be taken to prevent their destruction during the continued operation of Unit 1 (Section 6.4).
2. If harmful effects and/or evidence for potential irreversible damage are detected by the monitoring programs, the Applicant will provide to the Staff an analysis of the problem and a plan of action to be taken to alleviate the problem.

CONTENTS

	<u>Page</u>
SUMMARY AND CONCLUSIONS	i
TABLE OF CONTENTS	vi
LIST OF FIGURES	xi
LIST OF TABLES	xiii
FOREWORD	xv
1. INTRODUCTION	1-1
1.1 Status of Reviews and Approvals	1-2
2. THE SITE	2-1
2.1 Station Location	2-1
2.2 Regional Demography; Land and Water Use	2-1
2.3 Historical Places and Natural Landmarks	2-7
2.4 Topography and Geology	2-7
2.5 Hydrology	2-8
2.5.1 Surface-water Hydrology	2-8
2.5.2 Lake-water Hydrology	2-10
2.5.3 Groundwater Hydrology	2-13
2.6 Meteorology	2-13
2.7 Ecology	2-17
2.7.1 Terrestrial Ecology	2-17
2.7.2 Aquatic Ecology	2-17
2.8 Background Radiological Characteristics	2-25
3. THE STATION	3-1
3.1 External Appearance	3-1
3.2 Reactor and Steam - Electric System	3-1
3.3 Plant Water Use	3-4
3.4 Heat-dissipation System	3-4
3.4.1 Intake Structure	3-7
3.4.2 Discharge Structure	3-7
3.5 Radioactive Waste	3-11
3.5.1 Liquid Waste System	3-11
3.5.1.1 Existing Waste Collector (low conductivity) Waste System	3-13
3.5.1.2 Upgraded Waste Collector (low conductivity) System	3-16
3.5.1.3 Floor Drain (high conductivity) Waste System	3-16
3.5.1.4 Floor Drain Upgraded Waste System	3-17

CONTENTS

	<u>Page</u>
3.5.1.5 Regenerant Chemical and Miscellaneous Waste System . .	3-17
3.5.1.6 Summary of Liquid Waste Treatment System	3-18
3.5.2 Gaseous Waste System	3-23
3.5.2.1 Existing Gaseous Waste System.	3-23
3.5.2.2 The Upgraded Gaseous Waste Treatment System.	3-26
3.5.3 Solid Waste System	3-28
3.6 Chemical and Biocide Effluents	3-30
3.7 Sanitary Wastes and Other Effluents.	3-33
3.8 Transmission Facilities.	3-35
4. ENVIRONMENTAL EFFECTS OF CONSTRUCTION	4-1
4.1 Effects on Land Use.	4-1
4.1.1 Station Site	4-1
4.1.2 Transmission Lines	4-3
5. ENVIRONMENTAL EFFECTS OF STATION OPERATION. . . ,	5-1
5.1 Impacts on Land Use.	5-1
5.1.1 Station Environs	5-1
5.1.2 Transmission-line Environs	5-1
5.2 Impacts on Water Use	5-2
5.2.1 Water Consumption.	5-2
5.2.2 Thermal Studies.	5-3
5.2.3 Effects of Chemical Discharges	5-3
5.2.4 Compliance with Water Quality Standards.	5-7
5.3 Radiological Impact on Biota Other than Man.	5-13
5.4 Radiological Impact on Man	5-17
5.4.1 Radioactive Materials Released in Liquid Effluents	5-19
5.4.2 Radioactive Materials Released to the Atmosphere	5-21
5.4.3 Direct Radiation	5-26
5.4.4 Population Doses from all Sources.	5-26
5.4.5 Evaluation of Radiological Impact.	5-28
5.5 Nonradiological Effects on Ecological Systems.	5-28
5.5.1 Effect on Terrestrial Environment.	5-28
5.5.2 Effect on Aquatic Environment.	5-31
5.6 Effects on the Community	5-40
6. ENVIRONMENTAL MONITORING PROGRAM.	6-1
6.1 Aquatic Monitoring Program	6-1
6.2 Thermal Monitoring Program	6-7
6.3 Radiological Environmental Monitoring.	6-7
6.4 Terrestrial Monitoring Program	6-12

CONTENTS

	<u>Page</u>
7. ENVIRONMENTAL EFFECTS OF ACCIDENTS.	7-1
7.1 Plant Accidents Involving Radioactive Materials.	7-1
7.2 Transportation Accidents Involving Radioactive Materials . . .	7-5
8. IMPLICATIONS OF THE STATION	8-1
8.1 The Requirement for Power.	8-1
8.1.1 Power Demand	8-4
8.1.2 Power Generation	8-4
8.1.3 Planned Capacity Addition; Estimates of Future Power Requirements	8-8
8.1.4 Conclusion	8-8
8.2 Adverse Environmental Effects which Cannot be Avoided. . . .	8-8
8.2.1 Land Effects	8-11
8.2.2 Aquatic Effects.	8-11
8.2.3 Radiological Effects	8-11
8.3 Short-term Uses and Long-term Productivity	8-12
8.4 Irreversible and Irretrievable Commitments of Resources. . .	8-14
9. ALTERNATIVES TO THE PROPOSED PROJECT.	9-1
9.1 Alternative Energy Sources and Sites	9-1
9.1.1 Economic Considerations.	9-1
9.1.2 Environmental Considerations	9-3
9.1.3 Benefit-Cost Balance	9-7
9.2 Plant Design Alternatives.	9-7
9.2.1 Cooling System	9-7
9.2.2 Chemical Discharge System.	9-11
9.2.3 Biocide System	9-14
9.2.4 Sanitary Waste System.	9-14
9.2.5 Transportation Procedures.	9-14
9.2.6 Water Discharge System	9-15
9.2.7 Intake Structure	9-17
9.3 Alternatives to Normal Transportation Procedures	9-17
10. BENEFIT-COST ANALYSIS	10-1
10.1 Energy Generating Costs	10-1
10.2 Summary of Benefits	10-1
10.3 Environmental Costs	10-3
10.3.1 Land Use.	10-3
10.3.2 Water Use	10-3
10.3.3 Biological Effects.	10-3
10.3.4 Radiological Effects.	10-4
10.4 Benefit-Cost Balance.	10-4

CONTENTS

	<u>Page</u>
11. DISCUSSION OF COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL STATEMENT	11-1
11.1 General Considerations	11-2
11.1.1 Recommendation to Not Grant a Full Term License . . .	11-2
11.1.2 Regional Assessment	11-2
11.1.3 Geothermal Energy Sources	11-3
11.1.4 Topography and Geology	11-3
11.2 Aquatic Effects.	11-3
11.2.1 Fish Echo Sounder Survey.	11-3
11.2.2 Phytoplankton	11-4
11.2.3 Maturation of Yellow Perch	11-5
11.2.4 Ponar Dredge for Benthic Studies	11-5
11.2.5 Fish Impingement	11-5
11.2.6 Recirculation of Intake Cooling Water	11-6
11.2.7 Mechanical Damage from Entrainment.	11-6
11.2.8 Entrainment Damage Simulation Studies	11-6
11.2.9 Fish Replacement Costs	11-7
11.3 Water Quality.	11-7
11.3.1 Phosphorus Concentrations	11-7
11.3.2 Cooling Water Discharge	11-7
11.3.3 Total Dissolved Solids	11-8
11.3.4 Heavy Metal Corrosion Products in the Cooling Water .	11-8
11.4 Liquid Effluents	11-9
11.4.1 Dissolved Noble Gases	11-9
11.4.2 Compliance with WASH-1258 Conditions	11-9
11.4.3 Operating Liquid Effluent Releases.	11-9
11.4.4 Dose Assessment for Liquid Releases	11-10
11.5 Solid Radioactive Waste	11-10
11.5.1 Isotopic Breakdown of Solid Waste	11-10
11.5.2 Operating and Predicted Radioactivity Levels for Solid Wastes.	11-11
11.5.3 Offsite Disposal of Solid Radioactive Waste	11-11
11.6 Environmental Monitoring Programs	11-12
11.6.1 Radiological Monitoring Program	11-12
11.6.2 Implementation of the Revised, Comprehensive Aquatic Monitoring Program.	11-12
11.6.3 Thermal Monitoring Techniques	11-12
11.6.4 Atmospheric Dispersion Factor	11-13
11.6.5 Use of Operating Data to Assess Environmental Impact.	11-13

CONTENTS

	<u>Page</u>
11.7 Transmission Lines	11-14
11.7.1 Transmission Line Sound Levels	11-14
11.7.2 Utilization of Transmission Line Right-of-Way	11-15
11.7.3 Ozone Production From High Voltage Transmission Line	11-15
11.7.4 Transmission Line Interaction with Railroad Signals.	11-16
11.8 Reactor Accidents	11-16
11.8.1 Accident Probabilities	11-16
11.8.2 Postulated Plant Accidents Involving Liquid Releases	11-16
11.9 Alternatives	11-17
11.9.1 Cooling Tower Noise Levels	11-17
11.9.2 Estimated Emission Quantities from Oil and Coal Fired Plants	11-17
11.10 Location of Principal Changes in this Statement in Response to Comments	11-17
APPENDIX A: Comments on Draft Environmental Statement	A-1
APPENDIX B: Applicants Partial Response to Comments on Draft Environmental Statement	B-1
APPENDIX C: Applicants Partial Response to Comments on Draft Environmental Statement	C-1

FIGURES

<u>Figure</u>		<u>Page</u>
2.1	Vicinity of the Nine Mile Point Nuclear Power Station . .	2-2
2.2	Location of Nine Mile Point Nuclear Power Station in New York State.	2-3
2.3	Population Distribution within 5-mile Radius of Station .	2-4
2.4	Population Densities within 50-mile Radius of Station for 1980.	2-5
2.5	The Appearance of Nine Mile Point in 1963 before the Station Was Built	2-9
2.6	Average Monthly Temperature of Lake Ontario	2-11
3.1	Plot of Site of Nine Mile Point Nuclear Station Unit 1. .	3-2
3.2	Nine Mile Point Unit 1.	3-3
3.3	Water-usage Flow.	3-5
3.4	Circulating-water System: Plan	3-6
3.5	Intake and Discharge Structures	3-8
3.6	Schematic Diagram of the Screenwell	3-9
3.7	Circulating-water System: Profile.	3-10
3.8	Existing Liquid Radwaste System, Nine Mile Point Nuclear Station, Unit 1	3-14
3.9	Upgraded Liquid Radwaste System, Nine Mile Point Nuclear Station, Unit 1	3-15
3.10	Existing Gaseous Radwaste System, Nine Mile Point Nuclear Station, Unit 1	3-24
3.11	Upgraded Gaseous Radwaste System, Nine Mile Point Nuclear Station, Unit 1	3-25
3.12	Makeup-water Treatment.	3-31
3.13	Transmission Facilities	3-36
3.14	Transmission-line Structures North of Clay.	3-38
4.1	Wood "H" Frame: Single Circuit	4-2
4.2	Lattice Steel Tower: Single Circuit.	4-4
5.1	Three-dimensional Thermal Survey of Nine Mile Point: Nov. 16, 1971	5-4
5.2	Three-dimensional Thermal Survey of Nine Mile Point: July 30, 1971	5-5
5.3	Generalized Exposure Pathways for Organisms Other Than Man	5-15
5.4	Generalized Exposure Pathways to Man.	5-18

FIGURES

<u>Figure</u>		<u>Page</u>
6.1	Sampling Locations and Biotic Groups to be Sampled in the Vicinity of Nine Mile Point Area of Lake Ontario . .	6-3
6.2	Off-site Radiological Monitoring Stations	6-10
6.3	Lake-sampling Transects and Locations of On-site Radiological Monitoring Stations.	6-11
8.1	Niagara Mohawk Service Area	8-2
8.2	Maximum System Capacity and Load, MWe of the Niagara Mohawk Power Corporation for the Winter of 1972	8-5
8.3	Winter Peak Power Demand for Applicant's System	8-6
8.4	Forecast of Reserve Margins	8-9
9.1	Cooling Lake at 310-foot Elevation (880 acres)	9-10
9.2	Alternative Evaporative System for Treating Regeneration Wastes.	9-13
9.3	Once-through Cooling System with Diffuser Discharge	9-16

TABLES

<u>Table</u>		<u>Page</u>
1.1	Licenses and Permits for Nine Mile Point Nuclear Station Unit 1.	1-3
2.1	Population Projections for Oswego and Neighboring Counties.	2-6
2.2	Applicant's 1972 Water Quality Measurements -- Lake Ontario Near Nine Mile Point Nuclear Station Site	2-14
2.3	Data on Lake Ontario Water Quality.	2-15
2.4	Fishes Found in the Nine Mile Point Area.	2-20
2.5	Spawning, Food Habits, and Importance of Fishes Abundant in the Nine Mile Point Area of Lake Ontario	2-21
2.6	Abundance of Benthic Organisms at a Sampling Station Approximately Four Miles from Nine Mile Point Station, 1964.	2-23
2.7	Abundance of Major Diatom Species at a Sampling Station about Four Miles from Nine Mile Point Station, September 8-18, 1964.	2-26
2.8	Abundance of Phytoplankton (by Families) at a Sampling Station about Four Miles from Nine Mile Point Station, September 1964.	2-27
2.9	Environmental Sampling Stations in the Nine Mile Point Area, 1969-1972	2-28
3.1	Principal Parameters Used in Estimating Radioactive Release from Nine Mile Point Nuclear Station, Unit 1. . .	3-12
3.2	Estimate of Annual Release of Radioactivity in Liquid Effluents from Nine Mile Point Nuclear Station, Unit 1 as Existing July 1, 1972.	3-19
3.3	Upgraded System, Estimate of Annual Release of Radioactivity in Liquid Effluents from Nine Mile Point Nuclear Station, Unit 1	3-20
3.4	Summary of Reported Releases from Nine Mile Point Nuclear Station, Unit 1	3-21
3.5	Comparison of Nine Mile Point Unit 1 Liquid Waste Releases, Ci/yr	3-22
3.6	Estimate of Annual Releases of Radioactive Materials in Gaseous Effluents from Nine Mile Point Nuclear Station Unit 1 as Existing July 1, 1972	3-27
3.7	Estimate of Annual Releases of Radioactive Materials in Gaseous Effluents from Nine Mile Point Nuclear Station, Unit 1.	3-29
3.8	Composition of Settling-basin Overflow.	3-32
3.9	Chemical Discharges from Makeup Water System.	3-34

TABLES

<u>Table</u>		<u>Page</u>
5.1	Drinking Water Standards for Lake Ontario	5-10
5.2	Freshwater Bioaccumulation Factors for Radioelements	5-14
5.3	1971 Effluent Releases from Nine Mile Point, Unit 1	5-19
5.4	Annual Dose from Liquid Effluents under Equilibrium Conditions to Individuals at Various Locations before Installation of Augmented Radwaste System	5-21
5.5	Annual Doses from Liquid Effluents under Equilibrium Conditions to Individuals at Various Locations after Installation of Augmented Radwaste System	5-22
5.6	Annual Doses from Gaseous Effluents under Equilibrium Conditions to Individuals at Various Locations before Installation of Augmented Radwaste System	5-24
5.7	Annual Doses from Gaseous Effluents under Equilibrium Conditions to Individuals at Various Locations after Installation of Augmented Radwaste System	5-25
5.8	Cumulative Population in Selected Annuli around NMP-1	5-27
5.9	Environmental Impact of Transportation of Fuel and Waste to and from a Typical Light-water-cooled Nuclear Power Reactor	5-29
5.10	Annual Dose to the General Population for Operation of Nine Mile Point Unit 1	5-30
5.11	Total Fish-impingement Catch at NMP-1, May 30, 1972 - June 27, 1973	5-32
6.1	Frequency of Sampling for Ecological Studies in the Nine Mile Point Area of Lake Ontario	6-4
6.2	Radiological Monitoring Program for Lake Ontario	6-8
6.3	Radiological Monitoring Program for Land	6-9
7.1	Classification of Postulated Accidents and Occurrences	7-2
7.2	Summary of Radiological Consequences of Postulated Accidents	7-4
7.3	Environmental Impact of Accidents During Transportation of Fuel & Waste to and from Nine Mile Point Unit 1.	7-6
8.1	New York Power Pool Members	8-3
8.2	Projected Peak Situations	8-7
8.3	Data on Load and Capacity Projected to 1980	8-9
9.1	New York Generating-plant Costs for an 800-MWe Plant in the Mid 1970's	9-2
9.2	Comparative Environmental Impacts for Nine Mile Point	9-2
9.3	Incremental Costs for Alternative Cooling Systems	9-12
10.1	Estimated Generating Cost (in millions of dollars).	10-2
10.2	Benefit Cost Summary for the Station.	10-5

FOREWORD

This statement on environmental considerations associated with the proposed conversion to a full-term operating license for the Nine Mile Point Nuclear Station, Unit 1 was prepared by the U. S. Atomic Energy Commission, Directorate of Licensing (Staff) in accordance with the Commission's regulation, 10 CFR Part 50, Appendix D, implementing the requirements of the National Environmental Policy Act of 1969 (NEPA).

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

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

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

- (i) The environmental impact of the proposed action,
- (ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

- (iii) alternatives to the proposed action,
- (iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
- (v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Pursuant to Appendix D of 10 CFR Part 50, the AEC Directorate of Licensing prepares a detailed statement on the foregoing considerations with respect to each application for a construction permit or full-power operating license for a nuclear power reactor.

When application is made for a construction permit or a full-power operating license, the Applicant submits an environmental report to the AEC. The staff evaluates this report and may seek further information from the Applicant, as well as other sources, in making an independent assessment of the considerations specified in Section 102 (2)(C) of the NEPA and Appendix D of 10 CFR Part 50. This evaluation leads to the publication of a draft environmental statement, prepared by the Directorate of Licensing, which is then circulated to Federal, State, and local governmental agencies for comment. Interested persons are also invited to comment on the draft statement.

After receipt and consideration of comments on the draft statement, the Staff prepares a final environmental statement, which includes a discussion of questions and objections raised by the comments and the disposition thereof; a final cost-benefit analysis which considers and balances the environmental effects of the facility and the alternatives available for reducing or avoiding adverse environmental effects with the environmental, economic, technical, and other benefits of the facility; and a conclusion as to whether, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, the action called for is the issuance or denial of the proposed permit or license or its appropriate conditioning to protect environmental values.

At this site the Applicant also proposes to build Nine Mile Point Nuclear Station Unit 2, an 1100-MWe plant. In addition, the Power Authority of the State of New York is building the 821-MWe James A. FitzPatrick Nuclear Plant 3300 feet to the east of Unit 1.

The Staff considers the environmental impact of plants in the order of their licensing sequence. The environmental impact of a given plant is considered in light of the aggregate environmental consequences of its

operation in the presence of existing and scheduled precursor plants at the same location. As a result of this procedure, the environmental impact from Unit 1 is treated in the Unit 1 FES, the cumulative effects from Unit 1 and the FitzPatrick plant is treated in the FitzPatrick FES and finally, the cumulative effect from all three plants (Unit 1, Unit 2 and FitzPatrick) is treated in the Unit 2 FES.

Final environmental statements have been prepared concerning the FitzPatrick Plant (Docket No. 50-333) and the proposed Nine Mile Point Nuclear Station, Unit 2 (Docket No. 50-410), and were issued in March and June 1973, respectively.

Single copies of this statement may be obtained by writing the Deputy Director for Reactor Projects, Directorate of Licensing, U. S. Atomic Energy Commission, Washington, D. C. 20545. Mr. Gerald L. Dittman is the AEC Environmental Project Manager for this statement. (301:973-7263)

1. INTRODUCTION

This Environmental Statement pertains to the Nine Mile Point Nuclear Station Unit 1, is owned by the Niagara Mohawk Power Corporation, Syracuse, New York, and which has been in operation since December 1969. In particular, this Statement concerns the application for the conversion of the current provisional operating license (DPR-17) to a full-term license (Docket No. 50-220).

Unit 1 of the Station is situated on a 900-acre site at Nine Mile Point on the southern shore of Lake Ontario in Oswego County, New York. It utilizes a boiling-water reactor (BWR) rated at 1850 thermal megawatts (MWt) to provide the thermal energy necessary to supply steam for the turbine-generator, which produces 610 net electrical megawatts (MWe). The nuclear reactor and turbine-generator were designed and manufactured by General Electric Company. The Unit was designed by Niagara Mohawk Power Corporation (the Applicant) and constructed by Stone and Webster Engineering Corporation. Here, too, the Applicant proposes to build Nine Mile Point Nuclear Station Unit 2, an 1100-MWe plant. In addition, the Power Authority of the State of New York is building the 821-MWe James A. FitzPatrick Nuclear Plant 3300 feet to the east of Unit 1.

Unit 1 utilizes once-through cooling with lake water, as is proposed for the two new plants. Upon construction of Unit 2, the circulating-water system for Unit 1 will be modified so that there will be a combined discharge for both units. The "Applicant's Environmental Report, Operating License Stage, Conversion to Full-Term Operating License, Nine Mile Point Nuclear Station Unit 1," and "Supplements No. 1, 2 and 3," to the report were submitted to the AEC by the Applicant on July 5, 1972, March 2, 1973, April 16, 1973, and May 31, 1973, respectively. The Commission forwarded copies of these documents to the appropriate federal, state and local agencies.

Copies of these reports were also placed in the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C., and in the Oswego Public Library, Oswego, New York. A notice of availability of the Applicant's Environmental Report was published in the Federal Register on August 18, 1972 (37 FR 16692).

This Environmental Statement takes into account the Applicant's Environmental Report and Supplements No. 1, 2 and 3 thereto, and the Applicant's Final Safety Analysis Report.

Independent calculations and sources of information were also utilized as a basis for the Staff's assessment of environmental impact. Also used was information gained by the Staff during a visit to the Station site and surrounding areas.

The Applicant is required to comply with the Federal Water Pollution Control Act, as amended by the Federal Water Pollution Control Act Amendments of 1972.

1.1 STATUS OF REVIEWS AND APPROVALS

Table 1.1 lists permits, licenses, and approvals for the construction and operation of the Station as well as the granting agency and the status of the document as of the printing date of this statement. Table 1.1 reflects changes in permit, license, or approval requirements necessitated by the recent Federal Water Pollution Control Act Amendment of 1972.

TABLE 1.1. Licenses and Permits for Nine Mile Point
Nuclear Station Unit 1

Agency	Description	Date of Issue
<u>Federal Agencies</u>		
U. S. Atomic Energy Commission	Construction permit for nuclear station and assoc. facilities (CPPR-16)	April 1965
	License to possess and use by-product material	June 1967
	License to possess and use special nuclear material	August 1967
	Provisional nuclear station operating license (DPR 17) at 1538 MWt	August 1969
	Amendment No. 1, authorization to increase source material quantity	June 26, 1970
	Amendment No. 2, to increase power rating to 1850 MWt	April 14, 1971
	Amendment No. 3, to designate the facility as Unit 1	June 12, 1973
	Full-term nuclear station operating license	Filed, July 1972
U. S. Army Corps of Engineers	Construction permits for intake and discharge tunnels of circulating-water system	October 1964
Environmental Protection Agency	Liquid Waste Discharge Permit (NPDES)	Filed, October 24, 1972
Federal Aviation Authority	Approval for stack construction	October 1968

TABLE 1.1. (Cont'd)

Agency	Description	Date of Issue
<u>State of New York</u>		
New York Department of Health, Bureau of Water Resources	Cooling-water-discharge permit	April 1965
	Sewage-disposal-system permit	May 1965
New York Department of Health, Air Pollution Control Board	Stack-effluent-discharge permit	April 1966
New York Department of Environmental Conservation	Water-quality certification	Filed, April 5, 1973
	Diesel Exhaust Permit	Filed, October 17, 1973

2. THE SITE

2.1 STATION LOCATION

The Station is located on a 900-acre site in an area known as Nine Mile Point on the south shore of Lake Ontario in Oswego County, New York. The Applicant has proposed to build an 1100-MWe Station, Unit 2, on this site. The James A. FitzPatrick Nuclear Power Plant, owned by the Power Authority of the State of New York, is located on a 700-acre plot immediately east of the site. Figure 2.1 shows the relative locations of the generating stations. The site is about 8 miles east of Oswego, 36 miles northwest of Syracuse, and 135 miles east of Buffalo, New York. Other towns and points of interest are shown in Fig. 2.2.

2.2 REGIONAL DEMOGRAPHY; LAND AND WATER USE

During most of the year, the total population within a five-mile radius of the site is about 3000. In addition to the year-round population, a few cottages along the lake shore are occupied in the summer months. The Ontario Bible Conference operates a summer camp, known as Lakeview, 4500 feet southwest of the site. The Applicant indicates that during the summer a maximum of 1500 persons may be at the camp for short periods on weekends.

The nearest dwellings are on Lakeview Road about one mile southwest from the site. Figure 2.3 shows the 1971 population distribution in a 0-5 mile radius. The projected 1980 population distribution within a 0-50 mile radius, is given in Fig. 2.4. Table 2.1 gives the present and projected population of the ten counties which wholly or partially fall within the 50-mile radius of the Station. This projection was prepared by the New York State Office of Planning Services.¹

The land area within five miles of the site is primarily rural. Much of the land in the vicinity of the Station and in Oswego County was formerly farmed but is now covered with second-growth trees and other woody vegetation. Such areas constitute about half the land in the county. The remainder is made up of wooded areas and farms. According to a recent publication by the New York State Office of Planning Coordination,² about 34% of the land in Oswego County was devoted to farming and dairying in 1968; however, only about 10% of the land has farms that appear capable of supporting viable farm businesses throughout the foreseeable future. The number of farms in the Oneida Plain, which includes Oswego County, decreased 40% in the period 1949-1959 and about 21% in the 1959-1964 period. The New York State Office of Planning Coordination projects that land under farming in this area will continue to decline more rapidly than

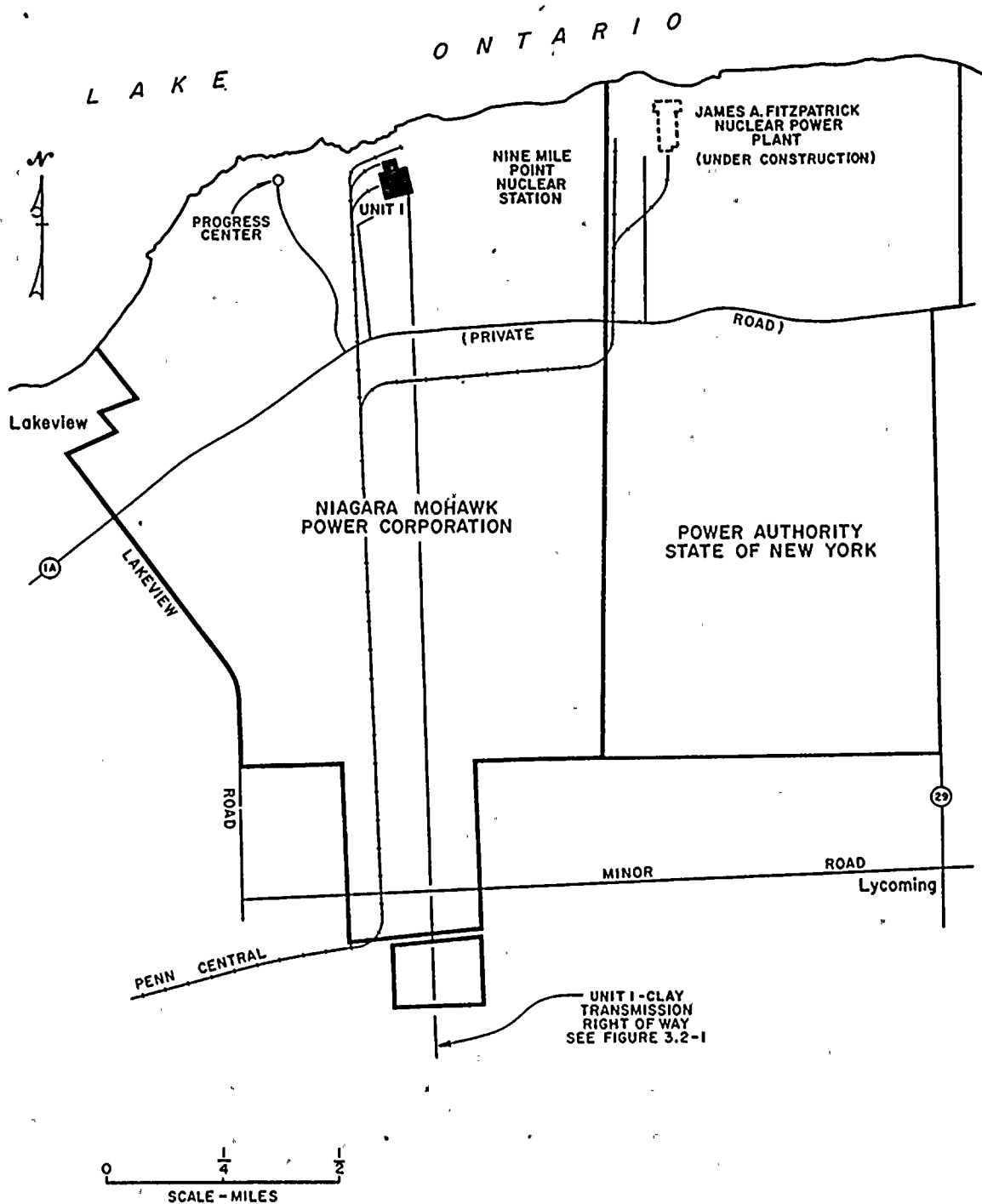


Fig. 2.1. Vicinity of the Nine Mile Point Nuclear Power Station.
From the Applicant's Environmental Report.

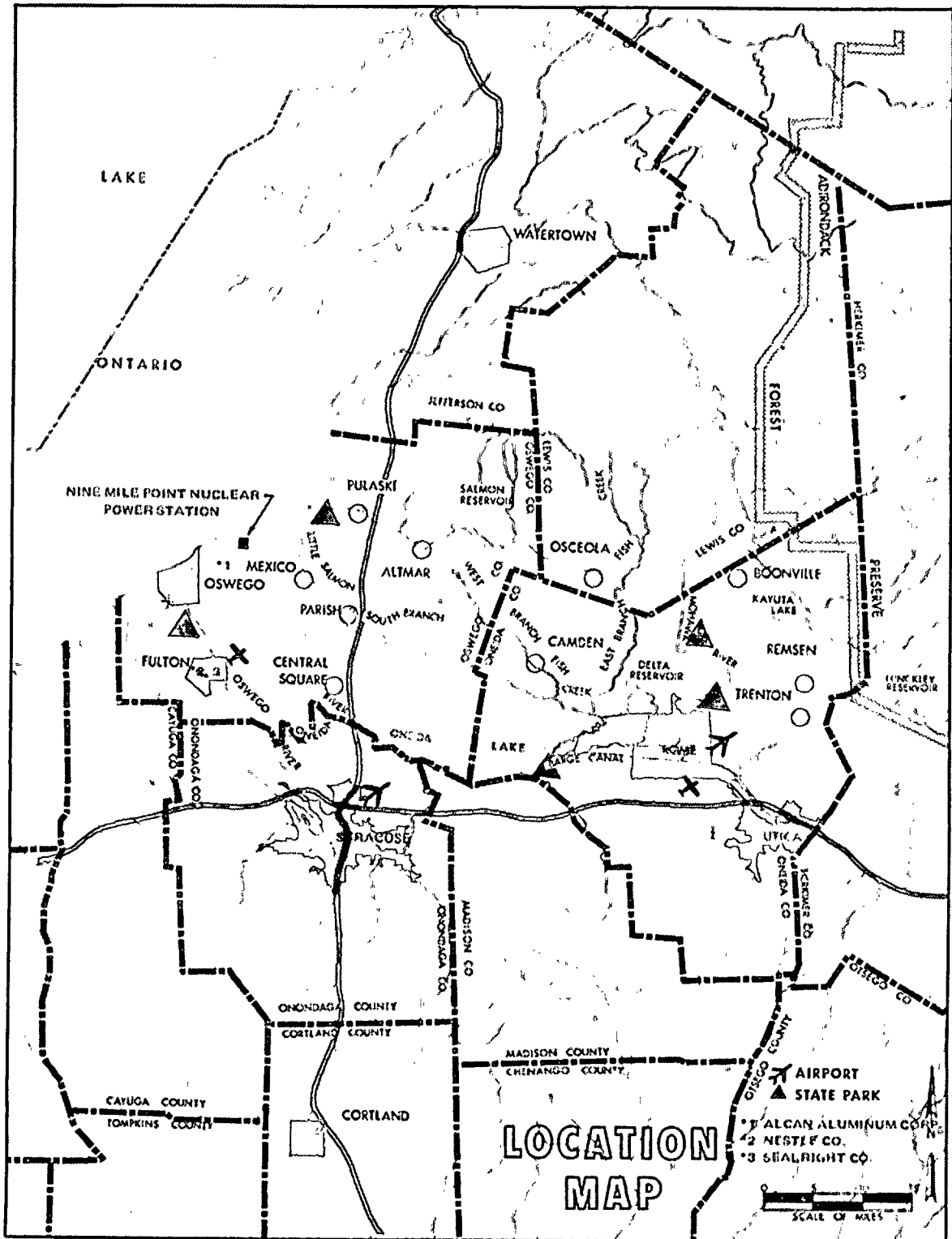


Fig. 2.2. Map Showing Location of Nine Mile Point Nuclear Power Station in New York State. From Applicant's Environmental Report.

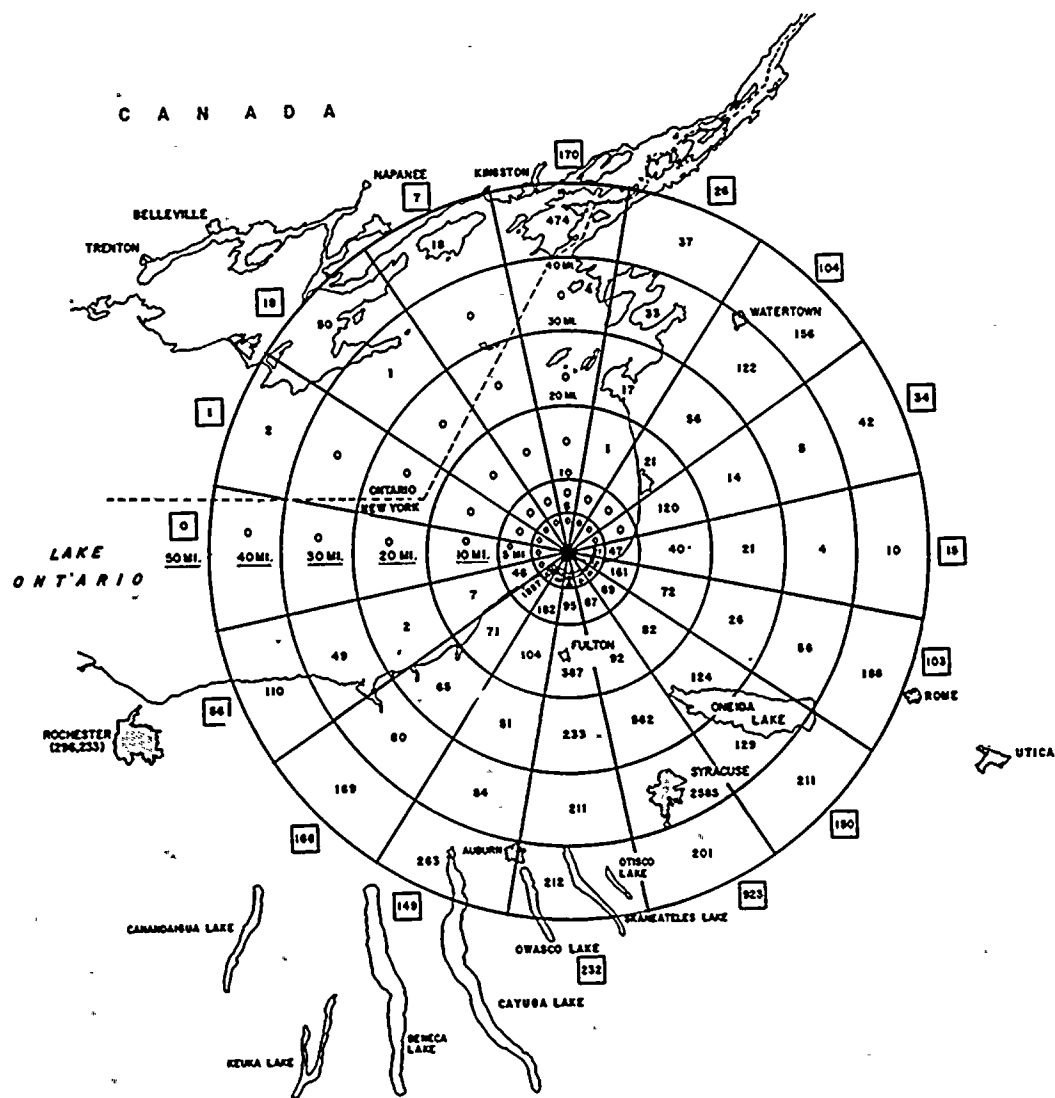


Fig. 2.4. Population Densities within 50-mile Radius of Station for 1980.

TABLE 2.1 Population Projections for Oswego and
Neighboring Counties (in thousands)*

County	1970	1980	1990	2000
Cayuga	77	82	87	91
Jefferson	89	89	91	92
Lewis	24	24	25	26
Madison	63	73	83	94
Oneida	273	285	300	308
Onondaga	473	518	581	639
Ontario	79	91	108	125
Oswego	101	122	147	178
Seneca	35	38	41	44
Wayne	79	93	112	131

*Data taken from Ref. 1.

in the state as a whole.² According to the New York State Development Plan,³ land-use projections for 1990 indicate that the northeast half of Oswego County (which includes the site) will remain sparsely settled and predominantly natural open space.

According to the Applicant, the entire shoreline north of Unit 1 will be accessible to the public. The site and adjacent areas along the shore near the site, however, have little potential for water-based recreation. The lake in this area is not suitable for swimming because the lake bottom is largely bedrock, and there are few natural harbors or landings. The Applicant has stated that during August and September, the peak fishing weekends, up to 30 boats have been observed at one time in the cooling-water discharge area for the Nine Mile Point Unit 1. Smallmouth bass and white and yellow perch are the major species caught.

Two state parks are nearby -- Selkirk State Park, ten miles northeast of the proposed Station site along the shore, and Battle Island near Fulton, 15 miles southwest of the site. About 250,000 vacationers visit these parks yearly.

Two hospitals in Oswego County -- the Oswego Hospital, with 176 beds, is about seven miles from the site in Oswego, and the Lee Memorial Hospital, with about 60 beds, is 15 miles away in Fulton. The closest school is the New Haven Elementary School, which is five miles southeast of the site. The only industrial establishment along the lake shore in Scriba is the Alcan Aluminum Corporation located 3-1/4 miles southwest of the site. This plant employs 750 people. The nearest grazing pasture is 0.7 mile southwest from the site.

2.3 HISTORICAL PLACES AND NATURAL LANDMARKS

There are no known historic places within the site or in the transmission-line right-of-way. None of the historic sites listed in the National Register of Historic Places are affected by the transmission line connecting the Station to the substation near Clay, New York. There are no known archaeological deposits in the Nine Mile Point area. The Applicant has contacted the Liaison Officer for Historic Preservation in New York State and has received a certification that the transmission line and the Station will not have a harmful effect on sites of historical or architectural interest.

2.4 TOPOGRAPHY AND GEOLOGY

The Station and its associated transmission line are within the Erie-Ontario Lowlands physiographic province. This province consists of a relatively flat

plain which rises gently from Lake Ontario to the Appalachian Uplands, which form its southern border. The Erie-Ontario Lowlands is bounded on the east by the Tug Hill Upland.

The site is a generally flat and featureless plain. Figure 2.5 is a photograph of the area before the Station was built. It has an elevation of 260 feet MSL rising to 310 feet one mile away at its southern extremity. The surface soils consist of bouldery-ablation tills that immediately overlie a compact basal till lying on bedrock, a flat-lying sandstone imbedded with shale of the Ordovician Age (Oswego Sandstone). The shale content increases with depth; at approximately 130 feet below the surface, the Oswego Sandstone grades into the underlying Lorraine group, which is predominantly shale with some sandstone.

Most of the earthquakes recorded in the state were at distances greater than 50 miles from the site. Most of these have occurred in the St. Lawrence and Hudson River Valleys and the Buffalo-Rochester area. The St. Lawrence River Valley trend appears to be the most active.

From 1853 to 1963, at least thirteen earthquakes were recorded within fifty miles of the Station. The highest intensity earthquake during this period occurred at Lowville in 1853; it was intensity VI on the modified Mercalli scale. Most of the other earthquakes in this area had an intensity of III or less.⁶

There is a minor fault line at Nine Mile Point that crosses the intake and discharge tunnels at right angles trending N78°W and dipping approximately 60° to 64° south, and a system of joints at the barge slip with an attitude similar to the fault that crosses the tunnels. The U. S. Department of the Interior considers these geological features to be of minor significance as far as the potential movement of the intake and discharge tunnels is concerned. The last movement along the fault is thought to be geologically old, probably much older than the last glacial episode in the area.⁷

The relationship of site seismology to the safety of the Station, its design, and seismic design criteria have been considered in detail by the Staff in the safety review.⁸

2.5 HYDROLOGY

2.5.1 Surface-water Hydrology

The Station is in the northeast portion of the Lake Ontario Plain drainage basin. This basin encompasses about 34,800 square miles, exclusive of



Fig. 2.5. The Appearance of Nine Mile Point in 1963 before the Station Was Built. From the Applicant's Environmental Report.

lake surface, in New York and the Province of Ontario. Of the average 34 inches of annual precipitation, about 17 inches becomes stream flow, about 15 inches is lost by evapotranspiration, and about two inches becomes ground water.

Although the basin has numerous large streams, none is in the immediate vicinity of the Station. Catfish Creek (approximately three miles east of the Station) and the Oswego River (eight miles to the west) are the closest large streams. Surface water runoff from the Station site flows into the smaller creeks and marshes nearby, which, in turn, drain northward into Lake Ontario.

2.5.2 Lake-water Hydrology

Lake Ontario, the easternmost of the Great Lakes, is 193 miles long and 53 miles across at its widest point. It has a shoreline length of 726 miles and a surface area of 7340 square miles. The surface of the lake is 245 feet above mean sea level. Its greatest depth is 840 feet; the average depth, 300 feet. The total volume of the lake is 390 cubic miles. Lake Ontario has a large volume of water per unit of surface area.

The major inflow (about 80 percent) is from Lake Erie via the Niagara River, which discharges, on the average, approximately 200,000 cfs into Lake Ontario. Other rivers draining into the lake are the Genesee, which flows from the Appalachian Front; the Oswego, which drains the Finger Lakes region; the Black River, which flows from the Adirondacks; and the Trent River, which drains a portion of the Province of Ontario. The St. Lawrence River carries the outflow of Lake Ontario to the Atlantic Ocean.

Lake Ontario is a dimictic lake (with spring and fall turnover) having a maximum surface temperature of 72°F in the summer (Fig. 2.6), and a large thermal gradient. The computed retention time for water in the lake is on the order of 15 years.⁹

In the summer, the lake becomes vertically stratified (thermally and chemically). A warm, readily circulating upper (epilimnion) and a cold, undisturbed lower layer (hypolimnion) develop with a zone of rapid temperature change (thermocline or metalimnion) between the two. Because the epilimnion and hypolimnion waters do not mix, nutrients released by decay in and near the bottom sediments remain trapped in the bottom waters. Upwellings of the cold, nutrient-rich, bottom water (caused by storm action) can lead to sudden, rapid temperature changes in the inshore waters. These upwellings can also lead to an increase in the productivity of certain shallow water areas.

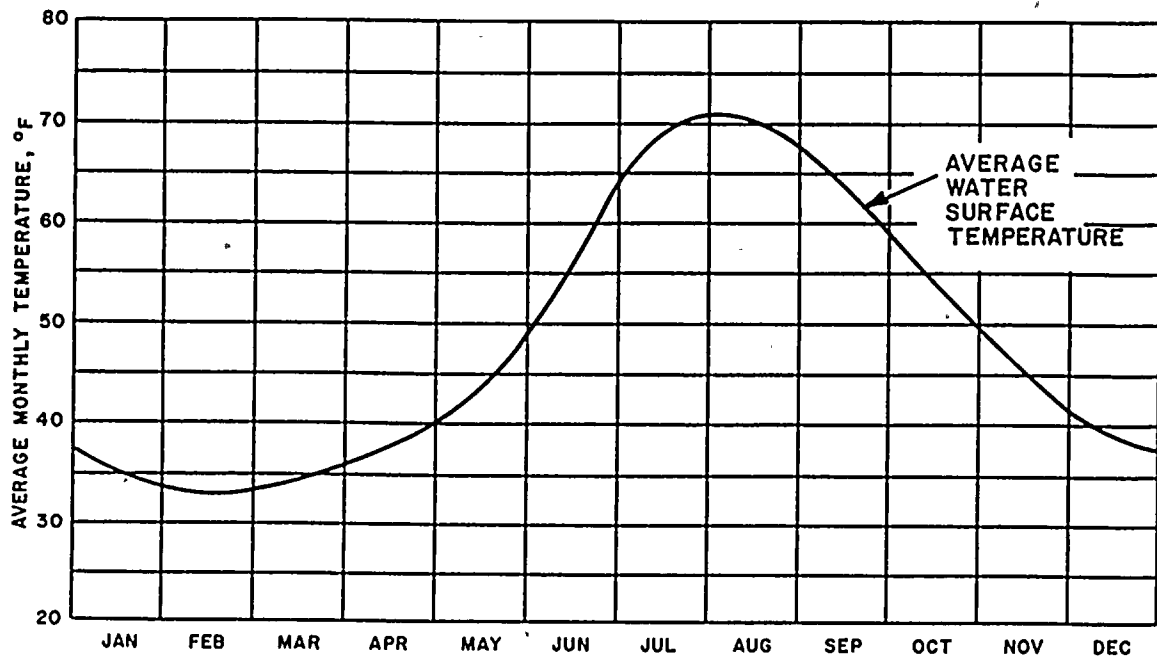


Fig. 2.6. Average Monthly Temperature of Lake Ontario.

In the fall, the upper waters cool and the lake becomes vertically isothermal, while in the winter, for all practical purposes, the lake can be considered as essentially isothermal. It does not freeze except near land, particularly in slack bay areas in the eastern end of the lake.

In the spring, the entire lake begins mixing (spring turnover). During mixing, because of preferential heating of the shallow inshore waters, a "thermal bar" gradually develops and moves toward the center of the lake until it disappears early in June. During the existence of the bar, nutrients carried into the lake by streams may become trapped for short periods in the inshore waters.

Lake temperature surveys have been made by the Applicant in the Nine Mile Point area in over 100 feet of water during the months May to September. The data for May and early June showed a temperature difference of about 5°F between the surface and the 40 ft depth, and uniform temperature below. No thermocline was observed. During late June and through July, thermoclines appeared at depths ranging from 10 ft to 70 ft., and lasted no more than a few days each. In August, the lake reached its maximum temperature, ranging from about 71°F at the surface to about 62°F at the 100 ft. depth, no thermocline was seen. However, in late August and throughout September, stratification was observed with a thermocline in 70 to 90 ft. depth lasting for about two weeks.

The circulation of the lake is generally counterclockwise for surface currents (upper 33 feet), intermediate currents (33-66 feet), and bottom currents (below 66 feet). The surface currents depend strongly on wind conditions, especially during summer stratification, whereas the bottom currents are modified by friction and topography. The surface currents have a mean speed of about 0.1 ft/sec and a range from 0 to 0.5 fps. Surface currents react quite rapidly to changes in wind speed and direction; the flow pattern can change in less than four hours. On the other hand, the response time of wind-induced circulation at intermediate depth may be about 40 hours. Under isothermal conditions, the wind can affect the currents at the intermediate depth far more than it can during the summer when the lake is stratified.

Lake currents measured in the vicinity of the site appeared to be primarily wind-induced,¹⁰ generally low speed and showed relatively frequent changes in east-west direction.

Tides in Lake Ontario are small, less than one inch. Seiches generally have amplitudes of less than two feet. Wind-driven surface waves up to 15 feet high can occur.

The lake bottom near the site is rocky and the bedrock out to the 15-foot depth is relatively free of overburden because of heavy wave activity. The bedrock in deeper waters is covered with a loose overburden. The shore line in the area is abrupt, and there are no beaches.

Lake Ontario is morphometrically an oligotrophic lake.* The nutrient input from Lake Erie tends to give this lake a mesotrophic trend; however, since most of the lake is over 120 feet deep, the nutrients are not fully utilized. The dissolved oxygen concentrations in the deep waters are normally 90% to 100% of saturation; such a high concentration indicates low rates of oxygen-consuming processes in these waters. Changes in the chemical characteristics of Lake Ontario closely approximate the trends exhibited by Lake Erie. Available data¹¹ indicate that sodium, chloride, sulfate, and calcium concentrations have been increasing during the past 50 to 60 years. The high total dissolved solids and low transparency indicate a eutrophic trend.

Table 2.2 shows the Applicant's 1972 data on water quality near the Nine Mile Point site. Water quality samples were collected and analyzed during the Applicant's 1972 ecological investigations. Surface and bottom samples were taken at two lake locations; one was in 30 feet of water and the other in 40 feet. Both sampling stations were about one mile west of the mouth of the Oswego River. Grab samples were taken at the cooling-water intake and at the discharge, and a composite sample was taken at the plant compositor. The survey was conducted for six months between April and November 1972 (May and October excluded) with samples taken monthly. The analytical results, shown in Table 2.2, list the lowest and the highest of the six values for each location. Additional water-quality data are shown in Table 2.3; these data pertain to samples obtained at the City of Oswego water intake, 6500 feet offshore and about seven miles east of the Station.

The inshore waters are less oligotrophic than offshore waters. This is a reflection of the shallow depths involved and the fact that most nutrient inputs, both natural and man-derived, enter along the shores.

*"Eutrophic" lakes are characterized by a high production of organic matter and "oligotrophic" lakes have low production of organic matter. A "Mesotrophic" condition can be described as an intermediate or a transient condition.

TABLE 2.2.. Applicant's 1972 Water Quality Measurements-Lake Ontario near
Nine Mile Point Nuclear Station Site

		30-foot Water Depth				40-foot Water Depth				Unit 1					
		Surface		Bottom		Surface		Bottom		Intake		Discharge		Composite**	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Alkalinity	mg/l	86	90	86	90	77	87	81	84	83	90	72	89	86	88
Color Units		20-30	30-40	20-30	40-50	10-20	30-40	20-30	30-40	10-20	30-40	0-30	30-40	20-30	20-30
Sp. Conductivity, umho/cm		326	330	341	344	302	319	347	367	298	360	314	354	294	396
Turbidity	JTU	2	4	2	4	2	4	2	6	2	3	2	4	4	4
Phenol	mg/l	0	2.25	0	1.51	0	1.32	0	1.45	0	1.32	0	2.15	0	1.38
BOD	mg/l	1	5	0	4	1	3	1	2	1	3	0	3	0	2
COD	mg/l	2	42	2	51	3	40	3	41	1	44	1	25	4	13
TKN	mg/l	0	7.5	0	2.2	0	3	0	2.5	0	3.25	0	4.5	0	1.3
NH ₃ -N	mg/l	0	4.7	0	1	0	1.7	0	0.6	0	2.30	0	1.7	0	0
Nitrate-N	mg/l	0.04	0.30	0.04	0.28	0.04	0.40	0.02	0.30	0.04	0.30	0.04	0.36	0.04	0.32
T-Phosphorous	mg/l	0.02	0.11	0.03	0.10	0.01	0.09	0.02	0.10	0.01	0.11	0.01	0.28	0.01	0.12
Ortho Phosphate	mg/l	0.005*		0.010*		0.005*		0.01*		0.01*		0.01*		0.01*	
T. Volatile Solids	mg/l	109	133	90	111	95	187	82	114	114	141	134	153	112	153
Chloride	mg/l	22	72	23	83	22	75	24	62	28	72	26	58	36	39
Sulfate	mg/l	26.5	31	23.2	31.2	28.4	36	26	30	24.5	30	26.8	29	23.5	33
Total Solids	mg/l	226	302	197	297	250	324	223	309	284	291	271	306	255	300
Total SS	mg/l	0	5	0	11	0.1	4	0	9	0	5	0	16	0	9
Beryllium	ug/l	<1	5	<1	<1	<1	15	<1	<1	8	8	<1	<1	<1	13

TABLE 2,2 (Contd.)

		30-foot Water Depth				40-foot Water Depth				Unit 1					
		Surface		Bottom		Surface		Bottom		Intake		Discharge		Composite**	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Cadmium	ug/l	<1	12	<1	10	<1	4	<1	4	1	4	<1	7	<1	4
Chromium	ug/l	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
Copper	ug/l	<2	<2	<2	17	<2	<2	<2	<2	<2	68	<2	<2	<2	13
Lead	ug/l	<20	164	<20	<20	<20	<20	<20	<20	<20	25	<20	50	<20	<20
Mercury	ug/l	<1	<1	<1	2	<1	<1	<1	2	<1	17	<1	5	<1	2
Vanadium	ug/l	<60	<60	<60	429	<60	353	<60	404	<60	353	<60	93	<60	116
Zinc	ug/l	<2	<2	18	28	<2	75	22	24	<2	52	8	20	26	32
pH		8.0*		8.0*		8.0*		8.0*		6.8*		8.0*		8.0*	
Temperature	°F	66	70.5	62	68	65.5	72	61*		61*		87.8*		-	-
Fecal Streptococci #/100 ml		10.6*		10.8*		10.8*		10.9*		10.8*		10.8*			

* Single value.

**Taken at screenhouse discharge channel.

TABLE 2.3 Data on Lake Ontario Water Quality*

Parameter	Units	No. of Samples	Record of Data	Concentrations			Maximum Concentrations, USPHS or NYS
				Min.	Mean	Max.	
Hardness (CaCO ₃)	mg/l	54	6/64-1/71	112	146	240	--
Alkalinity (CaCO ₃)	mg/l	16	3/65-11/66	85	94	101	--
Ammonia, nitrogen	mg/l	54	6/64-1/71	0.0	0.47	1.31	--
Calcium	mg/l	54	6/64-1/71	32.0	44.0	54.0	--
Chlorides	mg/l	54	6/64-1/71	3.8	30.3	55.5	250
Iron	mg/l	54	6/64-1/71	0.0		0.6	0.3
Manganese	mg/l	54	6/64-1/71	0.00	0.01	0.13	0.3
Magnesium	mg/l	51	9/65-1/71	4.9	8.9	29.0	--
Nitrates (N)	mg/l	54	6/64-1/71	0.0	0.14	0.51	10
Nitrates (N)	mg/l	54	6/64-1/71	0.0	0.005	0.029	--
Phosphates	mg/l	54	6/64-1/71	0.0	0.19	1.65	--
Potassium	mg/l	54	6/64-1/71	0.5	1.6	11.4	--
Sodium	mg/l	54	6/64-1/71	1.0	16.6	45.0	--
Sulfates	mg/l	54	6/64-1/71	13.0	30.1	50.0	250
pH	--	71	5/64-1/71	7.2	7.9	9.0	--
Turbidity	ft	71	5/64-1/71	1.0	8.4	25.0	5
Temperature	°F	70	5/64-1/71	34	49.3	73.4	--
Dissolved oxygen	ppm	70	5/64-1/71	6.8	10.9	14.4	--
5-day BOD	ppm	66	5/64-1/71	0.2	1.25	3.0	--
Color	--	68	6/64-1/71	2	8.5	20	15
Conductivity	mmhos	53	6/64-1/71	131.0	306	437.0	--
Coliform bacteria	no/100 ml	70	5/64-1/71	2.2	56	240	1.1
COD dichromate	ppm	51	6/64-1/71	0.2	7.9	28.1	--
Res. on evap. (total)	ppm	54	6/64-1/71	128	243	533	--
Res. on evap. (fixed)	ppm	51	9/65-1/71	73	135	367	--
Suspended solids (total)	ppm	51	9/65-1/71	1	10.5	44	--
Suspended solids (fixed)	ppm	26	8/66-1/71	0	5.5	17	--

*Data recorded by New York State Department of Environmental Conservation of Oswego, N. Y., city water intake, 6500 ft into the lake at 40 ft below lake level.

2.5.3 Groundwater Hydrology

Some water is obtained from wells that are drilled into the upper five- to ten-foot fractured zone of the Oswego Sandstone. Yields in this material average about 10 gallons per minute. Below the sandstone bedrock there is another hydrologic bedrock unit. This layer is composed of black and gray shale; it is 800 feet thick and wells yield an average of three gallons of water per minute.

Ground water is used for private needs in the area. The nearest known producing well is about one mile from the Station. The locations of this and other private water supplies are given in the Applicant's Environmental Report (Fig. 2.5-4). In the vicinity of the Station, the ground water flows north to the lake.

2.6 METEOROLOGY

The climate at the Nine Mile Point area is essentially continental, with cold winters and warm summers. The winters are usually long with an average temperature near 25°F; the summers are short with an average temperature close to 70°F. For about a ninety-year period ending in 1960, the temperature extremes recorded at the U.S. Weather Bureau Station in Oswego were 100° and -23°F.

The climate in the area is controlled by the St. Lawrence Valley storm track and moderated by Lake Ontario. During the summer, the lake stores heat, which is dissipated in the fall and early winter. The resultant warm air moves inland in the fall and prolongs the warmer weather onshore. During late winter, spring, and summer, the lake is a heat sink; it absorbs heat from the sun and warmer air. The cool winds from the lake cause the near shore temperature to be lower in the spring and summer. The lake also affects the humidity, cloudiness, and precipitation onshore; in the fall and winter, wind currents absorb moisture over the lake and deposit it inland in some form of precipitation (usually snow showers). Low-pressure areas moving along the St. Lawrence storm track also bring moist air to the southern shore of the Lake Ontario area from the Gulf of Mexico.

Precipitation is moderate and rather uniformly distributed throughout the year. It consists mainly of thundershowers during the summer and snow during the winter. The average annual precipitation and snowfall occurring at the U.S. Weather Bureau Station at Oswego was 33.6 inches and 88.1 inches, respectively. Winter snowfall averages one to two feet per month during December through March. The maximum short-term (three-day) snowfall on record was 75 to 90 inches during the winter of 1965-1966.

The prevailing winds during most months are from the southwest approaching the direction of the long axis of the lake. During the winter, the predominant wind direction shifts to the west. High winds in the Lake Ontario

area result mostly from intense winter storms and severe thunderstorms. An absolute peak wind speed of 73 miles per hour was recorded by the Applicant during two years of continuous observation at the site in 1963-1964.

A number of tornadoes have been reported in the 1° latitude-longitude square at the site. Calculated by the Thom formulation¹² and using the most recent tornado frequency estimate*, the probability of a tornado striking a point in a 1° latitude-longitude square at the site is 4.1×10^{-4} per year. The calculated recurrence interval for such a tornado is 2459 years.

2.7 ECOLOGY

2.7.1 Terrestrial Ecology

The Station and its associated transmission line are in the Erie-Ontario Lowlands physiographic region. There is an extensive northern hardwood forest in this region which has sugar maple, beech, white ash, basswood, black birch, hemlock, yellow poplar, chestnut, and red, black, white, and burr oaks. White pine is found only near swamps. Elm, alder, maple, and ash swamps are numerous. Arborvitae and cattail swamps are scattered throughout the area.

The areas in the vicinity of the Station that were formerly farmed and are now covered with second-growth trees and other woody vegetation constitute about half the land in the county. The remainder is made up of wooded areas and farms. The woody vegetation consists of red cedar, hawthorn, gray birch, raspberry, meadowsweet, and red osier dogwood. Crops such as wheat, cabbage, corn, beans, and tomatoes are still grown in this region. There are also apple, pear, and cherry orchards.

The wildlife species found near the site are typical of the northeastern United States. The most common mammals include the cottontail rabbit, fox, raccoon, chipmunk, and gray squirrel. Very few white-tailed deer are in this area. Predatory birds which inhabit the more open spaces include sparrow hawk, red-tailed hawk, marsh hawk, and broad-winged hawk. Two species of game birds — ruffed grouse and woodcock — are found throughout the site. Very few pheasants are found in this area. Lake Ontario, in the vicinity of Nine Mile Point, has important concentrations of diving ducks in the winter, with lesser scaup being the most abundant species. Dabbling ducks, such as the wood duck, black duck, mallard, and blue-winged teal, can be found on a few ponds of the region; this is a breeding area for these ducks. The southern shore of Lake Ontario is a major migration route used by many water fowl and other migrating birds. The American osprey and bald eagle use this route too.

*Based on Technical Memorandum WBTM FCST 12, "Severe Local Storm Occurrences, 1955-67," U.S. Dept. of Commerce, ESSA, Sept. 1969.

The Applicant has stated that a cursory terrestrial survey of the site area was performed to determine the flora and fauna present. No rare or endangered species of plants and animals were noted by the Applicant either as a result of the site survey or their literature search regarding the site area. However, the bog turtle, *Clemmys muhlenbergii*, classified as endangered by the State of New York, is usually found near marshes similar to those along the path of the transmission line.

2.7.2 Aquatic Ecology

Generally, the benthos and plankton of Lake Ontario indicate an oligotrophic situation. The deep water benthos is comprised mostly of the opossum shrimp, *Mysis relicta*, the amphipod, *Pontoporeia affinis*, and oligochaetes. Phytoplankton consists mostly of diatoms. The abundance of diatoms *Melosira islandica* and *Asterionella formosa* in the pelagic waters of the lake suggests oligotrophy. However, the preponderance of *Stephanodiscus tenuis* in inshore waters may indicate higher nutrient concentrations along shore.¹³

Considerable change in the relative abundance of fishes has occurred in Lake Ontario. The Atlantic salmon (*Salmo salar salar*), which was once abundant, almost disappeared by 1880. Lake sturgeon (*Acipenser fulvescens*) was over exploited and was greatly reduced in all the Great Lakes by the early 1900's. The cisco (*Coregonus artedii*) has declined since the 1920's. The abundance of lake trout (*Salvelinus namaycush*) and blue pike (*Stizostedion vitreum glaucum*) has also declined during recent years, and the blue pike is now on the endangered species list. The sea lamprey may have reduced the abundance of large species. The presence of alewife (*Alosa pseudoharengus*) dates back to 1870; in the absence of large predators, it has flourished and is now the most abundant fish in the lake. Another view is that the population of alewife stabilized prior to the decline of the large predators; this hypothesis is supported by resurgence of premium fish stocks in the 1920's and the newspaper reports during the same era of two major alewife mortalities.* White perch (*Morone americana*) have become more abundant recently. Despite the high nutrient content of Lake Ontario, the fish production is relatively low.¹⁴

The total commercial catch has declined from 7.5 million pounds in 1890 to 3.2 million pounds in 1970. Landings for lake herring and chubs, white fish, walleye, lake trout, and blue pike have consistently decreased in recent years.¹¹ Recent commercial landings have been dominated by white perch, carp, bullheads, yellow perch, whitefish, smelt, eel, sunfish, and walleye.

*Christie, W. J. 1972. Lake Ontario: effects of exploitation, introductions, and eutrophication on the salmonid community. J. Fish. Res. Bd. Can. 29:913-929.

Commercial fishing in the U. S. portion of the lake is a small fraction of the total catch (330,000 pounds compared with 2,905,000 pounds in Canadian waters in 1970) and is confined mostly to the extreme northeast section of the lake in Chaumont Bay (approximately 40 miles from Nine Mile Point) and its nearby shoal areas. Additional fishing is conducted from Sacketts Harbor westward and Oswego Harbor eastward.

The shoreline at Nine Mile Point, except for the fenced area around the plant, is accessible for sport fishing. Smallmouth bass, yellow perch, white perch, walleye, bullhead, and northern pike are the principal sport fishes in the area. The full extent of sport fishing in the vicinity of the site, however, is not known.

Studies now in progress under the auspices of the International Field Year for the Great Lakes will yield considerably more information for the Nine Mile Point area and eastern Lake Ontario. However, the final results of these studies will not be forthcoming in the immediate future.

The aquatic biota of this area are described below on the basis of the Applicant's preoperational studies described in the Applicant's Environmental Report and information available in literature on Lake Ontario.

a. Fishes

The fishes found in the Nine Mile Point area are listed in Table 2.4. Observations incidental to the Applicant's survey indicate that the alewife spawns near the site. In spring, the alewife eggs are deposited in the *Cladophora* mat close to the shore. However, because of limited sampling, the possibility of spawning by other species cannot be discounted.

Heavy wave activity will tend to discourage use of shallow waters in this area for spawning by species which build nests and care for the eggs or young for some period. Mexico Bay, two miles east of the site, offers shallow waters suitable for spawning and nursery use.

Information about spawning, food habits and importance of fishes abundant in the Nine Mile Point area, derived from References 15-18, is given in Table 2.5.

An echo-sounder survey by the Applicant, reported in the Environmental Report, has shown higher concentrations of fish in the area along the 20-foot depth and in slightly deeper water than in shallow, near-shore waters. Fish are most abundant in the area during May. Such abundance could be related to the spawning activity during this period. The abundance declines in August, and few fish are left in the area as winter approaches. Large concentrations were noted at depths of 30 to 40 feet

TABLE 2.4 Fishes Found in the Nine Mile Point Area

Common Name	Scientific Name
<u>Decreasing Order of Yearly Abundance</u>	
Alewife	<i>Alosa pseudoharengus</i>
Yellow perch	<i>Perca flavescence</i>
White perch	<i>Morone americana</i>
Northern redhorse sucker	<i>Maxostoma sp.</i>
Rock bass	<i>Ambloplites rupestris</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Bluegill sunfish	<i>Lepomis macrochirus</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
<u>Other Fishes in the Area</u>	
Carp	<i>Cyprinus carpio</i>
Coho salmon	<i>Oncorhynchus kisutch</i>
Walleye	<i>Stizostedion vitreum vitreum</i>
Smelt	<i>Osmerus mordax</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
White bass	<i>Morone chrysops</i>
Bowfish	<i>Amia calva</i>
Calico bass	<i>Pomoxis nigromaculatus</i>
Minnows	<i>Notropis spp.</i>
Northern pike	<i>Esox lucius</i>
White sucker	<i>Catostomus commersoni</i>
Lake whitefish	<i>Coregonus clupeaformis</i>

TABLE 2.5 Spawning, Food Habits, and Importance of Fishes Abundant
in the Nine Mile Point Area of Lake Ontario

Species	Spawning			Food Habits	Importance
	Parental Care	Time/Temp, °F	Place		
Alewife	No	55 to 72 Late May to early August	6" to 12" deep in vegetation	Zooplankton, insects, crustacea, small fish	Forage
Yellow perch	No	44 to 54 April and May	Inshore at night	Small crustaceans, insect larvae, small fish	Sport, commercial food
White perch	No	April, May and June	Fine gravel near shallow areas	Plankton, insect larvae, crusta- ceans, large invertebrates	Commercial, food sport
Rock bass	Yes	70 to 78 June, July	Nest in a gravel bed	Insects and other small invertebrates, crayfishes, small fishes, large insects	Food, sport
Smallmouth bass	Yes	65 or above	Nest in a depres- sion circular	Small animals in shallow water	Commercial, food sport
Bluegill sunfish	Yes	80 to 90 June, July	Nests on sand beaches or gravel bars	Crustaceans, insects, crayfishes, fishes	Food, sport
Brown bullhead	Yes	65 or above May, June	Nest	Crustaceans, insect larvae, fish fisheggs, molluscs, plants	Sport, food
Smelt	No	April, May at cold temperature	Shallow, sandy beaches	Plankton, fingernail clams, smelt young, shiners	Commercial, food

between 10 PM and 3 AM. These studies also indicate a two-fold increase in numbers of fish from shallow water (10 feet) to deeper water (20 feet).

Experimental gill netting showed a preponderance of alewives near the surface. Relatively few were caught near the bottom. Yellow and white perch are the other two abundant species in the area. Perch and minnows were captured in the nets close to the shore. Except for alewives, very few fish were found near the surface. Extensive mortality of alewives was observed in the lake during the spring of 1970; the cause of such mortality is not fully understood. Such extensive mortality could occur because of any of the following causes: (1) high population density, resulting in depletion of food supply, which in turn results in the poor physical condition of the fish; (2) temperature stress during cold winters and in the spring during spawning; and (3) physiological effects as a result of their saltwater origin.

Gill netting in 1970 and 1971 has shown that carp, sunfish, smallmouth bass, alewives, and some other fishes tend to concentrate in the thermal plume of Unit 1 during cooler months. The Applicant has not seined in the area and therefore no information on juveniles near the shore is available.

Food-preference studies of fishes in the area, as given in the Applicant's Environmental Report, have indicated that small alewives, a few minnows, darters, and alewife eggs are the major food supply during spring. Later in the season, *Gammarus* (an amphipod), crayfish, minnows, and darters serve as the principal forage.

b. Benthos

Several studies have described various aspects of benthic macroinvertebrates of Lake Ontario.¹⁹⁻²⁵ Oligochaetes comprise the largest group of macrobenthos in the lake. These are represented by four families: Enchytraeidae, Lumbriculidae, Naididae, and Tubificidae. The Enchytraeids are widespread but not abundant and do not exhibit depth preference. *Stylodrilus heringianus* (Lumbriculidae) occurs throughout the lake. The species of Naididae occur in shallow water. None of them, however, is abundant. The greatest number of species and individuals belongs to the family Tubificidae.

Amphipods are represented by *Pontoporeia affinis* and *Gammarus*. *P. affinis* seems to be more abundant in the shallow zone than in deep zones. *Gammarus* is limited to waters less than 100 feet deep.

Chironomids (midge fly larvae), with a few exceptions, are not found in the lake at depths over 160 feet. Most of these larvae and all gastropods (snails) are restricted to the shallow zone.

Table 2.6 (from Ref. 20) shows the abundance of benthic organisms at a sampling station about four miles from the Station.

Observations by the Applicant indicate that benthos in the vicinity of the Nine Mile Point site is characterized by abundance of *Cladophora* (filamentous green alga) along the 10-foot depth contour; the growth is sparse at 5 and 20 feet. The growth is greater in June and declines in August. Optimum temperature for *Cladophora* is about 65°F.²⁶ Temperatures higher than 65°F tend to limit the growth. *Gammarus* has been found to be abundant in Mexico Bay and at the 10-foot depth in the Nine Mile Point area. It is more abundant in August than in June. Three species of snails have been found at the 15-foot depth. The midge fly larvae, *Tendipes*, have also been observed in this area. Preliminary results of the sampling conducted by the Applicant indicate that thermal discharge from Unit 1 depresses the *Cladophora* growth in late summer and increases the abundance of *Gammarus* in the zone of the thermal discharge. The laboratory studies,²⁶ conducted with *Cladophora* taken from this site, have determined the lower and upper thermal tolerance levels to be 53° and 77°F, respectively.

c. Periphyton

A study of the periphytic organisms in Mexico Bay, Lake Ontario (adjacent to Nine Mile Point area) was conducted during May-November 1966.²⁷ The maximum average abundance of organisms for each month was obtained at a depth of four inches. Except for June, the average harvest value at all stations and during all months occurred at the 12-foot depth. The monthly value for all stations was highest in June and lowest in October. Zoospores of an alga of the family Chlorophyceae (green algae) were observed in large numbers in May and June samples. A total of 35 genera was recorded. Ten of the genera belong to Chlorophyceae, of which *Cladophora* was most abundant. The Chrysophyceae (yellow-green or yellow-brown algae) were represented by three genera. Bacillariophyceae (diatoms) were most widespread, and were represented by 17 genera, *Melosira* and *Stephanodiscus* being abundant at all stations. Myxophyceae (blue-green algae) were represented by five genera, although none was abundant.

d. Plankton

(1) Zooplankton

Results of a lakewide study on composition and horizontal distribution of crustacean plankton in Lake Ontario²⁸ indicate that most of the species appear in June and July in the eastern end of the lake, with zones of abundance later expanding westward. By October there is a tendency toward uniform distribution throughout the lake. Ninety percent of the zooplankters occupy the 0 to 167-foot stratum. Eleven species each of copepods and cladocerans have been reported from the

TABLE 2.6 Abundance of Benthic Organisms at a Sampling Station
Approximately Four Miles from Nine Mile Point Station, 1964

Organism	Number of Organisms per Square Meter at 34-foot Depth (11 m)
Nemata	
Unidentified	103
Oligochaeta-Naididae	
<i>Piguetiella michiganensis</i>	5
Oligochaeta-Tubificidae	
<i>Potamothenis moldaviensis</i>	103
<i>P. vejdoskyi</i>	70
<i>Rhyacodrilus coccineus</i>	5
Unidentified	1885
Arthropoda	
<i>Hydracarina</i>	22
Crustacea	
<i>Gammarus</i> sp.	1199
<i>Pontoporeia affinis</i>	675
Ostracods-unidentified	11
Insecta	
<i>Cryptochironomus digitatus</i>	11
<i>Microsectra</i> sp.	49
<i>Microtendipes</i> sp.	5
<i>Potthastia longimana</i>	5
Mollusca	
<i>Ammicola</i> spp.	561
<i>Valvata sincera</i>	680
<i>Pisidium</i> spp.	1889
<i>Sphaerium transversum</i>	38

lake, the most abundant forms being: *Cyclops bicuspidatus*, *Tropocyclops prasinum mexicanus*, *Daphnia retrocurva*, *Bosmina longirostris*, *Bosmina coregoni coregoni*, and *Ceriodaphnia lacustris*. At the time of maximum population density there was a strong positive correlation between zooplankton abundance and temperature of the top 25 meters of water column. The eastern zone of the lake had 1.7 times more individuals per unit volume of water than the western zone of the lake. Whether this effect is produced by an acceleration of zooplankton growth rates or by increased production of food organisms has not been ascertained. The eastern zone of the lake has a small second peak of abundance in October. The abundance of zooplankton in a given area can be affected by the general pattern of the wind over the lake.

Studies conducted during 1969 and 1970 near Unit 1²⁹ have shown that the thermal discharge from Unit 1 has increased the standing crop of *Bosmina* 25.0 times and *Daphnia retrocurva* 1.2 times in the overall study area. Adjacent to the outfall, these same populations increased 123.8 and 2.4 times, respectively. At the same time, primary production was not significantly affected. These studies covered a limited time period, and the conclusions were based on few data. Further studies are necessary before any sound conclusions can be drawn.

(2) Phytoplankton

The phytoplankton of Lake Ontario have been described.³⁰⁻³⁸ Phytoplankton along the shore have more species per milliliter and a higher percentage of *Stephanodiscus tenuis* as compared to waters offshore. *Asterionella formosa*, *Melosira islandica*, *Melosira binderana*, and *Nitzschia sigma* are the other important species. The midlake and locations six miles offshore have a lower abundance of *Stephanodiscus tenuis*, and *Melosira islandica* and *Asterionella formosa* become more abundant.

Information on the abundance of major diatom species in the Nine Mile Point area (derived from Reference 31) is given in Table 2.7. In a lakewide survey conducted during September 1964,^{25,30} the dominant plankters were green algae followed by diatoms. The distribution of phytoplankton by families at a station approximately four miles from the Nine Mile Point Station is given in Table 2.8.

Observations by the Applicant in 1964 on distribution of plankton near the site indicated higher plankton concentrations in the surface waters and dependence of plankton abundance on winds and currents, the plankton being more abundant in the area with no shore winds and currents. Very few fish larvae were observed in the plankton samples collected in 1964.

2.8 BACKGROUND RADIOLOGICAL CHARACTERISTICS

The radiological aspects of the site area are average for the region. There are no conspicuous natural sources, and radiation from all sources

TABLE 2.7 Abundance of Major Diatom Species at a Sampling
Station About Four Miles from Nine Mile Point
Station, September 8-18, 1964

Major Diatom Species	Abundance (cells/ml)	
	Surface	10 meter
<i>Asterionella formosa</i>	4.6	0.6
<i>Fragilaria crotonensis</i>	21.4	30.0
<i>Melosira islandica</i>	1.3	--
<i>Stephanodiscus astraes</i>	2.0	2.0
<i>Stephanodiscus var. minutula</i>	10.0	12.0
<i>Stephanodiscus tenuis</i>	4.0	0.6
<i>Tabellaria fenestrata</i>	7.4	8.6
Total	57.5	58.1

*Data taken from Ref. 31, Station 74.

TABLE 2.8 Abundance of Phytoplankton (by Families) at a Sampling Station About Four Miles from Nine Mile Point Station, September 1964

Family	Phytoplankton Event (cells/ml)	
	Surface	Bottom (10 meter)
Chlorophyceae	312	619
Bacillariophyceae	249	216
Myxophyceae	14	17
Dinophyceae	6	--
Euglenophyceae	61	139
Others	--	7
Total	642	998

*Data taken from Ref. 30.

is below average for the U. S., as is typical of the northeastern rain belt.^{25,39} Measured dose rate from natural background for the area is about 125 mrem/yr. Radiological aspects associated with Nine Mile Point are discussed in Section 5.

Some 25 state and federal monitoring stations have been active within 124 miles of the proposed Station for the last two decades. In addition, a monitoring program has been in operation at Nine Mile Point Unit 1 since 1967.⁴⁰ Values reported by the nearest stations in recent years are summarized in Table 2.9. Postoperational values for Unit 1 are also included. This large accumulation of available data provides an adequate baseline to which the Station's impact may be compared.

TABLE 2.9 Environmental Sampling Stations in the
Nine Mile Point Area, 1969-1972

Station	Samples Taken ^a		Range ^a	Mean ^a
Albany, N. Y.	PM	Sr-90	0-11	6
	SA	Gross beta	0-5	1
	P	Gross beta	2-29	7.7
	SW	Gross beta	0-3	2
	SW	Tritium	0-1600	<200
	TW	Tritium	0	<200
Buffalo, N. Y. (Niagara Falls) (Lake Erie)	PM	Sr-90	0-10	7
	SA	Gross beta	0-4	1
	TW	Tritium	0-500	<200
	SW	Gross beta	3-5	4
	SW	Gross beta, diss.	3-10	7
		Gross beta, susp.	<3-11	3.
		Gross alpha, diss.	<3	<3
Massena, N. Y.		Gross alpha, susp.	<0.2-2	1.2
	PM	Sr-90	3-14	7
	SW	Gross beta, diss.	2-8	4.7
		Gross beta, susp.	2-5	3
		Gross alpha, diss.	<0.2-1	<0.2
		Gross alpha, susp.	<0.2-06	<0.2
New Haven, N. Y.	SW	Gross beta	3-8	4
	TW	Tritium	0	<200
Oswego, N. Y.	SW	Gross beta	3-5	4
	TW	Tritium	0	<200
Rochester, N. Y.	SW	Tritium	0	<200
		Gross beta, diss.	3-4	3
		Gross beta, susp.	0	0
		Gross alpha, diss.	0	0
		Gross alpha, susp.	0	0
		Gross alpha	0	0
Rome, N. Y.	TW	Gross beta	3	3
		Gross alpha	0	0
Syracuse, N. Y.	PM	Sr-90	5-13	7
Toronto, Ont.	PM	Sr-90	3-9	5
	SA	Gross beta	0-1	0.1
	P	Gross beta	1-25	4.4
Utica, N. Y.	TW	Gross beta	6	6
		Gross beta	0	0
Watertown, N. Y.	SW	Gross beta	3-6	3.5
Nine Mile Point ^b	P	Gross beta	3-27	8 ^b
	SA	Gross beta	03-5	2
	SW at inlet	Tritium	2400	2400
		Vertebrates, Aquatic, Gross beta	0-5 ^b	2 ^b
		Invertebrates, Aquatic, Gross beta	0.5	0.5
		Plants, Aquatic Gross beta	14	14
		Vertebrates, Aquatic Gross gamma	0-1	0.2
		Invertebrates, Aquatic Gross gamma	0.5	0.5
		Plants, Aquatic Gross gamma	37	37

From Environmental Protection Agency, Radiation Data and Reports Vol. 1-13, (1972) and Semiannual Reports of Operation, Nine Mile Point Nuclear Station for 1971.

- ^aPM = Pasteurized milk, pCi/l
 SA = Surface air, pCi/m³
 P = Precipitation, nCi/m²/month
 SW = Surface water, pCi/l
 TW = Tap water, Tritium, pCi/l

^bpCi/gm dry weight, for biota.

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3. THE STATION

3.1 EXTERNAL APPEARANCE

The Station's various structures include the Progress Center and the administration, reactor, turbine, sewage treatment, and radwaste buildings (the last containing the screenwall pump house). The reactor building, the tallest, is approximately 140 feet high, but a 350-foot stack rises from the radwaste building. All the buildings except the Progress Center and sanitary plant are interconnected. The 345-kV switchyard is south of the main building. The buildings and auxiliary systems occupy about five percent of the 900-acre site. A plot of the Station is shown in Fig. 3.1.

The Station's exterior is of fluted metal siding on a concrete base. The russet color of the base contrasts with the light gray and green of the metal siding. The architecture emphasizes the rectangular shapes of the interconnected buildings. The external appearance of the grounds was developed by an independent landscape architect. The Progress Center, located west of the main building, is a contemporary stone and glass ranch-style structure used as a visitors reception center and museum. It contains exhibits of nuclear energy and local nature interest and is visited by over 50,000 persons a year. Figure 3.2 shows the appearance of the Station and nearby grounds.

3.2 REACTOR AND STEAM - ELECTRIC SYSTEM

A single boiling water reactor, manufactured by the General Electric Company, generates steam at 1000 psig to drive the turbine-generator. The reactor has a rating of 1850 Mwt, corresponding to a net electrical output of 610 MWe.

The turbine-generator is a tandem unit with a high-pressure section on the same shaft with three low-pressure sections and the electric generator. Steam is exhausted from the turbine to the main condenser, where it is condensed and returned via the regenerative feed-water heaters.

The reactor core, which contains 532 fuel assemblies, is refueled annually, with about 25 percent or 133 fuel assemblies replaced during each refueling period. The assemblies now in use were manufactured by General Electric Corporation.

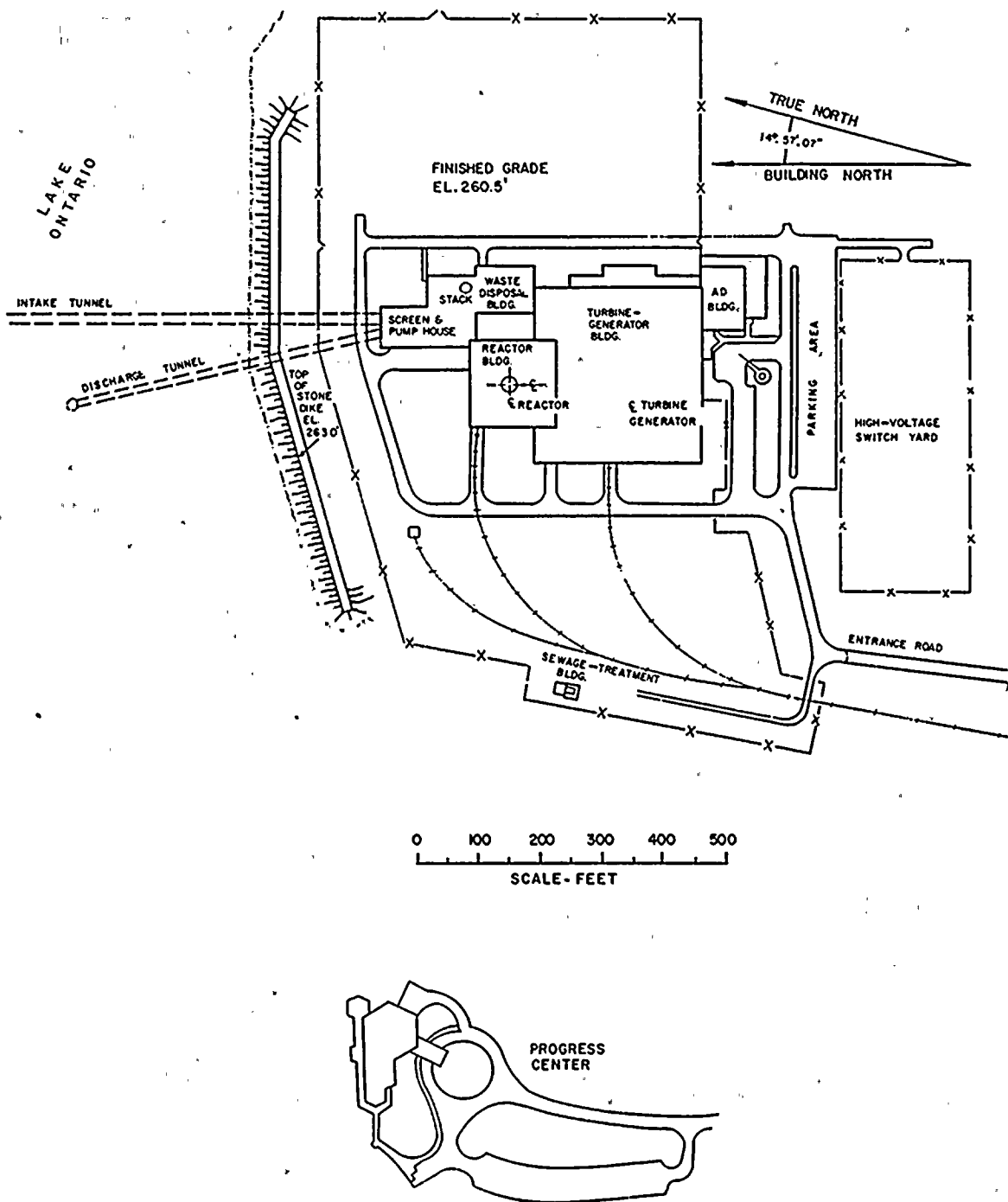


Fig. 3.1. Plot of Site of Nine Mile Point Nuclear Station Unit 1.

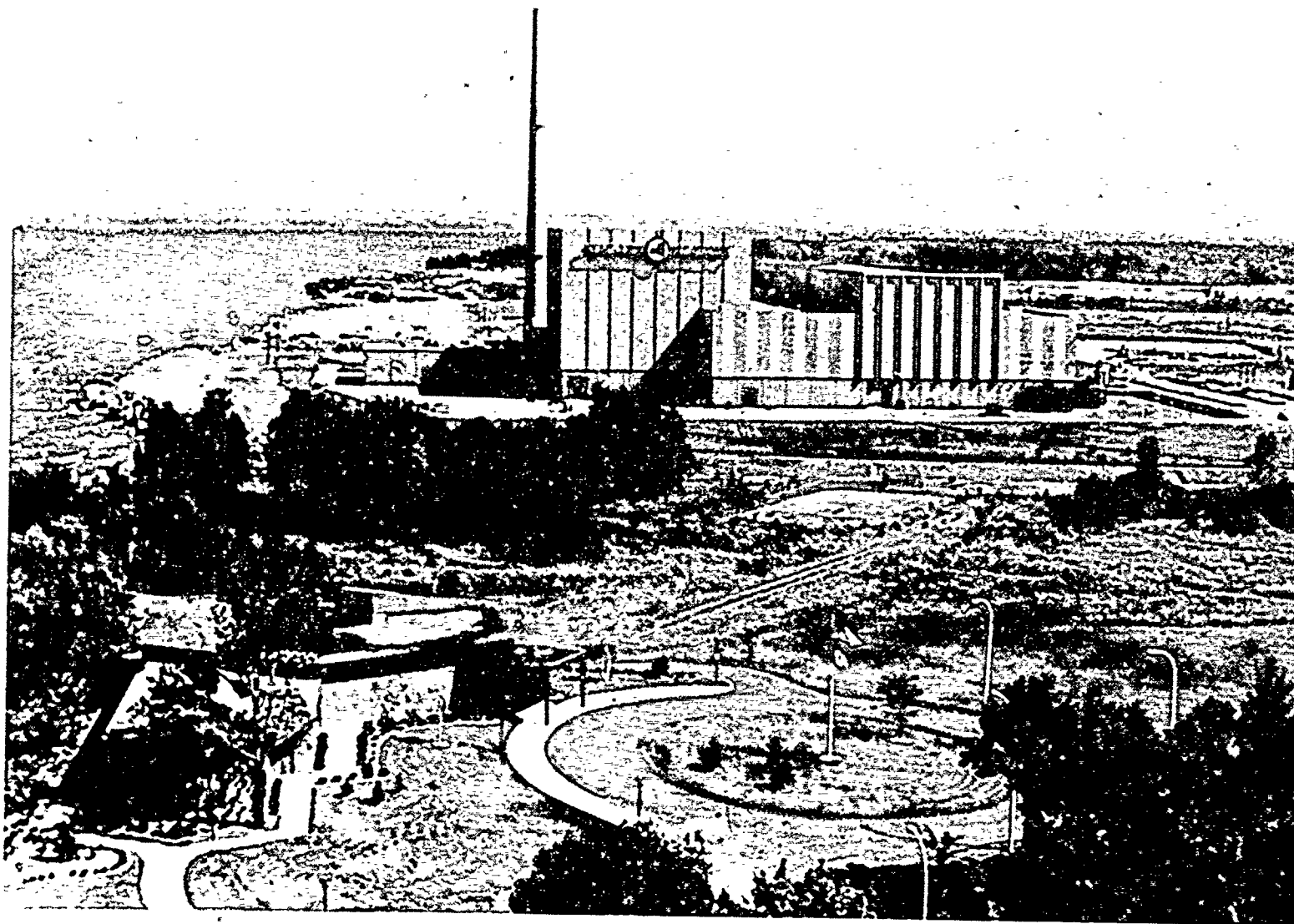


Fig. 3.2. Nine Mile Point Unit 1.

The unit was designed by Niagara Mohawk Power Corporation and constructed by Stone and Webster Engineering Corporation. The Station has been in commercial operation since December, 1969.

3.3 PLANT WATER USE

Cooling water for the main condenser, auxiliary systems, reactor-shutdown heat removal, and the primary cooling system is withdrawn from Lake Ontario and returned after use. The only net water consumption is that due to evaporation of water, water in disposed "solids" or radwaste solutions, and water due to minor leaks. Although an exact determination of this loss cannot be made, the Applicant estimates the maximum loss to be 10 gpm. This loss does not include evaporation from the lake surface due to the heated discharge.

No chemicals or inhibitors are added to the circulating or service water systems. The silt content of the raw lake water has been sufficient to prevent attachment of biological growth in the cooling system. Should cleaning of the condenser or service water become necessary, the Applicant proposes to use a high-pressure water flush or other mechanical means to prevent fouling of the condensers. Chemicals are used in the makeup—water treatment system, analytical sampling system, and the decontamination system. Chemical discharge from these systems is discussed in Section 3.6.

The City of Oswego supplies 3300 gpd for domestic-water use. Most of this water is returned to Lake Ontario after treatment. The water usage for the Station is shown in Fig. 3.3.

3.4 HEAT-DISSIPATION SYSTEM

The Station uses once-through cooling to dissipate to the environment waste heat from the main condensers and auxiliary cooling systems. The circulating water for the Station is drawn from Lake Ontario into a submerged inlet, circulated through the condensers, and returned to the lake through a submerged discharge structure. The intake and discharge tunnels run under the lake bed to the screenwell and pump house on shore. Figure 3.4 shows the location of the intake and discharge structures in Lake Ontario.

The Applicant has stated that, at maximum power output, the Station requires a total flow of 268,000 gpm; 250,000 gpm are for the main condenser and 18,000 gpm are for service-water requirements. The main condenser will raise the cooling water temperature a maximum of 32°F corresponding to a

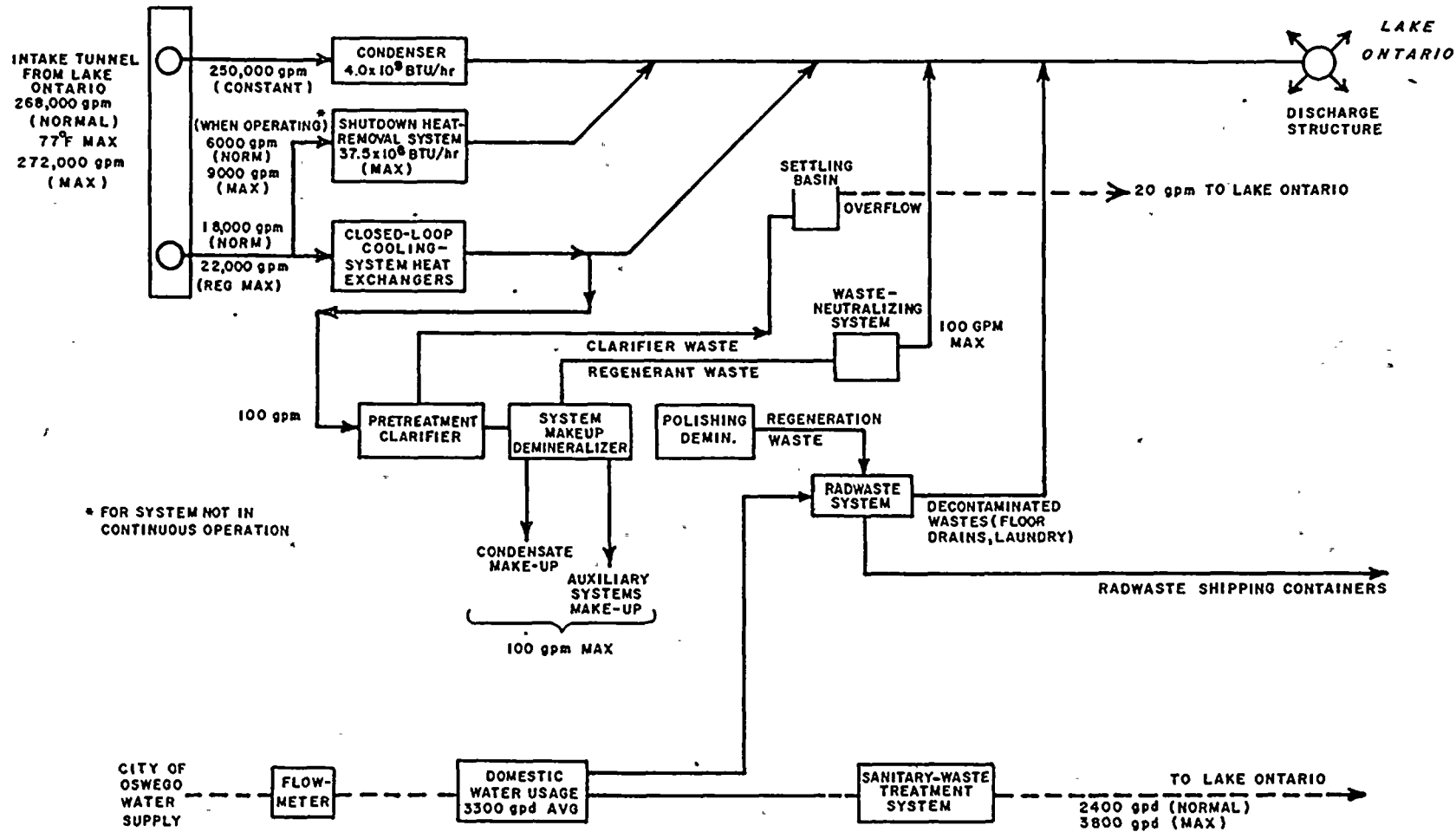
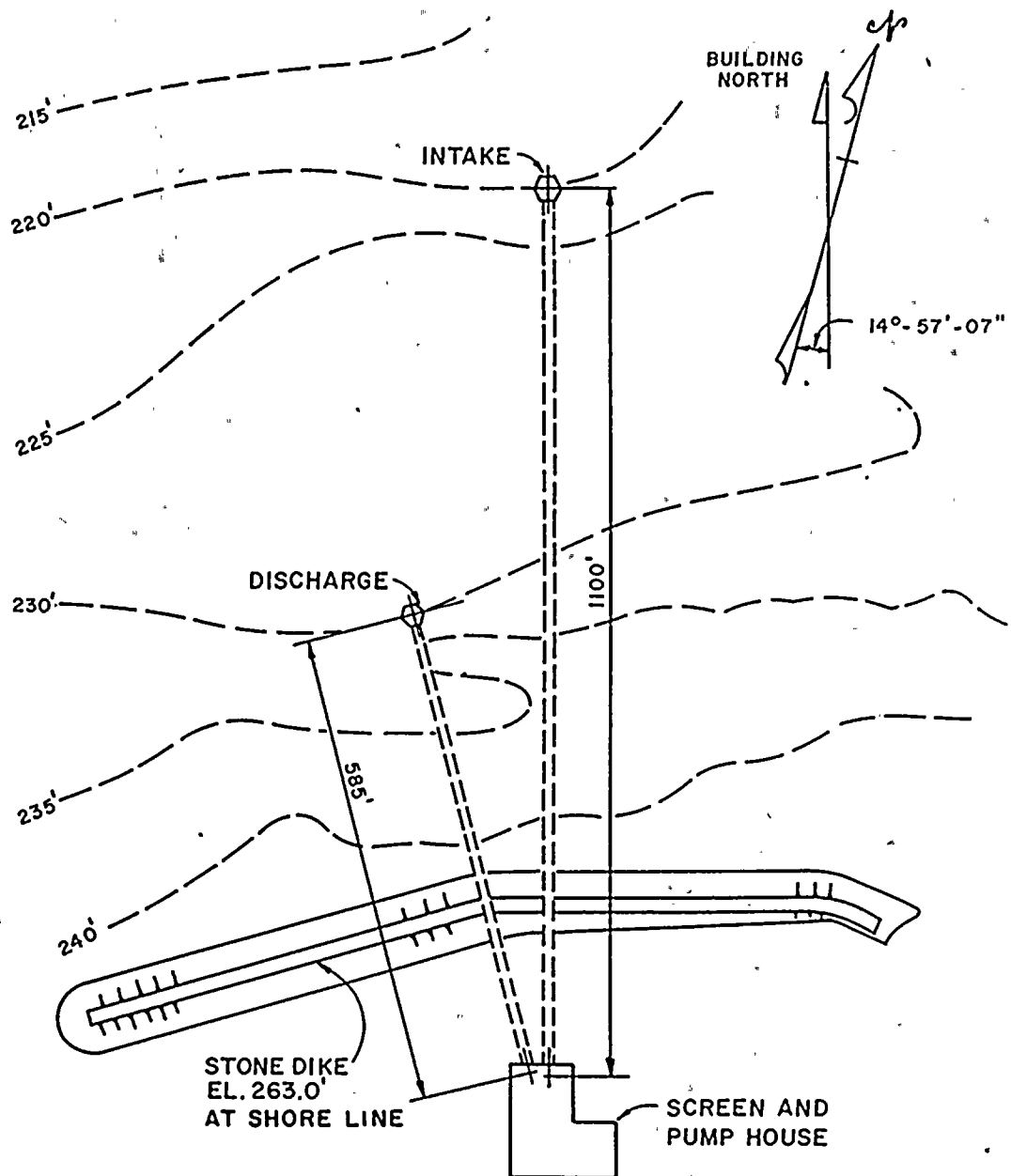


Fig. 3.3. Water-usage Flow.



NOTE:
ALL ELEVATIONS ARE REFERENCED TO USLS 1935 DATUM

0 100 200 300 400
SCALE 1" = 200'

Fig. 3.4. Intake and Discharge Structure Locations: Plan.

heat rejection rate of 4.0×10^9 BTU/hr. The service-water temperature will be raised about 20°F. The temperature rise for the total flow is 31.2°F. The temperature of the intake water varies with the season from 33° to 77°F, the maximum recorded temperature.

3.4.1 Intake Structure

Cooling water is taken from Lake Ontario into a hexagonal intake structure located in a water depth of approximately 18 feet about 850 feet from the existing shoreline. The six water inlets, each 5 feet high by 10 feet long, are guarded by galvanized steel racks to prevent the entrance of unmanageable flotsam into the water system. The Applicant states that this design provides for water to be drawn equally from all directions with a minimum of disturbance and no vortex at the surface. When the Station is at maximum output, the water velocity at the intake is about 2 fps. Fig. 3.5 shows structural details of the intake.

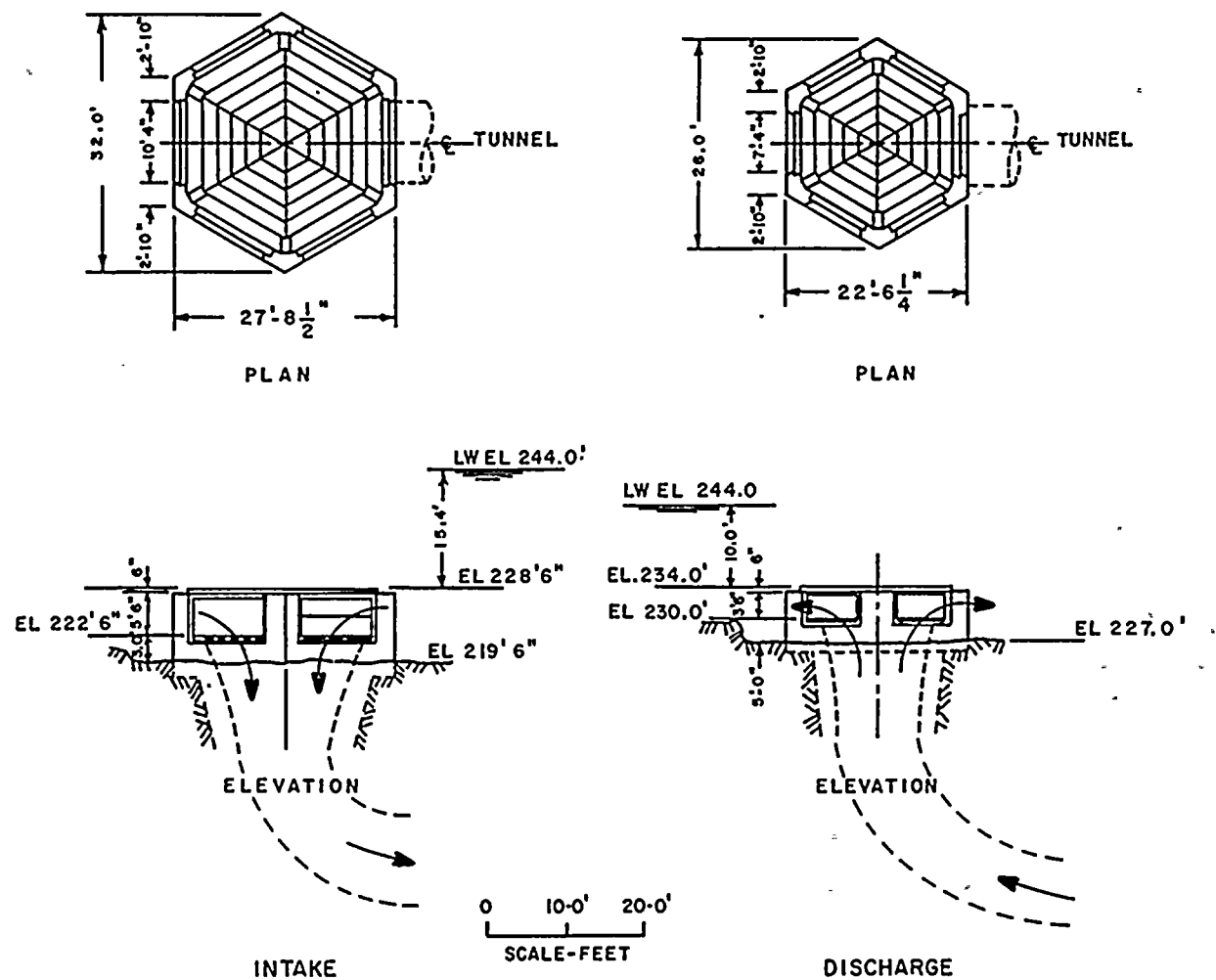
From the intake structure, the water flows at 8 fps maximum through a concrete-lined tunnel with approximately a 78-square-foot cross section (10-ft diameter) to the screenwell and pump house adjacent to the turbine building. From three separate interconnected bays in the screenwell, two circulating pumps (total capacity 250,000 gpm) take the water through trash racks and traveling screens and thence to the condenser at 0.85 fps maximum.

Service-water needs are supplied by two 22,000-gpm pumps (normally run at 18,000 gpm). Also located in the pump house are two 2500-gpm, 125-psig vertical turbine fire pumps. A diagrammatic sketch of the screenwell is shown in Fig. 3.6.

3.4.2 Discharge Structure

The discharge tunnel, ten feet in diameter, about 78 square feet in cross section and designed for a flow velocity of about 8 fps, takes the heated water from the screenwell to the discharge structure located about 335 feet off-shore. The top of the hexagonal discharge structure (Fig. 3.5), which has six ports 3 feet high by 7 feet 4 inches wide, is about 4 feet above the lake bottom and is about 8-1/2 feet below the lowest expected lake level.

The transit time of water through the cooling system is about 6 minutes, of which 14 seconds is for passage through the condenser. From the condensers to the exit at the discharge structure, travel time is about two minutes. The effluent at the exit has an initial velocity of approximately 4 fps. The profile of the circulating system is shown in Fig. 3.7.



ALL ELEVATIONS ARE REFERENCED TO USLS 1935 DATUM

Fig. 3.5. Intake and Discharge Structures.

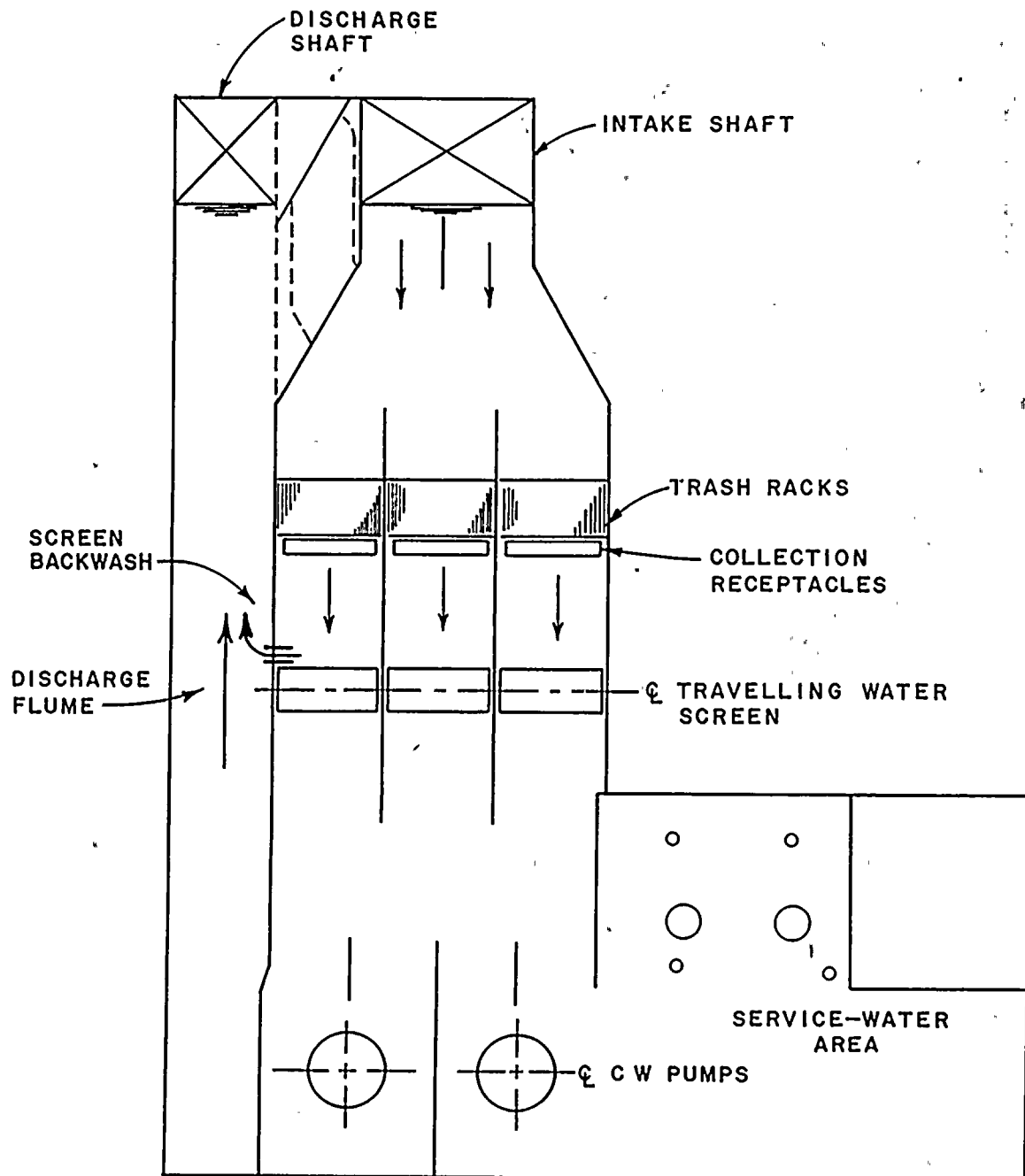
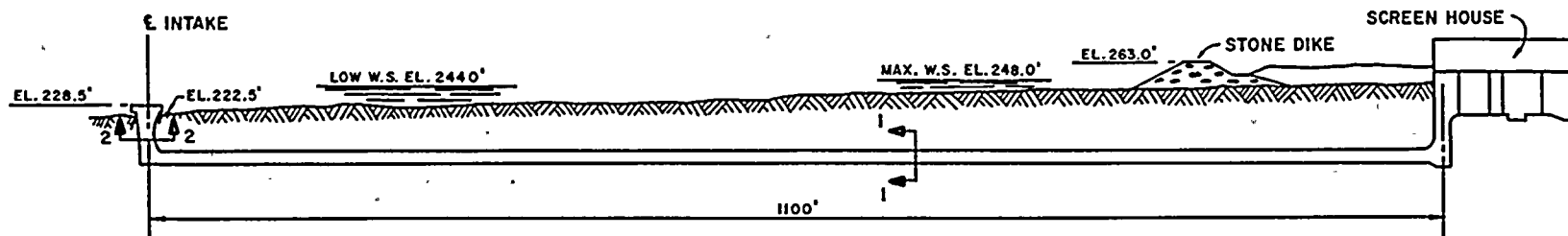
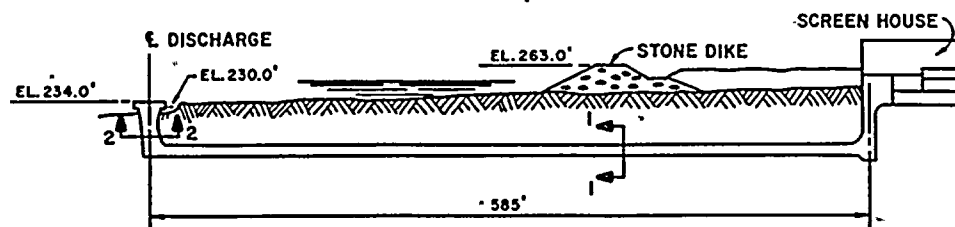


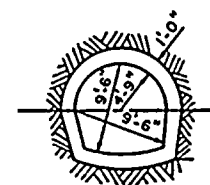
Fig. 3.6. Diagrammatic Sketch of the Screenwell.



INTAKE TUNNEL (LOOKING EAST)



DISCHARGE TUNNEL (LOOKING EAST)



SECTION 1-1

0 5 10
SCALE-FeET



SECTION 2-2

0 5 10
SCALE-FeET

NOTES:

ALL ELEVATIONS ARE REFERENCED TO USLS 1935 DATUM

0 100 200
SCALE-FeET
EXCEPT WHERE SHOWN

Fig. 3.7. Circulating-water System: Profile.

3.5 RADIOACTIVE WASTE

During operation of the Station, radioactive nuclides are produced by fission and by neutron activation of corrosion products in the reactor coolant system. Small amounts of gaseous and liquid radioactive wastes will enter the waste streams, which will be processed and monitored within the plant to minimize the radioactive nuclides that will ultimately be released to the atmosphere and into Lake Ontario. The radioactivity that is presently released due to operation of the plant meets the Commission's regulations set forth in 10 CFR Part 20. Modifications for conformance with 10 CFR Part 50 of both the liquid and the gaseous radioactive waste systems have been scheduled.

The original radioactive waste management systems are described in detail in the Applicant's Final Safety Analysis Report dated June 1967. The modifications which are proposed to upgrade the radioactive waste treatment systems are discussed in the Technical Supplement to Petition for Conversion from Provisional Operating License dated July 1972, and in the Environmental Report for Nine Mile Point, Unit 1 dated June 1972. In these documents, the Applicant has provided his analysis of the radioactive waste treatment system and has included his design estimate of the annual releases of radioactivity. In addition, the semi-annual reports of Unit 1 operation starting in September 1969 record releases of liquid and gaseous wastes and shipments of solid radioactive wastes from the plant.

The following evaluation is based on our model, adjusted to apply to this plant, and uses somewhat different operating conditions. Our calculated effluents are, therefore, different from the Applicants; however, the model used results from a review of available data of operating power plants. The principal parameters used in our evaluation are listed in Table 3.1.

The radioactive waste management systems at Unit 1 include liquid, gaseous and solid waste treatment systems. In our analysis two evaluations were made of each system. The first considered the waste management systems as they now exist and the second considered the upgraded systems. Included for comparison are the releases of radioactivity which have been recorded for the plant since startup in 1969.

3.5.1 Liquid Waste System

The liquid radwaste system is designed to collect, monitor, process, store and dispose of radioactive liquid wastes. The liquid wastes are

TABLE 3.1

PRINCIPAL PARAMETERS USED IN
ESTIMATING RADIOACTIVE RELEASES FROM
NINE MILE POINT NUCLEAR STATION, UNIT 1

Power	1850 MWt				
Plant Capacity Factor	0.8				
Fuel Fission Product Leakage (equivalent to 100,000 $\mu\text{Ci/sec}$ gas source term with 30 minute holdup for a 3400 MWt reactor)	55,000 $\mu\text{Ci/sec}$				
Total Steam Flow	7,250,000 lb/hr.				
Weight of Liquid in the Reactor and Recirculation System	470,000 lb.				
Weight of Steam in the Reactor	11,600 lb.				
Flow Through Cleanup Demineralizer	300,000 lb/hr.				
Reactor Building Leakage	480 lb/hr.				
Turbine Building Leakage	1,700 lb/hr.				
Gland Seal Leakage	7,250 lb/hr.				
Condenser Air Inleakage	10 scfm				
Iodine Partition Coefficients:					
A. Steam/Liquid	0.01				
B. Reactor Building Liquid	0.001				
C. Turbine Building Steam	1.0				
D. Air Ejector	0.005				
Fraction of Iodine Getting Through:					
A. Condensate Demineralizer	0.001				
B. Clean-up Demineralizer	0.1				
C. Charcoal delay beds	negligible				
Holdup Times:	Existing	Upgraded			
	System ¹	System ²			
A. Gland Seal Gas	2 min.	2 min.			
B. Air Ejector Gas	0.5 hrs.	5.0 hrs.			
C. Charcoal Delay - kryptons	0 days	1.7 days			
D. Charcoal Delay - xenons	0 days	29.0 days			
Liquid Waste Decontamination Factors:	I	Cs,Rb	Mo,Tc	Y	Others
High Purity Waste, Existing	10^2	10	10^2	10	10^2
High Purity Waste, Upgraded	10^2	10	10^2	10	10^2
Low Purity Waste, Existing	1	1	10^2	10	1
Low Purity Waste, Upgraded	10^3	10^4	10^6	10^5	10^4
Chemical Waste, Existing	10^5	10^5	10^6	10^5	10^6
Chemical Waste, Upgraded	10^5	10^5	10^6	10^5	10^6

¹ Existing as of July 1, 1972.

² Scheduled for completion approximately spring of 1974 for liquid radwaste;
late summer 1975 for gaseous radwaste.

classified and treated as follows: waste collector (low conductivity) system, floor drain (high conductivity) system, regenerant chemical system, and miscellaneous liquid waste system. Cross connections between the system components provide flexibility for processing by alternate methods. Two schematics of the liquid waste systems are shown in Fig. 3.8 and Fig. 3.9. The first figure shows the existing system and the second shows the upgraded system as proposed. The Applicant has tentatively scheduled the upgraded liquid radwaste system for completion by spring 1974.

Prior to release of any treated liquid wastes, samples are analyzed to determine the type and amount of radioactivity in a batch. Based on the analysis, these wastes are either released under controlled conditions to Lake Ontario, or retained for further processing. Radiation monitors in the waste discharge line provide a high radioactivity alarm and trip signal to the flow isolation valve such that no liquids with activity concentrations above a predetermined level will be discharged.

3.5.1.1 Existing Waste Collector (low conductivity) Waste System

Low conductivity wastes are collected in a waste collector tank and in case of excessive volume in a waste surge tank. Routine flows into this system are from equipment drains that empty into designated equipment drain sumps or tanks located in the drywell, the reactor building, the turbine building and the radwaste building. Other sources of low conductivity waste include the condensate demineralizer rinse, the waste concentrator distillate, and the drywell floor drain sump. These liquids are pumped to a 25,000 gallon waste collector tank which is located in the radwaste building. The 50,000 gallon waste surge tank, located in the turbine building is provided to collect any excess liquid from radioactive waste treatment system surges and to provide the necessary additional collection and storage volume for the liquid waste treatment system.

The low conductivity waste is pumped through either a precoat filter or a traveling flat bed filter. The flat bed filter was added to the original system to reduce backwash water required of the precoat filter. The liquid waste is then processed through a mixed bed demineralizer and collected in one of two waste sample tanks. Each sample tank has a volume of 25,000 gallons. After analysis, the liquid is normally pumped back to the condensate storage tank in the turbine building for reuse. In the event this liquid does not meet the purity specifications for use in the reactor coolant system it

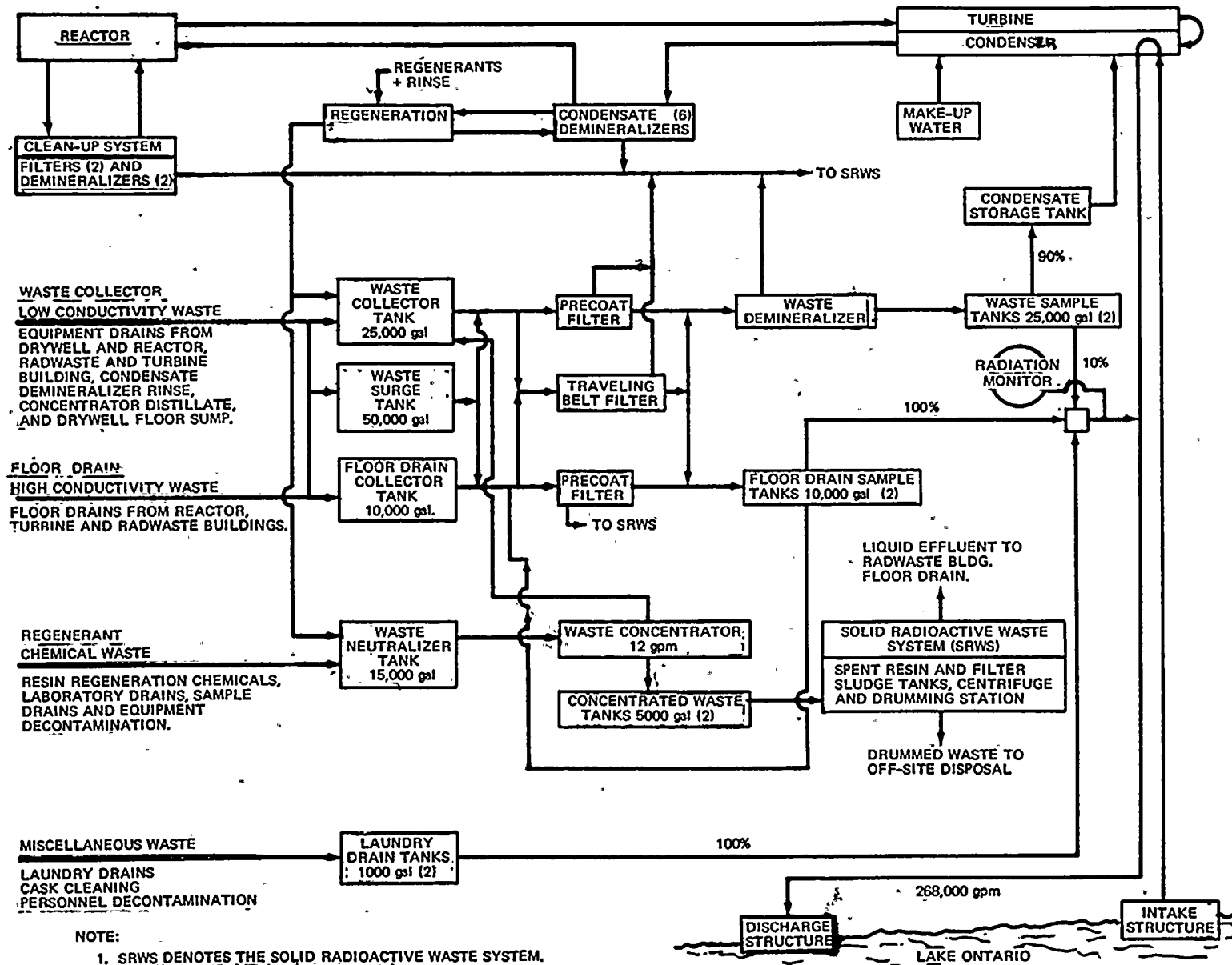


FIG. 3.8. EXISTING LIQUID RADWASTE SYSTEM, NINE MILE POINT NUCLEAR STATION, UNIT 1.

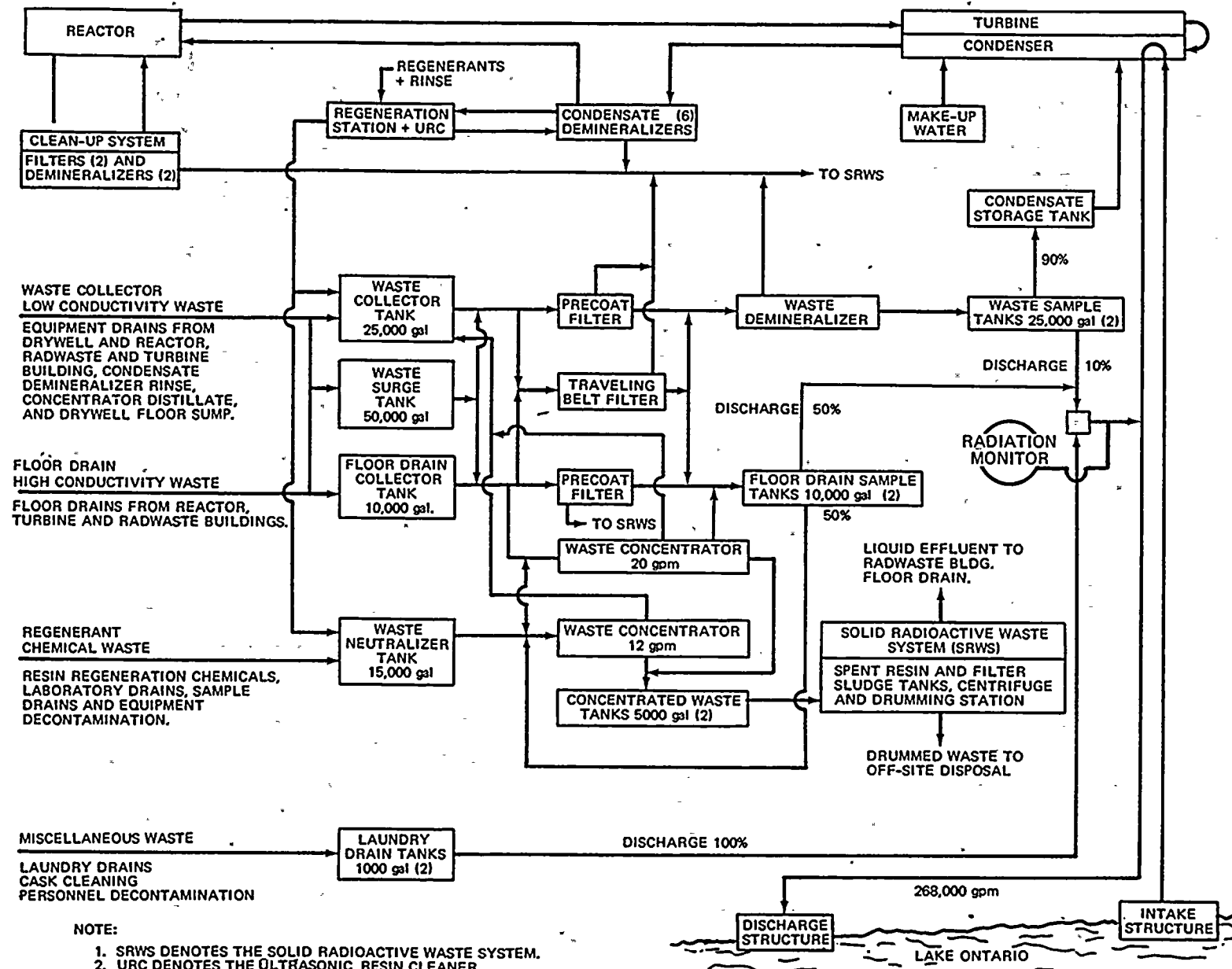


FIG. 3.9. UPGRADED LIQUID RADWASTE SYSTEM,
NINE MILE POINT NUCLEAR STATION, UNIT 1.

is either returned to the waste collector tank for reprocessing or discharged to Lake Ontario after dilution in the circulating water discharge canal.

In our evaluation we estimate that 64,000 gallons per day, with a concentration of approximately 20% of the primary coolant activity (PCA) will be processed through this system. Of this amount 90% will be recycled to the condensate storage tank with the remaining 10% released to Lake Ontario. We calculated an annual release from this source of 0.62 Ci excluding tritium. For tritium, BWR operating experience provides the basis for our estimate of 20 Ci/yr released from all the liquid waste subsystems. The Applicant assumes negligible releases due to the waste collector system exclusive of tritium. For tritium, the Applicant assumes a release of 20 Ci/yr from all liquid waste subsystems.

3.5.1.2 Upgraded Waste Collector (low conductivity) System

In our evaluation of the upgraded waste collector system we included 3,200 gallons of processed floor drain waste and 4,800 gallons rerouted directly from the drywell floor drain sump for a system total of 72,000 gpd at 18% PCA before treatment. Assuming 10% of this waste will be discharged we calculated an annual release of 0.76 curies (excluding tritium). This result is higher than the calculated existing system value because of the additional floor drain volume rerouted to this system. The Applicant estimated 72,000 gpd of low conductivity waste will be treated in the system and 10% will be discharged to Lake Ontario for a release (excluding tritium) of 0.4 Ci/yr.

3.5.1.3 Floor Drain (high conductivity) Waste System

High conductivity liquid waste is collected in the floor drain sumps located within the reactor building, the turbine building and the radwaste building. The accumulation of these wastes in their respective sumps or tanks is transferred to the 10,000 gallon floor drain collector tank located in the radwaste building. From this tank the waste is pumped either through a precoat filter or a traveling belt filter to one of two 10,000 gallon floor drain sample tanks. Presently, this waste is normally discharged without further treatment if the radioactivity is below a predetermined level. In our evaluation we considered that 100% of the high conductivity waste, approximately 8,000 gpd at 1% PCA, is discharged through the circulating water discharge canal to Lake Ontario for an annual release of 1.1 curies, excluding tritium. The Applicant estimated 21,000 gpd would be treated and 100% discharged for a release of approximately 0.3 Ci/yr.

3.5.1.4 Floor Drain Upgraded Waste System

In the upgraded system the addition of a 20 gpm waste concentrator will permit processing of floor drain (low purity) waste to a high purity condition for recycle to the waste collector system. In our evaluation we assumed that a total of 6,300 gpd will be evaporated and that 50% of the condensate is returned to the waste collector system and 50% of the floor drain processed waste is discharged for a negligible release. The Applicant assumed 5,300 gallons are processed by evaporation or filtration with 50% discharged for a negligible release.

3.5.1.5 Regenerant Chemical and Miscellaneous Waste Systems

Chemical wastes originate from regeneration of the demineralizer resin, laboratory sinks, and equipment decontamination. These wastes consisting of high conductivity acid and other chemicals are collected in the 15,000 gallon waste neutralizer tank in the radwaste building. After sampling and analysis the waste can be routed to either the floor drain precoat filter, or the traveling belt filter, and into the floor drain sample tank. If the radioactivity is above a predetermined level the waste is pumped from the neutralizer tank to the waste concentrator and evaporated. The distillate is returned to the waste collector (low conductivity) system for further processing.

In our evaluation of the existing system we assumed a daily input of 9,400 gallons to the regenerant chemical-miscellaneous waste system and that 100% of the waste is routed to the floor drain waste system. For the upgraded system we estimated 2,400 gpd with 100% returned to the waste collector (high purity) system. In both systems, the existing and the upgraded, we assumed no direct release to the environment from this source. The Applicant assumed 100% recycling to the waste collector system.

In the upgraded system an ultrasonic resin cleaner will be added to the resin regeneration unit. The Applicant has estimated that this will double the interval between regenerations and thus decrease the use of chemicals and result in additional holdup time for decay. In our evaluation the additional nuclide holdup time provided by the use of the ultrasonic cleaner resulted in a negligible decrease in radioactive releases from the regenerant chemical source since this waste will be processed by the concentrator. The combination of the additional concentrator and ultrasonic resin cleaner in the upgraded system, however, resulted in a calculated decrease of radioactivity released in liquid waste from 1.8 Ci/yr to 0.76 Ci/yr, excluding tritium.

For both the existing and the upgraded systems, liquid wastes from laundry operations, cask cleaning and personnel decontamination, are collected in one of two 1,000 gallon laundry drain tanks in the radwaste building. After sampling and analysis this waste is normally pumped to the circulating water discharge canal for release to Lake Ontario. In our evaluation of both the existing and the upgraded systems, we estimated 100% discharge of this waste (450 gpd) and calculated a release of 0.06 Ci/yr. The Applicant estimated a negligible release due to this source.

3.5.1.6 Summary of Liquid Waste Treatment System

Our estimates of the annual liquid releases are presented in Table 3.2. for the existing system and Table 3.3 for the upgraded system. Our calculated releases based on the parameters listed in Table 3.1 are a fraction of the values shown in Tables 3.2 and 3.3. However, to compensate for equipment downtime and expected operational occurrences the values have been normalized to 4 Ci/yr for the existing plant and 2 Ci/yr for the upgraded plant exclusive of tritium and other dissolved gases. The Applicant's operating experience since plant startup in 1969 is summarized in Table 3.4.

A comparison of our estimated liquid waste releases to the Applicant's design predictions and operating experience is summarized in Table 3.5. The table compares our calculated results with the actual annual liquid waste releases from Unit 1 for the period 1970 through 1972.

Operating experience to date has resulted in higher liquid waste releases than those calculated from either the Applicant's or our source term model. The operating maintenance report indicates that the radwaste equipment has not performed according to design. Identified and unidentified equipment leakage has resulted in larger liquid waste volumes than designed for, and malfunctions have caused some cross contamination of liquid waste subsystems. Improvements incorporated into the system include the installation of the traveling belt screen and modification of lines to provide more flexibility in the liquid radwaste system.

We have calculated that releases from both the existing and the upgraded liquid radwaste systems will not result in a whole body or critical organ dose in excess of 5 mrem/yr in the offsite environment. Based on our evaluation we conclude that the existing liquid radwaste system meets 10 CFR 20 requirements and that with the proposed upgrading will meet the "as low as practicable" guidelines.

TABLE 3.2

ESTIMATE OF ANNUAL RELEASE OF RADIOACTIVITY IN
LIQUID EFFLUENTS FROM NINE MILE POINT NUCLEAR
STATION, UNIT 1 AS EXISTING JULY 1, 1972

<u>Nuclide</u> ¹	<u>Ci/yr</u>	<u>Nuclide</u> ¹	<u>Ci/yr</u>	<u>Nuclide</u> ²	<u>Ci/yr</u>
Br-82	0.0004	I-130	0.0018	Na-24	0.021
Rb-86	0.00008	Te-131m	0.0043	P-32	0.0023
Sr-89	0.23	Te-131	0.00078	P-33	0.0089
Sr-90	0.011	I-131	0.43	Sc-47	0.0001
Y-90	0.015	Te-132	0.05	Cr-51	0.0460
Sr-91	0.066	I-132	0.051	Mn-54	0.0044
Y-91m	0.043	I-133	0.63	Mn-56	0.0009
Y-91	0.28	Cs-134	0.036	Fe-55	0.16
Sr-92	0.0001	I-135	0.049	Fe-59	0.061
Y-92	0.014	Cs-136	0.014	Co-58	0.33
Y-93	0.26	Cs-137	0.032	Co-60	0.037
Zr-95	0.0025	Ba-137m	0.03	Ni-63	0.003
Nb-95m	0.00006	Ba-140	0.36	Zn-65	0.0001
Nb-95	0.0021	La-140	0.22	Zn-69m	0.0001
Zr-97	0.0012	La-141	0.0007	Zn-69	0.0001
Nb-97m	0.0011	Ce-141	0.0075	Zr-95	0.00008
Nb-97	0.0012	Ce-143	0.0054	Nb-92	0.0087
Mo-99	0.084	Pr-143	0.0028	Nb-95	0.00019
Tc-99m	0.08	Ce-144	0.0014	Nb-96	0.00027
Ru-103	0.0016	Pr-144	0.0014	Mo-99	0.063
Rh-103m	0.0016	Pr-145	0.00006	Tc-99m	0.061
Rh-105	0.0014	Nd-147	0.0008	Sn-117m	0.0022
Ru-106	0.0004	Pm-147	0.0001	Sn-121	0.0004
Rh-106	0.0004	Pm-148m	0.00006	W-185	0.0014
Pd-109	0.00008	Pm-148	0.0002	W-187	0.11
As-109m	0.00008	Pm-149	0.0009	U-237	0.0005
Te-125m	0.00005	Pm-151	0.0002	Np-238	0.0001
Sb-127	0.0001	Sm-153	0.0003	Np-239	0.033
Te-127m	0.0004	Eu-156	0.00009	Pu-241	0.00006
Te-127	0.0008				
Te-129m	0.0019				
Te-129	0.0012				

ESTIMATE OF TOTAL (EXCLUDING TRITIUM)

4.0 Ci/yr

ESTIMATE OF TRITIUM RELEASE

20.0 Ci/yr

¹These nuclides represent estimate of fission products.²These nuclides represent estimate of corrosion and activation products.

TABLE 3.3

UPGRADED SYSTEM¹ESTIMATE OF ANNUAL RELEASE OF RADIOACTIVITY IN
LIQUID EFFLUENTS FROM NINE MILE POINT NUCLEAR
STATION UNIT 1

<u>Nuclide</u> ²	<u>Ci/yr</u>	<u>Nuclide</u> ²	<u>Ci/yr</u>	<u>Nuclide</u> ³	<u>Ci/yr</u>
Br-82	0.0001	I-130	0.00089	Na-24	0.009
Br-83	0.00006	Te-131m	0.0011	P-32	0.0004
Rb-86	0.00006	Te-131	0.00021	P-33	0.0015
Sr-89	0.038	I-131	0.076	Cr-51	0.0078
Sr-90	0.0018	Te-132	0.0099	Mn-54	0.0007
Y-90	0.013	I-132	0.011	Mn-56	0.0044
Sr-91	0.043	I-133	0.21	Fe-55	0.027
Y-91m	0.028	Cs-134m	0.00015	Fe-59	0.01
Y-91	0.31	Cs-134	0.026	Co-58	0.054
Sr-92	0.00067	I-135	0.051	Co-60	0.006
Y-92	0.048	Cs-136	0.011	Ni-63	0.00048
Y-93	0.47	Cs-137	0.023	Ni-65	0.00009
Zr-95	0.0004	Ba-137m	0.022	Zn-69m	0.00007
Nb-95	0.0003	Ba-140	0.062	Zn-69	0.00007
Zr-97	0.0004	La-140	0.025	Nb-92	0.0015
Nb-97m	0.0004	La-141	0.0017	Nb-96	0.00009
Nb-97	0.0004	Ce-141	0.0012	Mo-99	0.076
Mo-99	0.1	Ce-143	0.0014	Tc-99m	0.074
Tc-99m	0.096	Pr-143	0.0004	Sn-117m	0.00038
Ru-103	0.00026	Ce-144	0.0002	Sn-121	0.0001
Rh-103m	0.00026	Pr-144	0.0002	W-185	0.00023
Rh-105	0.0003	Pr-145	0.00007	W-187	0.033
Ru-106	0.00007	Nd-147	0.00015	U-237	0.0001
Rh-106	0.00007	Pm-149	0.00009	Np-239	0.0071
Te-127m	0.00007	Pm-151	0.00006		
Te-127	0.0003	Sm-153	0.00008		
Te-129m	0.0003				
Te-129	0.0002				

ESTIMATE OF TOTAL (EXCLUDING TRITIUM)

2.0 Ci/yr

ESTIMATE OF TRITIUM RELEASE

20.0 Ci/yr

¹Scheduled for completion in spring of 1974.²These nuclides represent estimate of fission products.³These nuclides represent estimate of corrosion and activation products.

TABLE 3.4

SUMMARY OF REPORTED RELEASES FROM NINE MILE POINT
NUCLEAR STATION, UNIT 1¹

	Annual Releases (Curies)			
	1969	1970	1971	1972
Total identified and unidentified liquid releases	0.9	28	32	34
Tritium releases	~ 0	10	19	28
Total identified and unidentified noble gas releases	55	9,500	250,000	520,000
Total iodines and particulates in gaseous effluents	~ 0	0.06	0.8	0.95
<hr/>				
	1969	1970	1971	1972
Solid Waste Shipped:				
Volume (cu ft)	0	3,100	13,000	15,000
Curie content	0	4	200	260

¹Nine Mile Point Unit No. 1 started operation September 5, 1969.

TABLE 3.5

COMPARISON OF NINE MILE POINT UNIT 1
LIQUID WASTE RELEASES, CI/YR.

	<u>Estimated from Model</u>				<u>Reported from Operation</u>		
	<u>Existing System</u>		<u>Upgraded System</u>				
	<u>(A)</u>	<u>(S)</u>	<u>(A)</u>	<u>(S)</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
Tritium	20	20	20	20	10	19	28
All Others	0.3	4	2	2	28.0	32.2	34.5

Note: (A) denotes Applicant's values, (S) denotes staff values,

3.5.2 Gaseous Waste System

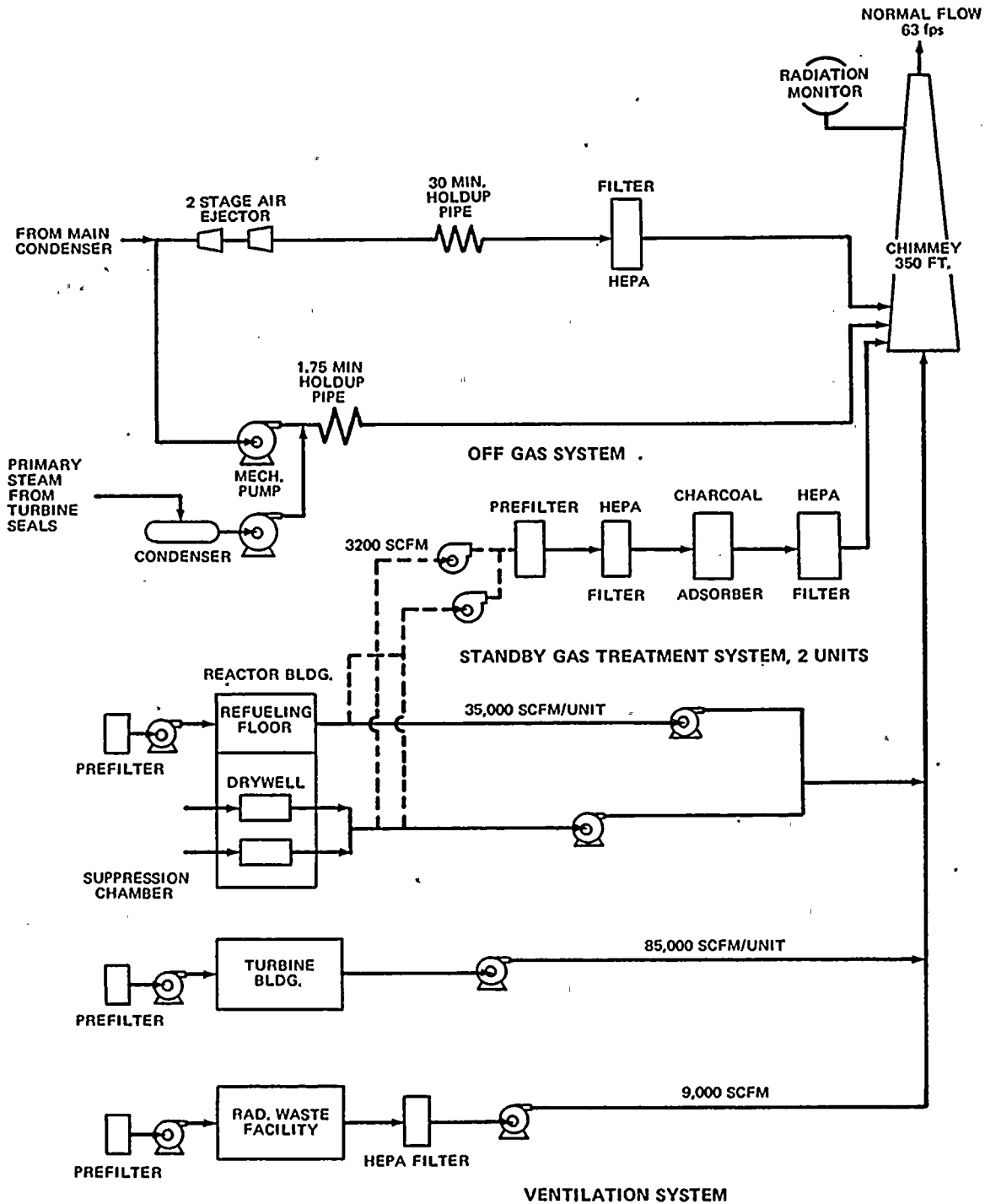
During operation of the Station radioactive nuclides that may be released to the atmosphere in gaseous form include fission product noble gases (xenon and krypton) and halogens (primarily iodine); activated argon, oxygen and nitrogen, tritium, and particulate material including some fission products and activated corrosion products.

The major source of gaseous radioactive waste during normal plant operation will be the offgas from the main steam condenser air ejectors. Other sources of gaseous waste include vent gas from the mechanical vacuum pump used to evacuate the condenser during startups, the turbine gland seal condenser vent, and ventilation air discharged from the radwaste, the reactor, and the turbine building exhaust systems. The existing waste gas treatment system and the upgraded system are shown schematically in Fig. 3.10 and 3.11.

3.5.2.1 Existing Gaseous Waste System

In the existing gaseous waste treatment system the offgases from the air ejectors are allowed to decay by flowing through a 30-minute holdup pipe. The offgases are processed through a HEPA filter, and discharged to the atmosphere through the main stack. Gaseous effluent from the principal release points are discharged to the atmosphere through the main stack. Turbine gland seal exhaust gases are vented to the stack through a 2-minute holdup pipe which permits decay of the short lived nuclides. Ventilation air from the turbine building, the reactor building, and the radwaste building is vented to the stack. The radwaste building ventilation air is processed through a HEPA filter prior to discharge. The ventilation air from the reactor building can be routed through the standby gas treatment system in case of radioactivity above a predetermined level before being released through the main stack. The standby gas treatment system consists of HEPA filters and charcoal adsorbers. The standby gas treatment system is used during periods of refueling or maintenance when the normally sealed drywell space is purged before entry. The purge exhaust is released through the standby gas treatment system to prevent radioactivity above a predetermined level from being released to the atmosphere.

The principal parameters listed in Table 3.1 were used in our evaluation of the existing gaseous waste treatment system. Our estimates of the annual releases of noble gases and radioiodine and the principal release points are listed in Table 3.6. For the reactor building, we calculated negligible releases of noble gases and approximately 0.014 Ci/yr of iodine-131. For the turbine building, we calculated 1,200 Ci/yr of noble gases and 0.53 Ci/yr of iodine-131. For the turbine gland seal



NOTES:

1. SOLID LINE DENOTES NORMAL OPERATION.
2. BROKEN LINE DENOTES SPECIAL OPERATION.

FIG. 3.10. EXISTING GASEOUS RADWASTE SYSTEM, NINE MILE POINT NUCLEAR STATION, UNIT 1.

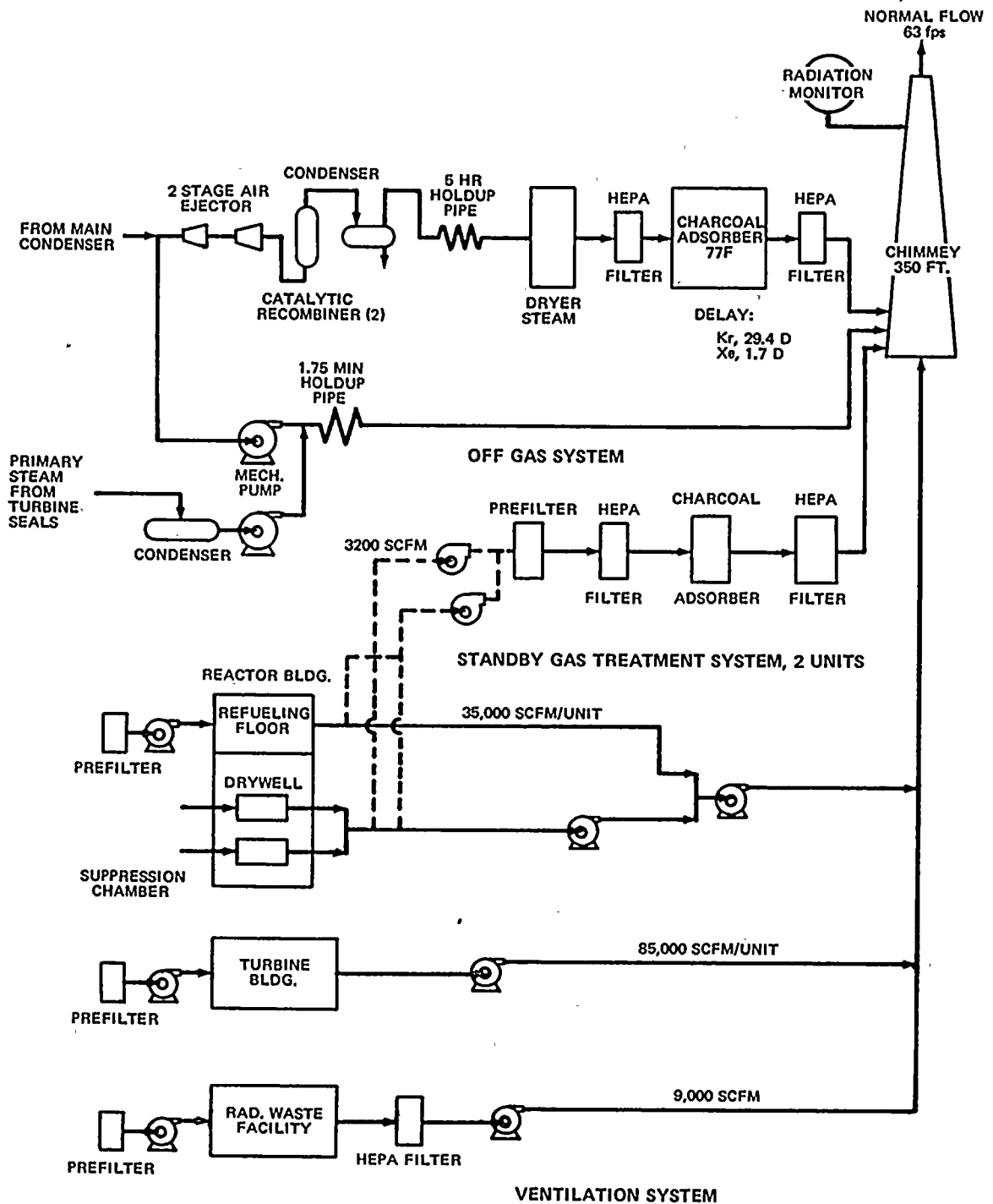


FIG. 3.11. UPGRADED GASEOUS RADWASTE SYSTEM, NINE MILE POINT NUCLEAR STATION, UNIT 1.

we calculated 4,200 Ci/yr of noble gases and 0.022 Ci/yr of iodine-131. For the mechanical vacuum pump, we assumed 16 hours per year of operation and calculated a release of 2,500 Ci/yr of noble gases and a negligible release of iodine. For the sources identified the Applicant estimated very small releases and included them in the analysis made of the air ejector offgas discharged to the stack. In both our evaluation and the Applicant's, the major source of radioactivity released is the offgas from the main condenser air ejectors. We calculated a release of 1,500,000 Ci/yr of noble gases and 11 Ci/yr of iodine-131 will be released from this source. The Applicant estimates 1,570,000 Ci/yr as a total offgas release based on an assumed offgas release rate of 50,000 μ Ci/sec after 30-minute delay. Operating experience at the Unit 1 plant shown in Table 3.4 gives the release values for 1971 as 250,000 Ci/yr for noble gases and 0.8 Ci/yr for all iodines. In 1972 release values were 520,000 Ci/yr for noble gases and 0.9 Ci/yr for all iodines.

The reason that our estimates are higher than the amounts reported can be attributed to the fact that the fuel performance has been somewhat better than expected. Also the plant capacity factor has been between 35% to 63% whereas we assumed 80% in our evaluation.

3.5.2.2 The Upgraded Gaseous Waste Treatment System

The proposed upgraded gaseous waste treatment system is shown schematically in Fig. 3.11. To reduce the radioactivity released a catalytic recombiner-charcoal delay train will be added for the treatment of the offgases from the main condenser. The offgas will be processed through a catalytic recombiner where the hydrogen and oxygen will recombine in the form of steam. The condensed steam will be recycled to the hotwell. The removal of most of the hydrogen and a corresponding stoichiometric amount of oxygen considerably reduces the volume of gases which remain to be treated. Non-condensable gases will be delayed up to 5 hours in the original holdup pipe to allow decay of short-lived noble gases and activation products. The gas stream will be processed through a sacrificial charcoal bed and then through an ambient temperature charcoal delay train consisting of 76,000 pounds of charcoal in six beds in series. Prior to discharge through the main stack, the offgas will pass through HEPA filters to remove any particulates which might be carried into the vent stream. There will be a redundancy of all essential components of the off-gas treatment system.

In our evaluation we calculated the charcoal delay train will provide holdup periods of 1.7 days for krypton and 29 days for xenon. We also assumed that approximately all of the radioiodines which were present in the offgas from the main condenser will be retained in the charcoal beds. Our estimated annual releases of radioactive materials in the

TABLE 3.6
ESTIMATE OF ANNUAL RELEASES OF RADIOACTIVE
MATERIALS IN GASEOUS EFFLUENTS FROM
NINE MILE POINT NUCLEAR STATION UNIT 1
AS EXISTING JULY 1, 1972

Nuclide	Curies Per Year					Mech. Vac. Pump	Approx. Total
	Reactor Bldg.	Turbine Bldg.	Gland Seal	Main Cond. Air Ejector			
Kr-83m	a	11	45	38,000			38,000
Kr-85m	"	18	75	70,000			70,000
Kr-85	"	a	a	390			390
Kr-87	"	53	220	170,000			170,000
Kr-88	"	57	240	220,000			220,000
Kr-89	"	190	550	1,200			1,900
Xe-131m	"	a	a	340			340
Xe-133m	"	1	5	4,800			4,800
Xe-133	"	31	150	130,000	2,220		130,000
Xe-135m	"	91	360	100,000			100,000
Xe-135	"	90	380	370,000	350		370,000
Xe-137	"	330	1,000	6,100			7,500
Xe-138	"	<u>280</u>	<u>1,100</u>	<u>360,000</u>			<u>360,000</u>
Approx. Sum	a	1,200	4,200	1,500,000	2,500		1,500,000
I-131	0.014	0.53	0.022	11.0	a		12
I-133	0.06	3.1	0.13	64.0	a		68

a - less than 1 Ci/yr noble gases or less than 10^{-4} Ci/yr iodine.

effluent from the gaseous waste treatment system are listed in Table 3.7. We estimated a release of 11,000 Ci/yr of noble gases and 0.56 Ci/yr of iodine-131. The Applicant estimated 10,800 Ci/yr of noble gases and negligible radioiodine releases. We have calculated that releases from the upgraded radwaste system will not result in either a whole body or a critical organ dose in excess of 5 mrem/yr at the site boundary. Based on our evaluation we conclude that the upgraded gaseous waste system will meet our "as low as practicable" guidelines. The upgraded system is scheduled to be operational by late summer in 1975.

3.5.3 Solid Waste System

The solid radioactive waste system is designed to collect, process, package, and provide temporary storage for solid wastes prior to shipment to a licensed burial ground. Radioactive solid wastes resulting from station operation using either the existing or the upgraded system include the following: (1) concentrates from the radwaste evaporators, (2) spent resins and filter sludge from the spent resin tank, (3) routine operation waste such as paper, air filters, rags, etc., (4) miscellaneous high level solid wastes such as control rods, fuel channels and contaminated replaced equipment.

The bottoms from the waste concentrator are cooled prior to transfer to the plant's packaging facility, mixed with an adsorbent, loaded in containers, and stored for shipment. Spent resins from the mixed bed demineralizers are flushed to the packaging facilities, dewatered, loaded into containers, and stored for shipment. Filter sludges are dewatered, and transferred to shipping containers. The solid waste system centrifuge residue is also transferred directly to packaging. Solid wastes containing medium to high radioactivity include the concentrated process fluids, filter sludges and spent resins. These wastes are packaged with semi-remote handling equipment.

Low level activity wastes resulting from routine handling and maintenance are collected in containers located in appropriate zones around the station. These containers are monitored during filling to ensure that permissible dose rates are not exceeded before final packaging. When full the containers are moved to a controlled access storage area to await shipment.

Contaminated equipment too large to be handled in a normal manner is treated as a special case and procedures for decontamination, shielding, storage, and shipment of such items are designated on an individual case basis.

TABLE 3.7

UPGRADED SYSTEM¹ESTIMATE OF ANNUAL RELEASES OF RADIOACTIVE
MATERIALS IN GASEOUS EFFLUENTS FROM
NINE MILE POINT NUCLEAR STATION UNIT 1

Nuclide	Curies Per Year					
	Reactor Bldg.	Turbine Bldg.	Gland Seal	Main Condenser Air Ejector	Mech. Vac. Pump	Approx. Total
Kr-83m	a	11	45	a		56
Kr-85m	"	18	75	67		160
Kr-85	"	a	a	390		390
Kr-87	"	53	220	a		280
Kr-88	"	57	240	4		300
Kr-89	"	190	550	a		750
Xe-131m	"	a	a	60		60
Xe-133m	"	1	5	a		6
Xe-133	"	31	130	2,700	2,200	5,100
Xe-135m	"	91	360	a		450
Xe-135	"	90	380	a	350	820
Xe-137	"	330	1,000	a		1,300
Xe-138	"	280	1,100	a		1,400
Approx. Sum	a	1,200	4,200	3,300	2,500	11,000
I-131	0.014	0.53	00022	a	a	0.56
I-133	0.060	3.1	0.13	a	a	3.3

¹Scheduled for operation approximately in summer of 1975.a - less than 1 Ci/yr noble gases or less than 10⁻⁴ Ci/yr iodine.

The Applicant's record of solid radioactive waste from Unit 1 operation for 1971 shows that 13,000 cubic feet containing 200 curies of activity were shipped. For 1972, the Applicant reports that 15,000 cubic feet of solid waste containing an activity of 260 curies were shipped. We estimate from a composite of operating BWR plant shipments that 11,000 cubic feet at an activity of 2700 curies is the expected solid waste from a plant of this type. We conclude that the handling and packaging of the solid waste from Unit 1 is in accordance with AEC and Department of Transportation regulations.

3.6 CHEMICAL AND BIOCIDES EFFLUENTS

The principal chemicals used in the routine operation of the Station include sulfuric acid and sodium hydroxide for regeneration of resin in the condensate and makeup demineralizers, and ferric sulfate and lime for makeup-water clarification. Wastes from all these systems, except condensate-demineralizer regeneration, are added to the circulating water before discharge into the lake. Wastes from condensate-demineralizer regeneration are added to the radwaste system. Disposal of radioactive chemical wastes is discussed in Section 3.5.

Solutions containing ferric sulfate (50 ppm) and lime (150 ppm) are added to raw lake water in the clarifier of the treatment system for makeup water (Fig. 3.12) to produce sediment-free water to be demineralized for use in the primary reactor-condensate cycle. Chemical wastes from the makeup system consist of intermittent blowdown of solids from the clarifier, backwashings from the pressure and activated charcoal filters, and neutralized solution from the demineralizer regeneration cycle.

The clarifier blowdown, about 20 gph containing ferric hydroxide, calcium carbonate, and suspended material originally present in the lake water, is discharged to a settling basin. About one ton of solids is dredged from the basin quarterly and trucked to a land-fill disposal area in the southwest quadrant of the site. The Applicant has stated that the disposal area is situated so that sludge does not run off into any navigable waters or their tributaries or affect ground water.

The clear overflow from the settling basin is discharged to the lake via a drainage ditch. The composition of the overflow, as supplied by the Applicant, is listed in Table 3.8.

The anthracite pressure filter and the activated-charcoal filter are backwashed three or four times a month. The waste water, containing suspended and organic material originally present in lake water, is discharged to the lake via a storm drain.

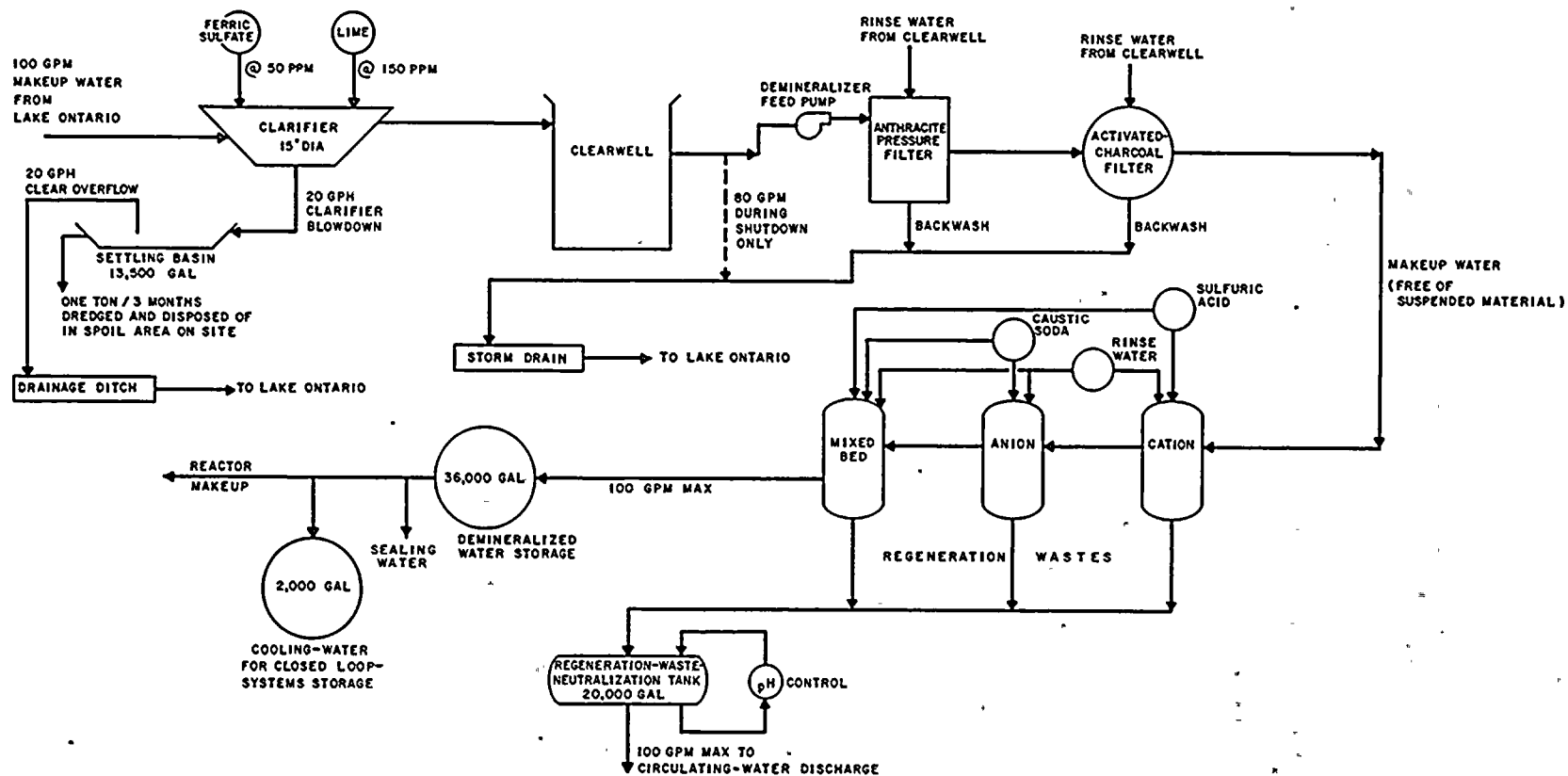


Fig. 3.12. Makeup-water Treatment.

TABLE 3.8

COMPOSITION OF
SETTLING-BASIN OVERFLOW^a
(IN PPM, EXCEPT FOR pH)

Hardness (as CaCO_3)	123
Alkalinity (as CaCO_3)	35
Calcium (as Ca^{++})	36
Magnesium (as Mg^{++})	8
Iron (as Fe^{+++})	<0.10
Sodium (as Na^+)	17
Chloride (as Cl^-)	30
Sulfate (as $\text{SO}_4^{=}$)	66
Dissolved solids	210
Suspended solids	<1
pH (range)	9.8-10.2

^aApplicant's Environmental Report.
Based upon the addition of 50 ppm $\text{Fe}_2(\text{SO}_4)_3$
and 150 ppm of lime to the Unit 1 clarifier
and a sludge blowdown rate of 20 gph to the
clarifier settling basin.

Regeneration wastes of spent acid and caustic solutions, approximately 16,000 gallons of mainly 9000 ppm sodium sulfate, are neutralized to a pH between 6.5 and 8.5 in a tank before being discharged to the lake at 100 gpm via the circulating-water discharge, where they are diluted by a factor of about 3000. The discharge normally occurs for about three hours once every eight days. The average incremental increase of dissolved solids in the returning circulating water (268,000 gpm) is about 4 ppm. Table 3.9 shows the composition of the discharges from the water-treatment facility along with the amounts of chemical constituents originally removed from the lake water by the demineralizers. The incremental concentrations occur only during periods of actual discharge of demineralizer waste. The cation and anion demineralizers require regeneration three or four times monthly; the mixed-bed unit one or two times monthly. The Applicant obtained a permit in 1965 to discharge these chemical wastes into waters of New York State.

For emergency use, two diesel electric generators and one diesel fire pump are available. The fuel oil used contains 0.4 to 0.7 sulfur and leaves a negligible amount of ash. Except for an emergency requiring their use, these units are operated only for testing intermittently; release of combustion products is considered to be insignificant.

Drainage from roofs, and from the administration building, ship, and store-area floors, which have no potential for radioactivity, is discharged to the lake via a storm sewer.

Waste from laundering of protective clothing is processed in the rad-waste system (Section 3.5) and, after monitoring, is discharged into the circulating water at a controlled rate. During normal operation, about 100 pounds per month of detergent, 50% of which is sodium hexametaphosphate, produces 130 gpd of waste. During scheduled Station outages, about 450 pounds of detergent per month is used, and 1700 gpd of laundry waste is produced.

Treatment of radiochemical wastes is discussed in Section 3.5.

3.7 SANITARY WASTES AND OTHER EFFLUENTS

The sewage facility uses an activated sludge, extended aeration system followed by chlorination and then oxygenation in a 2800-square-foot pond with a seasonal variation in depth of 2 to 15 feet. The effluent is then carried by a drainage ditch to the lake. Excess sludge is removed quarterly from the Station to a state-approved disposal area by a state-licensed disposal firm.

TABLE 3.9
CHEMICAL DISCHARGES FROM MAKEUP WATER SYSTEM

Ion (or TDS)	Source of Ion	Amount Discharged		Conc. in Lake Ontario, ppm	Percentage Increase in Discharge
		Pounds per day ^a	Incremental ^b Conc. in Effluent, ppm		
Ca ⁺⁺	Lakewater ^c	6.7	0.15	44.0	0.3
Na ⁺	Sodium hydroxide for regeneration	53.2	1.19	16.6	7.2
	Lake water ^c	3.0	0.07		
Mg ⁺⁺	Lake water ^c	1.5	0.03	8.9	0.3
K ⁺	Lake water ^c	0.3	0.007	1.6	0.4
Mn ⁺⁺	Lake water ^c	0.002	4×10^{-5}	0.01	0.4
Cl ⁻	Lake water ^c	5.4	0.12	30.3	0.4
SO ₄ ⁼	Sulfuric acid for regeneration	111.0	2.49	30.1	8.3
	Lake water ^c	8.4 ^d	0.19		
HCO ₃ ⁻	Lake water ^c	8.4	0.19	114.7	0.2
PO ₄ ⁼	Lake water ^c	0.03	7×10^{-4}	0.19	0.4
NO ₃ ⁻	Lake water ^c	0.02	4×10^{-4}	0.14	0.3
TDS			4.44	246.5	1.8

^aBased on estimated average flow through demineralizers.

^bDischarged into 268,000 gpm circulating water for 160 minutes every eight days. Concentrations are for periods of actual discharge.

^cCollected from lake water on demineralizer resins, then released during regeneration.

^dIncludes SO₄⁼ from ferric sulfate added in clarifier.

The facility has a capacity of 15,000 gpd. With a per-capita requirement of 35 gpd and a maximum work force of 108 employees, the maximum load on the system would be 3880 gpd, well below the design capacity. The Applicant's reported sample analysis shows that the facility meets the following operating requirements:

Settleable solids removed	100%
Suspended solids removed	95%
BOD (5 day) reduced	95%
Chlorine residual	1 ppm max.

The chlorine demand of Lake Ontario in the vicinity of the Station is 7.5 ppm. From operating experience with the Applicant's Oswego Steam Station, the residual chlorine in the effluent from the sewage-treatment plant is expected to be converted to chloride as a result of the high chlorine demand of the water in the oxygenation pond.

The Applicant has obtained a permit from the State of New York Department of Health to operate this waste-treatment facility. Solid wastes collected on trash racks, lunchroom and office wastes, and machine-ship scraps are trucked offsite for disposal at a state-approved waste-disposal site.

3.8 TRANSMISSION FACILITIES

Two single-circuit 345-kV transmission lines connect the Station output to the Applicant's existing substation in Clay, New York, about 27 miles southeast of the site. The transmission right-of-way (Fig. 3.13) is owned by the Applicant. It traverses terrain ranging in elevation from 250 feet at the site to 400 feet at the substation and passes through 10 miles of open farmland, about four miles of wetlands, five miles of wooded areas and eight miles of fallow or pasture land.

To allow for probable need for a future 345-kV transmission line, a 500-foot right-of-way was purchased. In addition to the two 345-kV lines from Nine Mile Point Unit 1 in the center of the right-of-way, two single-circuit 115-kV lines are along the western edge for about four miles from the site to where they join the Applicant's Lighthouse Hill-Oswego 115-kV grid.

Wood-pole H-frame structures, Fig. 3.14, carry the major portion (about 25 miles) of the 345-kV cables. For the initial 1.7 miles from the Station and the final 0.3 mile into the substation, lattice steel towers are used. About 30 miles of unpaved dirt roads provide access for line inspection and service.

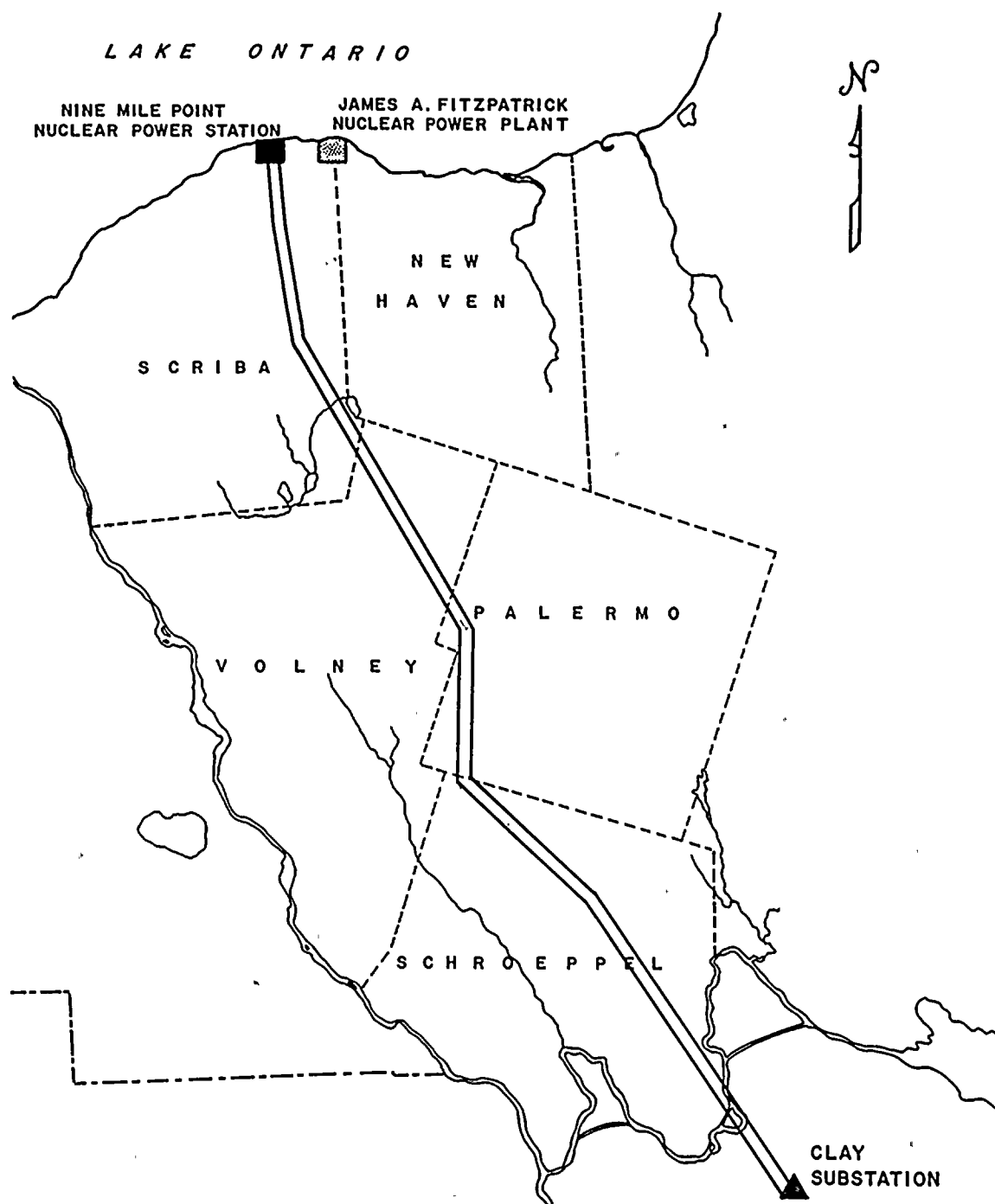


Fig. 3.13. Transmission Facilities.

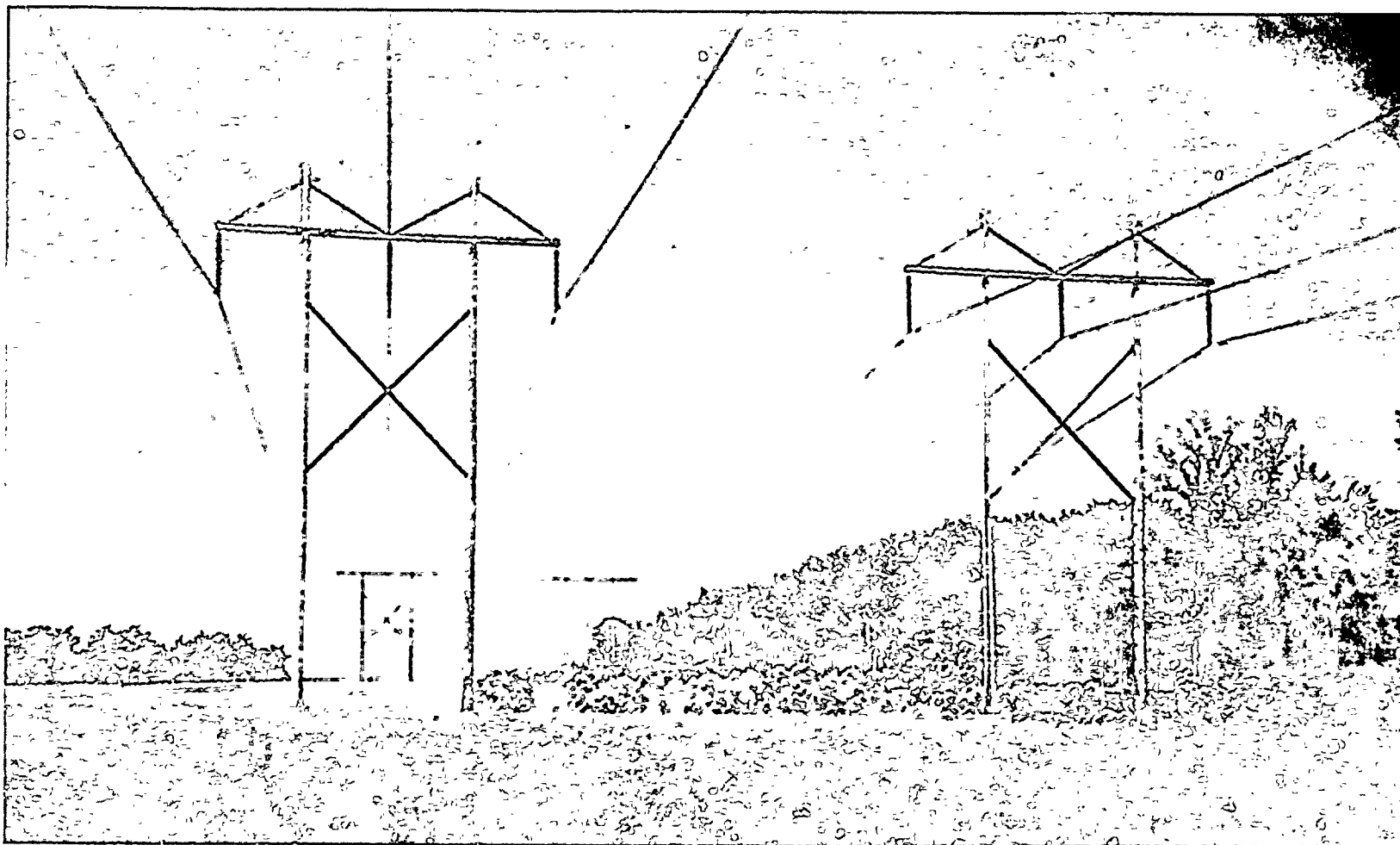


Fig. 3.14. Transmission-line Structures North of Clay.

4. ENVIRONMENTAL EFFECTS OF CONSTRUCTION

4.1 EFFECTS ON LAND USE

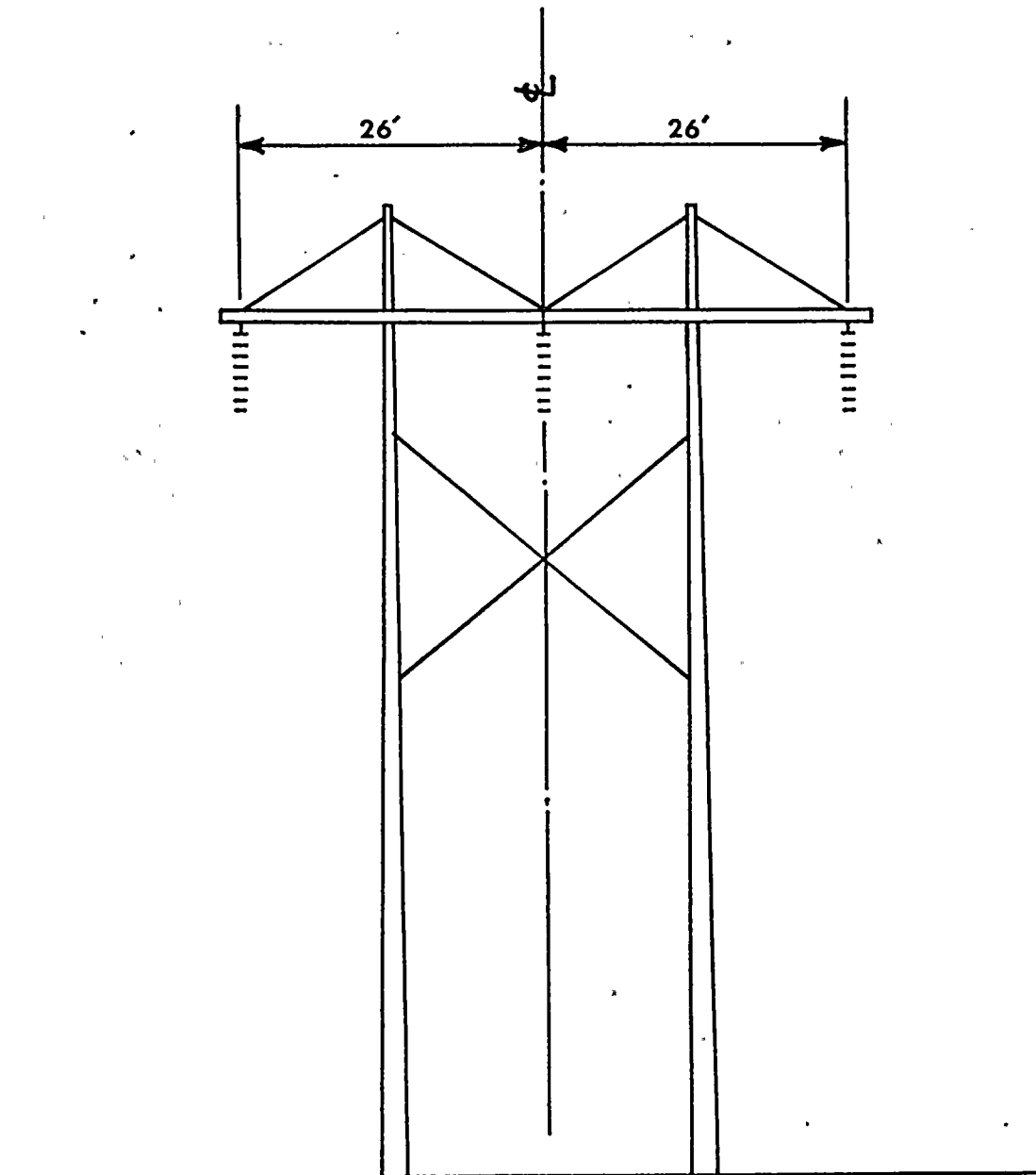
4.1.1 Station Site

Only 45 acres of the 900 acres in the plant site are used for plant structures and auxiliary systems. The 45 acres have been landscaped. The Applicant has set aside 130 acres of the site as a wildlife habitat in 1969 by posting the northwest corner of the site. The Applicant has stated that there are no plans for the creation of a larger habitat.

In addition, the Applicant has made a reasonable effort for multiple use of the site by opening a visitor reception center and museum. In conjunction with this center there is a nature trail through wooded area and picnic areas on the bluffs overlooking Lake Ontario.

A new radwaste building will be constructed onsite. This structure, which will be 80 feet by 60 feet by 30 feet above grade and 30 feet below grade, will be completed two years after start of construction approximately in January 1974. The maintenance of the present site grade will minimize possible erosion during construction. Excavated material will be used in grading; the remaining material will be disposed of offsite in a manner acceptable to the appropriate state agencies. The Applicant has stated that care will be taken that rock, soil, waste building material, oil, gasoline, or any other material connected with construction of the Station will not contaminate the lake or groundwater. The Applicant has stated that the amount of gaseous discharges from construction equipment in the vicinity of the site will be below the levels permitted in the state and federal air-quality standards and criteria. The normal precautions employed in large-scale construction will be taken; road sprinkling will be used to reduce the airborne dust expected to occur during construction activities. The small amount of blasting is expected to be made with appropriate concern for the integrity of the existing structures and safety of onsite personnel. The Applicant plans to use nets to control the resultant debris. It is recommended that any topsoil removed should be salvaged, protected and respread during the grading operation. The area should be landscaped immediately after construction is completed.

The Staff has inspected the site and believes that no impacts on neighboring lands will result from construction of the radwaste building. The increased traffic and noise will be of little consequence and temporary. Most of the traffic and noise related to construction will be limited to the daylight hours.



VOLTAGE: 345kV
 MATERIAL: Wood (treated)
 AVERAGE SPAN: 700'
 FOUNDATION: To be backfilled
 with crushed stone

MINIMUM HEIGHT: 80'
 MAXIMUM HEIGHT: 100'

Scale 1" = 15'

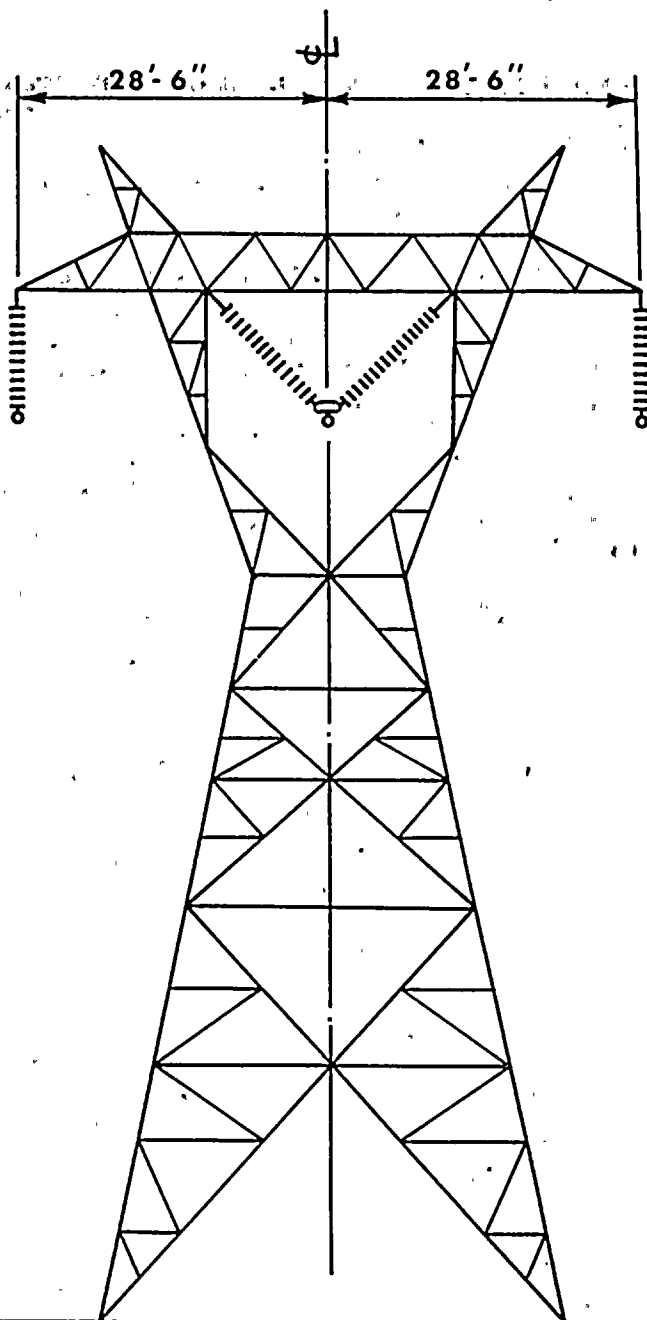
Fig. 4.1. Wood "H" Frame: Single Circuit.

4.1.2 Transmission Lines

Towers used most often along the Nine Mile Point-Clay transmission line are the standard wood-pole "H" frame (Fig. 4.1). At all strain points, a lattice structure is employed (Fig. 4.2). The Applicant did not have the benefit of the State of New York Department of Environmental Conservation guidelines and recommendations for transmission-line location and construction when the original 500-foot corridor was selected and cleared (the Nine Mile Point Unit-Clay Circuit). The construction of this transmission line has resulted in a very wide cleared zone, which has long straight sections. There do not appear to be any excluded areas at roads, streams, or marshes, nor was there any feathering of the right-of-way.

Herbicides were used in clearing the original right-of-way. Tordon 101 with thickener was applied in 1966 to the northern four miles with the aid of a helicopter. The remainder of the right-of-way was given a foliar application of 2, 4, 5-T from the ground in 1970.

The Applicant has indicated that certain shrubbery was not removed from the corridor, and ten acres of land used to grow Christmas trees were left untouched. Ten homes were removed when the transmission corridor was established.



VOLTAGE : 345kV

MATERIAL : Galvanized Steel

AVERAGE SPAN : 800'

**FOUNDATION : Grillage or
Reinforced Concrete**

MINIMUM HEIGHT : 61'(to crossarm)

MAXIMUM HEIGHT : 95'(to crossarm)

Scale 1' = 16'

Fig. 4.2. Lattice Steel Tower: Single Circuit.

5. ENVIRONMENTAL EFFECTS OF STATION OPERATION

5.1 IMPACTS ON LAND USE

5.1.1 Station Environs

Structures and auxiliary facilities have been designed to conform with contemporary architectural practices. The most prominent view of the plant is from the lake; only the stack can be seen from the nearest public road, which is about one mile from the Station.

The presence of the Station does not limit public access to the lake shore. Traditionally, this site has not been used by the local residents either for boating or bathing. The lake shore at this point is steep and stony and does not represent a potentially valuable recreational resource as far as water-related activities are concerned. Before acquisition by the Applicant, the site was used as an artillery range. It is concluded that the land use of the site and its immediate environs will not be adversely affected by the operation of the Station.

5.1.2 Transmission-line Environs

The transmission tower system has visual impact on the observer in the relatively flat and open terrain through which the line passes. The corridor is covered with vegetation (mostly grasses and herbaceous weeds). The maintenance of this type of cover will prevent erosion within the corridor and reduce runoff.

Maintenance of the transmission line should follow the New York State Department of Environmental Conservation guidelines and recommendations.

The Staff believes that means other than herbicides should be given intensive consideration for transmission-line maintenance. The planting of shrubbery and short food plants for game would be desirable.

However, if herbicides are used, these recommendations should be followed:

- (a) Only selective application of approved herbicides should be permitted to maintain "tight ground cover," which will allow growth of compatible weeds and woody species and encourage wildlife-habitat growth.
- (b) No spraying should be done within 100 feet of water courses or state reforestation areas.
- (c) Treatment should not be more than once a year.

- (d) No contamination of potential human foodstuffs, including wild berries, should be permitted.
- (e) No contamination of potable water supplies should be permitted.
- (f) If pastures are sprayed, owners of the pastures should be notified in advance of spraying and their written approval secured.
- (g) As soon as the Administrator of EPA issues standards for pesticide applicators, all spraying should be done by an individual meeting these standards or under his immediate supervision. All pesticide applicators should be certified under State provisions and comply with applicable State standards.
- (h) No formulation with a dioxin contamination level that exceeds 0.1 ppm should be used.
- (i) After sufficient time has elapsed for vegetation damage to become apparent but within the same growing season, visual inspection should be made for drift or volatilization contamination and damage of the vegetation off the right-of-way and action taken to ensure that drift or volatilization be held to a minimum in future applications.

The above recommendations on the use of herbicides in no way abrogate applicable state laws, regulations, or registrations such as the restricted-use list of the New York State Department of Environmental Conservation.

All herbicides, pesticides and related chemicals should be registered in accordance with PL 92-516, The Federal Insecticide, Fungicide and Rodenticide Act.

The Applicant should develop sufficient field study and monitoring programs to ensure that the above recommendations are followed to the extent possible and that no rare or endangered species of plants or animals are jeopardy.

5.2 IMPACTS OF WATER USE

5.2.1 Water Consumption

All water for the Station (for cooling, makeup, and plant operation) is taken from the lake and essentially all of it is returned to the lake. The Staff has calculated that the increase in evaporation due to the heat rejection of the Station to the lake will be 0.1 percent of natural evaporation off the lake. Therefore, no measurable impact is expected on the overall water balance.

5.2.2 Thermal Studies

Since Nine Mile Point Unit 1 went into operation in 1969, several field surveys of the plumes resulting from the discharge of heated condenser cooling water into Lake Ontario have been conducted.¹⁻⁷ An examination of these data shows that the plume extent and direction are strongly dependent on wind-induced lake currents, wave action and upwelling. A thorough discussion of the effect of these factors by various wind regimes is given in Reference 5. The data reported by the Applicant's consultants are for 12 surveys in which temperature measurements were taken at various lake depths and reduced to isotherm plots. Of these, two surveys (Figs. 5.1 and 5.2) are discussed further because they represent extreme cases of interest for their potential biological impact.

Figure 5.1 (Field Survey,⁶ November 16, 1971) represents a situation in which an extensive stretch of shoreline will be affected by the thermal discharge. During this survey, the wind was from the north at 5-10 mph. The warmer water spread out along the shore and slightly westward because of a weak current. Waves were slight (six inches to one foot) and little upwelling was observed. As an indication of the extent of shoreline affected, temperatures for about two miles of shoreline were at least 5°F greater than lake ambient temperature. Below the surface, less shoreline was affected. However, even at a depth of 5 feet, approximately one and a quarter miles of shoreline had temperatures greater than 5°F above ambient. The thermal plume did not extend much deeper than five feet because at a depth of 7-8 feet, the temperatures were not far from the ambient lake value.

Figure 5.2 (Field Survey,⁶ July 30, 1971) represents a situation in which less shoreline is affected. On this occasion, the wind was from the east at 0-5 mph with waves at 1-2 inches. As a result a wedge of warm water was observed that extended 3000 feet offshore for the isotherm of the 5°F above ambient temperature. In other surveys, isotherms typically ranged from 1000 to 2000 feet offshore.

For the other surveys in which the wind and wave conditions were different, considerably less shoreline was affected; about one half or less than that indicated above.

5.2.3 Effects of Chemical Discharges

The chemicals that will be used in the Station and their discharge concentrations are given in Table 3.9. The major chemical waste excluding

November 16, 1971

WIND N 5-10 mph
 AIR TEMP. 10°C (50°F)
 SKY COVER 10
 WAVES 6"-1'
 SURFACE AMBIENT 9.5°C (49.1°F)

STATION DATA
 NET OUTPUT 565 MWe
 DISCHARGE FLOW 2.6×10^8 gpm
 TEMP. IN 11.7°C (53°F)
 TEMP. OUT 28.9°C (84°F)

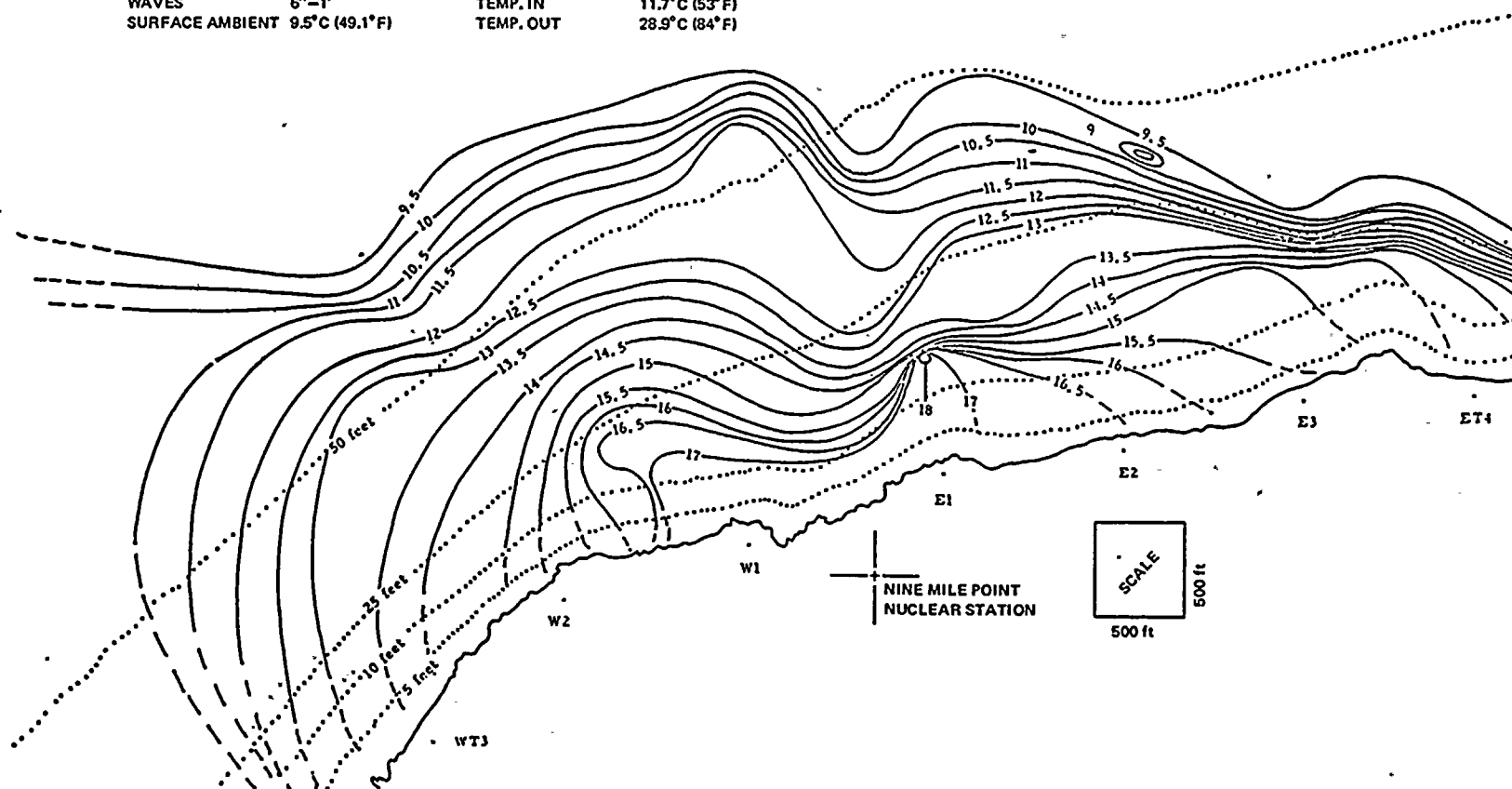


Fig. 5.1. Three-dimensional Thermal Survey of Nine Mile Point: Nov. 16, 1971 (surface temperatures, °C).

July 30, 1971

WIND E 0-5 mph
 AIR TEMP. 19.4°C (67°F)
 SKY COVER 1 with haze
 WAVES E 1"-2"
 SURFACE AMBIENT 22.5°C (72.5°F)

STATION DATA
 NET OUTPUT 490 MWe
 DISCHARGE FLOW 2.5×10^3 gpm
 TEMP. IN 21.7°C (71°F)
 TEMP. OUT 37.2°C (99°F)

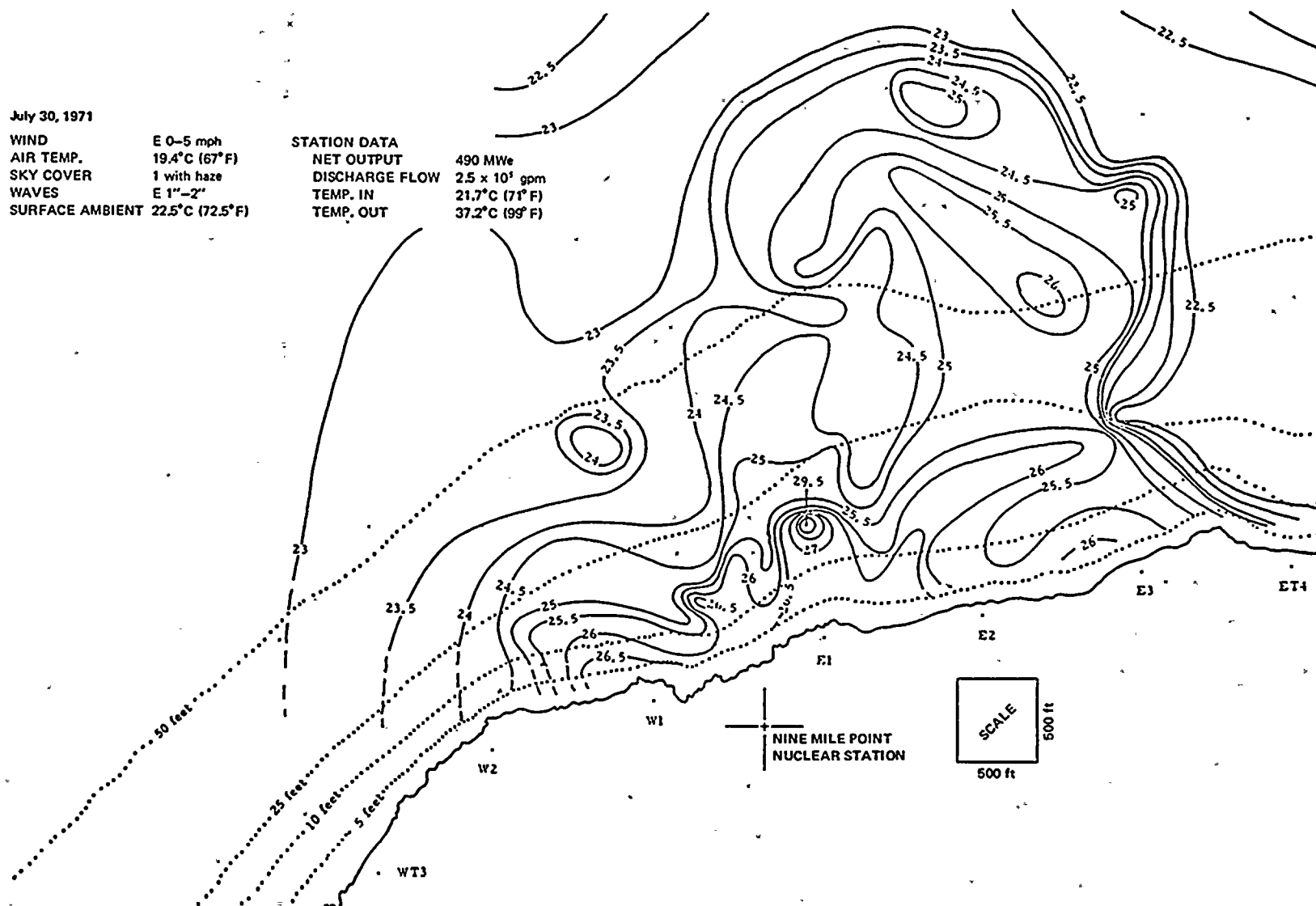


Fig. 5.2. Three-dimensional Thermal Survey of Nine Mile Point: July 30, 1971 (surface temperatures, °C).

liquid radioactive wastes and treated sewage is a neutralized solution of sodium sulfate and other salts (originally removed from lake water) from the makeup-demineralizer regeneration. This solution is discharged during a three-hour period once every eight days along with the heated water. This solution will be dispersed and diluted in the lake.

As calculated from the data in Table 3.9, the total dissolved solids in the cooling-water effluent from the Station will be increased by 4.4 ppm during the discharge periods or an overall average of 0.56 ppm (a 0.2% increase in the natural level). This increase is small in comparison with the natural variation in the lake. For example, the residue on evaporation (total solids) varied at one station off Oswego between 128 and 533 ppm during a 6-1/2-year period (see Table 2.2). On this basis, no detectable effect on inshore waters is expected. The 198 lb/day average discharge of chemicals from the Station will increase the dissolved-solids content of the 400 cubic miles of water of Lake Ontario by 0.002 ppm, or 0.0007% per century (80% capacity factor). For such long time periods, complete mixing can probably be assumed. This is a negligible fraction of the existing trend of 96 ppm/century increase for 1910-1960.⁸ Therefore, the Staff judges that no lake-wide effect will be discernible.

The only chemicals clearly relating to the eutrophic trend in Lake Ontario whose levels will be influenced by operation of Unit 1 are the phosphate and dissolved-nitrogen (ammonia, nitrate, and nitrite) species removed from lake water in production of makeup water and later returned to the lake as a waste from ion-exchanger regeneration. The mean value of the phosphate (Table 2.3) in nearby lake water is 0.19 mg/l; the sum of the mean nitrogen contents of ammonia, nitrate, and nitrite (Table 2.3) is 0.61 mg/l. Calculating as in the development of Table 3.9, the average quantity of excess dissolved chemicals returned to the lake will be 0.034 lb/day phosphate and 0.11 lb/day of nitrogen.

Phosphate is also released to the lake via the circulating water in used laundry detergent and in Station sewage. During normal operation, the unit releases 100 lb/month of detergent; during "scheduled outages", it releases 450 lb/month. While no detailed estimate of the total duration of "scheduled outages is available" it will be less than 20% because the expected capacity factor is 0.80. The total discharge would thus be 100 lb/month for 80% of the time and 450 lb/month for 20% of the time. Annual detergent release would thus be 2040 lbs. Since 50% of the material is sodium hexametaphosphate, the maximum orthophosphate release will be 950 lb/yr or an average of 2.6 lb/day. Concentration increments in the discharge will be 0.5 or 2.2 parts per billion phosphate, depending on whether there is a scheduled outage.

Sewage from the Unit has averaged 12 mg/l phosphate content, based on effluent analyses. At the maximum expected daily flow (during refueling-overhauling) of 3880 gal, the phosphate discharged will be 0.039 lb/day.

The total phosphate discharge will thus be 3.0 lb/day. This discharge is much smaller than that from other sources; for example, Thon⁹ uses 230,000 lb/day as the rate of phosphate input to Lake Ontario in his material-balance calculations. This change of 0.001% in the rate of addition of phosphate to the lake due to the operation of Unit 1 is undetectable. The effect will also be insignificant locally. The average increase in the phosphate concentration in the circulating water discharge will be 0.0008 mg/l, a 0.4% increase. This effect will be undetectable.

The nearest lake water intake for a public water supply is in Oswego, about eight miles west. The nearest recreational area on Lake Ontario is Selkirk Shores State Park, ten miles east of the site. The Applicant's model studies have shown that for a typical velocity of 0.4 fps for the lake current, the discharged water will be diluted 156 and 235 times, respectively, by the time it reaches the Oswego intake and the State Park. By using a model of a surface discharge fitted to the field temperature data of Unit 1 discharge, the Staff concludes that the Applicant's calculations for the dilution factor at Oswego and Selkirk are reasonable. In view of the already low concentrations of chemicals (see Table 3.9) that reach these points, no impact on the consumptive or recreational use of the water is expected.

Private water supplies in the area use ground water. The nearest operating well is about 3500 feet from the Station. The water table in the vicinity of the Station slopes toward the lake; therefore, ground water contamination is extremely unlikely.

5.2.4 Compliance with Water Quality Standards

With the exception of the limits on total dissolved solids, the phosphate concentration in the discharged sewage, and the thermal-plume size, the effluents of Unit 1 conform to all criteria and standards of the State of New York, Minimum Federal Water Quality Criteria (MFWQC) provided by the Environmental Protection Agency, and the International Agreement on Great Lakes Water Quality between the United States and Canada (April 15, 1972).¹⁰

The following is the detailed consideration arranged in the order of the New York State Standard 701.3, Classes and Standards for Fresh Surface Waters, Class AA.

1. Floating solids; settleable solids; oil; sludge deposits; taste or odor-producing substances (see also MFWQC 1.1, 1.2, and 1.3): There is no discharge from Unit 1 of materials that form objectionable deposits, that provide floating debris, oils, scum and other matter, or substances producing objectionable color, odor, taste or turbidity to Lake Ontario.
2. Sewage or waste effluents: Disinfection is required; the geometric mean of fecal coliform counts in the lake is limited by regulation to 200/100 ml (MFWQC 2.2.1). The sanitary wastes from Unit 1 have extended aeration secondary treatment and chlorine disinfection before oxygenation in a pond and discharge into the lake. A 24-hour composite sample in September 1971 showed 430 fecal coliform bacteria per 100 ml in the oxygenation-pond outlet. During those periods when rainwater or other surface runoffs in the ditch carrying the effluent to the lake is greater than about 2.2 times the instantaneous sewage flowrate, the criterion will be complied with. For other periods, a small zone will be produced in the lake within which the fecal coliform count is in excess of the criterion; this zone will probably not be more than a few feet in average diameter, since the maximum average daily flow corresponds to only 2.7 gal/min.
3. pH: The combination of the International Agreement and MFWQC apparently would require that effluent pH be maintained at 6.7-8.3, "except when due to natural causes and in no case shall be less than 5.0 nor more than 9.0. When the pH is less than 6.5 or more than 8.3, discharge of substances which would increase the buffering capacity of the water should be limited."* The Unit 1 circulating water is returned to the lake at the same pH at which it was removed from the lake. The Staff judges that the regulation is complied with because: the natural pH of Lake Ontario in the vicinity of the Station ranges from 7.2 to 9.0 (see Table 2.3); the pH is not measurably changed by passage through the Station; and no significant buffering capacity is added to the circulating water.

*From the "Report of the Committee on Water Quality Criteria to the Federal Water Pollution Control Administration, U.S. Department of the Interior" (The Green Book"). The MFWQC was formulated by using this report as a gauge.

4. **Dissolved Oxygen:** The most restrictive applicable standard is Item 2.1.1.1(b) of the MFWQC, which requires that the dissolved oxygen (DO) be not less than 6.0 mg/l (except that the DO may be between 5.0 and 6.0 mg/l for not more than four hours within any 24 hour period, provided the water quality is favorable in all other respects and normal daily and seasonal fluctuations occur). The dissolved oxygen in Lake Ontario in the vicinity of Nine Mile Point has ranged from 6.8 to 14.4 mg/l (Table 2.3). This level is in conformity with widespread observations of oxygen content of the water of Lake Ontario; in one study,¹¹ summertime saturations ranged from 9.5 to 13 mg/l. The oxygen content in the cooling water has been observed by the Applicant not to be diminished by passage through the condenser even though the temperature is increased. The Staff concludes that the standard is complied with.
5. **Toxic Wastes, Deleterious, or Colored Substances:** For the protection of people who might use the lake water as a supply of drinking water, the Standards of the U. S. Public Health Service apply. Limits are provided for some 21 chemical species or groups. Of these species, only iron (limit 0.3 mg/l) and sulfate (limit 250 mg/l) are added to the circulating water. The iron content of the lake is of the order of 0.005 mg/l.¹² Unless there is a local incidence of high concentration in the lake, the concentration of iron in the discharge is not expected to exceed the 0.005 mg/l naturally occurring, with a 0.4% increase when the makeup-water demineralizer is regenerated. No violation of the Standard is expected.

The sulfate in Lake Ontario near the Station is about 13 to 50 mg/l (Table 2.3), and the incremental concentration during periods of discharge of regeneration wastes from the makeup-water demineralizers is 2.49 mg/l for Unit 1 (Table 3.9). The maximum total is thus well below the 250 mg/l specified in the Standard. The Standard is complied with.

For all other chemicals in the water except sodium ion, the concentration in the circulating water discharge is the same as in the lake water except during periods of discharge of wastes from regeneration of makeup-water ion exchangers. At these times there is about a 0.4% increase in the concentrations of nearly all species present. As an approximation, those ions present in the lake water below the limits allowed in the Standards are returned to the lake in the same state. Thus, if the concentrations naturally present in the lake are below the Standards, there will be no violations. All ions for which the average natural levels are known (see Table 5.1) are below the maximum permitted level; thus, except for

TABLE 5.1 Drinking Water Standards for Lake Ontario

Substances	Limit, ^a mg/l	Concentration in Lake, mg/l
Arsenic	0.05	Unknown ^b
Barium	1.0	Unknown (0.04) ^c
Cadmium	0.01	0.00009, ^d 0-0.012 ^e
Chromium	0.05	0.0007 ^d
Lead	0.05	0.0008, ^d 0-0.164
Chloride	250	30 (Table 2.3)
Copper	1.0	0.006, ^d 0-0.068 ^e
Manganese	0.05	0.0005
Nitrate	45	0.14 (Table 2.3)
Sulfate	250	30 (Table 2.3)
Total dissolved solids	500	233 (Table 2.3)
Zinc	5	0.007, ^d 0-0.075 ^e
Cyanide	0.2	Unknown
Fluoride	~1	Unknown
Selenium	0.01	Unknown
Silver	0.05	Unknown
Alkyl benzene sulfate	0.5	Unknown
Carbon chloroform extract	0.2	Unknown
Phenols	0.001	0-2.25 ^e

^aU. S. Public Health Service Drinking Water Standards, 1962.

^bArsenic was undetectable in about 95% of samples in the United States (13).

^cAverage concentration in 99% of samples in the United States (13).

^dReference (12).

^eTable 2.2.

rare local increases in some substances (e.g., phenols), no violations are expected. For the remaining substances, no statement can be made with certainty because the concentrations are unknown. There is no reason to expect violations.

Six toxic substances affecting fish life are identified in the New York State Standard, referring to natural waters with a median alkalinity of 80 ppm or above of calcium carbonate equivalent (which is true for Lake Ontario). None of these substances are added to discharge streams but will have minor concentrations periodically in the circulating-water discharge as indicated above. Levels of ammonia or ammonium compounds nearby the lake (limit 2.0 mg/l at pH at or above 8.0) have been 0.0 - 5.7 mg/l NH_3 , with an average of 0.57 mg/l (Tables 2.2 and 2.3). The level of ferrocyanide or ferricyanide (limit 0.4 mg/l) in the lake is unknown, but small; the status of cyanide (limit 0.1 mg/l), copper (limit 0.2 mg/l), zinc (limit 0.3 mg/l), and cadmium (limit 0.3 mg/l), are given in Table 5.1. Of those substances present in the natural water, the levels are below those permitted in the Standard, and no violation will occur. No reason is known to expect violations to occur for the remaining ions.

6. Additional Items:

New York State thermal standards

As mentioned in Section 5.2.2, a thermal plume results from the discharge of heated water into the lake. The surface areas that are encompassed by the 3°F isotherm varies from 50 to 400 acres.

The New York State criteria that govern thermal discharges impose the following restrictions on discharges into lakes:

"The water temperature at the surface of a lake shall not be raised more than 3 degrees F over the temperature that existed before the addition of heat of artificial origin, except that within a radius of 300 feet or equivalent area from the point of discharge, this temperature may be exceeded (6 NYCRR, 704.1)."

However, a footnote to this standard provides:

"It is recognized that a radius of 300 feet or equivalent area may be too liberal or too restrictive and that a lesser or greater area may be required or permitted under the procedure set forth in 'Additional limitations or modifications', section 704.2, *Infra*."

These numerical limitations for thermal discharges were adopted on July 25, 1969, after the discharge for Unit 1 was constructed. Section 704.4 of the State Code sets the following restrictions on existing discharges:

"In determining whether a discharge existing prior to the adoption of the above criteria complies with the applicable standard of thermal discharges ('None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish life...or impair the waters for any other best usage...' [6 NYCRR, 701.3 et seq.]), these criteria are intended only to be a frame of reference."

The Staff has noted no adverse effect on the aquatic biota due to the thermal discharge, thus Nine Mile Point Unit 1 thermal discharge complies with the Standard (6 NYCRR 704.4, 6 NYCRR 701.3).

In the international agreement for water quality of the Great Lakes, the level of dissolved solids in Lake Ontario "should not exceed" 200 mg/l. Since the average level of total dissolved solids in Lake Ontario is about 233 mg/l (range 127 to 489, Table 2.3), withdrawing and redischarging might appear to violate the intent with respect to total level. In view of the fact that the increase in dissolved solids caused by the operation of Unit 1 is very small (see Table 3.9), it is believed that the intent of the Standard in preventing increases in the level of total dissolved solids is being met.

The MFWQC also restrict phosphorus. The total phosphorus is not to exceed 50 µg/l in any lake or at any point where it enters the lake (Section 2.1). The phosphorus content of the sewage from Unit 1 is 4 mg/l. Thus, for times when there is no water flowing in the ditch from which sewage is discharged to the lake, the MFWQ criterion for phosphorus is exceeded. Because the quantity of phosphorus is small and the sewage flow rate is low, the size of the zone in which the concentration exceeds the criterion is small. When storm water in the rivulet is flowing at a rate greater than 40 times the sewage flowrate (i.e., greater than 146 gpm), the 50 µg/l concentration will not be exceeded because of the resultant dilution of the sewage before discharge to the lake.

The MFWQC limit radioactivity in the lake to the levels in the U. S. Public Health Standards for drinking water. These allow 100 picocuries (pCi) per liter of gross beta activity in the absence of strontium and alpha emitters, 3 pCi of radium-226 and 10 pCi/l of strontium-90.

With these standards applied to the circulating-water discharge, the data in Section 5.4.1 indicate that the discharge contains an estimated 30 pCi/l of gross β -emitters. This is substantially below the 1000 pCi/l permitted. A strontium-90 discharge of 0.021 pCi/l is expected. This is substantially below the standard (10 pCi/l). It is anticipated that no radium-226 will be emitted, and therefore, the Standard for that radionuclide will not be exceeded.

Section 2.2.4 of the MFWQC limits the color and turbidity so that a Secchi disc will be visible at a minimum depth of 1 meter. Unit 1 will not discharge water that is measurably more turbid or colored than that drawn in. The maximum turbidity reading available (Table 2.3) is 6 Jackson Turbidity Units. The maximum length of this solution for which visibility is maintained is unknown, but extrapolation of the length in the table in Standard Methods* downward from 25 Jackson units provides an estimated minimum path length for the lake water in excess of one meter. It is, therefore, estimated that the standard will literally be fulfilled. If there are occasions when the lake turbidity will exceed the standard, no violation of the intent to restrict the increase of turbidity will have occurred.

Sections 3 and 4 of the MFWQC, requiring that mixing zones of discharges be small compared with the size of the lake and that there be ample undisturbed portions of the lake, will readily be met by discharges from Unit 1.

5.3 RADIOLOGICAL IMPACT ON BIOTA OTHER THAN MAN

The pathways by which biota other than man may receive radiation doses in the vicinity of a nuclear power station are shown in Figure 5.3. Two recent comprehensive reports^{14,15} have been concerned with radioactivity in the environment and the pathways by which the radioactive materials can reach biota. Depending on the pathway being considered, terrestrial and aquatic organisms will receive either approximately the same radiation doses as man or somewhat greater doses. No guidelines have been established for desirable limits for radioactive exposure to species other than man. However, it is generally agreed that the limits established for humans are also conservative for other species.¹⁶

The Applicant has proposed an improved radioactive-waste treatment system for Unit 1, which will significantly reduce the amount of radionuclides released to the atmosphere and the lake. The following analyses are performed assuming the existence of this improved system, where appropriate.

* Table 163(1) in "Standard Methods for the Examination of Water and Wastewater," 13th Edition, APHA, AWWA, WPCF, New York, 1971.

The quantities and species of radionuclides expected to be discharged annually by Unit 1 in liquid and gaseous effluents have been estimated by the Staff and are given in Tables 3.3 and 3.7 respectively.

For the determination of doses to biota other than man, specific calculations are done primarily for the liquid effluent. Doses to terrestrial animals such as rabbits or deer due to the gaseous effluent are quite similar to those calculated for man (Section 5.4). The liquid-effluent quantities, when diluted by the total annual coolant discharges of Unit 1, would produce an average gross activity concentration, excluding tritium, of 1.2×10^{-9} microcuries per milliliter in the lake between the plant discharge regions. Additional discussion concerning liquid dilution is presented in Section 5.4.

The maximum doses to aquatic organisms living in the water containing radionuclides discharged from the Station will be delivered to aquatic plants. This is a consequence of physiological mechanisms that concentrate within plants a number of elements that can be present in their aqueous environment. The extent to which elements are concentrated in fish, invertebrates, and aquatic plants upon uptake or ingestion has been estimated. Values of relative biological accumulation factors of a number of waterborne elements for several freshwater organisms are provided in Table 5.2.

The annual radiation doses to both aquatic and terrestrial biota, including man, were estimated on the assumption of constant concentrations of radionuclides at a given point in both the water and air. Figure 5.3 shows that radiation dose has both internal and external components. External components originate from immersion in radioactive air and water and from exposure to radioactive surfaces. Internal exposures are a result of ingesting and breathing radioactivity.

Doses to aquatic plants and fish living in the discharge region due to water uptake and to ingestion (internal exposure) were calculated to be 39 and 1.3 mrad/year, respectively, for Unit 1 operation. The discharge-region concentrations were those described above, and it was assumed that maximum concentrations were present all of the year. All calculated doses are based on standard models.¹⁷ However, the doses are quite conservative since it is highly unlikely that any of the mobile life forms will spend a significant portion of their life span in the maximum-activity concentration of the discharge region. Both radioactive decay and additional dilution would reduce the dose at other points in the lake.

External doses to terrestrial animals other than man are determined on the basis of gaseous effluent concentrations and direct radiation

TABLE 5.2 Freshwater Bioaccumulation Factors for Radioelements^a
(pCi/kg organism per pCi/l water)

Element	Fish	Invertebrates	Plants	Element	Fish	Invertebrates	Plants
Na	3(1) ^b	3(1)	2(2)	P	1(5)	1(5)	1(5)
Cr	2(2)	2(3)	4(3)	Ru	1(2)	2(3)	2(3)
Mn	2(1)	4(4)	1(4)	Rh	1(2)	2(3)	2(3)
Fe	3(2)	3(3)	5(3)	Sb	4(1)	2(4)	-
Co	5(2)	2(3)	1(3)	Te	4(2)	2(2)	1(2)
Ni	4(1)	1(2)	1(2)	I	1(0)	2(1)	1(2)
Zn	1(3)	4(4)	4(3)	Cs	1(3)	1(3)	3(2)
Ag	3(3)	3(3)	2(2)	Ba	1(1)	2(2)	5(2)
W	1(0)	3(1)	3(1)	Ce	1(2)	1(3)	1(4)
Rb	2(3)	2(3)	1(3)	Pr	1(2)	1(3)	1(4)
Sr	4(1)	7(2)	5(2)	Nd	1(2)	1(3)	1(4)
Y	1(2)	1(3)	1(4)	Pm	1(2)	1(3)	1(4)
Zr	1(2)	1(3)	1(4)	Np	1(4)	3(2)	1(3)
Nb	3(4)	1(2)	1(3)	La	1(2)	1(3)	1(4)
Mo	1(2)	1(2)	1(2)	H	1(0)	1(0)	1(0)

^aFrom, W. H. Chapman, H. L. Fisher, and M. W. Pratt, "Concentration Factors of Chemical Elements in Edible Aquatic Organisms," UCRL-50564, Dec. 30, 1968.

^bNumbers in parentheses represent powers of ten.

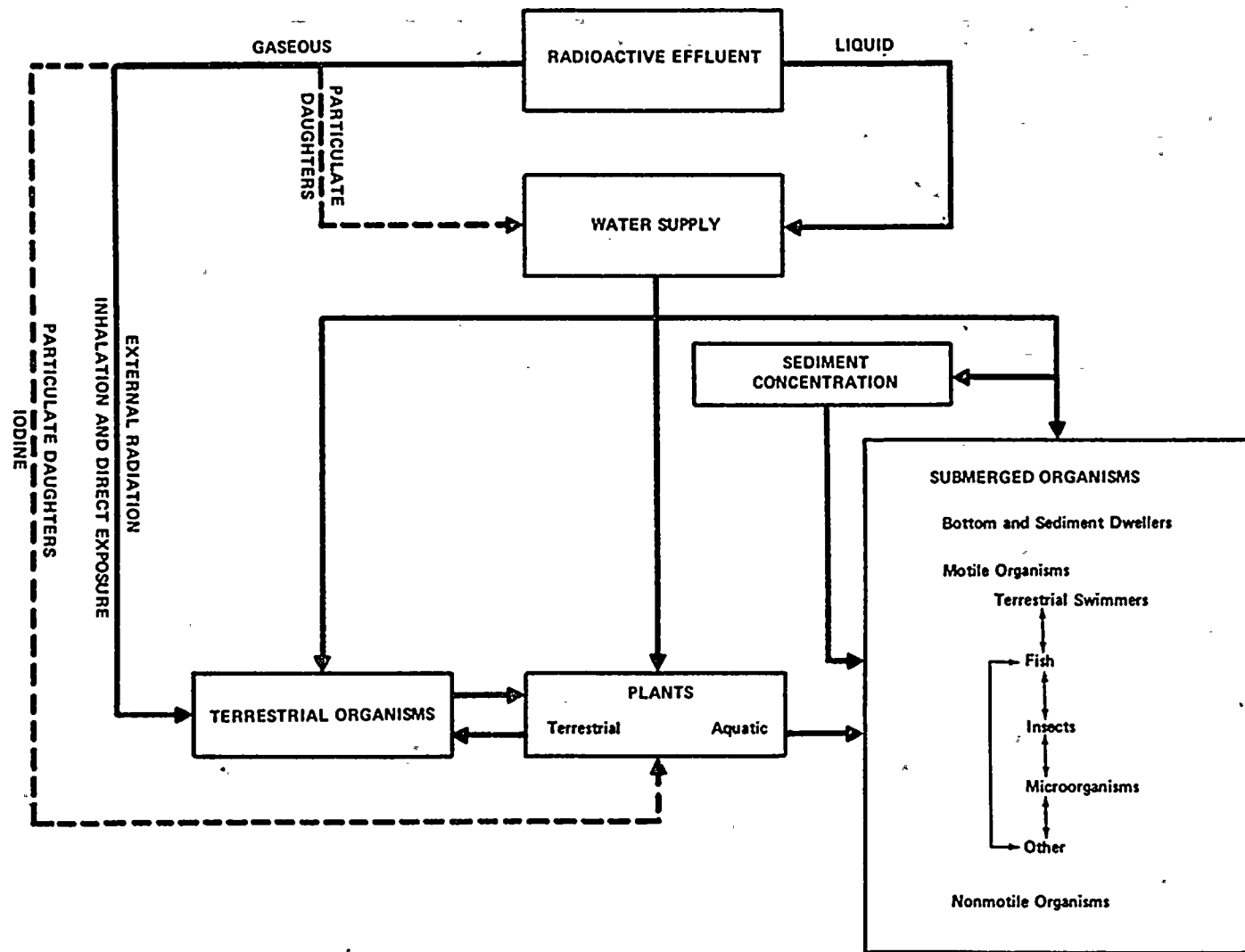


Fig. 5.3. Generalized Exposure Pathways for Organisms Other Than Man.

contributions at the locations where such animals may actually be present. Because the concentrations are primarily used in the calculations for dose to man, they are discussed in Section 5.4. The external doses to animals at the same locations are the same as those to man.

An estimate can be made for the ingestion dose to a terrestrial animal such as a duck, which is assumed to consume only aquatic vegetation growing in the water in the discharge region. The duck-ingestion dose was calculated to be about 20 mrad/year. All of the calculated ingestion doses are believed to represent upper-limit estimates, because equilibrium was assumed to exist between all aquatic organisms and all radionuclides in water. A nonequilibrium condition for a radionuclide in an actual exposure situation would result in a smaller bioaccumulation and, therefore, in a smaller dose from internal exposure. Also, there are many pathways of internal exposure to terrestrial biota, but the pathway selected assumed that the muskrat or duck consumed only aquatic vegetation growing in the water in Lake Ontario near the discharge region.

The literature relating to radiation effects on organisms is extensive, but very few studies have been conducted on the effects of continuous low-level exposure to radiation (from ingested radionuclides) on natural aquatic or terrestrial populations. The most recent and pertinent studies point out that, while the existence of extremely radiosensitive biota is possible and while increased radiosensitivity in organisms may result from environmental interactions, no biota have yet been discovered that show a sensitivity to radiation exposures as low as those anticipated in the area surrounding Unit 1. In the BEIR report¹⁸ it is stated in summary that evidence to date indicates that no other living organisms are very much more radiosensitive than man. Therefore, no detectable radiological impact is expected in the aquatic biota or terrestrial mammals as a result of the quantity of radionuclides to be released into Lake Ontario and into the air by Unit 1.

5.4 RADIOLOGICAL IMPACT ON MAN

Routine power generation by Unit 1 will result in the release of small quantities of fission and activation products in the environment. These releases will be kept as low as practicable in accordance with 10 CFR 50 and well within the limits specified in 10 CFR 20. Nuclide releases from Unit 1 have been measured since the station began generating power in 1969. The Staff has also estimated the probable nuclide releases from the Station after the addition of a proposed improved radioactive waste treatment system.

Estimations were made of radiation doses to man at and beyond the site boundary via the most significant pathways diagrammed in Fig. 5.4. The

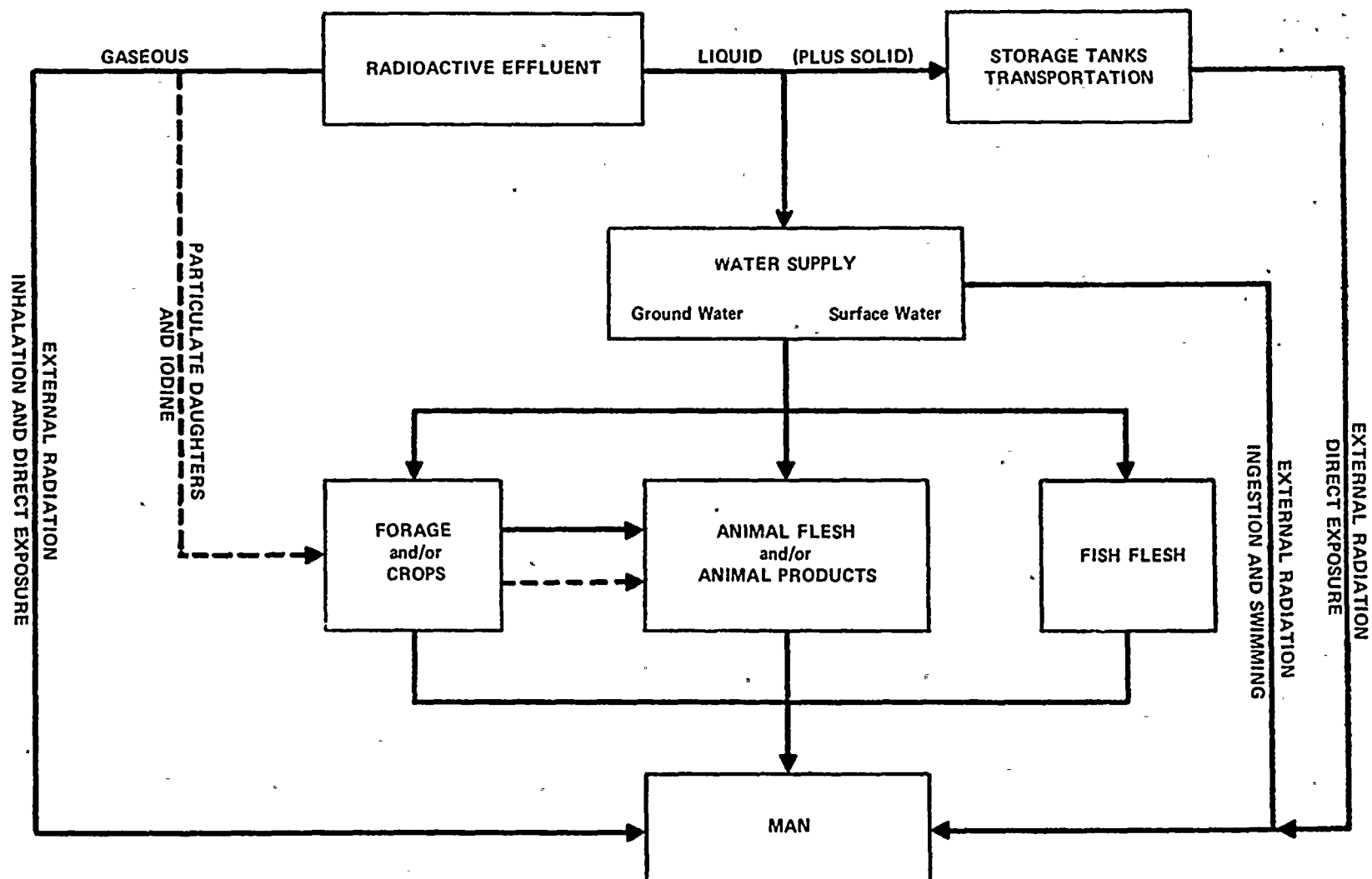


Fig. 5.4. Generalized Exposure Pathways to Man.

calculations are based on conservative assumptions regarding the dilutions of effluent gases and radionuclides in the coolant discharge, and the use by man of the plant surroundings.

5.4.1 Radioactive Materials Released in Liquid Effluents

Expected nuclide releases in the liquid effluent have been calculated for Unit 1 assuming completion of the improved radioactive-waste treatment system. The respective values are listed in Table 3.3. Effluent activities discharged into Lake Ontario by Unit 1 during 1971 have been measured¹⁹ and are presented in Table 5.3. Since Unit 1 operated at about 56% of its total license capacity during 1971, the measured effluents were increased by the factor $0.80/0.56 = 1.43$ to approximate a full year of normal (80%) operation. These measured and normalized releases were used to estimate existing potential doses.

The discharge structure of Unit 1 is designed to improve diffusion of the heated water with the lake water. The diffusers increase mixing of the coolant water with the lake by a factor of 3.²⁰ Concentrations of radionuclides in the mixing zones reflect the additional dilution. In the immediate vicinity of the Unit 1 discharge, the gross activity concentration, exclusive of tritium, is estimated to be 1.2×10^{-9} $\mu\text{Ci}/\text{cm}^3$ and 2.9×10^{-8} $\mu\text{Ci}/\text{cm}^3$ with and without the augmented radioactive waste treatment system, respectively.

During normal reactor operations, a fraction of the noble gases produced will be released in the coolant water and subsequently discharged into the lake. The AEC Directorate of Regulatory Operations has analyzed operating reactor coolant discharge water for noble gas content. Under conditions of highest annual average noble gas concentrations in the discharge water, no significant doses would be delivered to human beings.

Consumption of potable water from Lake Ontario constitutes the principal exposure pathway to man for the liquid effluents. Both the Onondaga County Water District and the city of Oswego use Lake Ontario water. Dilution of the effluents from the mixing zone to the nearest intake, which is about 8 miles from the site, was conservatively estimates to be 15 by the Applicant.²¹ Doses to individuals consuming 1.2 liters/day of this water were calculated using standard models.¹⁷

Other pathways of relative importance involve recreational use of the lake in the vicinity of the discharge zone. Individual doses from consuming fish caught in the immediate discharge area were evaluated using the biological accumulation factors listed in Table 5.2 and standard models.¹⁷ Swimming, boating, and fishing in the discharge region were also included in the evaluation.

TABLE 5.3 1971 Effluent Releases from Nine Mile Point, Unit 1^a

	Liquid, Ci		Gases, Ci
Cr-51	8.57 (12.25) ^b	Xe-138	22,414 (32,100)
Mn-54	5.91 (8.45)	Kr-87	35,868 (51,300)
Co-58	3.30 (4.72)	Kr-88	33,483 (47,900)
Fe-59	2.92 (4.18)	Kr-85m	20,287 (29,000)
Co-60	6.50 (9.30)	Xe-135	75,588 (108,000)
Sr-89	0.17 (0.24)	Xe-133	42,718 (61,100)
Mo-Tc-99	0.23 (0.33)		
I-131	1.34 (1.92)		
I-133	0.26 (0.37)		
Cs-134	0.49 (0.70)		
Cs-137	1.47 (2.10)		
Ba-La-140	0.05 (0.07)		
Np-239	0.33 (0.47)		
Na-24	0.09 (0.13)		
Total identified and unidentified noble gas releases			253,240 (362,000)
Total identified and unidentified liquid releases			32.2 (46.0)
Total iodines and particulates in gaseous streams			0.8 (1.14)

^aFrom operating experience of NMP-1; 56% of total generation capacity.

^bNumbers in parentheses are extrapolations to 80% annual operating time.

Tables 5.4 and 5.5 summarize the potential individual doses from the liquid effluents. All calculations were performed twice to illustrate potential effects with and without the addition of the augmented radioactive waste treatment system. Operating data (Table 5.3) were used to illustrate present potential doses. Staff estimates of nuclide releases after installation of the improved radwaste system (Table 3.3) provided data for long-term dose assessments.

5.4.2 Radioactive Materials Released to the Atmosphere

Gaseous radioactive effluents from the plant will result in the most significant radiation doses to the public. As with the liquid effluents, the measured releases for Unit 1 (Table 5.3), corrected to a full year of normal (80%) operation, were used to calculate existing potential doses. AEC staff estimates of the probable gaseous releases after installation of the augmented radwaste were used to evaluate future potential doses.

All dose calculations were performed using annual average site meteorological conditions and assuming that releases occur at a constant rate. Doses due to radioactive gases released from stacks include the contribution from immersion in the part of the cloud which has reached ground level²² as well as the contribution from the elevated plume.²³

Hence, the given gaseous-diffusion factors (X/Q 's) can only be used to directly calculate doses associated with ingestion or inhalation pathways.

The primary food pathway to man involves the ingestion by dairy cows of radioiodine deposited onto grazing areas. Consumption of milk from these cows can result in exposure to the human thyroid. Doses to a child's thyroid which would result from consuming one liter of milk daily from a cow grazing five months annually were calculated for the nearest farm (0.64 miles, SW) using recognized models.²²

Another food pathway to man of secondary importance involves the consumption of leafy vegetables subject to radionuclide deposition from the stack plume. The thyroid dose resulting from an annual consumption of 72 kgm of leafy vegetables produced at the nearest farm during the three-month growing period was evaluated and found to be 0.034 and 0.017 mrem/yr before and after installation of the upgraded radwaste system, respectively.

Doses due to gaseous effluents are summarized in Tables 5.6 and 5.7.

TABLE 5.4 Annual Dose from Liquid Effluents under Equilibrium Conditions to Individuals at Various Locations before Installation of Augmented Radwaste System

Location	Pathway	Dose, mrem/yr			
		Total Body	Thyroid	GI Tract	Bone
Public water supplies -- 8 mi	Ingestion, 1.2 liters/day	4.3×10^{-3}	6.2×10^{-2}	1.5×10^{-2}	1.0×10^{-2}
Lake Ontario -- near discharge	Ingestion of fish, 20 g/day	6.8×10^{-1}	1.7×10^{-2}	1.7×10^0	9.5×10^{-1}
Lake Ontario -- near discharge	Swimming, 100 hr/yr	5.4×10^{-4}			
Lake Ontario -- near discharge	Fishing and boating, 500 hr/yr	1.4×10^{-3}			

TABLE 5.5 Annual Doses from Liquid Effluents under Equilibrium Conditions to Individuals at Various Locations after Installation of Augmented Radwaste System

Location	Pathway	Dose, mrem/yr			
		Total Body	Thyroid	GI Tract	Bone
Public water supplies -- 8 mi	Ingestion, 1/2 liters/day	1.3×10^{-4}	3.2×10^{-3}	8.1×10^{-4}	1.2×10^{-4}
Lake Ontario -- near discharge	Ingestion of fish, 20 g/day	1.9×10^{-2}	8.4×10^{-4}	2.9×10^{-2}	4.7×10^{-2}
Lake Ontario -- near discharge	Swimming, 100 hr/yr	6.9×10^{-5}			
Lake Ontario -- near discharge	Fishing and boating, 500 hr/yr	1.7×10^{-4}			

TABLE 5.6 Annual Doses from Gaseous Effluents under Equilibrium Conditions to Individuals at Various Locations before Installation of Augmented Radwaste System

Location	Atmospheric Dispersion Factor (χ/Q ; sec/m ³)	Pathway	Dose, mrem/yr		
			Total Body	Skin	Thyroid
Boundary dose (1.2 mi. E)	1.9×10^{-8}	Direct plume radiation ("shine") Cloud immersion and inhalation	5.0	6.9	5.0
Summer camp ^a (1.0 mi. WSW)	2.8×10^{-9}	Cloud immersion and inhalation	0.50	0.57	0.50
Niagara Mohawk visitor center ^b (0.5 mi. W)	1.4×10^{-9}	Cloud immersion and inhalation	2.1	2.4	2.1
Nearést dairy farm (0.64 mi. SW)	1.3×10^{-8}	Milk consumption and cloud immersion	6.5	7.8	0.69 ^c

^a Assumes an annual occupancy of three months.

^b Assumes an annual occupational dwell-time of 2000 hours.

^c Thyroid doses are calculated for a two-year old child consuming 1 liter of milk daily from cows grazing 5 months per year at this location.

5-24

TABLE 5.7 Annual Doses from Gaseous Effluents under Equilibrium Conditions to Individuals at Various Locations after Installation of Augmented Radwaste System

Location	Atmospheric Dispersion Factor (χ/Q ; sec/m ³)	Pathway	Dose, mrem/yr		
			Total Body	Skin	Thyroid
Boundary dose (1.2 mi. E)	1.9×10^{-8}	Direct plume radiation ("shine") Cloud immersion and inhalation	0.067	0.093	0.072
Summer camp ^a (1.0 mi. WSW)	2.8×10^{-9}	Cloud immersion and inhalation	0.007	0.008	0.0073
Niagara Mohawk visitor center ^b (0.5 mi. W)	1.4×10^{-9}	Cloud immersion and inhalation	0.012	0.013	0.012
Nearest dairy farm (0.64 mi. SW)	1.3×10^{-8}	Milk consumption and cloud immersion	0.094	0.017	0.34 ^c

^a Assumes an annual occupancy of three months.

^b Assumes an annual occupational dwell-time of 2000 hours.

^c Thyroid doses are calculated for a two-year old child consuming 1 liter of milk daily from cows grazing 5 months per year at this location.

5.4.3. Direct Radiation

Normal reactor power plant operations result in some human exposure to direct radiation (i.e., radiation from contained sources). The principal sources of human exposure to direct radiation that would result from the operation of Unit 1 are the high-pressure turbines of the boiling-water reactors. As a consequence of nuclear reactions occurring in the primary heat exchange loop of these systems [particularly, the 0-16 (n,p) N-16], energetic gamma rays are produced. In their passage through the containment and the atmosphere, the flux is attenuated and the gamma energy is degraded.

Estimates of direct radiation dose may be obtained by using values measured at another site.²⁴ The closest distance to the shoreline from the Station turbine is about 550 feet in the northerly direction. At an operational level of 0.8 for the plant, the direct radiation dose delivered to a person boating at this location for 500 hours per year is estimated to be 6 mrem per year. All other offsite, direct-radiation doses due to operation of Unit 1 will be less than the above quoted value under the same conditions.

5.4.4 Population Doses From All Sources

Radiation doses calculated by the Staff are intended to apply to an average adult. Specific persons will receive higher or lower doses, depending upon his age, living habits, food preferences, or recreational activities.

The combined doses (man-rem)* due to gaseous effluents to all individuals living within a fifty-mile radius of the plant was calculated using the projected 1980 population data furnished by the Applicant.²¹ Values for the man-rem dose at various distances from the plant are summarized in Table 5.8.

Presently, according to the Applicant,²¹ about 190,000 people derive their drinking water from the intake located 8 miles west of the plant. The total exposure to this population was evaluated using the drinking-water dose presented in Tables 5.4 and 5.5. Based on water usage tables,²⁵ it was estimated that an additional 360,000 people obtain their drinking water from other locations on the south shore of Lake Ontario. The population exposure for this group was evaluated by applying a general dilution of 100 over the concentrations in the immediate discharge region. The man-rem contribution from other water intakes on the lake is expected to be negligible.

* Man-rem is an expression for the summation of total body doses to individuals in a group. It is the product of the number of persons in that population multiplied by the average total body dose in rem received by each member of that population.

TABLE 5.8 Cumulative Population (annual man-rem dose, and average annual dose) in Selected Annuli Around NMP-1

Radius, miles	Cumulative Population, 1980	Cumulative Dose, man-rem/yr,		Average Individual Dose, mrem/yr,	
		without	with	without	with
		Augmented Radwaste System			
1	3	0.020	0.00028	6.5	0.094
2	337	0.60	0.0083	1.7	0.024
3	1000	1.2	0.017	1.2	0.017
4	2310	2.3	0.032	1.0	0.014
5	5290	4.5	0.063	0.86	0.012
10	43,100	9.5	0.14	0.22	0.0032
20	102,000	13	0.19	0.13	0.0019
30	217,000	18	0.26	0.082	0.0012
40	678,000	20	0.29	0.030	0.00043
50	1,060,000	30	0.42	0.028	0.00040

In estimating the combined doses resulting from the consumption of fish harvested from Lake Ontario, 1970 reported fish landings (3,235,000 lbs) from the lake in the United States and Canada were used.²¹ The coolant-water discharges were conservatively assumed to be diluted by an average of 100 over those dilutions in the immediate discharge region. The edible weight of the fish was further assumed to represent one-half of the gross weight.

The exposed fishing and boating population was estimated to represent 25% of the total population within a fifty-mile radius, and each person was assumed to be exposed during 1 hour/yr of swimming and 5 hours/yr of boating in the mixing zone.

The transportation of cold fuel to a reactor, of irradiated fuel from the reactor to a fuel-reprocessing plant, and of solid radioactive wastes from the reactor to burial grounds is within the scope of the AEC report entitled, "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants". The environmental effects of such transportation are summarized in Table 5.9.

The population doses from all sources, including cloud immersion, drinking-water ingestion, consumption of fish, recreation, and transportation are summarized in Table 5.10.

5.4.5 Evaluation of Radiological Impact

Using conservative estimates, the total man-rem from all effluent pathways received by the approximately 1,060,000 persons who will live within a fifty-mile radius of Unit 1 would be about 2.5 man-rem per year assuming the installation of the augmented radwaste system. By comparison, an annual total of about 110,000 man-rem is delivered to the same population as a result of the average natural background dose rate of about 0.1 rem per year in the vicinity of the plant.²¹

Operation of Unit 1 will then be an extremely minor contributor to the radiation dose that persons living in the area normally receive from natural background radiation.

5.5 NONRADIOLOGICAL EFFECTS ON ECOLOGICAL SYSTEMS

5.5.1 Effect on Terrestrial Environment

The Station is not a major obstruction to the free movement of terrestrial animals. Only about 45 acres of the site are actually used for power generation or transmission for Unit 1, including the Progress Center. The wildlife habitat of these 45 acres has been lost as a result of

TABLE 5.9 Environmental Impact of Transportation of Fuel and Waste to and from a Typical Light-water-cooled Nuclear Power Reactor^a

Normal Conditions of Transport	
	<i>Number of shipments per year</i>
Unirradiated fuel and return of empty containers	12 truckloads
Irradiated fuel and return of empty containers	120 truckloads or 20 railcarloads or 10 barges
Solid radioactive wastes	46 truckloads or 11 railcarloads
	<i>Environmental Impact</i>
Heat, weight, and number of shipments	Negligible

Radiation Doses	Number of Persons Exposed	Estimated Dose Range to Exposed Individuals ^b	Cumulative Dose to Exposed Population ^c
Transport workers	200	0.01 to 300 mrem/yr	3 man-rem/yr
General Public:			
Onlookers	1100	0.003 to 1.3 mrem/yr	2 man-rem/yr
Along route	600,000	0.0001 to 0.06 mrem/yr	

^aData supporting this table are given in the Commission's "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," dated December 1972.

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

^cMan-rem is an expression for the summation of whole body doses to individuals in a group. Thus, if each member of a population group of 1000 people were to receive a dose of 0.001 rem (1 millirem), or, if 2 people were to receive a dose of 0.5 rem (500 millirem) each, the total man-rem dose in each case would be 1 man-rem.

TABLE 5.10 Annual Dose to the General Population
for Operation of Nine Mile Point Unit 1

Pathway	Cumulative Dose, man-rem/yr,	
	without Augmented Radwaste System	with
Cloud	30	0.4
Drinking-water ingestion	1.1	0.03
Fish consumption	0.7	0.02
Recreation (swimming, fishing, and boating)	0.01	0.001
Transportation of nuclear fuel and radioactive wastes	2	2
Total	~34	~2.5

construction activities. Some forest animals and much of the vegetation formerly inhabiting the transmission line rights-of-way was lost. However, other forms of wildlife which inhabit forest-edge areas have probably colonized the rights-of-way. The loss of animals and vegetation will be small compared with the large numbers living in similar habitats available in this part of New York.

Almost all of the waste heat is released to the lake via the condenser cooling water and is eventually dissipated into the atmosphere. Wispy steam fog will sometimes occur over the thermal plume depending on the moisture in the air and the temperature of the plume. Observations of the occasional steam fog that occurs over the thermal discharges indicate it will be thin and wispy and, because of air turbulence, will rarely penetrate more than 10-50 feet inland before disappearing.²⁶ The density of the steam fog is not expected to be sufficient to interfere with shipping or other modes of transportation on the lake or on land. Many years of observation at power stations indicate that no serious atmospheric effects are expected from heat from the once-through cooling system.²⁶ Church has found that natural steam fog over Lake Michigan never penetrated inland more than 200 meters before disappearing.²⁷

The Applicant's measurements of sound intensity indicated that the maximum sound produced at the site boundaries was from the transformer at all locations; sound intensity from the transformer was equal to or less than the background noise.

The Staff concludes that the operation of Unit 1 is not expected to have a measurable effect on the terrestrial environment.

5.5.2 Effect on Aquatic Environment

Possible major environmental impacts on the aquatic ecosystem of Lake Ontario due to the operation of the Station include fish losses at the cooling-water-intake screens, entrainment of unscreened organisms through the condensers, and effects of thermal and chemical discharges.

a. Intake Effects

The Applicant has collected fish trapped and impinged on the traveling screens at Unit 1 to assess the potential for fish loss. The data collected by the Applicant are summarized in Table 5.11. Data were collected on an hourly basis from 4 to 24 hours on 32 sampling days to cover the period from May 30, 1972 to June 27, 1973, thus representing an annual pattern of mortality at the screens. Inasmuch as the sampling design for data collection has not been satisfactory, only gross approximations can be made about the annual fish kill

TABLE 5.11 Total Fish-impingement Catch at NMP-1; May 30, 1972-June 27, 1973

<u>Date</u>	<u>Total Numbers¹</u>	<u>% Alewife</u>	<u>% Smelt</u>
1972 May 30	2,858	66.0	23.7
June 22	15,258	45.7	38.9
July 14	2,041	66.4	19.7
August 1	259	69.2	0.0
August 9	1,809	38.7	6.5
August 20	17	20.0	0.0
September 7	171	64.9	24.6
September 25	27	75.0	0.0
October 12	288	73.0	14.6
October 17	510	18.8	40.0
November 7	30	11.1	11.1
November 20	206	50.8	3.7
December 5	87	0.0	58.6
December 19	984	0.3	68.0
1973 January 3	1,597	0.2	79.1
January 29	813	0.0	75.6
March 14	89	4.5	86.5
March 21	16,503	96.9	3.1
March 28	26,890	99.2	0.7
April 4	4,516	97.9	2.0
April 11	496,778	99.8	0.1
April 18	9,463	98.1	1.8
April 25	2,532	83.6	14.7
May 2	7,668	98.0	1.7
May 9	2,709	93.4	5.2
May 16	7,488	91.1	4.9
May 23	2,515	85.7	12.3
May 30	1,137	77.0	16.8
June 6	1,448	80.9	11.1
June 13	4,269	97.2	0.5
June 20	2,979	93.2	4.2
June 27	3,946	93.1	5.2

Total for 32 Sampling Days 617,885

¹

Data for hourly rates converted to daily rates.

at the Nine Mile Point site. The fish kill data for the NMP-1 intake are dominated by large numbers of alewives collected during spring.* Disregarding such surges of alewife mortality at the intake, the NMP-1 intake may have collected at least 1,000,000 fish (weighing about 50,000 lbs) during the period June 1972 - June 1973. If, however, the peak mortality of alewives is included, the number of fish killed during the year could be between 2 and 4 million. Because of the similarity in design of the intake, additional fish are expected to be killed at the intakes if and when J. A. FitzPatrick and NMP-2 plants go into operation. However, the additional mortality at these plants is not expected to be a linear function of cooling water flow rate because of two reasons. First, all three plants are located at one site and, therefore, are very much like competitive predators; a fish killed at one plant is not available to the other two plants. Second, the intake velocities at the FitzPatrick and the NMP-2 plants are less than that at NMP-1. Therefore, the Staff estimates that about 2,500,000 fish (weighing 125,000 lbs) per year (excluding the high mortality of alewives in spring) may be killed at all three plants; if the high mortality during spring is included, the total number of fish killed may be between 5 and 7 million.

The role and importance of alewives in Great Lakes is uncertain at present. On one hand alewives have been held responsible for degrading fisheries of the Great Lakes while on the other hand their presence has been defended as having played a rather harmless role after the initial impact of introduction. Whatever the view, one basic fact must not and cannot be ignored, i.e., the alewives represent aquatic production from the lakes and provide an intensive forage base for a top-carnivore.

The success of the salmon stocking program in Lake Michigan is closely keyed to the flourishing abundance of alewives. The State of New York and the Province of Ontario have initiated similar salmon stocking programs for Lake Ontario. At present, it is not possible to ascertain whether the salmon stocking program will be as successful in Lake Ontario as it has been in Lake Michigan, nor is it possible to estimate the impact of alewife mortality at NMP site on success of the salmon stocking program. Nevertheless, the Staff considers alewife production and abundance in the lake as a natural resource which should not be wasted. Also, there is no assurance that a commercially important species which might in the future replace alewives in abundance will not be as vulnerable at the cooling water intakes as the alewives.

* In spring, alewives move into shallow inshore waters from deep offshore waters. The alewife die-offs are common in the Great Lakes during such periods.

Regarding the implications of such fish kills on the ecosystem of the lake, the Staff makes a distinction between the phrases "significant fish kills" and "undesirable fish kills." The significance of the fish kill depends upon the level of disruption of intricate inter- and intra-species' relationships in the lake. Therefore, the significance of these fish kills cannot be evaluated or predicted unless the ecological investigations are under way for a considerable period of time. The Applicant's ecological investigations at this site are designed to make an effort in this direction. The concept of undesirability of fish kills stems from the fact that fish kills from unnatural causes and natural catastrophic events act to lower the threshold level -- a level beyond which the fish kills can result in significant and perhaps irreversible damage to the population. Since the threshold level is not known, it would be prudent to minimize the fish kills. In the Staff's assessment, fish kills at the site can be called "undesirable" and might act to lower the threshold value, thus diminishing the margin for future developments on the lake.

The data available show that large fish kills have occurred at the NMP-1 intake and it appears that they may not be manageable without design changes. Under the circumstances, therefore, the Staff is requiring the Applicant to collect fish impingement data three times per week and to continue the comprehensive ecological survey program described in Section 6 that was initiated earlier this year. When these data are available (approximately March 1974 and June 1975, respectively) the Staff will evaluate the seriousness of the fish kill. If significant fish mortality occurs at the intake screens, modification of the existing intake or development and implementation of other preventive methods, or both, will be required.

b. Entrainment Effects

The organisms not removed by the 3/8-in.-square wire mesh of the traveling screens will pass through the Station's cooling system. Entrained organisms include small fish, fish eggs and larvae, zoo- and phytoplankton, etc. Damage to these organisms can occur from one or more of the following causes: (1) physical impact in the pump and condenser tubing; (2) pressure changes across the condensers; and (3) thermal shock in the condenser and the discharge tunnel.

The extent of damage to the entrained organisms is mainly a function of two variables. One is the "residence time," the period from intake to discharge, which can be subdivided further into: (1) the duration of mechanical-injury hazards; and (2) the duration of thermal exposure in addition to mechanical injury. The other variable is the temperature rise in the condensers.

The total residence time for the entrained organisms in the system, from intake to discharge, is more than six minutes. The residence time in the condensers is about 14 sec. From the point of entry into the condensers to the discharge at the end of the tunnel, the organisms are exposed to the temperature increase for over two minutes. At maximum expected output, the Station requires a total flow of 600 cfs, which is discharged at a ΔT of 31.2°F (the ΔT through the condensers is 32.0°F. The seasonal temperature variation of the cooling water flow at the intake is about 33°F - 77°F. Because there is no mixing or cooling of the discharge water before it reaches the outlets at the end of the discharge tunnel, the entrained organisms are exposed for over three minutes to approximately 63.2°F and 108.2°F during extreme winter and summer conditions, respectively.

Laboratory studies shows that juvenile white perch at ambient river temperature below 80°F survived 15-minute exposure to a 15°F temperature increase.²⁹ However, these fish exhibited some indications of thermal stress during exposure. In another study conducted at a power plant, survival was nil for young fish exposed to 96°F for 93 seconds (ambient = 75°F, ΔT = 21°F).³⁰ Fish in this study included seven species found in the Nine Mile Point area. Consequently, fish larvae and small fish that may be entrained are expected to suffer from thermal shock with a high mortality when ambient water temperature is 65°F or above. Data are insufficient to make a conclusion concerning possible adverse effects of a ΔT of 31.2°F on juvenile fish at low ambient water temperatures. Investigations outlined in Section 6 should provide the necessary data.

Results of several studies on entrainment of zoo- and phytoplankton have been reported.³¹ In Green River, Kentucky, 100% mortality was reported for zooplankton when the ambient water temperature was raised from 82° to 98.6°F.³² With a temperature rise of 14.4° - 21.0°F (at 50° - 51.8°F ambient temperature), 17 - 19% of the copepods and cladocera were killed at a station on Cayuga Lake, New York.³³ High mortality of zooplankton is expected at the Station when discharge temperature exceeds 95°F.

Results obtained from studies conducted at a station on York River, Virginia, indicate that at ambient temperatures of 32° - 50°F, a temperature rise increased biological production; however, at summer ambient temperatures of 50° - 68°F and a ΔT of about 10°F and above, it depressed production.³⁴ In studies at the Chalk Point Plant on the Chesapeake Bay, a temperature rise of about 14.5°F stimulated photosynthesis when the natural water temperature was 57.6°F or below and inhibited photosynthesis when the temperature was 68°F or above.³⁵

No reasonable predictions can be made of the possibility of increased production in entrained phytoplankton during low ambient temperatures. However, photosynthesis probably will be inhibited when the discharge temperature exceeds 95°F.

Entrainment studies by the Applicant have shown that most organisms do not survive exposure to 105°F. Mechanical stress does not appear to be significant at moderate lake temperatures (50° - 59°F).

On the basis of currently available information, the Staff concludes that small fish and fish larvae are not expected to survive passage through the plant throughout the year and high mortality of all zooplankton is expected to occur during summer.

The Staff has evaluated the effects of entrainment in the Nine Mile Point area and the eastern end of the lake. The water circulation through the plant will be 51,840,000 cubic feet per day, which is about 0.9% of the volume present in 2-mile by 2-mile by 50-foot depth. Thus, the fraction of water being circulated at any time is not large compared with the volume available in the immediate vicinity for the plant. Furthermore, the water in the area should not be considered as having its own distinct identity as there is good mixing of inshore-offshore waters. It is expected that even with 100% kill of zoo- and phytoplankton, the entrainment effects will be diffused over a wide area, and they are not expected to be measurable. The short-lived organisms, which have in most cases regeneration periods of less than three weeks, may respond to the heated plume by increased growth and higher productivity and thus tend to offset any adverse effects that may occur in the immediate vicinity of the plants. Fish larvae do not come under the same category, and additional studies will be required on spawning and nursery areas and on abundance to establish impact of their entrainment in the circulating water.

A more quantitative assessment of the effects of damage to plankton will require data based on limnological aspects of the lake and on plankton populations in the vicinity of the site. The Applicant has made neither reliable studies on plankton in the lake near the site nor proper and adequate studies of plankton entrainment. These studies are necessary for a better assessment of the effects of damage.

c. Thermal-discharge Effects

In assessing the impact of thermal discharge on aquatic biota, the Staff has used as a guide the Applicant's monitoring data pertaining to the temperature distribution and area of the plume. The Applicant's measurements have yielded estimates of 61 - 461 acres as the area within the 2.7°F isotherm at ΔT of 27°F. Since two of the discharge openings are

directed toward the shore, considerable temperature rise between the discharge outlets and the shoreline occurs. The Staff's analysis indicates that a temperature rise of 5°F above ambient could extend up to approximately 2 miles of the shoreline. The surface area and volume of the lake within the 3°F isotherm are approximately 300 acres and 3000 acre-feet, respectively.

(1) Fishes

The response of fish to the thermal plume may be preference, avoidance, or a physiological adjustment. The preferred temperatures for many species are equal to or higher than the ambient acclimation temperatures. Studies²⁸ have shown that white perch (found in the Nine Mile Point area) preferred 90°F when the ambient acclimation temperature was 75°F, and 88°F when it was 86°F. At lower ambient temperatures, the perch preferred 41°F when the acclimation temperature was 34° or 35°F.

Similar response was observed for yellow perch and other species.³⁵

The Applicant's studies have shown that fish in the area are attracted to the plume and prefer its slightly higher temperature. The Applicant has reported increased abundance of fish in and around the plume, perhaps because of availability of dead or dying organisms in the discharged water. Fish species including carp, smallmouth bass, sunfish, and alewives have been reported to reside in the plume at Nine Mile Point during colder months.

A preference for temperatures higher than the ambient does not continue with increasing temperature. A final preferendum is reached beyond which avoidance can be expected to occur. This response has been noted to occur at 44°F for white perch acclimated to 34°F and at 95°F for white perch acclimated to 77°F.²⁸ Therefore, although fish are attracted to and reside in the plume, they will avoid temperatures that may be higher than their final preferendum. An occasional small fish, however, may travel into temperatures that may be lethal — such a zone is expected to be small at the Station's discharge.

Some fish, particularly when small, do not respond predictably to temperature gradients during conditions of low ambient temperatures. Because of this low thermal responsiveness, which has been known to occur in white and yellow perch^{20, 36} (found near the Nine Mile Point area), some small fish probably may swim into the high temperatures of the plume in winter. These fish may die from thermal shock or secondary effects or survive on return to ambient temperatures or less heated water.

It should be noted, however, that the preferred temperatures discussed above are determined for the most part, by very short term laboratory experiments and only indicate fish preferences over temperatures they were acclimated to at the time. Preferred temperatures in this context may or may not indicate biologically desirable temperatures for growth, maturation, reproduction, etc.

The Applicant has reported an increase in commercial fishing in the vicinity of the plume from Unit 1.

Because of a 6°F isotherm extending 1 mile along the shoreline, it can be postulated that a thermal barrier may develop which might restrict or prevent free movement of fishes along the shore in summer. The Applicant's ecological studies have shown a general lack of fishes in the upper six feet of water. During summer, the cold-water species such as the introduced salmon would find the shorewaters too warm even without the thermal discharge and are expected to inhabit deeper and cooler waters. Therefore it is not expected that the plume will serve as a barrier to free movement of fishes along the shoreline as they will be able to move under or around the plume. The Applicant's studies have not covered the thermal-barrier aspect of the probable impact. The Staff will require that studies be implemented to fully investigate the effects of this possible thermal barrier on resident and introduced fish populations.

Also, because of the large area of the thermal plume, sudden winter shutdowns are likely to cause "cold kills" affecting fishes residing in or near the thermal plume. In order to minimize the number of fish thus affected, the Staff recommends that any planned shutdowns in winter be carried out over a long enough period of time to reduce the rate of decay of discharge temperature.

(2) Plankton

During summer, an isotherm with a ΔT of 11°F has been observed to extend to 75 feet around the discharge. Thus, under the maximum summer ambient temperature, water could be heated to about 88°F (up to maximum discharge temperature) within a relatively small volume and surface area. Although a temperature range of 95° - 104°F has been reported as the best suited for the growth of the blue-green algae,³⁷ the Staff does not anticipate displacement in dominance from diatom and green algae to blue-green algae. Standing crops of green algae and diatoms, however, may increase. Studies conducted in and adjacent to the surface plume of Unit 1 during 1969 and 1970³⁸ have shown increases in the standing crop of 25 times for *Bosmina* spp. and 1.2 times for *Daphnia retrocurva* in the overall study area. Primary production was not significantly affected. These findings, however, cannot be considered conclusive because the populations were not observed in their growth phase, and estimates of instantaneous birth rates were not good.

Studies on zoo- and phytoplankton should be conducted to determine seasonal and species variations in the abundance and diversity of organisms. Overall implications of suppressed or enhanced productivity rates can then be assessed. In view of the total volume and area of the lake, any change in productivity that may ensue will be limited to the Nine Mile

Point area. Due to strong currents and good mixing characteristics of the water in this area, any significant effect on benthos due to a sinking plume is not expected.

(3) Benthos

The species structure and abundance of the benthic community that may inhabit the loose overburden beyond the 20-foot depth are not known. Benthic organisms in the immediate vicinity of the discharge may be affected by direct contact with the plume. However, organisms under the plume are unlikely to be affected because of the buoyancy of the plume; however, it does affect benthos near the shoreline. The entrained organisms that die in the condensers may settle and provide food to the benthos.

The Applicant's studies have shown that *Cladophora* growth proceeds earlier after the winter in areas within the influence of the thermal plume. The growth is, however, suppressed in these regions during summer owing to increased temperatures, with the growth stopping at about 77°F.³⁹

The increased abundance of *Gammarus* in the areas under the warm plume could be due to the thermal discharge. The increased abundance of darters (bottom-dwelling fish) could be due to the dead or dying organisms in the discharge water.

The Staff does not expect that the thermal discharge will have a significant deleterious effect on the plankton, benthos and fish life in the Nine Mile Point area.

d. Effects of Chemical Discharges

The chemicals to be discharged from Unit 1 and their concentrations in the discharge tunnel are given in Table 3.9. As noted in Section 3.6, chemicals will not be discharged continuously. Concentrations of ferric sulfate and sodium sulfate are extremely low, and the Staff does not expect these salts to have any adverse effects on aquatic life.

The Applicant has not found any significant reduction of the oxygen content in the cooling water by passage through the condenser system even though the temperature is increased.⁴⁰

5.6 EFFECTS ON THE COMMUNITY

Since the construction of Nine Mile Point Unit 1 is complete and since the reactor is presently operating, any short-term effects on the community have already been realized.

At present, effects on the local community are minimal because all the operational activities occur on the 900-acre site except the occasional maintenance on the substation, transmission lines, and right-of-way. Since most of the work is done inside buildings and cannot be seen or heard by local residents, the only direct impact is from highway traffic to and from the site by plant employees and by visitors to the Progress Center.

The Station's full-time operating Staff numbers about 68 in all phases of the Station's activities with an annual payroll of about \$1,000,000. Most of these workers were recruited from outside the immediate area of the Station. This small number of workers and their families, dispersed among several communities, does not impose a noticeable load on hospitals, schools, or other community services. Additional jobs have been created away from the site area in activities related to the production, shipment, and disposal of radioactive materials.

The school district benefits greatly from the increased tax base produced by the Station. The Applicant's tax roll for 1971 was approximately \$3,000,000. A large part of the tax goes to the school district. Thus, the overall economic effect of this Station is a favorable tax base for the local community.

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6. ENVIRONMENTAL MONITORING PROGRAM

6.1 AQUATIC MONITORING PROGRAM

The Applicant has conducted a monitoring program in the Nine Mile Point area since 1963 in connection with the preoperational and operational monitoring program for Unit 1. Data collection from July 1963 through December 1969 was infrequent. Only since May 1970 has the Applicant collected data on fish distribution, food preferences of fishes, and benthos with some continuity. Sampling and observation of plankton from the intake and discharge wells of Unit 1 during June-October 1971 provide neither estimates of plankton abundance in the area nor a base for reasonable assessment of damage due to entrainment. Sampling of lake water for usual chemical and physical parameters for correlation with biological data is entirely wanting. The Staff believes that the studies as they have been conducted by the Applicant will not provide information adequate to assess the operational effects of the Station on aquatic biota.

The Applicant's environmental monitoring program has been extensively revised and augmented by the Staff to allow determination of the operational effects of Nine Mile Point Unit 1 and the preoperational characteristics of both Nine Mile Point Unit 2 and James A. FitzPatrick plants. In essence, the study program is designed to evaluate the impact of all three plants in the Nine Mile Point area. The program is comprised of the following.

a. General Ecological Survey

Objectives of the General Ecological Survey are:

- (1) Determination of distribution and relative abundance of species in space and time in the biotic groups (phytoplankton, zooplankton, periphyton, benthos, and fish);
- (2) Determination of changes in biological parameters and their significance within and out of the area influenced by the thermal plume;
- (3) Determination of the relationship of changes within and among biotic groups and with the physical and chemical characteristics of the environment; and,
- (4) Determination of the relationship of changes to the operation of the plant and significance of the effect of such changes on the ecosystem.

The general ecological survey will span at least a two (2) year period, ending approximately in June 1975. The program scope is shown in Fig. 6.1 and Table 6.1.

Studies on various biotic groups will include:

Phytoplankton - Monthly duplicate samples will be collected from approximately one (1) meter below the surface at each of the sampling locations in all four transects. Phytoplankton density will be determined (units/ml) for total phytoplankton (diatoms, and green and blue-green algae) present. Where possible, identification will be to species and the density of dominant organisms will be reported. Chlorophyll-a and primary productivity (as determined by light dark bottle ^{14}C method) will be determined for monthly samples at each of the sampling locations.

Zooplankton - Monthly replicate samples will be collected at sampling stations in all four transects by vertical tows from the bottom to the surface of the lake in such a way as to ensure sampling of Mysis, Pontoporeia, and Gammarus populations. If these three populations are not properly sampled additional sampling with other sampling gear will be done to ensure a total picture of zooplankton fauna. Organisms will be identified to the lowest possible taxonomic level and enumerated. Density in numbers per M^3 will be determined for major zooplankton taxa and dominant species.

Periphyton - Monthly, four (4) replicate samples will be examined from artificial substrates at each of the sampling locations in all four transects. The samples will be analyzed for biomass, species composition, and relative abundance.

Benthos - Replicate samples of the macroinvertebrate community will be collected every other month at each of the sampling locations in all four transects. Organisms will be identified to the lowest possible taxa and enumerated. Results will be reported in terms of total biomass and numbers of organisms per unit area of the substrate sampled.

Fish - Adult and immature fish will be collected twice per month by trawling, gill nets, and seines. Wherever possible trapnets will also be used to ensure a complete representation of fish populations in the area. Trawling will be done for approximately 15 minute durations for each sample at three stations each in three transects. The gill nets will be set for 48 hours and fish shall be removed at approximately 12 hour intervals to correspond with the diurnal cycle at all stations in all four transects. Trawling will also be done at night.

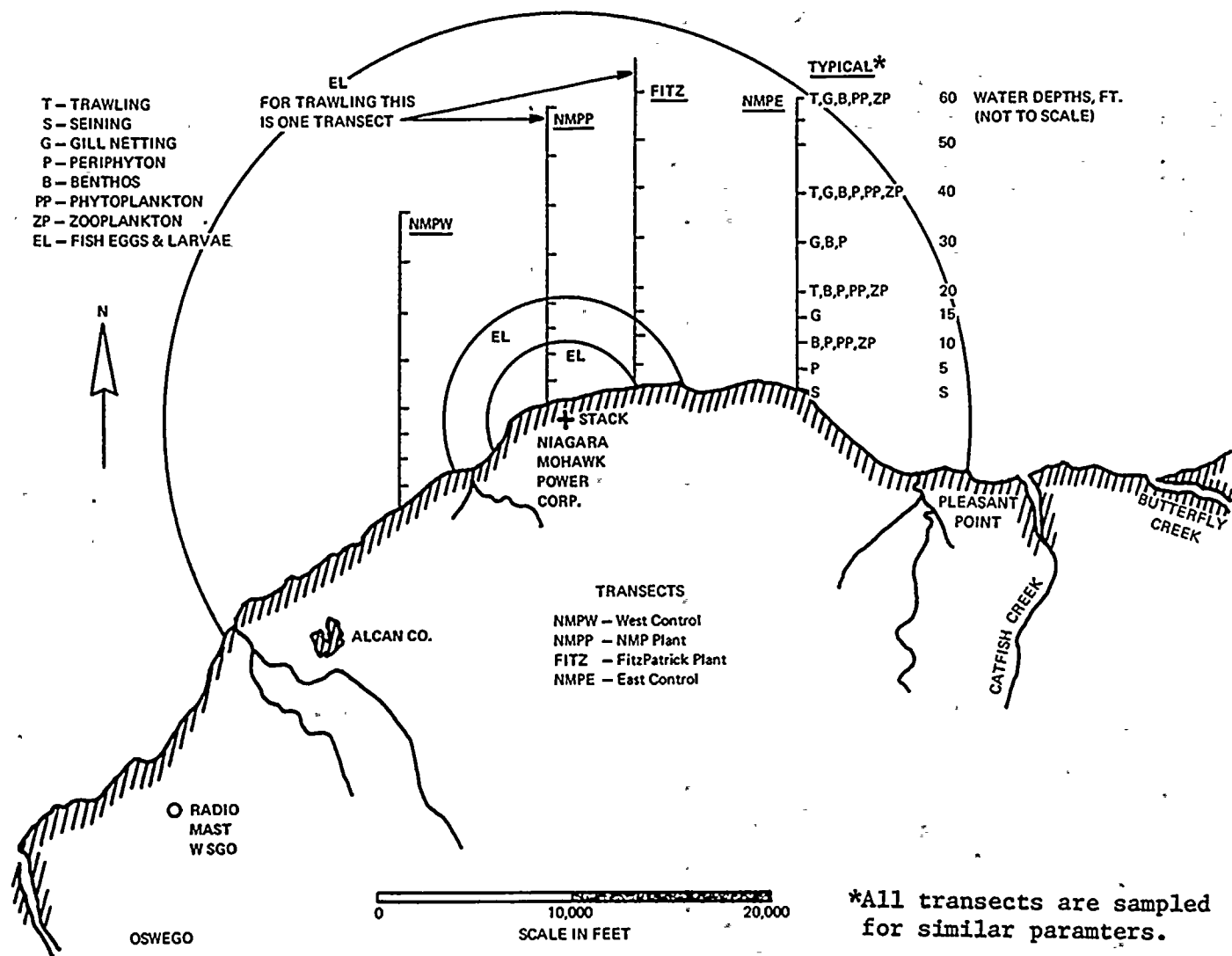


FIG. 6.1. Sampling Locations and Biotic Groups to be Sampled in the Vicinity of Nine Mile Point Area of Lake Ontario.

TABLE 6.1 - Frequency of Sampling for Ecological Studies
in the Nine Mile Point Area of Lake Ontario

Study/Biotic Group	Frequency (April-December)
A. General Ecological Survey	
Phytoplankton	Monthly
Zooplankton	Monthly
Periphyton	Monthly
Benthos	Every Other Month
Fish - Trawling, Seining, Gill Netting	Twice per Month
Lake Water Chemistry	Twice per Month
B. Impingement of Organisms	
Collection of impinged fish	Three times per week
C. Entrainment of Organisms Through the Condenser	
	Twice per month, throughout the year

Age and growth studies will be conducted and food habits determined for three species: yellow perch (Perca flavescense), white perch (Morone americana), and small mouth bass (Micropterus dolomieu). The number of individuals of each species collected will be noted along with individual lengths and weights. For a large sample, a representative random subsample will be satisfactory. Coefficient of condition will be calculated for each sex by months. Fecundity measurements will be made on species spawning in the vicinity of Nine Mile Point; periodicity of spawning will be determined for these species.

Fish eggs and larvae will be sampled at 5 equidistant locations each in 1/2, 1 and 2 mile radii. Samples will be collected at surface, mid-depth, and bottom with appropriate sampling gear. Samples will be collected weekly during daylight and night from mid June to mid September and only during daylight from April to mid June and mid September to December.

Lake water chemistry - Water quality surveys will be conducted to complement the sampling for biotic groups. Samples will be collected twice per month in 20 ft. and 60 ft. of water at the west and east controls and off Nine Mile Point and analyzed for:

Dissolved Oxygen	BOD(5)
Temperature	COD
Specific Conductance	Total solids
Carbon Dioxide	Total Suspended Solids
pH	Silica
Total and Orthophosphorous	Turbidity
Total Kjeldahl Nitrogen	Chlorophyll
Ammonia Nitrogen	
Nitrate Nitrogen	

The information gathered under the general ecological survey will be analyzed in accordance with accepted biostatistical methods for significance and correlation within and among biotic groups in order to meet the stated objectives.

At the end of each study year the results from the General Ecological Survey will be analyzed, evaluated by the licensee and the assessment reported.

b. Impingement of Organisms

The objective of this study is to estimate the number and weight of fish impinged on the trash racks and the traveling screens in the intake structure during day and night in various seasons so that the significance of this fish mortality to the ecosystem may be determined and corrective measures taken if deemed necessary.

The impingement study will span at least a twelve (12) month period ending approximately in March 1974. After this period an evaluation report of the study with appropriate substantiated recommendations will be made by the licensee.

Species, numbers, lengths, and weights of all fish removed at the traveling screens and trash racks will be recorded on a three times per week basis. Once a week samples will be collected in such manner that diurnal variations can be identified. In the event of large collections, representative subsampling for various parameters will be satisfactory. The age and growth analysis will be performed for the two most abundant species collected during a given season.

The interim results will be analyzed and evaluated by the licensee and the assessment reported periodically.

c. Entrainment of plankton, fish eggs and larvae

The objective of this study is to determine the extent of entrainment and the mortality of entrained organisms.

The entrainment studies will span at least a two (2) year period ending approximately in June 1975. The interim results will be analyzed and evaluated by the licensee and the assessment reported periodically.

Twice per month, replicate samples will be collected during day and night for all entrained organisms at following locations: (1) Intake forebay, (2) discharge forebay, (3) at the discharge before mixing with ambient water occurs, (4) in the mixing zone, and (5) in the plume 2°F above ambient. Simulated laboratory studies will be acceptable where actual field sampling is not possible due to design features.

Phytoplankton - The viability of phytoplankton after condenser passage and the concentration of chlorophyll-a and photosynthetic rate as determined by ¹⁴C uptake shall be determined at 7, 24, 48 and 72 hours after collection.

Zooplankton - Organisms will be identified to the lowest possible taxa and viability shall be determined as soon as possible after collection up to 24 hour period. Attempts will be made to identify size selective mortality.

Fish eggs, fry, and young of the year - Two plankton nets will be permitted to drift in the current in the forebay. The contents of nets will be examined for fish eggs and larvae which will be identified and enumerated for approximately five (5) minute collections. Extent of mortality will be determined in field and laboratory thermal shock studies.

At the end of two years of the entrainment study the results will be analyzed, evaluated by the licensee and the assessment reported.

6.2 THERMAL MONITORING PROGRAM

Field investigations of the thermal plume shall be undertaken to correlate the data obtained from the aquatic environmental program discussed above. These investigations should be made for the different seasons under different hydrological and meteorological conditions, with a variety of measuring techniques. Details of the thermal monitoring program will be given in the Technical Specifications.

6.3 RADIOLOGICAL ENVIRONMENTAL MONITORING

Unit 1 has been engaged in an environmental monitoring program since 1967, two years prior to startup.³ This same program, with minor changes, serves to determine operational effects of Unit 1 (and furnishes pre-operational data for the FitzPatrick and the proposed Unit 2 plants). The details of the program are outlined in Tables 6.2 and 6.3. Figures 6.2 and 6.3 indicate the sampling locations. Data obtained at the pre-operational stage have not indicated the existence of any radiological anomalies at the sampling locations. Postoperational studies have not shown any buildup of radioactivity in the environment associated with plant operation.

The only criticism of the program concerns the stated dependence of sample analyses on the measured plant radioactive releases. It is the opinion of the Staff that analyses should be carried out independent of release quantities. However, at this time, this dependence is not of concern since the analyses are being routinely performed to obtain baseline data for the FitzPatrick and the proposed Unit 2 plants.

It is therefore concluded that the Nine Mile Point site will be sufficiently monitored so that no adverse effects will remain undetected.

TABLE 6.2 . Radiological Monitoring Program for Lake Ontario

Type of Sample	Type of Analysis ^a	Collection Frequency	Number of Locations
1. Fish	GB and Sr-90	Spring and fall	Two
2. Clams	GB, GSA, Sr-90	Spring and fall	Two
3. Gammarus (fresh water shrimp)	GB, GSA, Sr-90	Spring and fall	Two
4. Lake water	GB, GSA	Weekly	Downstream of effluent discharge

^aGB - Gross beta

GSA - Gamma spectral analysis

Notes on Graded Program:

- A. No environmental lake program for effluent discharged at less than 1×10^{-8} $\mu\text{Ci/ml}$ average concentration.
- B. Standard environmental lake program as shown for items 1 through 3 for effluent discharged between 1×10^{-8} to 1×10^{-7} $\mu\text{Ci/ml}$ average concentrations.
- C. Standard environmental lake program as shown for items 1 through 4 for effluent discharged above 1×10^{-7} $\mu\text{Ci/ml}$ but less than MPC in accordance with Appendix B, Table II, Column 2, of CFR 20 and note 1 thereto.
- D. An appropriate number of samples shall be taken at each location.

TABLE 6.3 Radiological Monitoring Program for Land
(For sampling stations see Figs. 6.1 and 6.2)

Type of Sample	Type of Analysis ^a	Collection Frequency	Number of Stations	Location
1. Air particulates	GSA (monthly) GB - all (24 hrs. decay)	Weekly	Eleven	5 on-site 6 off-site
2. Precipitation	GB and GSA	Monthly	Eleven	5 on-site 6 off-site
3. Film badges or TLD's	Gross gamma	Monthly	Eleven	5 on-site 6 off-site
4. Radiation monitors	Gross gamma	Continuous	Six	5 on-site 1 off-site
5. Farm milk	Gross beta, Sr-90, I-131	Monthly	Adjacent dairy herds	Plant vicinity
6. Airborne halogens	GSA	Weekly	Eleven	5 on-site 6 off-site

^aGSA - Gamma spectral analysis

GB - Gross beta

GB and GSA - Gross beta and gamma spectral analysis

Notes on graded Program:

- A. No environmental land program for stack releases less than approximately 3 percent of maximum release rate.
- B. Standard environmental land program as shown for items 1 through 5 for stack releases between approximately 3 to 10 percent of maximum release rate.
- C. Standard environmental land program as shown for items 1 through 6 plus weekly for farm milk samples for stack releases between 10 to 30 percent of maximum release rate.
- D. Environmental land program upgraded to twice weekly onsite for item 1, weekly onsite for item 2, bi-monthly on-site for item 3 and weekly for item 5 for stack releases greater than approximately 30 percent of maximum release rate.
- E. After substantiating data is analyzed for any of the release rate levels, the environmental land program is degraded by one level, i.e., B. to A., C. to B. and D. to C.

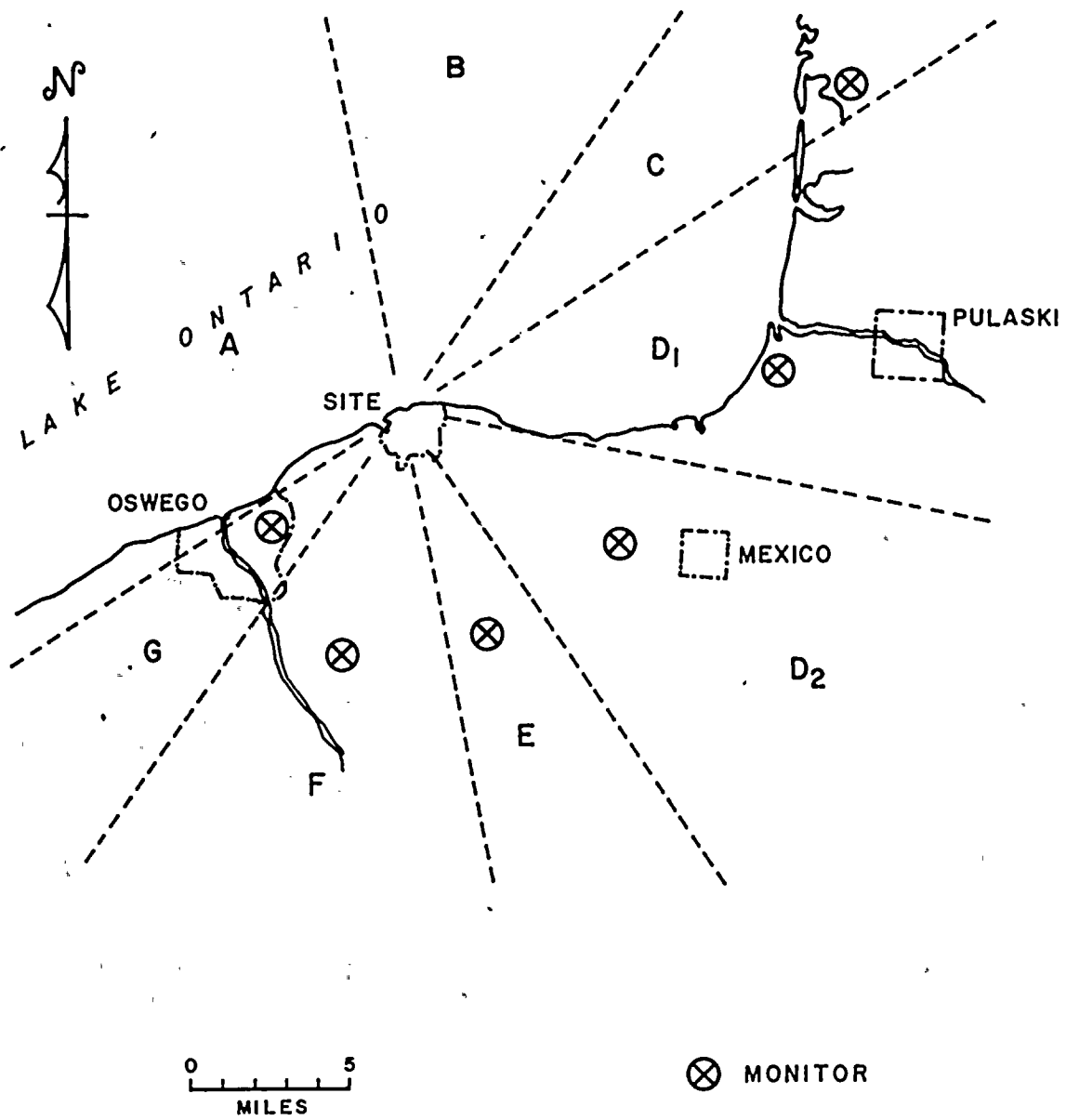


Fig. 6.2. Off-site Radiological Monitoring Stations.

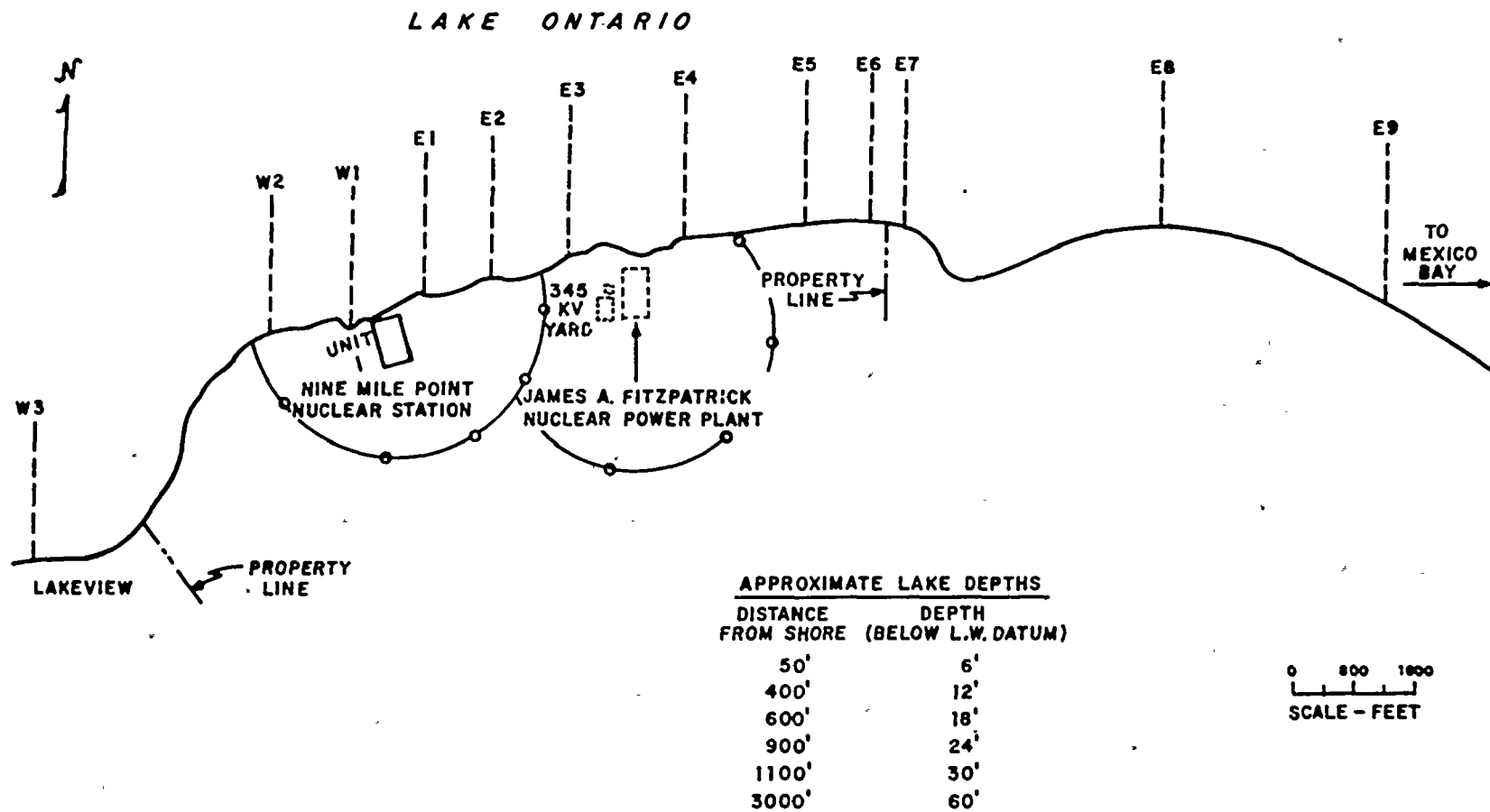


Fig. 6.3. Lake-sampling Transects and Locations of On-site Radiological Monitoring Stations.

6.4 TERRESTRIAL MONITORING PROGRAM

A terrestrial monitoring program to ensure that the recommendations in Sections 5.1.2 are followed should be included. The program should include a field study to determine the presence and status of rare or endangered plants and animals at the site and along the transmission line right-of-way. If endangered species are present, steps should be taken to prevent their destruction during the continued operation of the facility.

References

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7. ENVIRONMENTAL EFFECTS OF ACCIDENTS

7.1 PLANT ACCIDENTS INVOLVING RADIOACTIVE MATERIALS

A high degree of protection against the occurrence of postulated accidents in Unit 1 is provided through correct design, manufacture, and operation, and the quality assurance program used to establish the necessary high integrity of the reactor system, which was considered in the Commission's Safety Evaluation, dated May 26, 1969 and additionally in the Safety Evaluation for power increase dated March 3, 1971. Deviations that may occur are handled by protective systems to place and hold the plant in a safe condition. Notwithstanding, the conservative postulate is made that serious accidents might occur, even though they may be extremely unlikely; and engineered safety features are installed to mitigate the consequences of those postulated events which are judged credible.

The probability of occurrence of accidents and the spectrum of their consequences to be considered from an environmental-effects standpoint have been analyzed using best estimates of probabilities and realistic fission product release and transport assumptions. For site evaluation in the Commission's safety review, extremely conservative assumptions were used for the purpose of comparing calculated doses resulting from a hypothetical release of fission products from the fuel against the 10 CFR Part 100 siting guidelines. Realistically computed doses that would be received by the population and environment from the accidents which are postulated would be significantly less than those presented in the Safety Evaluation.

The Commission issued guidance to applicants on September 1, 1971, requiring the consideration of a spectrum of accidents with assumptions as realistic as the state of knowledge permits. The Applicant's response was contained in the "Environmental Report" submitted by Niagara Mohawk Power Corporation dated March 2, 1973.

The Applicant's report has been evaluated, using the standard accident assumptions and guidance issued as a proposed amendment to Appendix D of 10 CFR Part 50 by the Commission on December 1, 1971. Nine classes of postulated accidents and occurrences ranging in severity from trivial to very serious were identified by the Commission. In general, accidents in the high potential consequence end of the spectrum have a low occurrence rate and those on the low potential consequence end have a higher occurrence rate. The examples selected by the Applicant for these cases are shown in Table 7.1. The examples selected are reasonably homogeneous in terms of probability within each class.

Commission estimates of the dose which might be received by an assumed individual standing at the site boundary in the downwind direction, using the assumptions in the proposed Annex to Appendix D, are presented in

TABLE 7.1. Classification of Postulated Accidents and Occurrences

Class	AEC Description	Applicant's Examples
1.	Trivial incidents	Not considered.
2.	Small releases outside containment	Turbine steam leak.
3.	Radioactive waste system failure	Inadvertent discharge of radwaste tank.
4.	Fission products to primary system (BWR)	No events identified.
5.	Fission products to primary and secondary systems (PWR)	N.A.
6.	Refueling accident	Fuel bundle drop in canal; heavy object drop onto core.
7.	Spent fuel handling accident	No events identified.
8.	Accident initiation events considered in design-basis evaluation in the Safety Analysis Report	Loss of coolant accident, steam line break accident, and control rod drop accident. Radioactive liquid storage tank accident. Off-gas system accident.
9.	Hypothetical sequence of failures more severe than Class 8.	Not considered.

Table 7.2. Estimates of the integrated exposure that might be delivered to the population within 50 miles of the site are also presented in Table 7.2. The man-rem estimate was based on the projected population within 50 miles of the site for the year 2010.

To rigorously establish a realistic annual risk, the calculated doses in Table 7.2 would have to be multiplied by estimated probabilities. The events in Classes 1 and 2 represent occurrences which are anticipated during plant operations; and their consequences, which are very small, are considered within the framework of routine effluents from the plant. Except for a limited amount of fuel failures the events in Classes 3 through 5 are not anticipated during plant operation; but events of this type could occur sometime during the 40 year plant lifetime. Accidents in Classes 6 and 7 and small accidents in Class 8 are of similar or lower probability than accidents in Classes 3 through 5 but are still possible. The probability of occurrence of large Class 8 accidents is very small. Therefore, when the consequences indicated in Table 7.2 are weighted by probabilities, the environmental risk is very low. The postulated occurrences in Class 9 involve sequences of successive failures more severe than those required to be considered in the design bases of protection systems and engineered safety features. Their consequences could be severe. However, the probability of their occurrence is judged so small that their environmental risk is extremely low. Defense in depth (multiple physical barriers), quality assurance for design, manufacture and operation, continued surveillance and testing, and conservative design are all applied to provide and maintain a high degree of assurance that potential accidents in this class are, and will remain, sufficiently small in probability that the environmental risk is extremely low.

The AEC is currently performing a study to assess more quantitatively these risks. The initial results of these efforts are expected to be available in early 1974. This study is called the Reactor Safety Study and is an effort to develop realistic data on the probabilities and sequences of accidents in water cooled power reactors, in order to improve the quantification of available knowledge related to nuclear reactor accidents probabilities. The Commission has organized a special group of about 50 specialists under the direction of Professor Norman Rasmussen of MIT to conduct the study. The scope of the study has been discussed with EPA and described in correspondence with EPA which has been placed in the AEC Public Document Room (letter, Domb to Dominick, dated June 5, 1973).

As with all new information developed which might have an effect on the health and safety of the public, the results of these studies will be

TABLE 7.2. Summary of Radiological Consequences of Postulated Accidents^{1/}

Class	Event	Estimated Fraction of 10 CFR Part 20 limit at site boundary ^{2/}	Estimated Dose to Population in 50 mile radius, man-rem
1.0	Trivial Incidents	<u>3/</u>	<u>3/</u>
2.0	Small releases outside containment	<u>3/</u>	<u>3/</u>
3.0	Radwaste System failures		
3.1	Equipment leakage or malfunction	0.034	5.1
3.2	Release of waste gas storage tank contents	0.13	20
3.3	Release of liquid waste storage contents	<0.001	<0.1
4.0	Fission products to primary system (BWR)		
4.1	Fuel cladding defects	<u>3/</u>	<u>3/</u>
4.2	Off-design transients that induce fuel failures above those expected	0.001	0.52
5.0	Fission products to primary and secondary systems (PWR)	N. A.	N. A.
6.0	Refueling accidents		
6.1	Fuel bundle drop	<0.001	<0.1
6.2	Heavy object drop onto fuel in core	<0.001	0.49
7.0	Spent fuel handling accident		
7.1	Fuel assembly drop in fuel rack	<0.001	0.1
7.2	Heavy object drop onto fuel rack	<0.001	0.19
7.3	Fuel cask drop	0.026	4.0
8.0	Accident initiation events considered in design basis evaluation in the SAR		
8.1	Loss-of-Coolant Accidents		
	Small break	<0.001	<0.1
	Large break	0.001	8.7
8.1(a)	Break in instrument line from primary system that penetrates the containment	<0.001	<0.1
8.2(a)	Rod ejection accident (PWR)	N. A.	N. A.
8.2(b)	Rod drop accident (BWR)	0.001	0.62
8.3(a)	Steamline breaks (PWR's outside containment)	N. A.	N. A.
8.3(b)	Steamline break (BWR)		
	Small break	0.001	0.18
	Large break	0.007	0.90

^{1/}The doses calculated as consequences of the postulated accidents are based on airborne transport of radioactive materials resulting in both a direct and an inhalation dose. Our evaluation of the accident doses assumes that the applicant's environmental monitoring program and appropriate additional monitoring (which could be initiated subsequent to a liquid release incident detected by in-plant monitoring) would detect the presence of radioactivity in the environment in a timely manner such that remedial action could be taken if necessary to limit exposure from other potential pathways to man.

^{2/}Represents the calculated fraction of a whole body dose of 500 mrem, or the equivalent dose to an organ.

^{3/}These releases are expected to be a small fraction of 10 CFR Part 20 limits for either gaseous or liquid effluents.

made public and would be assessed on a timely basis within the regulatory process on generic or specific bases as may be warranted.

Table 7.2 indicates that the realistically estimated radiological consequences of the postulated accidents would result in exposures of an assumed individual at the site boundary to concentrations of radioactive materials that are within the Maximum Permissible Concentrations (MPC) of 10 CFR Part 20. The table also shows the estimated integrated exposure of the population within 50 miles of the plant from each postulated accident. Any of these integrated exposures would be much smaller than that from naturally occurring radioactivity. When considered with the probability of occurrence, the annual potential radiation exposure of the population from all the postulated accidents is an even smaller fraction of the exposure from natural background radiation and, in fact, is well within naturally occurring variations in the natural background. It is concluded from the results of the realistic analysis that the environmental risks due to postulated radiological accidents are exceedingly small and need not be considered further.

7.2 TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVE MATERIALS

As discussed in Section 5.4.4, the Commission's staff has recently completed an analysis of the potential impact on the environment of transporting fuel and solid radioactive wastes for nuclear power plants under existing regulations. The results of this analysis were published in a report entitled "Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants," dated December 1972. The report contains an analysis of the probabilities of occurrences of accidents and the expected consequences of such accidents, as well as the potential exposures to transport workers and the general public under normal conditions of transport.

For Unit 1, the characteristics of the reactor fuel and wastes and the conditions of transport for the fuel and waste fall within the scope of the Environmental Survey of Transportation. The initial fuel supply for Unit 1 was supplied by General Electric from its fabrication facilities located in San Jose, California. New fuel elements were shipped approximately 3000 miles from the fabrication plant to the site by truck.

The reactor core of Unit 1 contains 532 fuel assemblies and about 133 fuel assemblies are replaced each year. Spent fuel elements are shipped from the site by rail to the General Electric Reprocessing Plant in Morris, Illinois, or the Nuclear Fuel Reprocessing Plant in West Valley, New York, or the Allied Gulf Nuclear Services Reprocessing Plant in Barnwell, South Carolina. In any case, the shipping distance is within the 1,000 miles used as a basis for analysis in the survey.

Solid radioactive wastes will be shipped by truck to the West Valley, New York, site or to the Nuclear Engineering Company facility in Morehead,

Kentucky, or to the Chem. Nuclear facility in Barnwell, South Carolina. This will involve approximately 46 shipments per year. In any event, the distance is within the 1,000 miles used as a basis for analysis in the survey.

In accordance with the proposed amendment (Sect. F) to Appendix D of 10 CFR Part 50, published on February 5, 1973; and the subsequent rule-making hearings, Table 7.3 summarizes the environmental impact of accidents during transportation of fuel and waste to and from the plant. (Normal conditions of transport were summarized in Table 5.9.)

Table 7.3 Environmental impact of accidents during transportation of fuel and waste to and from Nine Mile Point Unit 1

Aspect	Environmental risk
Radiological effects	Small
Common (nonradiological) causes	1 fatal injury in 100 years; 1 nonfatal injury in 10 years; \$475 property damage per year

8. IMPLICATIONS OF THE STATION

8.1 THE REQUIREMENT FOR POWER

The growth of population and industry in the northeastern region of the United States has resulted in a continuing increase in the demand for electric power. This increase in power consumption is expected to continue in the foreseeable future because of population growth and increasing per-capita consumption of electrical power.

The Applicant supplies electric power to approximately 3.6 million people in upstate New York. The Applicant's franchise territory (Fig. 8.1), which includes about half of the total land area of New York State, is divided into two major sectors: one is in the western part of the state between the Pennsylvania border, Lake Erie, and Lake Ontario; and the other is in the central and northeastern part of the state between Lake Ontario, the St. Lawrence River, and the Vermont border. Major load centers are at Buffalo in the west, Syracuse in the center, and Albany in the east.

The Applicant is a member of the New York Power Pool (NYPP) together with six other private utilities and the Power Authority of the State of New York (Table 8.1). The Pool coordinates the hour-to-hour operation of the state's entire generating capacity to meet demand reliably and economically. Power Pool standard operating procedures and New York Public Service Commission orders require that all areas of the state assist any area where there is a power shortage. Since upstate New York is a winter-peaking area and downstate New York is a summer-peaking area, this coordination of generation by the Pool is intended to insure that reserve capacity is used with maximum efficiency for the benefit of customers throughout the state. The New York Power Pool members agree to maintain installed capacity at least equal to that required to meet an 18% reserve during its most recent annual peak load.^{1,2}

Planning of new power facilities in the northeastern section of the United States and in adjoining sections of Canada is coordinated by the Northeast Power Coordinating Council. The Council has established reliability criteria for the New York Power Pool and other member systems which require that the generating supply equal or exceed area load at least 99.9615% of the time³, equivalent to a probability of loss of load of one day in ten years. The Applicant has stated that operation of Unit 1 fills a part of the New York Power Pool's plan for meeting this reliability criterion.⁴

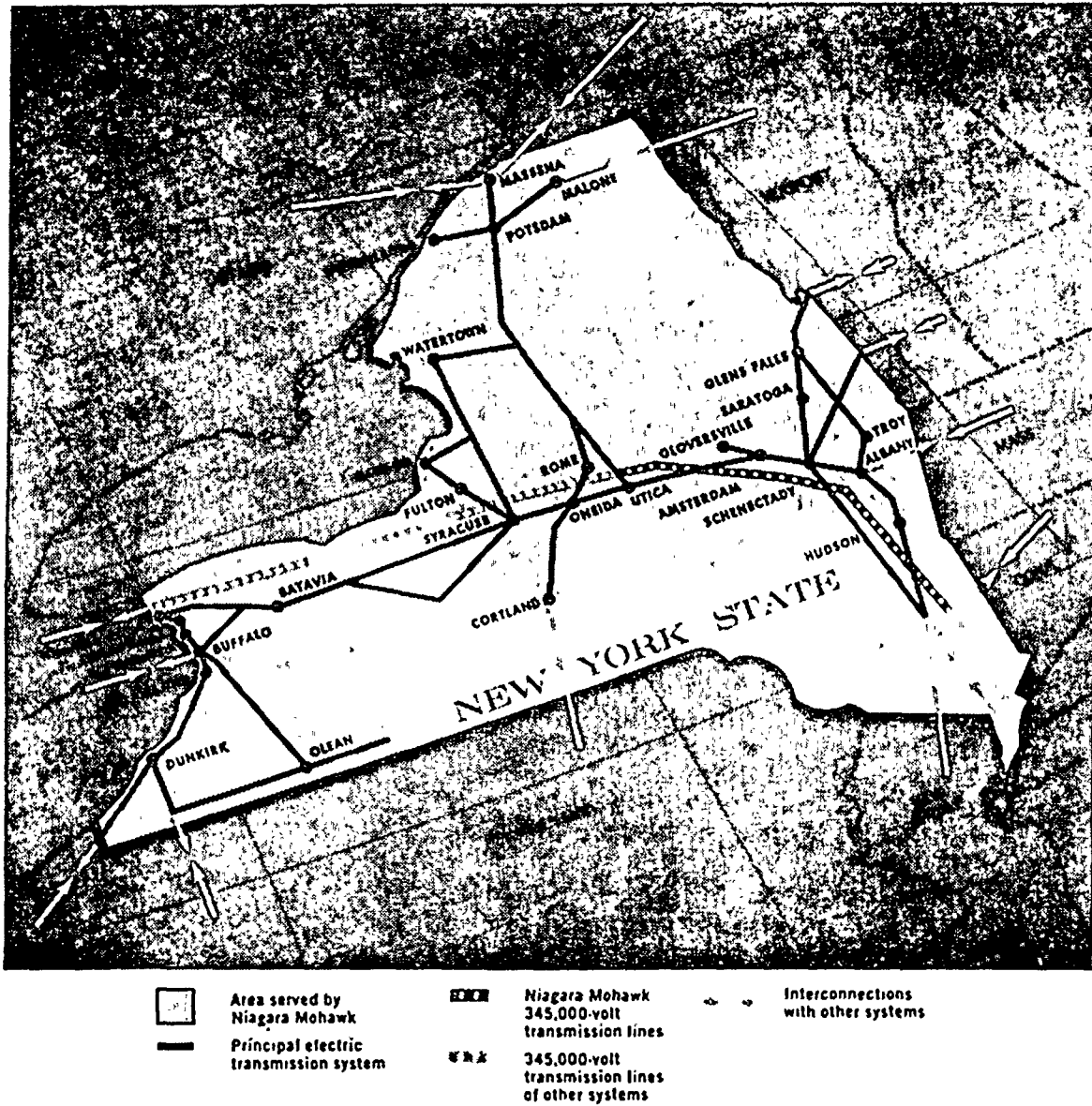


Fig. 8.1. Niagara Mohawk Service Area. From Applicant's Annual Report 1964.

TABLE 8.1. New York Power Pool Members

	Peak Load, MWe ¹	
	Summer 1972	Winter 1972-73
Central Hudson Gas and Electric Corp.	566	603 ²
Consolidated Edison Co. of N.Y., Inc.	7,872	6,104
Long Island Lighting Company	2,620	2,277 ²
New York State Electric and Gas Corp.	1,421	1,724 ²
Niagara Mohawk Power Corporation ³	4,392	4,827
Orange and Rockland Utilities, Inc.	579	481
Rochester Gas and Electric Corporation	854	827
Power Authority of the State of New York	800	894
Jamestown Municipal Electric System ⁴	60	56
Long Sault, Inc. ⁴	27	14
Village of Freeport ⁴	34	29
Total	19,225	17,836

¹Data from Applicant's Environmental Report, Supplement No. 2.

²January 1973 peaks (from Applicant's Environmental Report, Supplement No. 1).

³The Applicant; operates nuclear Nine Mile Unit 1 at 610 MWe and plans to build nuclear Nine Mile Unit 2 for 1100 MWe.

⁴New York State companies that are not members of the New York Power Pool but report their loads and capabilities as part of the New York State Interconnected Systems.

8.1.1 Power Demand

The peak demand on the Applicant's system in the winter of 1972 was 4827 megawatts. This was met by a combination of owned and leased generating facilities and purchased power as shown in Fig. 8.2. About 27% of the electrical energy was supplied to residential customers, 61% to commercial and industrial customers, and 12% to municipalities, schools, and other customers.^{4,5} The Applicant's projected demand for the system for the next decade indicates that the increase in load will be mostly in the western and central regions.

From 1960 through 1972 the trend rate of growth of annual peak demand for the Applicant's system was about 4.6% per year, (Fig. 8.3). The corresponding rate of NYPP was 5.5% per year from its formation in 1966 through 1971.⁶ The number of residential and commercial customers increased by 5.4% and 0.4%, respectively, in the Applicant's franchise area from 1961 to 1966 and by 7.9% and 1.6%, respectively, from 1966 to 1971.⁷ The number of industrial customers increased 9.5% during the first five-year period, then the rate of increase declined to 2.6% during the second five-year period.

8.1.2 Power Generation

Unit 1 has been in commercial operation since 1969. The 610-MWe generating capacity of Unit 1 is an important part of the total installed capacity of the Applicant's system as it represented 12.6% of the peak power demand in the winter of 1972 (Fig. 8.2). The Applicant made an analysis of those times during 1971 and 1972 when Unit 1 was shut down or operating at less than 80 percent power. Although the Applicant was able to meet its customers' requirements without load curtailment or voltage reduction during these times, gas-turbine operation and reliance on power purchases were necessary on several occasions. The maximum purchase during this time period was 460 MWe during November 1972.

The Applicant's projected demand and supply for winter peak load 1973-1976, with and without the capacity of Unit 1, are shown in Table 8.2. If Unit 1 is not in service during the next four years there will be insufficient reserve capacity in 1973 and 1975, based on the Applicant's peak load forecast, to meet the NYPP required reserve margin. Should completion of any of the fossil-fueled generating plants due within the next few years be delayed, the reserve margins would be further decreased. The Applicant has stated that if Unit 1 were to be shut down, a capacity deficiency would exist, resulting in degradation of system reliability.

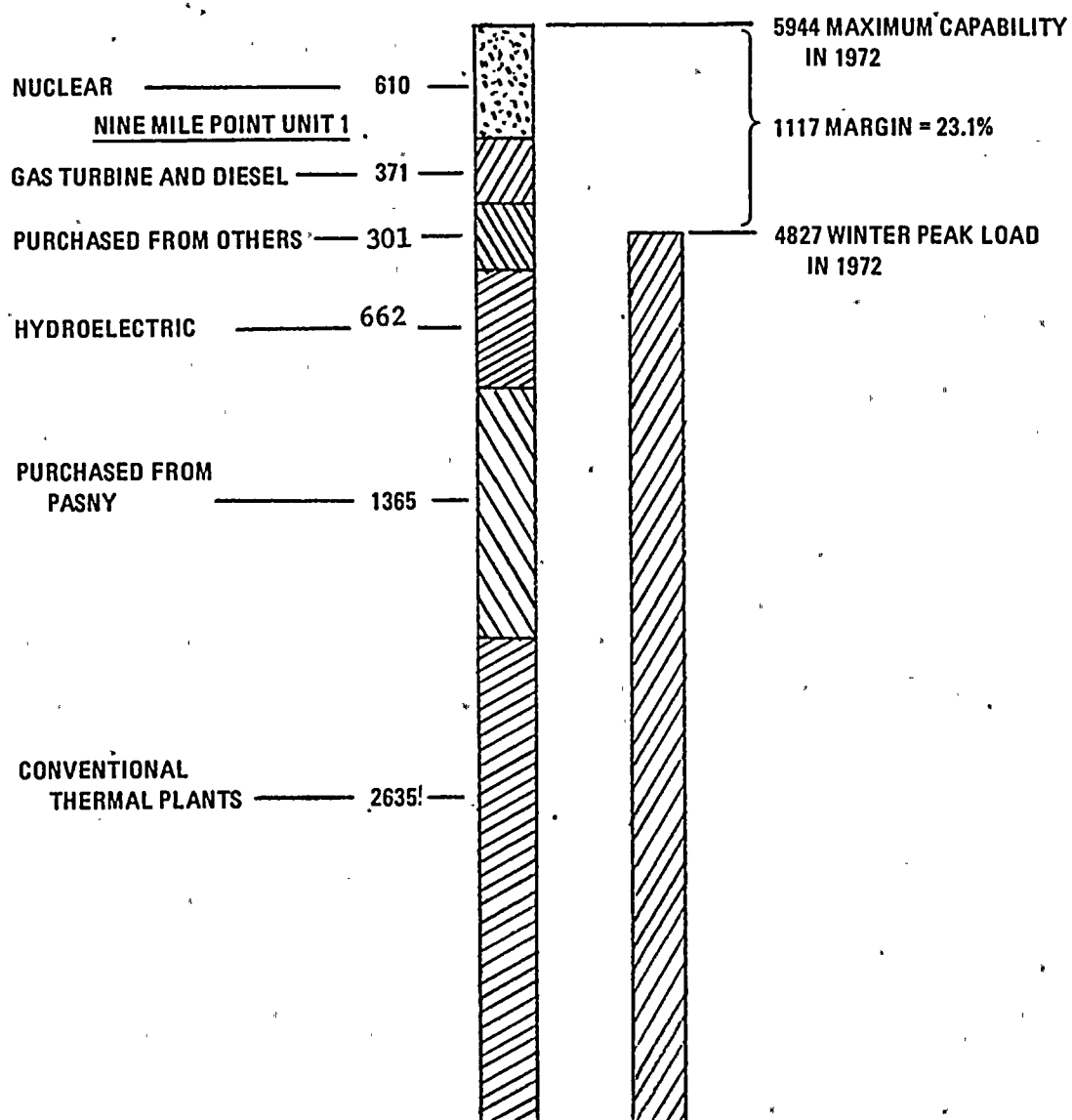


Fig. 8.2. Maximum System Capacity and Load, MWe of the Niagara Mohawk Power Corporation for the Winter of 1972.

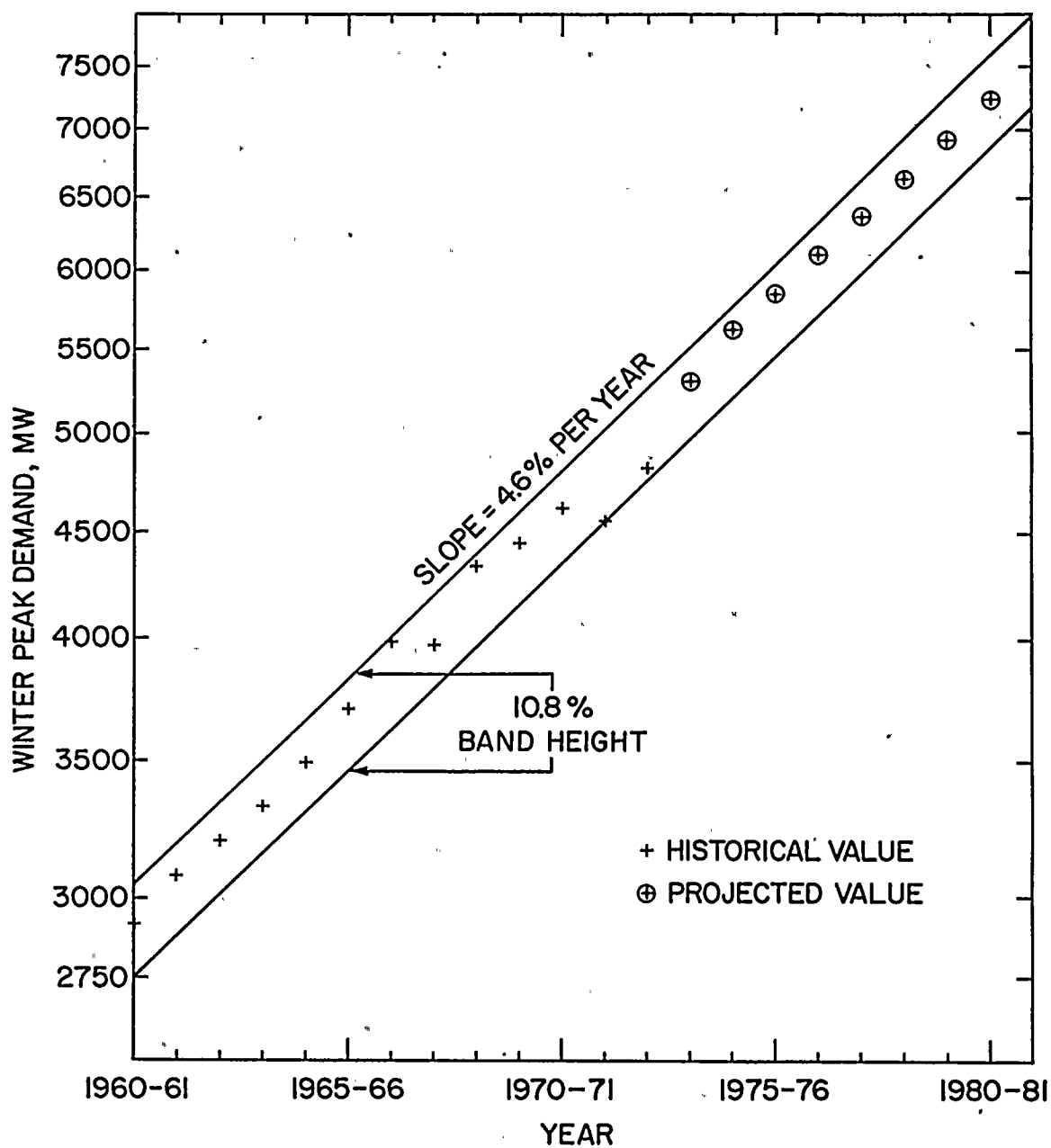


Fig. 8.3. Winter Peak Power Demand for Applicant's System.

TABLE 8.2. Projected Peak Situations

	1973	1974	1975	1976
<u>Conditions with</u>				
Nine Mile Point				
Unit 1				
Total capability, MWe	6674	7494	7463	8283
Peak load, MWe	5300	5620	5855	6105
Margin, MWe	1374	1874	1608	2178
Reserve, %	25.9	33.4	27.4	35.6
<u>Conditions without</u>				
Nine Mile Point				
Unit 1				
Total capability, MWe	6064	6884	6853	7673
Peak load, MWe	5300	5620	5855	6105
Margin, MWe	764	1264	998	1568
Reserve, %	14.4	22.5	17.0	25.7

8.1.3 Planned Capacity Addition; Estimates of Future Power Requirements

The Applicant's predictions of load growth and additions to generating capacity and the reserve margin through 1980 are shown in Table 8.3. Another nuclear unit (Nine Mile Point Unit 2), and two new oil-fired units (Oswego No. 5 and Oswego No. 6), each with a capacity of 850 MWe, are scheduled to begin operation during this period.¹ Generating capacity also will increase for the Applicant from joint installation with Consolidated Edison Company and Central Hudson Gas and Electric Corporation of two thermal units at the Roseton Station in the Central Hudson system. The Applicant expects to purchase portions of the power output of the Gilboa and FitzPatrick generating stations from the Power Authority of the State of New York. No generating units are scheduled to be retired during this period, but the Applicant's share of the Roseton capacity will be reduced by 120 megawatts in 1977.

Figure 8.4 shows the Applicant's projected reserve capacity for the system and the effect of abandoning Unit 1 and excluding Unit 2. The projected reserve margin does not include Unit 2 (expected in 1978) because it would be unrealistic to abandon Unit 1 and then build Unit 2. According to the Applicant's projections, the reserve margin would decrease from the NYPP required reserve margin of 18% in 1977 to about 3% in 1980.

8.1.4 Conclusion

Projected generating capacity, peak demand, and reserve margins for the periods 1973-76, with and without Unit 1, are compared in Table 8.2. If the projections prove accurate, the Applicant would not quite meet the NYPP reserve requirements without Unit 1 in 1975. In 1978 and subsequent years the deficiency would be severe (see Fig. 8.3). The Staff considers the Applicant's demand projection to be reasonable by comparison with the historical trend. In the event of a delay in the completion of other plants, the Applicant's shortage of reserve margin would be even greater. Thus, the Staff concludes that the generating capacity of Unit 1 is a valuable component of the Applicant's system and its loss would have a serious effect on the ability of the Applicant to meet New York Power Pool obligations.

8.2 ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

The following are the major impacts of the construction and operation of the Station.

TABLE 8.3. Data on Load and Capacity Projected to 1980. (MWe)
(Niagara Mohawk Power Corporation)

Year	Installed Generating Capacity ^a	Power Purchased	Adjusted Capacity	Peak Load (Winter)	Reserve Margin	Reserve Margin, %
1966	3,068	1,305	4,373	3,987	386	9.7
1967	3,082	1,401	4,483	3,971	512	12.9
1968	3,063	1,603	4,666	4,335	331	7.6
1969	3,698 ^b	1,418	5,116	4,442	674	15.2
1970	3,833	1,592	5,425	4,614	811	17.6
1971	4,038	1,633	5,671	4,551	1,120 ^c	24.3
1972	4,278 ^c	1,666	5,944	4,827	1,117	23.1
Projection						
1973	4,518 ^d	2,156	6,674	5,300	1,374	25.9
1974	5,368 ^e	2,126	7,494	5,620	1,874	33.4
1975	5,368	2,095	7,463	5,855	1,608	27.4
1976	6,218 ^f	2,065	8,283	6,105	2,178	35.6
1977	6,098 ^g	2,034	8,132	6,365	1,767	27.7
1978	7,198 ^h	2,003	9,201	6,635	2,566	38.7
1979	7,198	1,972	9,170	6,905	2,265	32.8
1980	7,198	1,942	9,140	7,200	1,940	26.9

^aInstalled Generating Capacity is the sum of the maximum ratings of all thermal generating units under optimum operating conditions; hydro capacity is based on average seasonal stream conditions. Experience demonstrates that some portion of this capacity is unavailable on a day-to-day basis. Further, the figures do not include any allowance for construction and startup delays or low dependability during the early period of operation for new units.

^bAddition of Nine Mile Point Unit 1.

^cApplicant's share of jointly owned Roseton No. 2 unit (240 MW).

^dApplicant's share of jointly owned Roseton No. 1 unit (240 MW).

^eOswego No. 5 oil-fired unit (850 MW).

^fOswego No. 6 oil-fired unit (850 MW).

^gReduction in Applicant's share of Roseton plant capacity (-120 MW).

^hNine Mile Point Unit 2 nuclear-fired unit (1100 MW).

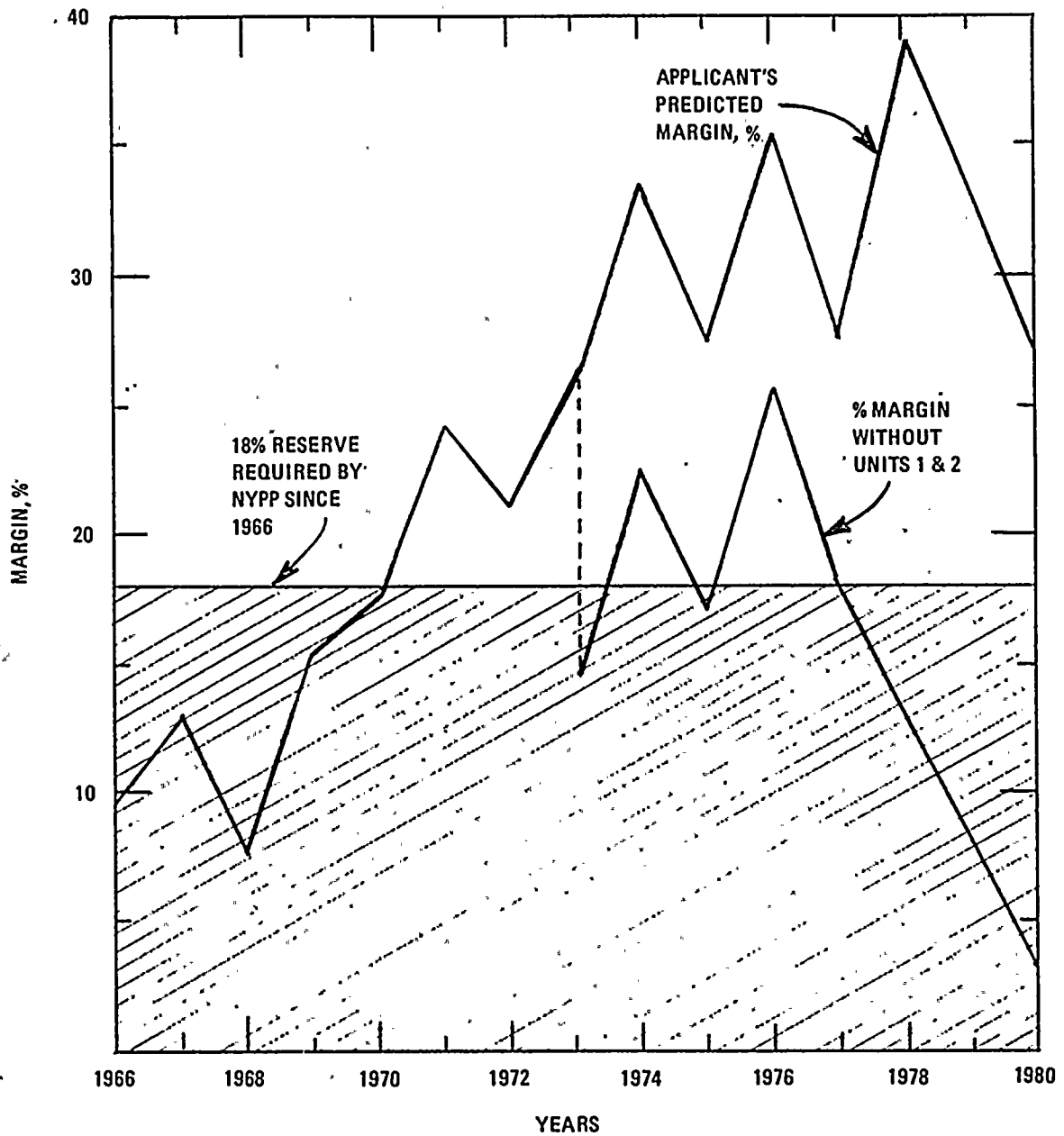


Fig. 8.4. Forecast of Reserve Margins.

8.2.1 Land Effects

The operation of Unit 1 does not interfere with present land use. At present, no other high-value use is preempted by locating and operating the Station at this site.

8.2.2 Aquatic Effects

The attempt by the Applicant to document entrapment of fishes in the intake structure and their subsequent impingement on the traveling screens is inadequate. Sufficient evidence has not been presented to demonstrate that the intake precludes the possibility of substantial fish kills at the intake structures.

Because of a high ΔT (31.2°F) and a residence time greater than 3 minutes in the heated water, small fish and fish larvae are not expected to survive passage through the station, and high mortality of zooplankton is expected during summer. Only a small fraction of the lake water is used from the area and furthermore, it is expected that even with 100% mortality of zoo- and phytoplankton, the entrainment effects will be diffused over a wide area and are not expected to be measureable. This assessment, however, is not applicable to entrainable forms of fish life which do not have a short generation time like that of the plankton.

With isotherms indicating only a small region favorable to production of blue-green algae, no shifts in algal species from abundance of diatoms and green algae to blue-green algae are expected.

Because of the aggregation of fishes in the large area covered by the plume in winter, the fishes are expected to undergo thermal shock if the station is shut down suddenly.

8.2.3 Radiological Effects

The estimated radioactive release, based on normal operation of Unit 1, near the site boundary could result in a total body dose to individuals of 5 mrem/year (0.067 mrem/year with the augmented radwaste system). The total man-rem dose from all effluent pathways received by approximately 1,060,000 persons who will live within a fifty-mile radius of the plant, would be about 34 man-rem/year (2.5 man-rem/year with the augmented radwaste system). In comparison, an annual total of about 110,000 man-rem is delivered to the same population as a result of the average natural radiation background. Unit 1 will be a minor contributor

to the total radiation dose that persons living in the area normally receive. Fluctuations in the natural background dose will be expected to exceed the small dose increment contributed by the operation of Unit 1.

The potential exposures to the population from postulated accidents during operation of the plant will depend on the type and magnitude of the accident. As indicated in Section 7.1, the different types of accidents, when multiplied by their respective probabilities of occurrence, result in a very small annual radiation exposure risk to the population. In fact, the potential exposure from all the postulated accidents is well within the naturally occurring variations in the background radiation. From the results of the realistic analysis it is concluded that the environmental risks due to postulated accidents involving abnormal releases of radioactivity during operation of Unit 1 are exceedingly small.

8.3 SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

On a scale of time reaching into the future through several generations, the life span of the Station would be considered a short-term use of the natural resources of land and water. The resource dedicated exclusively to the production of electrical power during the anticipated life span of the Station will be the land itself and the uranium consumed. (No significant commitment of water for consumption or use will have been made, since, in the foreseeable future, Lake Ontario will continue to be seasonally renewed.) No adverse impact on water use is expected to occur owing to the Station effluents.

About 45 acres of the site will be devoted to production of electrical energy for the next 30 to 40 years. (The Applicant states that the remaining 855 acres of the site will be left in its natural state.)

At some future date, Unit 1 will become obsolete and be retired. Many of the disturbances of the environment will cease when the Station is shut down, and a rebalancing of the biota will occur. Thus, the "trade-off" between production of electricity and small changes in the local environment is reversible. Recent experience with other experimental and developmental nuclear plants has demonstrated the feasibility of decommissioning and dismantling such a plant sufficiently to restore the site to its former use. The degree of dismantling, as with most abandoned industrial plants, will take into account the intended new use of the site and a balance among health and safety considerations, salvage values, and environmental impact.

The Commission's current regulations contemplate detailed consideration of decommissioning near the end of a reactor's useful life. The licensee initiates such considerations by preparing a proposed decommissioning plan, which will be submitted to the AEC for review. The licensee will be required to comply with Commission regulations then in effect and decommissioning of the facility may not commence without authorization from the AEC. The Applicant has outlined a basis for costs estimates.¹

Experience with decommissioning of civilian nuclear power reactors is limited to six facilities that have been shut down or dismantled: Hallam Nuclear Power Facility, Carolina Virginia Tube Reactor (CVTR), Boiling Nuclear Superheater (BONUS) Power Station, Pathfinder Reactor, Piqua Reactor, and the Elk River Reactor.

Several alternatives can be and have been used in decommissioning reactors: (Type 1) Remove the fuel (possibly followed by decontamination); seal and cap the pipes; and establish an exclusion area around the facility. The Piqua decommissioning operation was typical of this approach. (Type 2) In addition to the steps outlined in (1), remove the superstructure and encase in concrete all radioactive portions that remain above ground. The Hallam decommissioning operation was of this type. (Type 3) Remove the fuel, all superstructure, the reactor vessel and all contaminated equipment and facilities, and finally fill all cavities with clean rubble topped with earth to grade level. This last procedure is being applied in decommissioning the Elk River Reactor. Alternative decommissioning procedures (1) and (2) would require long-term surveillance of the reactor site. After a final check to assure that all reactor-produced radioactivity has been removed, alternative (3) would not require any subsequent surveillance. Possible effects of erosion or flooding will be included in these considerations.

The Applicant's plan is of Type 1, as described above. The estimated cost in 1972 dollars is \$2 million plus \$150,000 annually for perpetual inspection, maintenance, and 24-hour surveillance.⁸ Capitalizing the continuing costs at an assumed 8.75% discount rate leads to an equivalent total cost of about \$4 million. By the most conservative estimate (Type 3 above), the Staff estimates that decommissioning of the Station will cost \$30 million (1972 dollars). This figure is based on adjustment to a single unit of the estimate prepared by the Staff for the Consumers Power Company, Midland Plants, Units 1 and 2.⁹ The Midland estimate was made by careful scaling of the detailed estimates for the Elk River Reactor.

8.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Many resources are involved in construction and operation of a major facility such as the Station. These resources include the land upon which the facility is located; the materials and chemicals used to construct and maintain the Station; fuel used to operate the Station; capital; and human talent, skill and labor.

Major resources to be committed irreversibly and irretrievably because of operation of the Station are essentially the land (during the life of the plant) and the uranium consumed by the reactor. Only that portion of the nuclear fuel that is burned up or not recovered in reprocessing is irretrievably lost to other uses. This will amount to approximately 12 metric tons of uranium-235, with a 30-year lifetime assumed for the Station. Most other resources are either left undisturbed or are committed only temporarily, as during construction or during the life of the Station, and are not irreversibly or irretrievably lost.

Of the land used for plant buildings, only a small portion beneath the reactor, control room, radwaste, and turbine-generator buildings appears to be irreversibly committed. Also, commitment of some components of the facility, such as large underground concrete foundations and certain equipment, are, in essence, irretrievable because of practical aspects of reclamation and radioactive decontamination. The degree of dismantlement of the Station, as previously noted, will be determined by the intended future use of the site, which will involve a balance of health and safety considerations, salvage values, and environmental effects.

The use of the environment (air, water, land) by the Station does not represent significant irreversible or irretrievable resource commitments, but rather a relatively short-term investment. The biota of this region have been studied, and the probable impact of the plant is presented in Sections 4 and 5. As outlined in the preceeding section, most of the impacts in the vicinity of the site are expected to be localized and virtually undetectable. However, fish kills at Unit 1 may adversely affect the fish population in the Nine Mile Point area. Under the circumstances, the Staff will require that the Applicant perform intensive monitoring (diel and seasonal) to determine the number, species, and size of fish killed at Unit 1 and relate these data to the intake design and field-sampling program as outlined in Section 6. When this information is available, the Staff will evaluate the seriousness of the fish-kill problem. If too many mortalities of juvenile or adult fish result from operation of Unit 1, modifications of existing intake structure, or development and implementation of other preventative methods or both will be required within a specified period.

Should an unanticipated significant detrimental effect to any of the biotic communities appear, the monitoring programs are designed to detect it, and the Applicant would then be required to institute corrective measures.

The Staff concludes that the irreversible and irretrievable commitments are appropriate for the benefits gained.

References

1. Table of Niagara Mohawk Power Corporation Plans for Generating Capacity Expansion, Supplied with letter from George Anastis, Public Service Commission of the State of New York, to Charles Luner, Argonne National Laboratory, Nov. 13, 1972.
2. "Environmental Report for the Nine Mile Point Nuclear Station, Unit 2," Supplement No. 3, AEC Docket No. 50-410, Niagara Mohawk Power Corporation, December 1972.
3. Northeast Power Coordinating Council, "Basic Criteria for Design and Operation of Interconnected Power Systems," Originally adopted by the members of the Northeast Power Coordinating Council, Sept. 20, 1967, revision adopted on July 31, 1970.
4. "Environmental Report for the Nine Mile Point Nuclear Station, Unit 1," AEC Docket No. 50-220, Niagara Mohawk Power Corporation, June 1972.
5. "Environmental Report for the Nine Mile Point Nuclear Station Unit 2," Supplement No. 2, AEC Docket No. 50-410, Niagara Mohawk Power Corporation, October 1972.
6. Table of Peak Annual Loads of New York State Utilities, 1967-1971, supplied with letter from Lester M. Stuzin, Public Service Commission of the State of New York, to Lawrence Stein, Argonne National Laboratory, October 13, 1972.
7. Annual Reports of Niagara Mohawk Power Corporation, 1961-1971.
8. "Environmental Report for the Nine Mile Point Nuclear Station Unit 1," Niagara Mohawk Power Corporation, p. 9.4-2, June 1972.
9. "Transcript of the ASLB Hearing, June 12, 1972, In the Matters of Consumers Power Company (Midland Plant Units 1 and 2)," Docket Nos. 50-329 and 50-330, pp. 7822-7836.

9. ALTERNATIVES TO THE PROPOSED PROJECT

9.1 ALTERNATIVE ENERGY SOURCES AND SITES

The consumption of electric power in the Applicant's service area and throughout the U. S. has increased since Unit 1 was put into operation in 1969 and is expected to continue to increase (see Section 8.1). Therefore, cessation of the Unit's operation would require construction and operation of new equivalent generating capacity (in addition to that now planned to meet expected load growth) either by the Applicant or by some other utility which might sell power to the Applicant. Construction and operation of new capacity would impose new economic and environmental costs, which would be balanced to some degree by reduction of the cost now associated with operation of Unit 1. The purpose of this section is to define the reasonable range of economic and environmental costs to be expected from each of the several alternatives and then to strike the benefit-cost balance in order to establish the preferred alternative.

The alternative energy sources considered are those commercially proven for baseload power generation in the northeast U. S. -- namely, coal-fired, oil-fired, and nuclear steam-electric plants. Hydroelectric generation is not considered because substantially all the potential sites within New York are already developed¹ and development by the Applicant in other states is unlikely to be legally available to the Applicant. Geothermal power is not considered because no sites in New York or neighboring states have been identified to date as potential sources of geothermal energy.

The possibility of a better alternative site is also discussed in this section.

Possible modification of Unit 1 that might reduce the existing environmental impacts are considered in Section 9.2.

9.1.1 Economic Considerations

The depreciated construction cost of Unit 1 is about \$145 million (see Table 10.1). Because virtually none of the investment could be recovered if the plant were abandoned, construction cost of the replacement capacity would markedly increase the cost of the power to the Applicant and thus to its customers. From the data shown in Table 9.1, the incremental cost* of operating Unit 1 to produce 4.275 Billion kWh annually (80% capacity factor) would be about \$12 million. (The estimated annual cost of the same amount of power from a new nuclear plant would be \$12.8 million production cost, plus \$39.3 million capital charge.**)

*i.e., ignoring the irrecoverable construction costs.

**Based on \$213.5 million construction cost and 18.4% fixed charge rate. The fixed charge rate includes taxes as well as depreciation and interest on capital.

TABLE 9.1. New York Generating-plant Costs for
an 800-MWe Plant in the Mid 1970's

	Capital Cost, \$/kW	Production Cost, ^a mills/kWh
Nuclear	350	2.8
Fossil-oil ^b	250	7.0
Gas turbines ^c	120	14.2
Pumped storage ^d	175	10.0 (Pumped with fossil) 3.5 (Pumped with nuclear)

Based on: New York State Department of Public Service, "The New York Power System Generation and Transmission Plans 1971-1980," Table VII, p. 31.

^aIncludes fuel, operating labor, and maintenance.

^bBurning low-sulfur oil costing \$0.70/million Btu with a heat rate of 9300 Btu/kWh.

^cSixteen 50-MWe gas turbines burning No. 2 distillate fuel costing \$0.90/million Btu, with a heat rate of 13,000 Btu/kWh.

^dFour 200-MWe units -- fuel cost based on 3:2 power ratio between base-loaded unit providing pumping power during off-peak hours and pumped-storage output. A heat rate of 9300 Btu/kWh was assumed for the pumping unit using oil costing \$0.70/million Btu.

If the replacement power were produced by a new oil-fired plant, the estimated annual cost would be \$28.1 million production cost plus \$29.9 million capital charge. Uncertainties associated with the feasibility and cost of SO₂ removal, or alternatively the availability and cost of low-sulfur coal,² make it difficult to estimate the costs for a new coal-fired plant. However, the estimates for the oil-fired plant will serve as a reasonable lower limit. New fossil-fuel plants in the Northeast are predominantly oil-fired, implying that power-industry considers the probable cost of coal-fired plants to be higher.

Purchased power, if it were available, would be expected to be at least as costly as that from a new oil-fired plant because any vendor probably would be obliged to sell his lower-cost power to his own customers, rather than to another utility.

The hypothesized abandonment of Unit 1 might result in an annual tax saving to the Applicant of about \$6.5 million (state and local property taxes). With this sum allowed as a credit against the costs of an alternative plant or power purchase, or both, the estimated net annual penalty to the Applicant's customers would be about \$33 million if Unit 1 were replaced by another nuclear plant or about \$39 million if power were purchased or a fossil-fuel plant were elected. The present worth* (at 8.75% of the 26-year stream of penalty costs) would be about \$335 million for the least expensive alternative.

9.1.2 Environmental Considerations

a. Alternative Energy Sources

Modern fossil-fueled plants operate at higher thermal efficiency than most current nuclear plants. Also, some of the heat is discharged with the other combustion products through the stack to the atmosphere. Consequently, the heat released to cooling water is about two-thirds that for a nuclear plant of the same electrical capacity.

Oil-fired plants release almost no radioactivity to the atmosphere. The natural radioactivity in at least some types of coal is great enough that stack emissions have been measurable,² but the degree to which the effect varies with coal type is not known. The release of radioactivity

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

from modern nuclear plants is required to be "as low as practicable", in accordance with Commission regulations. Any resulting increase in dose levels from either nuclear or coal-fired plants will normally be a small percentage of doses resulting from natural background.

Finally, as with coal-powered generating plants, the emission standards for oil use are becoming increasingly stringent and costs of compliance are expected to increase. Substantial amounts of dust, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, and aldehydes are emitted from coal- and oil-fired plants. The Environmental Protection Agency (EPA) has set limits on emission of particulate matter (dust), sulfur dioxide, and nitrogen oxides for new generating plants.³ The control equipment and procedures required to meet the EPA standards probably will also change the emission of the other substances to some degree. However, the available data for combustion without pollution-control equipment⁴ give a rough indication of the magnitudes. For plants equivalent to Unit 1 (610 MWe), operating at full power (and without emission controls), the expected emissions (in pounds per day) are as follows:

	<u>Oil-fired Plant</u>	<u>Coal-fired Plant</u>
Carbon monoxide	83	5400
Hydrocarbons	1600	1600
Aldehydes	800	27

The environmental impacts of continued operation of Unit 1 and those expected from the operation of a coal- or oil-fueled plant of equal output are compared in Table 9.2. Radiological and cooling-system impacts are less for the fossil-fuel plants, as is the consumptive use of water through evaporation. However, these impacts are of small consequence, according to the evaluation given in Section 5. Either type of fossil-fuel plant would release many tons of chemical pollutants to the atmosphere each day, but such release from Unit 1 is nil. The last consideration appears to the Staff to dominate the balance of environmental effects during operation, which thus clearly favors the reference plant.

b. Alternative Sites

In its consideration of alternative sites, the Staff notes that the environmental impacts expected from another nuclear plant of similar

TABLE 9.2. Comparative Environmental Impacts for Nine Mile Point Unit 1 (nuclear) and Alternative Plants (610 MWe) (at full-power operation except as noted)

Impact	Reference Unit 1	Oil-fired Plant	Coal-fired Plant
<i>Land Use</i>	45 acres (plus exclusion area).	Larger (fuel storage, but no exclusion area).	Larger (fuel and ash storage, but no exclusion area).
<i>Releases to Air:</i>			
Radioactivity	35 Ci/day	None	Small
Dust, ^a tons/day	None	6	6
Sulfur dioxide, ^a tons/day	None	50	75
Nitrogen oxides, ^a tons/day	None	19	44
<i>Releases to Water:</i>			
Heat, billion Btu/day	100	70	65
Radioactivity:			
Tritium, mCi/day	31	None	None
Other, mCi/day	3	None	None
<i>Chemical:</i>			
Total dissolved solids, lb/day	340	450	390
<i>Water Consumed:</i>			
Evaporation, million gallons/day	7.2	5.3	4.4
<i>Fuel:</i>			
Consumed ^b	610 kg U ²³⁵ /year ^c	7.8 x 10 ⁶ bbl/year	1.7 x 10 ⁶ tons/year
Waste ^b	52 truck-loads/year	Small	1.7 x 10 ⁵ tons/year
<i>Aesthetic</i>	Inoffensive	Similar to Unit 1 except for tank farm	Similar to Unit 1 except for coal and ash storage

^aRelease estimates for fossil plants are based on the assumptions that each plant just meets the applicable EPA standards⁴ and that the efficiency is 40%.

^bAt 80% capacity factor.

^cPartly balanced by recovery in reprocessing of 172 kg U-235/year and 132 kg Pu/year.

size would occur in some degree at any other site. For example, all types of baseload power plants which would be feasible now in New York require either large flows of water for once-through cooling (268,000 gpm for the 610-MWe Unit 1) or a smaller, but substantial, flow of makeup water for closed-cycle evaporative cooling (about 6000 gpm would be evaporated at full power operation). Therefore, any useable site would be close to a large lake or river if closed-cycle cooling were chosen or to an adequately large lake or river if once-through cooling were elected.

As discussed in Sections 4 and 5, the terrestrial environmental impacts for the reference site are relatively small because the land is not uniquely valuable in any identified sense and large amounts of roughly equivalent land in the region remain unused by man.

Similarly, damage to the relatively sparse lake fauna near the Station associated with water intake and discharge has less impact on overall Lake Ontario ecology than would be true at another site where lake biota may be more abundant -- for example in a shallow bay area. The Staff judges that no other Lake Ontario site would have overall environmental impact sufficiently lower than that of the reference site for the difference to be predictable; i.e., the uncertainty in the prediction of comparative impacts would exceed any apparent difference between the reference site and the apparently best alternative site.

Had the design included some form of closed-cycle cooling, such as cooling towers or a cooling pond, the reduced water requirement would have allowed consideration of many alternative sites remote from Lake Ontario. However, the terrestrial environmental impacts for the reference site are so small that the comparative overall impact of the hypothetical best alternative site would be dominated by the impact on aquatic biota. The latter impact will tend to be greater in importance (for fixed plant throughput and evaporative consumption of water) for smaller bodies of water. It is, therefore, improbable that any site (in New York) not on Lake Ontario would be preferable to the reference site with respect to impact on aquatic life for either closed-cycle or once-through cooling of a large power plant.

The terrestrial impacts expected from the continued operation of Unit 1 at the reference site are very small and the aquatic impacts expected would be worse, or no better, at any other New York site. For these reasons, the Staff concludes that the reference site is a close approximation to the hypothetical best site that might be found for either nuclear or fossil-fired plants by an extended investigation.

9.1.3 Benefit-Cost Balance

Any alternative to the continued operation of Unit 1 would entail environmental impacts associated with construction of the equivalent capacity, whether by the Applicant or some possible vendor of power to the Applicant. It appears to the Staff, as discussed above, that the environmental costs associated with operation of an equivalent plant would probably not be significantly less than for Unit 1 and might well be greater. The overall balance of environmental cost thus appears to favor continued operation of the unit. Possible reduction of the existing impacts by modification of Unit 1 is considered in Section 9.2.

Taking into account the certain economic penalty to consumers which would result from either continuing purchase of replacement power or construction of a replacement generating plant by the Applicant, the Staff concludes that continued operation of Unit 1 is the preferred course.

9.2 PLANT DESIGN ALTERNATIVES

This section considers possible modifications to the Applicant's system which, if implemented, might change significantly the balance between economic and environmental costs.

9.2.1 Cooling System

Modern thermal electric generating plants (fossil-fueled or nuclear) discharge from 5100 to 7000 Btu of waste heat for each kilowatt hour of net electrical output; the higher figure is typical of current nuclear plants.⁵ Of the established methods of large-scale cooling, the most practical involve either (a) transfer of heat to the atmosphere by direct evaporation of water in "wet" cooling towers or cooling ponds, or (b) direct discharge of heat to a body of water. Even in direct discharge the heat is eventually transferred to the atmosphere. Depending on climatic conditions, the heat is released chiefly by evaporation or by radiation and convection. In an additional method of evaporative heat dissipation, nozzles spray water from a cooling pond or canal into the air. This method is not considered practical for the present plant because reliable operation in the required size has not been demonstrated. By another means of heat transfer, "dry" cooling towers transfer heat directly to the atmosphere without evaporation of a coolant (in the same manner as an automobile radiator). Dry towers have been used for relatively small thermal electric plants in arid regions, particularly

abroad, but the high coolant-return temperature in hot weather results in a condenser back-pressure too high for any large (over 300-MWe) steam turbines currently available.⁶ Thus, dry cooling towers are not considered a practical alternative for this plant.

a. The Present System

Unit 1 uses a once-through system in which virtually the entire heat load, about 4×10^9 Btu/hr, is discharged into Lake Ontario in the form of a stream of heated water from the condenser. The chief advantages of the system are: (1) Total costs are lower than those of any known alternative. (2) No modification or control of the chemistry of the cooling water is required. (3) Maximum efficiency is provided because the coolant will enter the condenser at a temperature lower than that with any of the alternative systems. This lower temperature leads to the lowest condensate pressure and the most efficient turbine operation. (4) The full flow of the once-through cooling stream provides a means of discarding chemicals from demineralizer regeneration, laboratory wastes, and radionuclides with minimum impact because of the large dilution before discharge.

The known and predicted impacts of the present system, particularly the adverse aspects, are evaluated in detail in Section 5.

b. Possible Alternatives

The alternative systems considered (natural- and mechanical-draft cooling towers, and a cooling pond) share the common feature of having a recirculating-cooling-water circuit. Such a circuit would reduce or eliminate the discharge of heat to Lake Ontario. In the cooling-water alternatives, only about 3% of the recirculating cooling water would be discharged as blowdown, and about 3% of the total heat would be dissipated to the lake (Applicant's design). Damage to organisms in the lake would be reduced because makeup water required for the recirculating system would be only about 7% of the flow in the once-through system.

Some disadvantages are also inherent in the recirculating systems. Because of evaporation in these systems, the dissolved-solids content of the water increases. This increased concentration of chemicals could increase corrosion and cause formation of carbonate scales. To control these problems, the water system would be refreshed and blown down to limit the total dissolved solids to a level two times that in the makeup

water (the ratio chosen by the Applicant for possible evaporative cooling towers). The Applicant's preliminary design did not include the use of additives to control scaling or algal growth. If scaling became a problem, the Applicant proposed to use a nontoxic nonphosphate inhibitor that would conform to the Food and Drug Administration criteria. Algal growths would be controlled, if necessary, by adding an algicide in quantities that would conform to New York State Water Quality Standards. Any nonvolatile chemicals added to the cooling-tower circuit would be discharged to the lake in the blowdown and would slightly increase the level of dissolved solids therein. Any proposed use of algaecides would need careful review to assure an acceptably small environmental impact. Hyperbolic cooling towers are prominently visible; some people object to their use on aesthetic grounds.

Water spray escaping from the top of the tower would fall on the surrounding ground. This "drift" would result in accumulation of the dissolved solids of the water droplets on the ground in the vicinity of the cooling tower. With the drift assumed to be 0.005% of the circulating-water flow rate (268,000 gpm), the 14 gpm of resulting drift would contain about 72 lb/day of dissolved solids (concentration about 450 ppm). The rate of deposition on the ground would probably have undetectable effect on local flora and fauna because levels would be substantially below the quantities deposited by rainfall.⁷

The Applicant has made a specific design study of natural and forced-draft cooling towers. Forced-draft towers have the advantage of smaller size and a lower "approach" temperature (the difference between the temperature of the water leaving the tower and the ambient atmospheric wet-bulb temperature) than natural-draft evaporative cooling towers. Because of the lower approach, forced-draft towers offer the opportunity for a lower condenser pressure and increased turbine efficiency. The disadvantages of forced-draft towers are more noise, more fogging, more ground-level drift (the Applicant estimated an increase in salt deposition rate at the property boundary to be a factor of 120 over that for the natural-draft cooling tower), and a decrease in net electrical output due to the use of power for the blowers.

A cooling pond uses the large surface area of a body of stored water to reject heat to the atmosphere by the transfer of sensible and latent heat. Use of such a pond would have the advantages of no noise or aesthetic disturbance. As a disadvantage, the pond would require the use of an estimated 880 acres of additional land for an evaporative surface of about that size. In the Applicant's study, a location near the Nine Mile Point Nuclear Station (Fig. 9.1) was chosen. A substantial

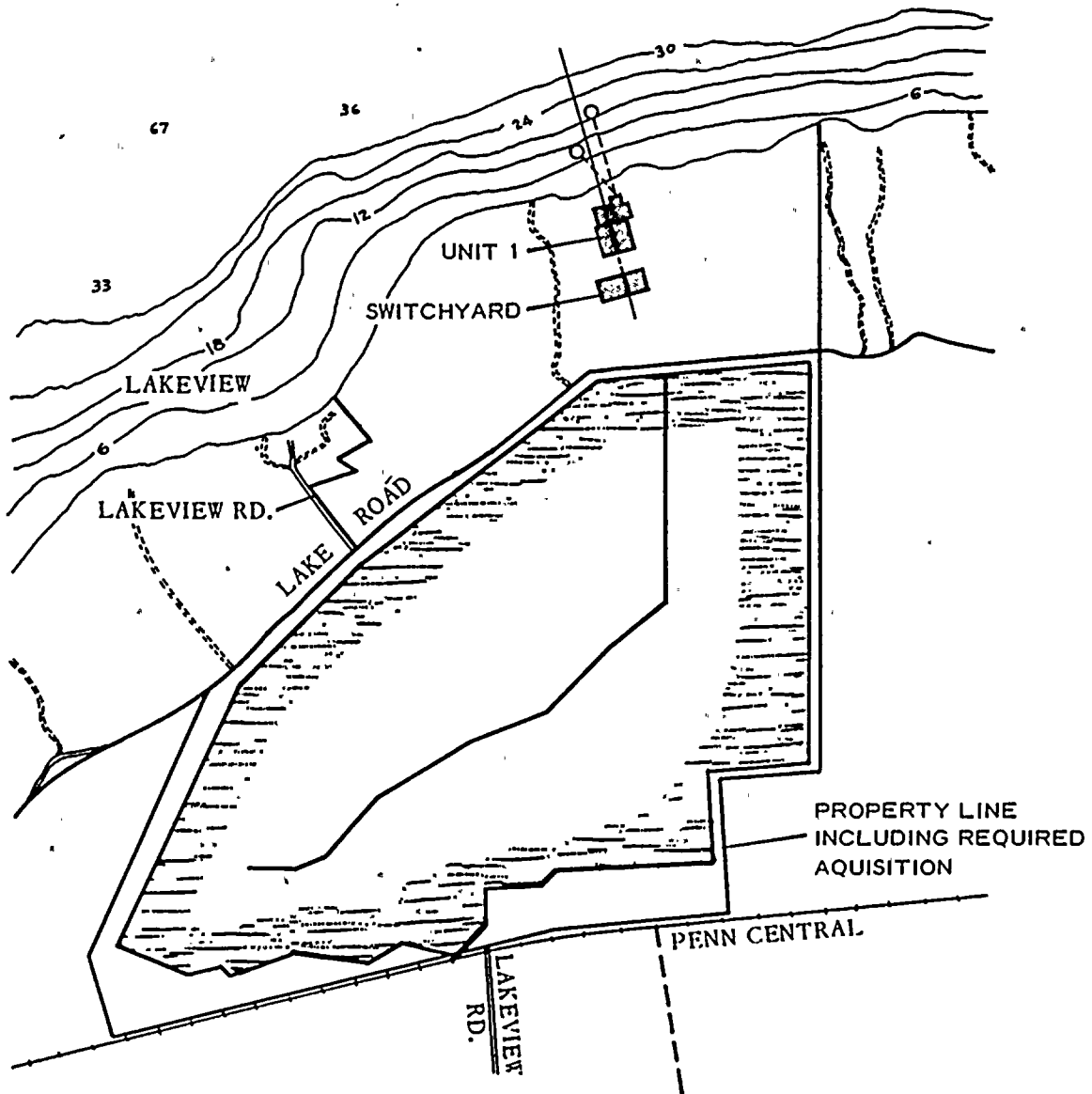


Fig. 9.1. Cooling Lake at 310-foot Elevation (880 acres).

amount of pervious and impervious fill material would be required to construct retaining dikes. Costs developed by the Applicant for the cooling-pond system are given in Table 9.3. The Staff agrees that the costs are at least approximately correct.

Estimated incremental costs for the alternative cooling systems considered above, given in Table 9.3, indicate that each would add a substantial cost to the Unit. The system with mechanical-draft cooling towers would add the smallest cost and would reduce the overall power output of the Station the least. Backfitting such a cooling tower or any of the alternative cooling systems would also lead to an interruption in power production; the extent of the interruption would depend on the system chosen.

In view of the lack of significant identified environmental disadvantages of the once-through cooling system and the additional costs that would be incurred by adoption of any of the alternative cooling systems, the reference once-through system is preferred.

9.2.2 Chemical Discharge System

In the makeup water system for Unit 1, lime and ferric sulfate are added for clarification, and sulfuric acid and sodium hydroxide are added in regeneration of the ion exchangers. Use of these chemicals leads to the discharge of salts to the lake. In addition, the salts originally present in the lake water, removed in the ion exchanger, are discharged back to the lake at the time of regeneration. The total dissolved solids (see Table 3.2) discharged, incremental to those already in the circulating water, is about 198 lb/day. About 15% of this material originates in the lake water.

The Applicant suggested an alternative to the proposed treatment in which evaporation would be used to eliminate chemical effluents resulting from demineralizer-regeneration cycles. The evaporation process would require use of a falling-film evaporator and an adequately designed lagoon to store the concentrated brine bottoms produced in the evaporator. Alternative treatment of chemical effluents resulting from the settling basin overflow and clear-well bypass would not be required because their chemical composition after pH adjustment would be comparable to that of Lake Ontario. A simplified sketch of the system is shown in Fig. 9.2.

Elimination of the discharge of the regeneration chemicals by this method is estimated by the Applicant to entail an additional \$857,000 direct cost and \$50,000 annual operating and maintenance costs. The "present value" of the latter figure, assuming an 8.75% cost of capital, a 26-year remaining plant life, and a present worth factor of 10.1379,

TABLE 9.3. Incremental Costs^a for Alternative Cooling Systems
(in millions of dollars)

	Natural-draft Cooling Tower	Mechanical-draft Cooling Tower	Cooling Pond
Construction	16.96	11.85 -	21.60
Present value of construction ^b	13.81	9.65	17.59
Annual operating costs	0.568	0.690	0.312
Annual value of capability loss ^c	1.096	.854	1.241
Total annual costs	1.664	1.544	1.553
Present value (1973) of annual costs ^d	11.45	10.62	10.69
Total present value (1973)	25.26	20.27	28.28

^aCalculated from Applicant's data.

^bPresent value calculated for four years' annual expenses (each one fourth of the total) at an interest rate of 8.75%. Present worth factor 3.2576.

^cUsing Applicant's values.

^dFor a remaining lifetime of 22 years and 8.75% (present worth factor 9.6233) after completion date of 1977; brought to 1973 value by dividing by $(1.0875)^4$.

NOTE:

THE OPERATION OF THIS SYSTEM IS INTERMITTENT
AND IS REQUIRED ONLY UPON ACCUMULATION OF LIQUIDS
IN THE REGENERATION-WASTE-NEUTRALIZATION TANKS

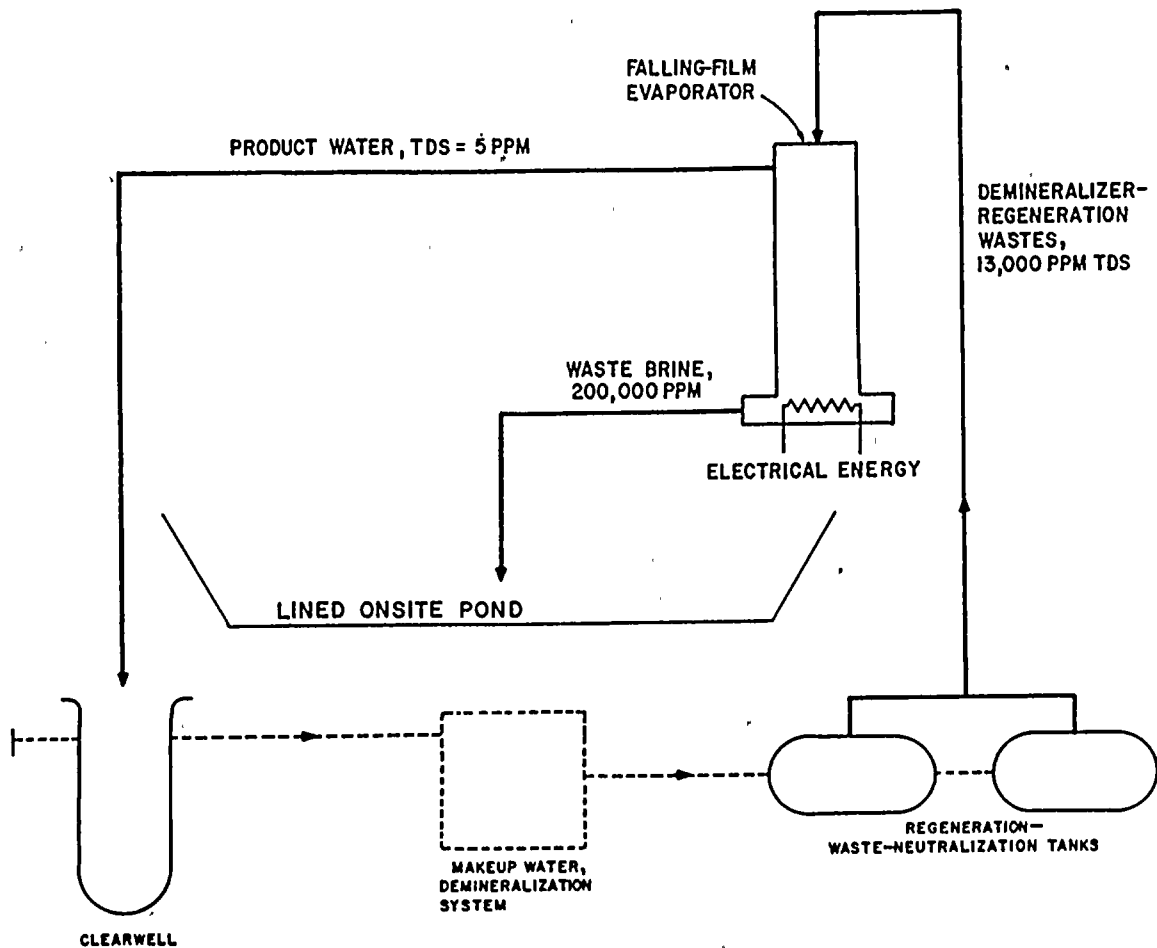


Fig. 9.2. Alternative Evaporative System for Treating Regeneration Wastes. From Applicant's Environmental Report.

is \$507,000. The total present value of the additional costs due to this alternative is thus \$1.36 million.

The small increase in the chemical content of Lake Ontario water caused by Unit 1 will have no measurable effect on the aquatic biota. The discharge of 198 lb/day is calculated to increase the total dissolved solids of the 400 cubic miles of water in the lake by only 0.002 ppm, or 0.008%, per century, and inshore chemical concentrations are believed not to increase significantly (see Section 5.2). The Staff, therefore, believes the institution of an alternative system for removing regeneration chemicals is unnecessary.

No chemicals are discharged as a consequence of regeneration of the condensate demineralizer, acid cleaning of the plant, or laboratory and decontamination operations; therefore, alternatives are not considered for these operations. Also, no alternatives are considered for the small fractions of a pound per day of phosphate and sulfate discharged from the auxiliary heating boilers because these quantities of these chemicals would be undetectable and would have a negligible impact.

9.2.3 Biocide System

The Unit uses no biocides in its water systems; no alternatives are developed.

9.2.4 Sanitary Waste System

Plant sanitary wastes are given extended aeration and chlorination, then sent to an oxygenation pond from which effluent flows to Lake Ontario via a drainage ditch. The normal sewage load from Unit 1 is 2400 gallons per day. Because sanitary standards are met and no adverse effect on the lake from sewage discharge is expected (see Section 5.2), no alternative system is considered.

9.2.5 Transportation Procedures

Alternatives, such as special routing of shipments, providing escorts in separate vehicles, adding shielding to the containers, and constructing a plant for fuel recovery and fabrication on the site rather than shipping fuel to and from the Station, have been examined by the Staff for the general case. The impact on the environment of transportation under normal or postulated accident conditions is not considered to be sufficient to justify the additional effort required to implement any of the alternatives.

9.2.6 Water Discharge System

The Staff has considered whether some modifications could be made to the present discharge structure to improve dilution of the heated discharge flow before it reaches the lake surface and to give a smaller affected surface area.

Closing selected ports on the hexagonal discharge structure, causing an increase in discharge velocity at the remaining open ports has been considered. Two situations were examined. In the first case, three slots facing the shore line (Fig. 3.4) were considered to be blocked. This change would double the discharge velocity at the three remaining ports. In the second case, the slot opposite the tunnel was also closed and the total discharge flow exited through the remaining two ports.

The results of these analyses indicate that, for the cases of two and three slots open:

- (a) Closing off some of the slots or alternatively increasing the discharge velocity will reduce the extent of the thermal plume, and
- (b) the modifications suggested are still not sufficient to bring the thermal discharge into conformance with current New York State thermal criteria.

Another alternative to the present system is once-through cooling with a discharge diffuser, as considered by the Applicant. With this system the water circulated through the condensers would be returned to the lake through a submerged jet diffuser. In this way, more mixing of the heated stream with the lake water will occur and thus reduce ecological damage associated with effects of the thermal discharge. Since this type of discharge structure should be located in deeper water than the present structure to be effective, a new discharge shaft and tunnel would be required, as shown in Fig. 9.3. Incremental costs include \$5.77 million for construction (1973 value \$4.70 million), and \$55,000 for annual operating costs (1973 value \$380,000) for the remaining lifetime after 1977 of 22 years. An 8.75% interest rate was assumed. Total present cost would thus be \$5.08 million. On the basis of available information, the Staff has identified no significant disadvantage of the existing discharge system. Also, the Applicant proposes to combine the present discharge system with that of Unit 2 when the proposed plant is accepted. Consequently, the Staff believes that modifying the existing system is not now justified.

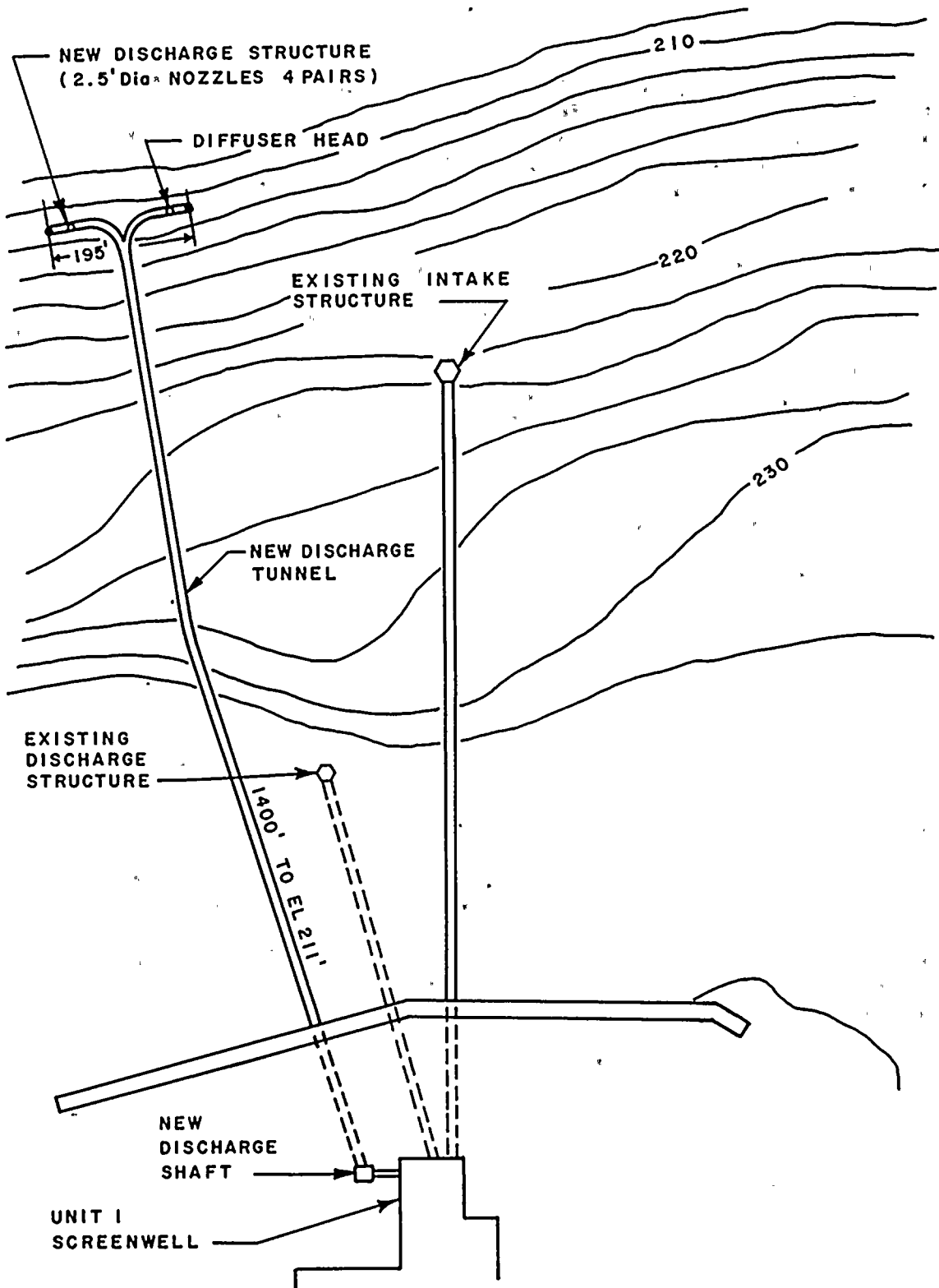


Fig. 9.3. Once-through Cooling System with Diffuser Discharge.

9.2.7 Intake Structure

The Applicant has presented no alternatives to the design of the intake system. Data from the Applicant's intensive monitoring program to date has shown that the existing intake system does result in substantial fish kills. Consequently, it is recommended that alternative intake structures be examined. Examples of such alternatives include:

- Design modifications of the offshore intake to achieve low average intake velocity by increase in area of intake;
- Use of a limestone filled porous dyke around the offshore intake similar to one employed at the Point Beach Nuclear Plant;
- Use of a traveling band screen similar to one scheduled to be installed by Central Power and Light at its plant in Corpus Christi;
- Use of bar racks with smaller spacing to prevent entry of large fish in the intake tunnel;
- Use of air bubble curtain or electric fish screen for repelling fish at the intake;
- Use of fish guiding techniques to guide fish away from area of impingement.
- Relocation of the intake structure to a different depth.

9.3 ALTERNATIVES TO NORMAL TRANSPORTATION PROCEDURES

Alternatives such as special routing of shipments, providing escorts in separate vehicles, adding shielding to the containers, and constructing fuel recovery and fabrication facilities on the site rather than shipping fuel to and from the plant have been examined by the staff for the general case. The impact on the environment of transportation under normal or postulated accident conditions is not considered to be sufficient to justify the additional effort, cost, and/or environmental impact required to implement any of the alternatives.

References

1. "The 1970 National Power Survey," Federal Power Commission, p. II-1-95.
2. M. Eisenbud and H. G. Petrow, "Radioactivity in the Atmosphere from Power Plants that Use Fossil Fuels," Science, 144, April 1964.
3. "Environmental Protection Agency Regulations on Standards of Performance for New Stationary Sources," 40 CFR 60; 36 FR 24876, Dec. 23, 1971.
4. "Compilation of Air Pollutant Emission Factors," Revised 1972, Office of Air Programs, Environmental Protection Agency, Supt. of Docts., U. S. Government Printing Office, Washington, D. C.
5. "Nuclear Reactors Built, Being Built, or Planned in the U. S. as of June 30, 1973," TID-8200 (26th Rev.), U. S. Atomic Energy Commission.
6. J. P. Rossie et al., TID-26007, "Cost Comparison of Dry-Type and Conventional Cooling Systems for Representative Nuclear Generating Costs," U. S. Atomic Energy Commission Report.
7. "Forked River Nuclear Station Environmental Report," Appendix B, Attachment 5, Jersey Central Power and Light Co., AEC Docket No. 50-363, Jan. 1972.

10. BENEFIT-COST ANALYSIS

10.1 ENERGY GENERATING COSTS

Using the Applicant's basic estimates of total capital investment,¹ annual fuel cost,² and annual operating and maintenance cost,² the Staff has calculated for Table 10.1 the total and annualized generating costs on the basis given below.

The basis used by the Staff differs from that of the Applicant in the following respects. An interest rate of 8.75% is assumed (Applicant's assumption is 9.6%). Federal, state, and local taxes are not considered by the Staff. The plant capacity factor is assumed to be 80% (Applicant's assumption is 85%).

In order to combine the 26-year stream of operating costs, the present worth in 1973 is considered. The 1973 present worth of an estimated \$30 million expenditure in the year 1999 for decommissioning of the Station is also included. This estimate is based on adjustment to a single unit of the estimate³ prepared by the Staff for Type-3 decommissioning of the Consumers Power Company Midland Plant Units 1 and 2. The Midland estimate was made by careful scaling of the detailed estimates for the Elk River Reactor.

10.2 SUMMARY OF BENEFITS

A primary benefit from operation of the Station is the contribution to the maintenance and improvement of economic wellbeing and the quality of life in the Applicant's service area which results from the generation of about 4.3 billion kilowatt hours of electricity per year. The augmented reliability of electric power within the NYPP area due to 610 MWe of additional generating capacity is an additional primary benefit.

An indirect local benefit to the population of the surrounding area is the employment of about 68 persons for operation of the Station and the resulting injection of about \$1 million per year into the local economy. The corresponding economic and societal costs (road use, school use, etc.) associated with an additional population of from 200 to 300 persons (employees and their families) tend to offset this local benefit. However, no unusual effect is to be expected since the increase in population is relatively small. The 1970 population of the City of Oswego was 23,744 and that of Oswego County was 101,000. A further local benefit will be the payment of an estimated \$3 million annually to local taxing bodies.

TABLE 10.1 Estimated Generating Cost (in millions of dollars)

Construction		
1973 present worth ^a	145	
Annualized (amortization over 26 years)		14.3
Operating Cost:		
1973 present worth	135	
Annualized:		
Operation and maintenance		1.3
Fuel		12.0
Decommissioning Allowance:		
1973 present worth	3	
Total Life-of-Plant Cost:		
1973 present worth	283	
Annualized equivalent		28

^aBased on 1969 construction cost of \$164.5 million, depreciated 4 years (straight line) to give \$142.6 million, plus 1973 modification cost of \$2.4 million.

Operation of the Station "Progress Center" provides an additional secondary educational and recreational benefit. About 50,000 persons annually visit the Center and associated picnic area.

10.3 ENVIRONMENTAL COSTS

10.3.1 Land Use

The Station is located in an area of declining agricultural use having no other significant human use. No prior use other than unplanned wildlife habitat has been arrested by the construction of the Station on 45 acres of the site. Since no ecological uniqueness was associated with the land and since thousands of acres of comparable land in the area remain unused by man, any negative impact is certainly small. As discussed in Section 5.1.1, the recreational potential of the area is limited.

10.3.2 Water Use

Operation of the Station will introduce about 30 trillion Btu per year into Lake Ontario. Calculations based on Asbury's method⁴ give the estimated resultant increase in mean surface temperature as about 0.002°F. The increase in evaporation is expected to be about 2.5 billion gallons per year, less than 0.1% of natural evaporation.⁵ Since total outflow through the St. Lawrence River is 13-fold greater than natural evaporation, no detectable change in lake level is expected to occur.

Chemical discharges from the Station will increase the dissolved-salt content of Lake Ontario by about 164 pounds per day of ions already present in substantial concentrations in lake water. Considering the conservative assumption that the only effective process of removal of chemicals from the lake waters is dilution by Niagara River flow-through, these discharges would in several centuries increase the dissolved-salt level of the Lake by less than 0.01 ppm. Since the present level is about 250 ppm (Table 3.2), the increase would be undetectable.

10.3.3 Biological Effects

Significant effects on terrestrial biota will be confined to those due to the removal of 45 acres from available wildlife habitat. Relative to available habitat within the region, the perturbation is small. Its effect is detectable only in the immediate vicinity of the affected areas.

No marked effects on aquatic life are expected from the thermal discharge (see Section 5.5.2). Some young fishes may be killed by passage through the warmest part of the thermal plume (within the 15°F isotherm). Because the volume within this isotherm is relatively small, the impact on fish populations will be small and undetectable.

Virtually all fishes, fish eggs, and fish larvae entering the cooling-water intake structure will be killed. Conceivably, when the impact of fish impingement can be assessed, design changes may be required for the intake structure (see subsection 9.2.7).

The damage to planktonic life (other than fish eggs and larvae) from entrainment in the cooling water is not expected to lead to detectable changes in lake populations except in the immediate vicinity of the discharge stream.

10.3.4 Radiological Effects

The cumulative cost from normal operation of Unit 1 will be about 2.5 man-rem per year after modification of Unit 1 (34 man-rem per year before modification is completed) for the population within 50 miles of the Station (expected to be about 1 million persons in 1980). The dose to individuals in areas near the Station will be less than 0.1% of that due to natural background. The dose is within the limits imposed by 10 CFR, Parts 20 and 50.

10.4 BENEFIT-COST BALANCE

The Station as designed is expected to have only a small impact on the environment except with respect to fish populations in the Nine Mile Point area, for which new data must be developed before a satisfactory assessment can be made. When the impact can be assessed, and if such impact is found to be adverse, plant modification would be required. The identified benefits and costs are listed in Table 10.2. The Staff has considered these benefits and costs in detail. With resolution of the question of impact on fish populations in the Nine Mile Point area, by additional data and/or modification of the intake design, the Staff believes that the overall benefits to be expected from continued operation of the Station will substantially outweigh the economic and environmental costs incurred. Except as noted for impact on fish populations (where the benefit-cost balance for alternative intake systems is uncertain), the effects of the different alternatives considered do not change the balance of benefits relative to costs in favor of the alternatives.

TABLE 10.2 Benefit-Cost Summary for the Station

Benefits

Primary benefits:

Electrical energy to be generated	4.3 billion kWh/year
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Generating capacity contributing to reliability of electrical power in New York	610,000 kilowatts
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Secondary local benefits:

Employment of operating staff	68 persons
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Environmental Costs

Land Use:

Previously unused land for the Plant	45 acres
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Transmission line right-of-way	~1640 acres
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Water use:

Water evaporated	5100 gallons per minute (average)
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Lake Ontario surface area within 3°F excess isotherm of thermal plume	50-400 acres
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Chemicals discharged to lake	164 pounds per day of salts occurring naturally in lake water
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Radiological impact:

Normal operation:

Cumulative population cost (50-mile radius)	2.5 man-rem per year after modification (34 man-rem per year at present)
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Whole-body dose to nearby residents

Less than 0.1% of natural background after modification.
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Biological impact:

Insufficient data to assess fish kills at intake screens. Possibility of excessive fish kills at intake. This may adversely affect fish population in the area, but not on a lakewide basis.
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References

1. "Environmental Report for Nine Mile Point Nuclear Station, Unit 1," Niagara Mohawk Power Corporation, Syracuse, New York, June 1972, p. 9.8-3¹.
2. "Environmental Report for Nine Mile Point Nuclear Station, Unit 1, Supplement No. 3," Niagara Mohawk Power Corporation, Syracuse, New York, May 1973.
3. Transcript of the ASLB Hearing, June 12, 1972, In the Matter of Consumers Power Company (Midland Plant Units 1 and 2) Docket Nos. 50-329 and 50-330, pp. 7822-7836.
4. J. G. Asbury, "Effects of Thermal Discharge on the Mass/Energy Balance of Lake Michigan," ANL/ES-1, Argonne National Laboratory, June 1970.
5. "A Report on Chemical, Biological, and Physical Findings in Lake Ontario," U. S. Dept. of the Interior, Federal Water Pollution Control Administration, Great Lakes Region, Rochester Program Office, Rochester, N. Y., December 1967.

11. DISCUSSION OF COMMENTS RECEIVED ON THE
DRAFT ENVIRONMENTAL STATEMENT

Pursuant to paragraphs A.6 and D.1 of Appendix D to 10 CFR 50, the Draft Environmental Statement (DES) of July was transmitted, with a request for comment, to:

Federal Agencies

Advisory Council on Historic Preservation
Department of Agriculture
Department of the Army, Corps of Engineers
Department of Commerce
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Power Commission

New York State Agencies

Atomic Energy Council
Department of Commerce
Department of Environmental Conservation
Department of Public Service

Local Agencies

Oswego County Department of Planning

In addition, the AEC requested comments on the Draft Environmental Statement from interested persons by a notice published in the Federal Register on July 3, 1973 (38 FR 17758).

Comments in response to the requests referred to above were received from:

Advisory Council on Historic Preservation
Department of Agriculture
Department of Commerce
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Federal Power Commission
New York State Department of
Environmental Conservation

Appendix A reproduces the comments received. The Applicant's responses to the comments are contained in Appendices B and C. The Staff's consideration of these comments and the disposition of the issues involved are reflected in part by revised text in other sections of this Statement and in part by the following discussion.

11.1 GENERAL CONSIDERATIONS

11.1.1 Recommendation to Not Grant a Full Term License (Commerce, A-8; New York State Department of Environmental Conservation, DEC, A-18, EPA, A-42)

These comments suggest that the aquatic monitoring program be completed and an assessment made of the impact of plant operation on the biota of Lake Ontario, prior to the Commission granting a full term license.

Response: NEPA does not require the postponement of decision on a proposed action until a time when it is certain what the environmental impact will be. Courts have recognized that in some cases, decisions can properly be made even though some environmental studies remain to be completed. It is the Staff's view that the observed impact due to about four years' operation of Unit 1 on the aquatic biota of Lake Ontario is not significant except for the fish impingement problem, the significance of which on the Lake biota is not at all certain. Moreover, the decision here is the limited one that the full term license be granted with the condition that the upgraded comprehensive aquatic monitoring program be implemented and continued until a complete assessment can be made and that modification of the existing intake, and/or development and implementation of other preventive methods will be required if a significant impact is observed.

11.1.2 Regional Assessment (Commerce, A-2)

A comment was made relative to the Staff's evaluation that the plant's operation will have no significant impact on the biota in Lake Ontario. The objection raised was that this type of lake-wide approach fails to adequately consider all the point sources of waste heat that should be included in the evaluation if the lake as a whole is used as the unit of measurement of significant impact.

Response: The Staff concurs fully with the comment that an overall evaluation should take into consideration all point sources of waste heat on the lake. In the Staff's opinion such a regional assessment is most desirable for long term planning. However, procedural, manpower and economic restraints do not permit such an overall regional assessment. The Staff further agrees that the data procured under the International Field Year for the Great Lakes (IFYGL) will be immensely helpful if and when such an overall regional assessment is undertaken for Lake Ontario.

Due to lack of facilities to provide an overall lake-wide regional assessment, the Staff relies on the premise that if adverse effects cannot be detected in the vicinity of the Station, it is unlikely that a lake-wide monitoring program will yield any significant information, for in all probability, adverse effects are expected to diminish in intensity with increase in distance from the site.

11.1.3 Geothermal Energy Sources (FPC, A-61)

The comment requested discussion of geothermal energy as an alternate energy source.

Response: The applicant has indicated (See Appendix B, page B-113) that the only warm water spring listed for the State of New York is a spring at Lebanon, New York. This has a temperature of only 76°F which is unsuitable for steam production.

11.1.4 Topography and Geology (Interior, A-65; DEC, A-25)

This comment states that the section on topography and geology is inadequate for an independent assessment of how these major elements of the environment relate to Unit 1. Another comment suggested a brief description of the bedrock "pop-up" phenomenon be included in this section.

Response: Topographical, geological and seismological considerations in licensing actions are principally matters concerning safety. These are summarized in the Applicant's Environmental Report, and will be fully evaluated in the course of the staff's safety evaluation. It is not the policy of the AEC to repeat these discussions in the Environmental Statement in greater detail than is presently presented.

A description of the bedrock "pop-up" phenomenon is contained on p. C4 of Appendix I of the Unit 2 Preliminary Safety Analysis Report.

11.2 Aquatic Effects

11.2.1 Fish Echo-Sounder Survey (Commerce, A-5)

A request was made for more information concerning the type of fathometer used by the Applicant in the echosounder survey and its capabilities for detecting various stages of fish life history.

Response: The instrument used is a Ross Fathometer (fine line 200-A) with a 7-1/2" conical transducer. The Applicant is not able to detect

larval fish with this instrument. It is possible to detect young-of-the-year fish that are greater than 6" length; however, specific size analysis cannot be done with any degree of confidence.

11.2.2 Phytoplankton (Commerce, A-6)

A request was made for more information concerning the sampling equipment used to collect fish eggs and larvae. The effectiveness of the various types of sampling methods and equipment should be evaluated and discussed.

Response: The Applicant has supplied (Appendix B, p. B-13) the following information:

During 1973, sampling for fish eggs and larvae was begun on a limited scale in March and April, continued more extensively in May, and established on an intensive basis from June and subsequently. The program will be run at this final level through 1974.

The sampling location pattern finally arrived at is as follows. Samples are collected at the surface, mid-depth and bottom, at five stations in each of the three areas defined by radii of 1/2 mile, 1 mile and 3 miles from the Nine Mile Point plant. The stations are:

1/2 Mile Radius

- Station 1 - In 20 ft of water on the west
- Station 2 - In 40 ft of water on the west
- Station 3 - In 60 ft of water off the plant
- Station 4 - In 40 ft of water on the east
- Station 5 - In 20 ft of water on the east

1 Mile Radius

- Station 1 - In 20 ft of water on the west
- Station 2 - In 40 ft of water on the west
- Station 3 - In 80 ft of water off the plant
- Station 4 - In 40 ft of water on the east
- Station 5 - In 20 ft of water on the east

3 Mile Radius

- Station 1 - In 20 ft of water on the west
- Station 2 - In 40 ft of water on the west
- Station 3 - In 100 ft of water off the plant
- Station 4 - In 40 ft of water on the east
- Station 5 - In 20 ft of water on the east

Collections are made on a weekly basis, during the day, from May through December and during both day and night from mid-June through mid-September. Samples are collected by towing a 1.0 meter diameter Hensen type plankton net of #0 mesh (570u aperture) with an attached TSK flow meter. Duration of the tow is 5 minutes, timed with a stop watch, covering approximately a distance of 0.2 mile at 2. mph. The net is towed with a 200' line and is kept in position (at depth) by a system of float lines and depressors. It is hauled onto the boat, the bucket is washed and emptied into a collection container, and the sample is preserved and labeled.

An attempt is made to estimate viability of captured organisms, i.e., fish larvae by direct observation on the boat until such time that a vital stain can be employed.

11.2.3 Maturation of Yellow Perch (Commerce, A-7; Interior, A-66)

Comments were made regarding the possibility that yellow perch remaining in or near the heated discharge plume would not receive the six months exposure at 39°F or below which is necessary for maturation.

Response: Although perch during winter will probably be attracted to the thermal plume when plume temperatures are nearer to the preferred temperature, the volume of water above 39°F would be very small and would not provide a habitat for yellow perch in numbers that would significantly influence the spawning success of the yellow perch population.

11.2.4 Ponar Dredge for Benthic Studies (Commerce, A-8)

A comment was made concerning the possible use of a Ponar dredge in the benthic study.

Response: The Applicant's response from Appendix B, Page B-23 is as follows:

Three different benthic dredges were evaluated for this program; namely Peterson, Ponar and Eckman. The bottom of Lake Ontario, in this area, is composed of slabs of sedimentary rock, largely exposed. Benthos thickness, where it occurs, is no more than an inch or two. Dredges, of whatever design, have limited use here, and benthos sampling for this program is performed by means of a pump device. This is used to "vacuum clean" an area of the Lake bottom 15 inches in diameter, the material so removed being discharged into a net carried in the boat on the surf.

11.2.5 Fish Impingement (DEC, A-20)

A comment was made implying that a considerable portion of the impinged fishes come off the traveling screens alive and that a separate channel should be constructed to return these live fish to the lake as an improvement over the currently used system whereby fish are routed to the discharge well in heated water where they are not likely to survive.

Response: The Staff agrees with the proposal; however, the data available do not substantiate the contention that considerable number of impinged fishes come off the screens alive. If future data indicate the need for a separate channel for returning fish to lake, the Applicant will be required to build such a channel.

11.2.6 Recirculation of Intake Cooling Water (Interior, A-64)

A comment suggested that because of the location of the intake and discharge facilities, recirculation of the heated effluent at Unit 1 is likely to occur.

Response: The relatively deeper (15 ft) location of the intake as compared to the discharge (10 ft) and buoyant nature of the thermal plume during greater part of the year make the probability of recirculation extremely low. The Applicant's data also do not suggest any recirculation.

11.2.7 Mechanical Damage from Entrainment (EPA, A-53; DEC, A-38)

A comment was directed towards discussing the mechanical damage to entrained organisms in addition to thermal damage to more accurately determine the loss of biota as the mechanical stress may be more harmful than the thermal stress.

Response: In evaluating the significance of the entrainment effect, the Staff assumed 100% mortality of all entrained organisms. Therefore, a more detailed assessment of mechanical damage to entrained organisms is not required.

11.2.8 Entrainment Damage Simulation Studies (EPA, A-53; DEC, A-37)

This comment suggested the use of simulated studies on mechanical damage to entrained biota.

Response: The Staff believes that no simulation studies on this particular aspect can simulate actual damage. In the Staff's opinion the best way to study the mechanical damage is to conduct studies when the pumps are operating but the reactor is not operating. The mechanical damage thus determined can then be superimposed on thermal damage assessment from field and laboratory studies.

11.2.9 Fish Replacement Costs (Interior, A-72)

A comment suggested that the economic or replacement cost of fish be used for assessing the environmental costs.

Response: Because no method of monetizing environmental damage such as fish kills is generally acceptable to the concerned public, the Staff believes that the assignment of monetary values will usually generate use-less controversy without materially illuminating the issues in question. However estimated, the monetary costs obtained are usually not large in comparison with the major cost components. For example, applying the Pollution Committee values to an annual plant-associated mortality rate of 1 million 4-inch alewives would indicate an annual charge of \$25,000. For comparison, the estimated total annual plant cost (amortization, fuel, maintenance) is \$28 million as given in Table 10.1.

11.3 WATER QUALITY

11.3.1 Phosphorus Concentrations (HEW, A-14; EPA, A-56)

A question was raised as to the possible consequences of not meeting the MFWQA criteria for phosphate input to Lake Ontario.

Response: Using the method of Csanady,¹ the center line plume phosphate concentration was calculated to be 0.05 mg/l at a distance about 1.3 meters downstream of a continuous input of phosphate corresponding to 12 mg/l in a sewage stream of 3880 gal/day. This is the greatest distance from the point of addition of the sewage to the lake that Minimum Federal Water Quality Criteria (see Section 5.2.4) might be exceeded during typical maximum average sewage flow, since the concentration decreases with distance away from the plume center line both horizontally and vertically. It is concluded that a phosphate plume of this size or smaller in Lake Ontario will have no discernible effect.

11.3.2 Cooling Water Discharge (HEW, A-13; EPA, A-46; Interior, A-68)

These comments anticipate that the Unit 1 thermal discharge will be in violation of a revision to Federal-State standards now pending under the FWPCA and probably would fail to meet the effluent limitations guidelines, once promulgated. It also declares that the Applicant should evaluate alternative heat dissipation systems, taking into account the relationship of waste heat effects from Unit 2 and FitzPatrick as well as Unit 1.

Response: The NYS standards mentioned above have not been federally-approved. In such a case, the Staff is committed, under its Interim Policy Statement of Implementation of FWPCA of 1972, to apply its own judgement. Accordingly, the Staff has evaluated the environmental impact of discharging waste heat from Unit 1 into Lake Ontario via the plant circulating water. The finding is that "the Staff does not expect that the thermal discharge will have a significant deleterious effect on the aquatic biota" (this document, Section 5.5.2). Under the circumstances, it has not seemed proper to require the Applicant to change the method of waste heat dissipation (Section 9.2.1.).

It is possible that it will become legally mandatory that the waste heat dissipation system for Unit 1 be changed. In that event, response by the Applicant and possibly by the Staff is expected.

11.3.3 Total Dissolved Solids (EPA, A-56)

The EPA commented on the non-compliance with requirements for total dissolved solids.

Response: With respect to increase of total dissolved solids, the Staff has not only concluded that "no lake-wide effect will be discernible," but also that "no detectable effect on inshore waters is expected" (both on p. 5-6 of DES; also in Section 5.2.3 of this document).

The International Agreement for Water Quality of the Great Lakes with respect to total dissolved solids (TDS) is written so that it is not possible to determine whether replacing unchanged lake water would be a violation of the intent ("...should not exceed 200 mg/l..." when the TDS in the Lake already exceeds 200 mg/l). It is also considered not possible to determine whether the addition of some 4 mg/l of dissolved solids to the Unit 1 circulating water discharge for about one percent of the time (See Table 3.9) would be a violation. The Staff has addressed this matter in Section 5.2.4.

11.3.4 Heavy Metal Corrosion Products in the Cooling Water (Interior, A-66)

This comment suggests that the potential environmental impact on Lake Ontario of heavy metal concentrates in the cooling water be discussed,

Response: The Applicant has indicated the following (see Appendix C, p. C-14).

A number of Lake Ontario water quality parameters was analyzed in the vicinity of Nine Mile Point and in the Unit 1 cooling water discharge during 1972. These data were presented in a report submitted to the New York State

Department of Environmental Conservation in February 1973. (Effect of Circulating Water Systems on Lake Ontario Water Temperature and Aquatic Biology - Nine Mile Point Unit 2, QLM Project No. 191-9).

The minimum and maximum values of six samples collected monthly during the period April to November 1972 (May and October excluded) were analyzed for heavy metals. (These values are presented in the table on page C-15, Appendix C.) Evaluation of these values indicates a negligible contribution of the plant to lake water concentration of heavy metals.

11.4 LIQUID EFFLUENTS

11.4.1 Dissolved Noble Gases (DEC, A-28)

This comment notes that dissolved noble gases are not included in the staff's estimate of liquid effluent releases. The quantities and environmental effects of dissolved noble gases should be included in light of the proposed 5 curie release limitation.

Response: The staff has assessed the resulting dose from dissolved noble gases in liquid releases from BWR's as less than 0.5 mrem/yr. We consider this dose rate to be negligible.

11.4.2 Compliance with WASH-1258 Conditions (DEC, A-29)

This comment is concerned that the conditions of WASH-1258 (Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criteria "As Low as Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Reactor Effluents) will not be met by the upgraded radwaste system.

Response: WASH-1258 is a review of many systems for proposed rulemaking and is not meant to be a Regulatory Guide for design. The upgraded system does meet the guidelines of Regulatory Guide 1.42.

11.4.3 Operating Liquid Effluent Releases (DEC, A-29; EPA, A-47)

These comments are concerned with the fact that actual operating experience has resulted in higher liquid releases than calculated by the staff and question the applicability of the AEC standard model for evaluating the liquid radwaste system and the contention that the upgraded liquid radwaste releases will meet the ALAP guidelines.

Response: The Assumptions used in the standard AEC model are based on operating data from several operating reactors, including Nine Mile Point, Unit 1. Consequently, these parameters best represent nuclear power reactor

operating experience averaged over the life of the plant. Thus, the operation of all similar plants can be compared. Equipment leakage and decontamination water usage at Unit 1 have been greater than the expected for a plant of this type. Corrective action includes the upgrading of the liquid radwaste system to include a new ultrasonic resin cleaner and a new liquid radwaste concentrator unit.

Actual releases of radioactive materials to unrestricted areas will be controlled by revised limits in the Technical Specifications which will condition the operating license and which will be consistent with the ALAP guidelines.

11.4.4 Dose Assessment for Liquid Releases (EPA, A-48)

This comment suggested that extrapolations from the existing operating data associated with liquid releases be used for the dose calculations in order to present a more realistic picture of the impact of this facility.

Response: At the time the dose calculations for the DES were performed only 1971 operating data were available. However, inspection of 1972 data indicates no variations which would significantly change the Staff's estimate of the radiological environmental impact of Unit 1.

11.5 SOLID RADIOACTIVE WASTE

11.5.1 Isotopic Breakdown of Solid Waste (DEC, A-30; Interior, A-67)

This comment suggested that the isotopic breakdown, particularly the alpha content, be presented in order to better evaluate the solid waste disposal problem, demonstrate that these wastes will meet burial criteria and identify the location planned for offsite burial.

Response: The major quantity of radioactivity will be contained in wet solid wastes which will consist mainly of spent demineralizer resins, filter sludges, and evaporator bottoms. We consider that all wet solid waste will be stored onsite for 180 days prior to shipment. This period of onsite storage allows short lived radionuclides time for decay. Dry wastes will consist of ventilation air filters, contaminated clothing, paper and miscellaneous items such as tools and laboratory glassware. We assume that these wastes are shipped as packaged and not held for decay.

Based on evaluation of similar type reactors and data from generating plants, we estimate greater than 90% of the radioactivity associated with the solid waste will be long-lived fission and corrosion products, principally Cs-134, Cs-137, Co-58, Ce-60, and Fe-55. The alpha content of the solid waste is expected to be negligible.

The offsite location for burial has not been selected. However, it will be a commercial burial ground which has been licensed by the AEC.

11.5.2 Operating and Predicted Radioactivity Levels for Solid Wastes
(DEC, A-30)

This comment suggests a discussion explaining or indicating the significance of the staff's estimate for the radioactivity being approximately 10 times higher than actual experience at Unit 1 for approximately the same volume of solid waste.

Response: The Staff is of the opinion that it is too early in the life of this plant for the operating data to reflect the average curie content of the solid radwaste expected to be generated over the 40-year life of the plant. The Staff is in the process of reevaluating its model in light of more recent data from operating BWR's.

11.5.3 Offsite Disposal of Solid Radioactive Waste (Interior, A-67)

This comment indicated that the environmental statement should consider an evaluation of the solid radioactive waste disposal site, including licensing provisions, criteria, and responsibilities. Specific concerns include hydrogeologic suitability, surveillance and monitoring, and remedial/regulatory actions that might be required.

Response: The concerns expressed in this comment are appropriately addressed in the AEC document "Environmental Survey of the Nuclear Fuel Cycle." As noted in that document, the environmental effects of the entire uranium fuel cycle with regard to an individual reactor are small. Further, the potential for any significant effect from the disposal of solid radioactive wastes from a reactor is extremely limited due to (1) the small quantity of radioactivity contained in the wastes, and (2) the care taken in establishing and monitoring commercial land burial facilities. Commercial land burial facilities must be located on land which is owned by a state or the Federal government, and after radioactive wastes are buried at a site the land must not be used for any other purpose. Authorization to operate a commercial land burial facility is based on an analysis of nature and location of potentially affected facilities and of the site topographic, geographic, meteorological, and hydrological characteristics; which must demonstrate that buried radioactive waste will not migrate from the site. Environmental monitoring includes sampling of air, water and vegetation to determine migration, if any, of radioactive material from the actual location of burial. To date, there have been no reports of migration of radioactivity from commercial burial sites. In the event that

migration were to occur, plans for arresting any detected migration have been developed. On the basis of the general environmental considerations of burial sites now developed, the wide range of wastes that can be buried, and the observation that an applicant is not restricted to a specific burial site, the staff believes that a detailed discussion of solid radioactive waste disposal sites is inappropriate to an environmental statement for any one nuclear power plant facility.

11.6 ENVIRONMENTAL MONITORING PROGRAMS

11.6.1 Radiological Monitoring Program (Commerce, A-8)

This comment suggested that a list of organisms typically sampled and subjected to radioanalysis should be presented in the Final Environmental Statement.

Response: A list of organisms typically sampled and analyzed is presented in Table 6.1.

11.6.2 Implementation of the Revised, Comprehensive Aquatic Monitoring Program (DEC, A-22)

A comment was made regarding implementation of the Applicant's intensive ecological monitoring program so that redesign of the intake system, if required, can be accomplished with appropriate dispatch.

Response: The Staff recognizes the urgency for data collection and evaluation so that redesign of the intake system, if necessary, may be accomplished with minimum possible delay. As discussed in Section 6.1, the Applicant began collecting data in March 1973 for the General Ecological Survey and June 1973 for the Impingement and Entrainment portions of the program.

11.6.3 Thermal Monitoring Techniques (Interior, A-71)

This comment suggests that the thermal monitoring program be modified to include techniques developed in conjunction with the Surry Nuclear Power Station (A-71).

Response: A revised monitoring program is included in the FES and is designed to detect changes in Lake Ontario ecosystem in the vicinity of this station.

11.6.4 Atmospheric Dispersion Factor (Commerce, A-10)

This comment desires an explanation of the difference between the highest, offsite annual average concentration factor computed in 1967 and the value presented in the DES.

Response: The difference between the highest, offsite annual average concentration computed in 1967 (5×10^{-8} sec. m^{-3}) and that presented in the DES (1.9×10^{-8} sec. m^{-3}) can be attributed to different stratification of the meteorological data used and to different plume rise formulas.

In its evaluation, the staff used the meteorological data presented in the Nine Mile Point Unit 2 PSAR. Although basically the same as the data presented in the Unit 1 docket, the joint frequency distributions of wind speed and direction by stability were furnished stratified into seven Pasquill stability classes (A-G) based on temperature differences (ΔT) between two levels on the tower. The data used in 1967 had only four stability classes which were based on the Brookhaven turbulence classification (classes I-IV). The staff determined the plume rise above the stack top using equations developed by Briggs, while in 1967, the plume rise was estimated by using an equation attributed to Holland with a correction of a factor of three.

The staff believes that the value presented in the DES has been determined in accordance with present practice within the AEC Regulatory staff.

11.6.5 Use of Operating Data to Assess Environmental Impact (Commerce, A-3; HEW, A-13; EPA, A-51)

These comments indicated that actual measurements rather than estimates should have been used in assessing the environmental impact of the plant since it had started operations in 1969.

Response: Although the plant commenced operation in 1969, the Applicant did not anticipate the data requirements for a reasonable environmental impact assessment. The Applicant has been informed of these inadequacies in existing data and under the licensing conditions, the Applicant will collect data such that actual environmental damage may be recorded. However, due to lack of these data at the time of assessment, the Staff has relied on conservative estimates of damage to biota to arrive at a reasonable assessment.

11.7 TRANSMISSION LINES

11.7.1 Transmission Line Sound Levels (DEC, A-32)

This comment requests that data on the sound levels produced by the 345-kV and anticipated by the planned 765-kV transmission lines be discussed. Plans for the addition of higher voltage lines and the resulting potential for increased sound levels should also be addressed.

Response: The Applicant has stated (see Appendix B, p. B-86) the following:

The Applicant has a 765-kV transmission line (presently operated at 345-kV) in service.

To gain a better understanding of the audible noise which the bundle arrangement and conductor selection for this circuit would give, Applicant retained the professional services of Acres American, Inc., Bolt, Beranek and Newman of Cambridge, Massachusetts, consultants in the field of audible noise phenomena, and Westinghouse Electric Corporation to study audible noise on high voltage transmission lines.

Westinghouse Electric Corporation conducted audible noise measurements indoors at the Trafford High Voltage Laboratory and field measurements at the 750-kV project at Apple Grove, West Virginia. However, there was little valid agreement between laboratory and field data because acoustical measurements in an indoor laboratory are affected by the enclosure.

The measurements made by Bolt, Beranek and Newman (BB & N) were conducted during two occasions near Quebec City, Canada, where Hydro Quebec operates a 735-kV transmission line which has a four (4) conductor bundle configuration with 1.38 inch diameter conductor and a fifty foot phase spacing. This arrangement is similar to our 765-kV conductor size and bundle arrangement, and thus was ideal for audible noise measurements. Measurements were taken directly beneath the mid-span of the conductors and at various distances from the outer phase. During fair weather the audible noise from the transmission line was lower than the background noise from insects and other sources so that readings were difficult to obtain.

Bolt, Beranek and Newman have made up category classification and Noise Criterion curves (See Appendix B, Fig. 1, p. B-89 and Table I, p. B-90). This family of Noise Criterion (NC) curves has been used in noise control work for over fifteen years for design and evaluation of existing noise conditions. These curves accurately correlate the subjective response of the average human ear to acoustic levels at various frequencies and intensities as measured by instrumentation. Thus, the lower curves can describe

noise levels that are considered quiet enough for resting or sleeping or for excellent listening conditions in concert halls or auditoriums, while the upper curves can describe noisy work areas. For a quiet or rural community area the NC-20 Noise Criterion is normally applied for night time indoor conditions; but in city areas, or in apartments, dormitories, or motels for sleeping areas, an NC-30 Noise Criterion is normally used.

Figure 1 demonstrates how the noise fits the Noise Criterion curves at several distances from the outer phase. This shows that only houses at about 200 feet from the outer phase would be subjected to the low noise level (NC-25 to NC-30). This low noise level would be heard only in damp weather, with windows nearest the line open, and with a low ambient noise level (including the masking of rain noise).

When the system is energized to 765-kV the Applicant will test for audible noise and evaluate feasible methods of noise reduction if required.

At this date the Applicant does not intend to install any high voltage lines greater than 765-kV.

11.7.2 Utilization of Transmission Line Right-of-Way (DEC, A-31)

This comment questions the proposed future 345-kV transmission line to be installed in the existing 500-foot right-of-way because Applicant's testimony (Garcy, NYS Public Service Commission Case 26251, Tr Page Sm 4657 of January 26, 1973), and the Final Environmental Statement for Unit 2 note that the proposed future transmission line is 765-kV.

Response: The Applicant indicated (see Appendix B, p. B-83) that the future 345-kV transmission line mentioned in Section 3.8, page 3-35 of the Unit 1 DES could extend from a new Volney Station south to the Syracuse area. The Volney Station will be located approximately nine miles south from Nine Mile Point on one of the existing 345-kV Nine Mile Point - Clay transmission circuits. The 765-kV transmission line mentioned by Garcy could extend from Nine Mile Point to Volney.

11.7.3 Ozone Production From High Voltage Transmission Line (EPA, A-56)

This comment suggested that information be provided in the Final Statement related to the impact of the high voltage transmission line ozone production rate and its potential environmental impacts.

Response: The generation of ozone as a result of corona generated by transmission lines has recently been experimentally investigated in the laboratory and field.^{2,3} These investigations indicate that, for transmission

lines up to 765 kV, the maximum ground level ozone concentration will be well below federal standards. The National Primary Air Quality Standard for photochemical oxidants, as issued by the Environmental Protection Agency, is 0.08 ppm by volume for a one-hour concentration, not to be exceeded once per year. Laboratory studies have indicated that 0.0193 ppm by volume of total oxidants might be expected at ground level. Field studies with equipment sensitive to 0.002 ppm by volume indicated no measurable oxidants at either ground or transmission line wire level. Based on these and other data, the Staff anticipates no adverse environmental effects as a result of ozone created by the high voltage transmission lines.

11.7.4 Transmission Line Interaction with Railroad Signals (DOT, A-11)

This comment indicated that the currents induced from high voltage transmission lines may cause problems with railroad signal systems and with the rolling stock.

Response: The Applicant indicated (see Appendix B, page B-40) that a proper contact with appropriate railroad owners will be made and that if the possibility of excessive voltages is indicated, corrective action will be taken to preclude the possibility of hazard.

11.8 REACTOR ACCIDENTS

11.8.1 Accident Probabilities (EPA, A-49)

A comment was made by EPA concerning the analysis of the probabilities of occurrence of the classes of accidents discussed in Section 7.1.

Response: Section 7.1 has been changed to respond to this concern.

11.8.2 Postulated Plant Accidents Involving Liquid Releases (Interior, A-71)

The comment indicates that the environmental effects of releases to water is lacking. Many of the postulated accidents listed in Tables 7.1 and 7.2 could result in releases to Lake Ontario and should be evaluated.

Response: Potential releases to Lake Ontario are addressed in Footnote 1 to Table 7.2 which states the following. "The doses calculated as consequences of the postulated accidents are based on airborne transport of radioactive materials resulting in both a direct and an inhalation dose. Our evaluation of the accident doses assumes that the Applicant's Environmental Monitoring Program and appropriate additional monitoring (which could be initiated subsequent to an incident detected by in-plant monitoring) would detect the presence of radioactivity in the environment in a timely manner such that remedial action could be taken if necessary to limit exposure from other potential pathways to man."

11.9 ALTERNATIVES

11.9.1 Cooling Tower Noise Levels (DEC, A-40).

This comment requests additional discussion of the Applicant's study of the increased sound level associated with forced and natural draft cooling towers.

Response: The Applicant indicated (see Appendix B, p. B-111) that the study results determined that no residences, schools, or hospitals would receive a sound level greater than 65 dbA. Ten residences would be within the 45 to 65 dbA range with a natural draft cooling tower and forty residences would be within this range with a mechanical draft cooling tower.

It should be noted that the estimates used to determine the sound level contours are conservative and do not include attenuation from trees, terrain, or meteorological conditions which would reduce the offsite noise.

11.9.2 Estimated Emission Quantities from Oil and Coal Fired Plants (Interior, A-72)

A comment took issue with the Staff's expected emissions of carbon monoxide and hydrocarbons from oil fired and coal fired plants.

Response: The emission data given on page 9-4 (carbon monoxide, aldehydes, hydrocarbons) is based on the best data available to the Staff, that of the EPA publication referenced. The estimated emissions are actually quite small relative to the major emissions of the hypothesized fossil-fueled plants, namely carbon dioxide and (for the oil-fired plant) water vapor. For example, at full power the coal-fired plant would emit about 45 million pounds per day of carbon dioxide so that the estimated/dioxide ratio is only .01% (mass) or .017% (atom).

11.10 Location of Principal Changes in this Statement in Response to Comments

<u>Topic Commented Upon</u>	<u>Agency</u>	<u>Section Where Topic is Addressed</u>
Combined Effects of Unit 1, Unit 2 and FitzPatrick Plants.	Commerce, A-2, 6, 7 HEW, A-12 DEC, A-23 EPA, A-54 Interior, A-68	Forward

<u>Topic Commented Upon</u>	<u>Agency</u>	<u>Section Where Topic is Addressed</u>
Status of Reviews and Approvals	DEC, A-25	1.1
Lake Water Hydrology	DEC, A-26 Interior, A-65	2.5.2
Aquatic Ecology	Interior, A-65	2.7.2
Power Rating	DEC, A-24, 26	3.2
Heat Dissipation System	DEC, A-26	3.4
Intake Structure	Commerce, A-6 DEC, A-27, 28	3.4.1
Discharge Structure	DEC, A-28	3.4.2
Nuclide Symbols	DEC, A-24, 29, 30	3.5.1.6 3.5.2.2.
Upgraded Liquid Radwaste	DEC, A-27	3.5.1.2
System Diagram		3.5.1.4
Upgraded Gaseous Waste Treatment System	DEC, A-30	3.5.2.1 3.5.2.2
Construction Effects: Station Site	Agriculture, A-16 DEC, A-31	4.1.1
Construction Effects: Transmission Lines	DEC, A-32	4.1.2
Herbicidal Maintenance of Transmission Lines	Agriculture, A-16, 17 DEC, A-32 Interior, A-69	5.1.2

<u>Topic Commented Upon</u>	<u>Agency</u>	<u>Section Where Topic is Addressed</u>
Compliance with Water Quality Standards	HEW, A-13 Interior, A-68 EPA, A-54	5.2.4
Intake Effects on Aquatic Environment	Commerce, A-7 DEC, A-20, 37 Interior, A-69	5.5.2.a
Thermal Discharge Effects	Commerce, A-7, 8 DEC, A-38 Interior, A-70	5.5.2.c
Community Effects	DEC, A-23	5.6
Aquatic Monitoring Program	Commerce, A-8 DEC, A-22, 24, 38 Interior, A-70 EPA, A-53	6.1
Terrestrial Monitoring Program	DEC, A-24	6.4
Reactor Accidents	EPA, A-49	7.

REFERENCES

1. Csanady, G. T., "Dispersal of Effluents in the Great Lakes," Water Research, 4, 79-114 (1970). In particular, see pages 106-107.
2. Scherer, H. N., Jr., B. J. Ware, C. H. Shih (1972). Gaseous Effluents Due to EHV Transmission Line Corona. Preprint of Paper presented at the IEEE PES Summer Meeting, San Francisco, California, July 9-14, 1972.
3. Frydman, M., A. Levy, S. E. Miller (1972). Oxidant Measurements in the Vicinity of Energized 765-kV Lines. Preprint of paper presented at the IEEE PES Summer Meeting, San Francisco, California, July 9-14, 1972.

A-1

APPENDIX A

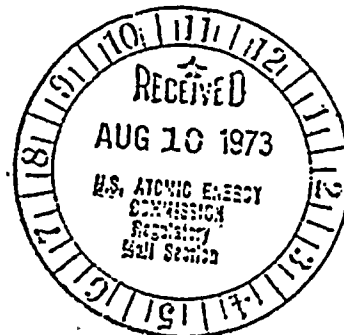
COMMENTS ON

DRAFT ENVIRONMENTAL STATEMENT



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

50-220



August 8, 1973

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

Dear Mr. Muller:

The draft environmental impact statement for Nine Mile Point Nuclear Station, Unit 1, which accompanied your letter of July 5, 1973, has been received by the Department of Commerce for review and comment.

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

General Comments

In the Summary and Conclusions section, as well as in the main text, the staff concludes that the plant's operation will have no significant impact on the biota in Lake Ontario. This type of lakewide approach fails to adequately consider all the point sources of waste heat that should be included in the evaluation if the lake as a whole is used as the unit of measurement of significant impact. In addition, the statement should include a discussion of the plume interaction with Nine Mile Point Unit 2, and the nearby James A. Fitzpatrick Nuclear Power Plant. Secondly, consultation with appropriate State and Federal agencies should be included in the design of the comprehensive environmental monitoring program. These agencies should also be involved in the evaluation of the information collected.

- 2 -

Since this plant has been operating under a provisional license since 1969, actual measurements, rather than estimates, of environmental impact have been possible. This greatly increases the confidence one can place in the conclusions.

From our point of view, the statement is satisfactory with regard to consideration of this single power station's impact on the environment. It appears, for example, that the thermal effect on the lake will be negligible. But what about the big picture? How many plants of this type can be constructed before the cumulative effect is no longer negligible? We should not consider each case as a separate problem. The National Oceanic and Atmospheric Administration's International Field Year for the Great Lakes Project Office recently completed an extensive study of Lake Ontario and they can provide input to this aspect of the impact statement.

Section 2.7.2, Aquatic Ecology

Page 2-18. It is stated that "Despite the high nutrient content of Lake Ontario, the fish production is rather low." Although fish production is presently low for a lake with the productive capacity of Lake Ontario, the situation may be altered in the near future. The Great Lakes Fishery Commission treated all lamprey spawning streams last year, and the Canadian streams and several key streams in U.S. waters again this year. Moreover, fishery management agencies in New York and Ontario have been planting salmonid species in Lake Ontario, and these agencies plan to intensify this activity in years to come. Since the forage base in Lake Ontario is as good or better than that in Lake Michigan when the Lake's salmon stocking program was begun in 1965, it is expected that the fishery which would develop in Lake Ontario will be equally as good. New York has planted salmonids in the Salmon River (10 miles east) and the Little Salmon River (6 miles east). Both rivers are close enough to the plant site that the fish leaving and returning to them could conceivably pass the intake and discharge of the Nine Mile Point Nuclear Station.

With regard to the assertion that the reason the alewife has flourished is that large predators have not been present, it is now thought that the population of alewife, an early colonist

of the lake, stabilized prior to the decline of the large predators. This recent theory is supported by the resurgence of premium fish stocks in the 1920's and newspaper reports during the same era of two major alewife mortalities.^{1/}

Concerning the controversy between Smith (1970) and Christie (1972), Christie (pp. 920-921) provides the following analysis of the interactions between the colonists and the native species in Lake Ontario:

"Of the species of fish which invaded or were introduced into Lake Ontario in the last century, the carp and alewife were the most obviously successful. Both must have affected other species in important ways, but it is difficult to make judgments because of the early colonization of these species.

"ALEWIFE

"Smith (1970) has argued on the basis of the recent effects of alewife colonization of the upper Great Lakes, that the species effectively caused all the misfortunes of the Lake Ontario fish stocks subsequent to its establishment there in the 1870s. The view held by the present author however, is that whatever the initial impact, the resurgence of the premium fish stocks in the 1920s in the face of heavy alewife densities, argues in favor of a harmless role for the alewife. The resurgence of the deepwater ciscoes (Coregonus sp.) in the 1930s was also seemingly unaffected by the alewife. Equally important, the collapse of the ciscoes was not followed by a surge of alewife abundance as might have been expected if competition pressure had been a major consideration.

There are no statistics with which to evaluate trends in alewife abundance but it has been assumed by Pritchard (1929) and Graham (1956) that the frequency of heavy

^{1/} Christie, W.J. 1972. Lake Ontario: effects of exploitation, introductions, and eutrophication on the salmonid community. J. Fish. Res. Bd. Can. 29:913-929.

spring beach mortalities is at least a rough indication of alewife density. On this basis, newspaper reports of two major mortalities in the 1920 decade do not suggest that the alewife, like the ciscoes, were scarce during the period of peak predator abundance. Dymond (1928) found that the alewife was an important item in the diets of both lake trout and burbot, but noted alewife were not as often eaten by the trout after the alewife moved inshore in the early summer. Juveniles would have been largely protected from these species by reason of their inshore distribution, and it is possible that the post-spawning adult alewife did not extend lakeward very far into the range of these predators in late summer. Wells (1969) found that trawling in September in Lake Ontario produced 81.2 alewife per tow at 120 ft. (37 m) and less, and only 7.2 for tows at 180 ft. (55 m) and greater. This would certainly reduce it, and possibly enough to reduce the severity of the predation impact on alewife adults. Predation on both juveniles and adults in the inshore areas is on the other hand, heavy, and inflicted by many fish species. The lack of obvious change in the abundance of the alewife stocks after the 1940s is especially compelling evidence that the abundance is limited by inshore factors, and possibly by the effects of the mortalities themselves to some extent."

Section 2.7.2.a, Fishes

Page 2-19. With regard to the Applicant's echo-sounder survey, more information should be supplied concerning the type of fathometer used and what its capabilities were for detecting concentrations of fish larvae, fry, and young-of-the-year. In addition, an example of a fathometer recording should be provided, including an explanation of its interpretation.

Page 2-22. It is stated that "The Applicant has not seined in in the area and therefore no information on juveniles near the shore is available." Newly hatched young-of-the-year alewives

begin to show up in seine catches in the middle of August and remain inshore until late fall.^{2/} Therefore, from late spring until fall larval and juvenile alewives would be susceptible to entrainment. In addition, the spottail shiner, also abundant inshore, remains inshore (in depths of less than 50ft); this species is considered an excellent forage stock.

Section 2.7.2.d.(2), Phytoplankton

Page 2-25. It is stated that "Very few fish larvae were observed in the plankton samples. . .". The sampling equipment used to collect plankton, fish eggs, and larvae should be described, and available data and literature on the comparative efficiency and effectiveness of the various types of sampling methods and equipment should be evaluated and discussed. In our opinion, if information from reference 30 was used to determine the abundance and distribution of fish larvae, sample collection with a Nansen bottle, as used in this survey, virtually precluded any larval entrapment.

Section 3.4.1, Intake Structure

Page 3-7. An estimate for the intake velocity at the traveling screens should be provided.

Section 5.2.2, Thermal Studies

Page 5-2. The combined effects of Nine Mile Point Unit 1, Nine Mile Point Unit 2, and the James A. FitzPatrick Nuclear Power Plant should be evaluated by the thermal studies.

Section 5.5.2.a, Effect on Aquatic Environment - Intake Effects

Pages 5-31 through 5-35. Given the tendency for fish to concentrate along the 25-ft. depth contour and the location of the intake at about the 20-ft. contour, and given the numbers of fish entrained

2/ Dr. Wilbur L. Hartman, Personal Communication. (Project Leader, Ecology of Fish Populations of Lower Great Lakes, Bureau of Sport Fisheries and Wildlife, Sandusky Field Station, 2022 Cleveland, Road, Sandusky, Ohio 44870.)

and subsequently impinged according to studies to date, even though not sufficient to permit a valid quantitative assessment of the problems of impingement, it is apparent to us that a potentially serious impingement problem may develop. We believe that this situation may require corrective action to reduce the intake velocity to 1 ft/sec or less, in addition to conducting the monitoring program. We also recommend that evaluation of the fish-kill problem be coordinated with the appropriate State and Federal agencies. Finally, we consider the statement that "The Staff does not intend to imply that fish impingement at the Station will produce significant adverse effects on lakewide fish populations" to be misleading. This statement should be revised to consider the effects of all water intakes in the lake if the entire lake is to be the frame of reference for evaluating the effects of this power plant on fish populations in Lake Ontario.

Section 5.5.2.c, Thermal Discharge Effects

Page 5-37. This section should include information on the combined effects of the Nine Mile Point Unit 2 and James A. FitzPatrick plants.

Yellow perch, a common fish in the area, require a given period of time at 4°C or below for maturation. 3/ The possibility that those fish remaining in or near the plume may not receive this low-temperature exposure and that they would, therefore, not mature should be discussed. This discussion should include appropriate data and documentation.

Section 5.5.2.c.(1) Fishes

Page 5-38. We suggest that the tagging study referred to in the fourth paragraph be required, rather than simply recommended, by the Staff.

3/ Edsall, T. A. and T. G. Yocom. 1972. Review of recent technical information concerning adverse effects on once-through cooling on Lake Michigan. Prepared for the Lake Michigan Enforcement Conference, September 19-21, 1972, Chicago, Ill., U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Great Lakes Fishery Laboratory, Ann Arbor, Michigan 48107. 86 pages.

- 7 -

Section 5.5.2.c.(3), Benthos

Page 5-39. The impact of sinking plumes on the benthic community should be discussed in this section.

Section 6.1, Aquatic Monitoring Program

Page 6-1. Based on the Staff's assessment that the present environmental studies now proposed and being carried out by the Applicant are inadequate to assess the effects of operation of the Station, we recommend denial of the full-term operating license until an adequate environmental monitoring program has been established and coordinated with appropriate State and Federal agencies.

A map depicting the sampling transects and stations should be provided in the final environmental statement.

With reference to the Staff's recommendation for improvements in the monitoring program (pages 6-2 and 6-5), we basically agree with the proposed changes. However, we feel that some sort of tabular format should be used to summarize for the reader the improved program. In addition, this program should be coordinated with appropriate agencies, as suggested above.

With regard to a sampling procedure that would permit reporting the results in terms of biomass per unit area, the possible use of a Ponar dredge for benthic work should be discussed.

Section 6.3, Radiological Monitoring Program

Page 6-6. A list of organisms typically sampled and subjected to radioanalysis should be presented in the final environmental statement. In our opinion, the primary function of an environmental impact statement is to serve as a full disclosure document. Therefore, we do not believe it is sufficient to merely refer the reader to a document such as the Applicant's Environmental Report, which may or may not be readily available to the reader. If the Staff disagrees with our opinion on this matter, we would appreciate a full explanation in the final environmental statement.

Section 9, Alternatives to the Proposed Project

Page 9-1. This section should include a complete environmental analysis of each alternative so that informed conclusions can be drawn and decisions made by responsible officials and others who review this document.

The warm water plumes tend to be close to the lake shore, due to the exposed location and the lake currents flowing near the shore. This could have some effect in reducing nearshore ice cover. However, this will cause no adverse effects either on water intake or shore erosion. The calculated increase in average lake surface temperature of about 0.002° F has no physical meaning and may mask adverse local effects. Much more meaningful is the area affected by a significant temperature increase.

To reduce the fish entrapment in the intake system and thus fish kills, the report recommends that alternative intake structures be examined. It is suggested that in addition to the above, a fish replenishment program be considered. Samplings indicate that 82% of the fish killed are the alewives and smelts. This low quality fish could be replaced by more desirable fish from hatcheries in the same or significantly larger amounts.

As described on page 3-23, the major source of radioactivity released to the open atmosphere during reactor operation is the off gas from the main condenser air ejectors. These off-gases are allowed to flow through a 30-minute holdup pipe before being discharged through the main plant stack. Consequently, we would consider the release to be continuous throughout the year and, assuming a rather uniform source emission rate, average annual diffusion parameters can be appropriately used.

In our comments on the Final Safety Analysis Report for this facility sent to the Atomic Energy Commission Division of Reactor Licensing on December 18, 1967, we computed that the

- 9 -

highest off-site annual concentration is 5×10^{-8} sec m^{-3} at a distance of 2 km to the northeast corner of the site assuming the effluent is released from a 350-ft. stack. This is somewhat higher than the 1.9×10^{-8} sec m^{-3} computed by the staff in table 5.7.

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

Sincerely,

Sidney R. Galler
Sidney R. Galler

Deputy Assistant Secretary
for Environmental Affairs

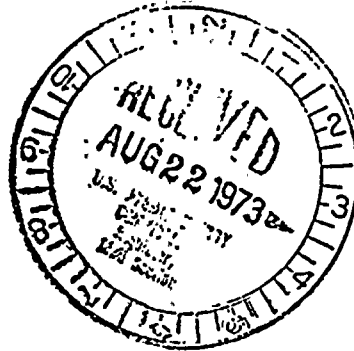


DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS: (G-WS/83)
U.S. COAST GUARD
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: 202-426-2262

17 AUG 1973

50-220



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

Dear Mr. Muller:

This is in response to your letter of 5 July 1973 addressed to Assistant Secretary Davis concerning the draft environmental impact statement for Nine Mile Point Nuclear Station, Unit 1, Lake Ontario, Oswego County, New York.

The concerned operating administrations and staff of the Department of Transportation have reviewed the material submitted. Noted in the review by the Federal Railroad Administration is the following:

"The Federal Railroad Administration commented at some length (6 Feb. 1973) regarding the applicants request for licensing of Nine Mile Nuclear Station Unit No. 2. Our continual concern over the inductive coordination problem with railroad signal and communication lines is also applicable to this more recent statement for Unit No. 1."

The U. S. Coast Guard commented as follows:

"It is noted that there may be a necessity to mark the intake and discharge points. It is recommended that the applicant contact Commander, Ninth Coast Guard District (oan) at 1240 E. Ninth Street, Cleveland, Ohio, 44199, for further amplification."

The Department of Transportation has no further comments to offer on this draft statement. We have no objection to the project, nor to its implementation. The final statement, however, should address the concern of the Federal Railroad Administration and the Coast Guard.

The opportunity for the Department of Transportation to review this draft environmental impact statement for Nine Mile Point Nuclear Station, Unit 1 is appreciated.

Sincerely,

R. I. PRICE
Acting Chief, Office of Marine
Environment and Systems

MEMORANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY

50-220

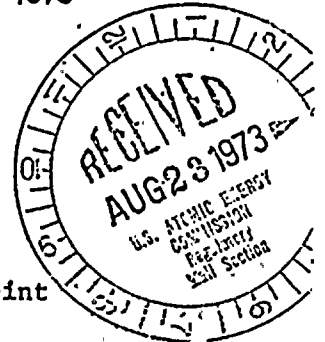
TO : Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
U.S. Atomic Energy Commission

DATE: AUG 17 1973

FROM : Acting Chief
Office of Environmental Affairs

SUBJECT:

The Draft Environmental Impact Statement on the Nine Mile Point
Nuclear Station Unit 1



Thank you for forwarding the draft environmental impact statement on the Nine Mile Point Nuclear Station Unit 1 for review. The following comments on the draft are based on suggestions by officials within the Public Health Service, H.E.W. Regional II Office and the H.E.W. Office of Environmental Affairs.

Our primary observation concerns the fact that the Nine Mile Point Nuclear Station Unit 1 is just one of three plants which are to operate essentially side by side on the southern shore of Lake Ontario. As stated in the introduction to the draft EIS, the applicant plans to construct a Unit 2 station adjacent to the Unit 1 site which will produce almost twice the amount of Unit 1's electrical power. In addition, the Power Authority of the State of New York is building the James A. Fitzpatrick Nuclear Plant 3300 feet east of the Unit 1 Station. All three plants are to utilize once-through cooling systems with lake water. It is therefore necessary that cumulative thermal effects be addressed. Likewise other cumulative effects of the three plants must be considered.

While the draft indicates that separate environmental statements have been prepared for these additional facilities, we have not received copies of them for review and have no way of knowing their content. We are unable therefore, to assess the environmental effects the proposed action will bring about in its actual operational context.

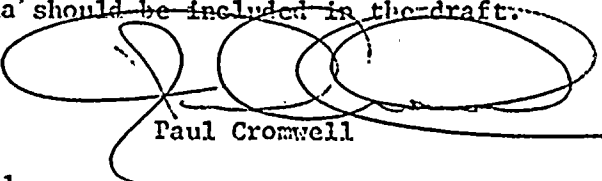
It would appear that a thorough analysis of the environmental impact of the Unit 1 Station requires consideration of the cumulative effects of all three nuclear plants including the effects of thermal discharges, gaseous effluents, liquid effluents, releases of radioactive materials, fish impingement, transmission lines, as well as the effects of increased populations on human services. This may, for reasons unknown to us, be unnecessary,

but, if so, the present limited approach should be justified in the statement.

Our more specific comments on the content of the draft EIS for the Unit 1 Station are as follows:

- 1) It is suggested that the upgraded liquid waste systems referenced in Sections 3.5.1.2., 3.5.1.4., and 3.5.1.6., and the gaseous waste treatment system referenced in Section 3.5.2.2., should be operational before a full-term license is granted the Niagara Mohawk Power Corporation for the Nine Mile Point Nuclear Station Unit 1.
- 2) In Section 2.7.1., describing the Terrestrial Ecology of the site, it is stated that the southern shore of Lake Ontario is a major migration route used by many birds including the American osprey and the bald eagle. Subsequently it is said that a terrestrial survey of the site found that no rare or endangered species of plants or animals were present. There seems to be an inconsistency here as the American osprey and the bald eagle are both listed as endangered species and as the site of the Unit 1 Station makes up part of the southern shore.
- 3) The information provided on the operational effects of the Unit 1 Station on aquatic biota is lacking. It does not allow for a thorough assessment of the environmental impact of the proposed action and therefore, offsets the environmental effects to be weighed in the decision-making process.
- 4) We note that the once-through cooling system utilized by the Unit 1 Station fails to meet the current New York State thermal criteria. These criteria "limit the rise in surface temperature to 30°F over the ambient temperature within 300-foot radius or equivalent area from the point of discharge". (5.2.2.) Studies of the thermal effects of the Unit 1 Station have shown that at times "even at a depth of 5 feet, approximately one and a quarter of shoreline had temperatures greater than 50°F above ambient". (5.2.2.) Further information should be provided as to the effects, including health effects, of this rise in temperature above the standard. It would also be useful to address legal ramifications of failing to meet the criteria.

- 5) Given the information provided in the draft, we find that the Unit 1 Station fails to consistently meet the minimum Federal Water Quality Criteria for phosphorus concentrations. More precise information on phosphorus effects and the legal considerations of failing to meet the criteria should be included in the draft.



Paul Cromwell

cc: Dr. Ian Mitchell
Mr. William Matuszeski

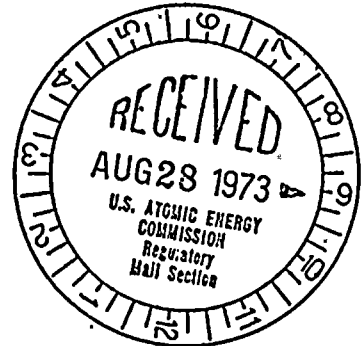


DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

50-220

August 24, 1973

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



Dear Mr. Muller:

We have had the draft environmental statement for the Nine Mile Point Nuclear Station Unit 1, Niagara Mohawk Power Corporation, reviewed in the relevant agencies of the Department of Agriculture, and comments from Soil Conservation Service and Forest Service, both agencies of the Department, are enclosed.

Sincerely,

A handwritten signature in dark ink, appearing to read "F. H. Tschirley". The signature is written in a cursive style and is positioned above the typed name and title.

FRED H. TSCHIRLEY
Acting Coordinator
Environmental Quality Activities

Enclosures

Soil Conservation Service, USDA, Comments on Draft Environmental Statement prepared by AEC for Nine Mile Point Nuclear Station Unit 1 (Conversion for Operating License Stage to Full-Term Operating License)

General Comment

The major proposed action concerns conversion of a current operating license to a full-term license which, in itself, will not have any significant effect on areas of interest to SCS.

Paragraph 4.1.1 Station Site

Construction of a new radwaste building is discussed. In the third paragraph a discussion should include a statement that topsoil will be salvaged, protected and respread during the grading operation. Prompt vegetating will be undertaken to prevent erosion of soil during construction of the building.

Paragraph 5.1.2 Transmission-line Environs (a)

"Only selective application of herbicides should be permitted ..." This is not only to encourage wildlife-habitat growth but to maintain a good vegetative cover to prevent soil erosion.

Paragraph 10.3.1 Land Use

This paragraph is summarized by a statement which says the recreational potential of the area is meager. In terms of public development, this statement may be true, but in terms of private recreation, there is more than meager potential. The paragraph might be modified to reflect this.

RE: NINE MILE POINT, NUCLEAR STATION UNIT 1,
NIAGARA MOHAWK POWER CORPORATION

FOREST SERVICE COMMENTS

We have no information to indicate that the continued operation of Nine Mile Point Nuclear Station Unit 1 will have any further adverse effect on forest land beyond that which has already occurred as a result of construction.

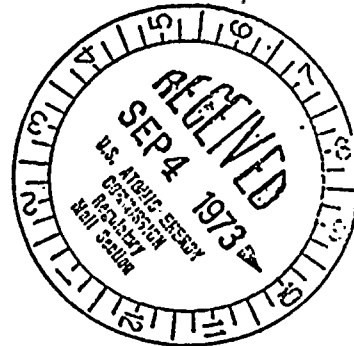
We are interested in the Staff's recommendations on the use of herbicides for transmission-line maintenance, and are particularly intrigued by the last one: "No stands of potentially poisonous plants should be sprayed with herbicides." We are curious about the basis for this recommendation.



RONALD W. PEDERSEN
FIRST DEPUTY COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY

50-220
50-220



August 29, 1973

Dear Sir:

The State of New York has completed its review of the "Draft Environmental Statement Related to the Nine Mile Point Nuclear Power Plant Unit No. 1", (Docket No. 50-220). The statement was prepared by the Commission's Directorate of Licensing and issued in July 1973.

In preparing the attached comments, we have taken into consideration the views of all appropriate State agencies including the New York State Atomic Energy Council. Many of the comments are quite detailed and directed to very specific points in the draft environmental statement with the intent of clarifying and improving the Commission's final environmental statement.

We concur with the findings of the Commission staff as noted in several sections of the draft statement that studies conducted by the applicant are not sufficient for a reliable assessment of some aspects of probable environmental impacts of plant operation. For example, the data supplied by Niagara Mohawk Power Corporation are not definitive enough to ascertain the extent of impact on fish resources as a result of plant operation.

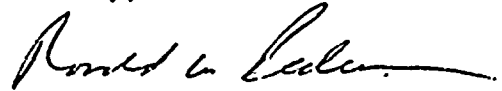
The deficiencies noted in the attached comments, and those discussed by the Commission staff in Section 6 of the draft environmental statement, indicate that additional information should be furnished to assess the long-term impact of plant operation on aquatic life. Until sufficient data using reliable methods of sampling and accurate assessment of this information are provided to generate a reasonable level of data confidence, we cannot concur with the Commission staff conclusion that a full-term operating license should be granted. However, if the Commission issues a full-term operating license under these circumstances, the license should be issued only with appropriate conditions to assure protection of the environment.

- 2 -

It is gratifying to note that the statement contains a section on alternate intake systems. New York State has urged the Commission to include this information on several other draft environmental statements.

However, without the information being available regarding the various intake systems to be examined (p. 9-17), the State cannot adequately assess the benefits and costs of various systems designed to reduce one of the plant's most significant environmental impacts. It is requested that the Commission direct their comments on examination of the suggested alternatives to the applicant and defer the issuance of a final environmental statement until the information is provided and properly assessed. This information should also be supplied to the various federal and state agencies reviewing the draft environmental statement. Their comments should also be solicited following a review period.

Sincerely,



Enclosure

United States Atomic
Energy Commission
Washington, D. C. 20545

Attention: Deputy Director for Reactor
Projects, Directorate of
Licensing

NEW YORK STATE
COMMENTS
on the
U.S. ATOMIC ENERGY COMMISSION'S
DRAFT ENVIRONMENTAL STATEMENT
for
NINE MILE POINT NUCLEAR STATION
UNIT NO. 1

1. General Comment

After reviewing the Applicant's Environmental Report and the AEC's draft statement, and observing the fish impingement study at the plant, three things are apparent:

1. A large number of fish have been impinged on the traveling screens;
2. A varying, but considerable portion of these come off the screens alive;
3. The process of returning impinged fish to the lake probably kills the remaining fish.

Three changes in plant and its operation would appear to reduce the kill of impinged fish. First, the normal schedule calls for the traveling screens to be stationary 57 minutes of each hour. Therefore, impinged fish are held against the screens for a considerable time. If the screens were traveling continuously, the impingement time would be greatly reduced with fewer fish dying on the screens. Second, the screens are cleaned with a very high velocity spray, which removes fish from the screens and slams them against the housing. It is felt, that the spray velocity could be reduced substantially and still

insure cleaning of the screens. If the fish were removed gently, fewer would die in this process. Third, the fish and debris from the screens flow directly into the discharge, with a temperature as much as 31.2°F above the water they just left. The fish are in the discharge tunnel at this temperature for about two minutes, and at reduced temperatures of the plume for an additional varying period. This same discharge is periodically used for disposal of chemical wastes from the laundry, regeneration wastes (page 3-33), floor drains (page 3-16), and waste collector system (page 3-13).

It is felt, that the combined effect of being held for up to 57 minutes on the screens, being slammed against the housing, and then placed in the heated and chemical discharge for two plus minutes, kills most of the impinged fish. Further, it is felt, that this kill could be reduced substantially, by cleaning the screens continuously with a reduced spray velocity and returning the fish through a separate sluiceway to the lake away from the intake and discharge areas.

It should be noted, that such measures will not insure that all fish will survive. Some impinged fish will die, and studies will have to be carried out after these modifications go in effect to determine the magnitude and significance of fish killed by impingement.

Any decision on alternate intake designs should, however, be made following the submittal by the applicant of information on alternate intake systems as suggested on Page 9-17. The above recommendations, however, should be implemented to reduce the fish kills until such decisions are made.

2. Summary and Conclusions, Page iii - License Conditions

Any Commission full term operating license for this facility should be appropriately conditioned to assure that the upgraded radwaste systems are installed in the most timely manner and further proven to operate within their design parameters.

3. General Comment

It is stated that the staff is of the opinion that the applicant's monitoring program to date has not shown that the intake system will avoid substantial fish kills, with subsequent lack of confidence on the impact of fish populations in the Nine Mile Point area. It is further stated that the applicant will be required to perform intensive monitoring at some unstated future time to determine the seriousness of this fish-kill problem. In addition, it is stated that the applicant has presented no alternatives to the design of the present intake system. Based on these statements, and the conservation assumption that the intensive monitoring program will reflect that the present intake system will not prevent "substantial" fish kills, it is considered prudent that the U. S. AEC require that the applicant implement the intensive monitoring program as soon as possible, so that redesign of the intake system, if required, can be accomplished with appropriate dispatch.

4. General Comment

With the construction of proposed Nine Mile Point Unit No. 2, the circulating water system for Unit No. 1 will be modified to a combined discharge system for both units. A discussion should be presented of the projected combined discharge velocity and thermal dilution improvements of the combined discharge system. The State's review of this report is obviously influenced by the fact that the applicant has this commitment.

5. General Comment

A discussion of the applicant's present and proposed energy conservation efforts should be included in the Environmental Statement.

6. General Comment

Most of the comments the State previously forwarded to the U. S. Atomic Energy Commission on the Nine Mile Point Unit 2 and James A. FitzPatrick Plant draft environmental statements regarding thermal/hydraulic water quality considerations are applicable to this draft environmental statement.

7. General Comment

A discussion of the effects that the construction and operation of the station has had on the local community should be included in the Environmental Statement. The impact on schools, housing, local roads, etc., with a statement on the net societal impact should be addressed in this discussion.

8. General Comment

There are numerous editorial oversights throughout the document. For example:

- a. Page Numbering - The page beginning each section should be numbered, i.e. 1-1, 2-1, etc. This is consistent with other environmental statements such as Ginna's Draft of April 1973, and FitzPatrick's Final of March 1973.

- b. Cover - the word "Energy" is missing in the title "United States Atomic Energy Commission."
 - c. Section 3.5.1.2, Page 3-16 - The first word of the paragraph should be "In" instead of "An."
 - d. Figure 2.5, Page 2-9; Figure 3.2, Page 3-3, and Figure 3.14, Page 3-38
The poor quality of the photographs in Figures 2.5, 3.2 and 3.14 does little to promote the aesthetic features of the facility.
 - e. Nuclide Symbols - A consistent set of symbols should be used to identify radionuclides in Tables 3.2, 3.3, 3.6, 3.7, and 5.3
 - f. Section 3.7.2, page 2-18. Second from last paragraph, third line introduces a new fish to the Lake Ontario fishery, the "allleye."
9. Summary and Conclusions, Page i and Introduction, Page 1-1 (not page numbered)
These sections note that 1850 MWt is required to produce 610 MWe net. The 610 MWe net is questioned, since other Nine Mile Point Unit No. 1 documents (i.e., U. S. AEC RO Inquiry Report No. 50-220/72-110 of 11/21/72) note a higher than 610 MWe output.
10. Summary and Conclusions, B, Page iv, suggests that studies be conducted to "... evaluate the magnitude of the fish-kill problem." We submit that the fish kill is large (Table 5.12, page 5-33) and that some steps, as outlined above, be taken to reduce the kill immediately. Then conduct a monitoring program to determine the extent to which Nine Mile Point is still killing fish, and the effect of this kill on the local populations and on Lake Ontario.
11. Summary and Conclusions, Page iv - The fifth Technical Specification Requirement should be expanded to read, "The Applicant will conduct a terrestrial monitoring program to determine the environmental effects of the use of herbicides for line maintenance. Particular attention should be given to

11. (continued)

vegetation which figures significantly in the life-cycle of valued wildlife species which may occupy this right-of-way. The program . . ."

12. Summary and Conclusions, Page iii - License Conditions

The 500-foot wide cleared transmission line corridor has a significant and disturbing visual impact. The applicant should be required, as a condition of full-term licensing, to alleviate this situation by means of planting. Trees of limited height potential, and shrubs, planted in groups at selected spots where long, straight sections of the corridor occur, will reduce the tunnel-like aspect. Species of trees and shrubs having wildlife benefits should be used.

Similar plantings should be made at points where the corridor is intersected by a road or stream.

13. Table 1-1, Page 1-4

Permits from the N.Y.S. Department of Environmental Conservation are needed for the standby diesel generators and fire pump.

14. Section 2.2, Page 2-7

It is stated that the entire shoreline north of Unit 1 will be accessible to the public. This is not clear, since the Environmental Report notes that most of the site area has only recreational possibilities, except for that restricted area in the immediate vicinity of the generating station which includes the Station's immediate shoreline.

15. Section 2.4, Page 2-8

The phenomena of bedrock "pop-up" should be briefly discussed in this section. The discussion should include statements that the applicant (PSAR for Unit 2)

15. (continued)

observed no "pop-up" features of consequence during Unit 1 excavation, and that the closest reported features of consequence are near Lowville, approximately 50 miles northeast of the site.

16. Section 2.5.2, Pages 2-10 and 2-11

Paragraph 3 and Figure 2.6 note that Lake Ontario has a maximum surface temperature of 72°F during summer. Paragraph 2 of Section 3.4 (Page 3-7) states that the intake water temperature varies with the season from 33 to 77°F. Initial impact implies a discrepancy (this impact is further substantiated by statements that vertical thermal stratification exists during the summer, and that the intake structure is a minimum of 15 feet below the surface), unless it is clarified (as in the FitzPatrick Environmental Technical Specifications) that: (1) the 77°F temperature is the maximum recorded Lake temperature, and (2) that 77°F is the conservative design basis for establishing the maximum allowable discharge temperature.

17. Section 3.2, Page 3

It is stated that the reactor has a Stretch rating of 1850 MWt, corresponding to a net electrical output of 610 MWe. This is questioned, since preceding sections (Page 1-1 and i) note that these are rated values:

18. Section 3.3, Page 3-4

It is stated that the applicant proposes to use a high pressure water flush or other mechanical means to prevent fouling of the condensers. This is not clear, since high pressure water flushing is not considered mechanical cleaning.

19. Figure 3.3, Page 3-5

The figure appears to depict the existing, and not the upgraded, liquid radwaste system because floor drain sample tank drains are shown going directly to the circulating water system discharge. Thus it should be noted, at least for the radwaste portion of the water-usage flow figure, that the existing system is depicted. In addition, the discharge canal, screen house and discharge tunnel should be labeled to clarify where effluent discharges interface with the circulating water discharge system.

20. Figure 3.4, Page 3-6

Figure 3.4 is entitled "Circulating Water System: Plan."

It is recommended that this title be modified to "Intake and discharge structure locations: Plan." This title more correctly describes that portion of the cooling water system depicted, and is consistent with the description contained in Section 3.4. In addition, for clarity (Reference Figure 3.4 of FitzPatrick's Final Environmental Statement dated March, 1973) the intake and discharge tunnels should be labeled, and after "intake" and "discharge" the word "structure" added.

21. Section 3.4.1, Page 3-7

The following clarifications and corrections should be made:

- a. For clarity and for consistency with Section 3.4.2, it should be noted that the intake structure is located about 850 feet offshore.
- b. It is stated that the intake tunnel has a 74 square-foot cross section. About 78 square-feet more accurately describes the cross section of the 10 foot diameter intake tunnel.
- c. "Diagrammatic Sketch" better describes the screenwall shown in Figure 3.6

21. (continued)

c. (continued)

than "Schematic Diagram." Schematic Diagram intonates single line (wiring, piping, etc.) depictions. The title of Figure 3.6 should also be changed.

d. It should be clarified that the noted 8 fps velocity through the intake tunnel is a design velocity based on the cooling water flow requirements for maximum power output.

e. A description of the traveling screen's backwashing sequence and sluicing operation should be included

22. Section 3.4.2, Page 3-7

The following clarifications and corrections should be made:

a. It should be noted that the discharge tunnel is 10 feet in diameter.

b. It is stated that the effluent has an initial velocity of approximately 4 fps. It is not clear where in the discharge flow path this effluent velocity exists.

23. Figure 3.6, Page 3-9

The service water and fire pumps should be labeled on Figure 3.6, since paragraph 3.4.1 refers to them as being shown of Figure 3.6

24. Table 3.2, Page 3-19 - Lists the estimated annual release of radioactivity in liquid effluents. The table does not include dissolved noble gases.

Appendix I, 10CFR50 states:

"The design objectives guides for liquid effluents include limitations on both quantities and concentrations of radioactive material in effluents. The estimated annual quantity of radioactive material,

24. (continued)

except tritium, released to unrestricted areas would be limited to not more than five curies per power reactor at a site."

The quantities and environmental effects of dissolved noble gases should be evaluated.

25. Table 3.2, Page 3-19

The isotope Ru-103 is incorrectly identified as Ra-103.

26. Table 3.3, Page 3-20 and Table 3.7, Page 3-29

A license condition notes that the applicant will complete construction of a new radwaste building onsite (expected to be fully operational in late 1975 with the liquid effluent portion being operational in September 1974) to assure compliance with the "as low as practicable" criteria contained in 10 CFR 50. Tables 3.3 and 3.7 tabulate estimated annual release of radioactivity in liquid and gaseous effluents for the upgraded radwaste system. It is questioned if these releases meet the conditions of WASH-1258 - (numerical Guides for Design Objectives And Limiting Conditions For Operation To Meet The Criteria "As Low As Practicable" For Radioactive Material In Light-Water-Cooled Nuclear Reactor Effluents) for the proposed treatment provided in the upgraded radwaste system waste streams. If WASH-1258 criteria and conditions are met, it is recommended that this be noted on the concerned tables and, in addition, briefly discussed in Section 3.

27. Section 3.5.1.6, Page 3-18

The applicant's calculations regarding the present liquid waste treatment system underestimated the actual reported radioactivity, excluding tritium, in liquid releases by a factor of about fifteen thousand. The Environmental

Statement should therefore provide more than calculational evidence to support the contention that radioactivity released from the upgraded liquid waste treatment system will meet the "as low as practicable" guidelines.

28. Table 3.3, Page 3-20

In column five, the 0:0014 should be replaced by TC-99m.

29. Section 3.5.2.2, Page 3-26

The upgraded gaseous waste treatment system shows a single catalytic recombiner system. Apparently the Table 3.7 does not consider down time for the recombiner system. For the draft environmental statement of the FitzPatrick plant, a down time of ten days per year was considered and considerable noble gases were estimated to be released.

30. Table 3.6, Page 3-27

The isotope ^{83m}Kr is listed twice. The second entry should be ^{85m}Kr .

31. Section 3.5.3, Page 3-28

The section on solid waste should consider the disposal problem as this was not covered in the "Survey of the Nuclear Fuel Cycle". To better evaluate the disposal problem, the isotopic breakdown, particularly the alpha content, should be presented in order to demonstrate these wastes will meet burial criteria.

32. Section 3.5.3, Page 3-30

The staff estimate of solid waste based upon experience at other operating BWR plants is given as 11,000 cubic feet with an activity of 2700 curies. The actual experience at Nine Mile Point Unit No. 1 indicates about the same order of magnitude of total cubic feet with an activity of approximately 10% of the staff estimate. The reason or significance of this difference should be discussed.

33. Section 3.8, Page 3-35

It is stated that to allow for probable need for a future 345-kV transmission line, a 500-foot right-of-way was purchased. The future 345-kV transmission line is questioned, since applicant's testimony (Garey, NYS Public Service Commission Case 26251, Tr Page Sm 4657 of January 26, 1973), and the Final Environmental Statement for Unit 2 note that the proposed future transmission line is 765-kV.

34. Section 4.1.1, Page 4-1

The first paragraph states, "The applicant established 130 acres of the site as a wildlife habitat in 1969 by posting the northwest corner of the site." Supplement 1, of the applicant's environmental report refers to this area as a "natural wildlife refuge" (page Sl.5-1). The problem here is use of terms and intent. It would seem that the reason for posting was safety concerns for the visitor center and there is no argument against that. However, if that is the case, state it. They certainly did not "...establish ... wildlife habitat... by posting..." and it is questionable that they established a natural wildlife refuge with an active visitor center involved. It would be very desirable at some time to have an active wildlife management program on the 855 acres available, but until this is the case, no such inference should be made.

35. Section 4.1.1, Page 4-1

It is stated that no impacts on neighboring lands will result from construction of the radwaste building and that the effects will be temporary. Yet, the radwaste building will take approximately two years to complete, the James A. FitzPatrick plant will be under construction nearby and additional

35. (continued)

plants may be constructed in the vicinity. The synergetic effect might be a continuing environmental impact from construction noise.

36. Section 4.1.2, Page 4-1

We note that the station is connected to the Applicant's system by two 345kV transmission lines and the right-of-way is planned for an additional 765 kV line. The Final Environmental Statement should present data on the sound levels produced by these lines. The intention of the Applicant with regard to the possible installation of higher voltage lines and the resulting potential for increased sound levels should also be stated in the Final Environmental Statement.

37. Section 4.1.2, Page 4-2

It should be noted that the existing 500-foot corridor accommodates two 345-kV transmission lines to the Clay Substation. In addition, it should also be noted that with construction of proposed Nine Mile Point Unit 2, at least a portion of the eastern edge of the existing corridor would have to be extended to accommodate a new 765-kV transmission line.

38. Section 5.1.2 Transmission Lines

We concur with the fact that the Applicant did not have the benefit of the State of New York Department of Environmental Conservation guidelines and recommendations for transmission line location and construction (as stated in Section 4.1.2) when the original 500 ft. corridor was selected and cleared (the Nine Mile Point Unit-Clay Circuit). However, this does not preclude the use of said guidelines in the maintenance of the transmission lines which are a part of the referenced documents.

38. (continued)

Accordingly, kindly consider the following in the preparation of an environmental maintenance management plan for this installation:

- a.) "It is recognized that it will be necessary for the applicant to periodically inspect the transmission line and the roadway and to maintain said line and roadway to insure the safe transmission of power."
- b.) Danger trees, as determined by the designated representatives of the applicant and the regulatory agency, may be cut as long as conditions and limitations for such cutting are established prior to the start of operation.
- c.) Native vegetation, particularly that of value to fish and wildlife, which was saved during construction or has since reproduced to natural growing conditions and does not pose a hazard to the facility should be allowed to grow, and in critical areas should be planted in the right-of-way.
- d.) Access roads and service roads should be maintained with native grass cover, water bars and proper slope in a manner which the designated representatives of the applicant and the regulatory agency deem sufficient to prevent soil erosion.
- e.) Burning will not be permitted during maintenance operation.
- f.) The prevention and control of environmental noise pollution resulting from maintenance operations and the operation of the high voltage transmission line should conform with New York State's proposed regulations.

g.) Maintenance or land management of the right-of-way in many instances can be best accomplished by encouraging the owner or former owner to continue his land use insofar as it is compatible with the Applicant's objectives. Such land use might be the raising of various crops, grazing, and recreational uses.

39. Section 5.1.2

The following are recommended modifications to Section 5.1.2 of the Draft Environmental Statement for Nine Mile Point Unit 1. A Technical Specification for the Nine Mile Point Unit 1. should be developed using this section as modified:

- a. Section 5.1.2 (b) - change "should" to "shall"
- b. Section 5.1.2 (c) - change to "Treatment shall not be more than once every 4 years."
- c. Section 5.1.2 (d) - change "should" to "shall"
- d. Section 5.1.2 (e) - " " " "
- e. Section 5.1.2 (f) - " " " " and add at end "and their written approval secured."
- f. Section 5.1.2 (g) - Add sentence at end - "All pesticide applicators shall be certified applicators under State provisions and shall comply with applicable State standards."
- g. Section 5.1.2 (h) - No "safe" dioxin level has been established.
- h. Section 5.1.2 (i) - Add phrase at end - "and action taken to ensure that drift or volatilization be held to a minimum for future applications."

40. Section 5.1.2, Page 5-2

It is stated that "No stands of potentially poisonous plants should be sprayed with herbicides." We are curious about the basis for this recommendation.

40. (continued)

Recommendation (j) should be expanded to include a list of potentially poisonous plants.

41. Section 5.2.4, Page 5-12

In paragraph two, the maximum allowable gross beta activity should be corrected to 1000 picocuries per liter rather than the stated 100 picocuries

42. Section 5.5.1, Page 5-31

The discussion of environmental noise is inadequate. A survey should be made of sound levels in and around the plant to determine sound levels created during various modes of plant operation. The survey should include sound levels associated with high voltage transmission facilities. Results of the survey would permit an evaluation of the sound level impact from this plant, and would be useful in evaluating the potential impact of proposed Unit 2. It is suggested that a sound level study be required of the applicant, and that a statement to that effect (as recommended in comment No. 44) could be added to the Technical Specification Requirements on page iv of the Draft Environmental Statement.

43. Page 5-31

It is stated that, "The Applicant's measurements of sound intensity indicated that the maximum sound produced at the site boundaries was from the transformer at all locations; sound intensity from the transformer was equal to or less than the background noise." The acoustical environmental impact evaluation should be presented in accordance with Part 75 of Subchapter E of the NYS Public Service Commission Interim Rules for Certificates of Environmental Compatibility and Public Need for Steam Electric Generation Facilities.

43. (continued)

It is noted that transformers generally radiate pure tones which are more annoying than broad band noise of the same energy content.

44. Page 5-31

The environmental technical specifications for Nine Mile Point Unit 1 should include the following:

OBJECTIVES

To determine the sound levels created during normal plant operations at and beyond the plant boundaries.

SPECIFICATIONS

A sound survey shall be made around the plant in accordance with Part 75 of Subchapter E of the Interim Rules for Certificates of Environmental Compatibility and Public Need for Steam Electric Generation Facilities of the Public Service Commission. These measurements shall be taken following initial full power operation. The results shall be evaluated by the applicant and a report with the appropriate recommendations as to the future of the program shall be submitted to the Directorate of Licensing and the New York State Environmental Conservation Department for consideration.

BASES

The sound survey shall show the extent to which the plant affects the ambient noise in surrounding land uses. This information is needed to insure that the plant conforms to noise rules and regulations of the New York State Environmental Conservation Department. The information will also be useful to the surrounding communities for land use planning decisions. In addition, if a second plant is proposed the data will be needed for preparation of the Environmental Impact Statement for that plant.

The above sound survey and subsequent evaluation should be completed prior to issuance of a Full Term License.

45. Section 5.5.2 a. Intake Effects, page 5-31.

The fourth sentence, 2nd paragraph implies that alewives and smelt amounted to 82% of the fish species which were impinged. Actually, these 2 species are only 6.7% of the 30 species collected. Of the 12,987 fish collected during the impingement studies, 82% were smelt or alewives.

46. Section 5.5.2 a. Intake Effects page 5-34, 3rd paragraph.

The description given here of removal of fish from the traveling screens differs from the process observed at the plant. This statement infers that impinged fish removed from the traveling screens "...collect in the trash pit along with the debris," and that "The "ecological death" of these stressed and disabled fish appears inevitable." In observation of this process, the fish were removed from the screens by a high velocity spray, slammed against the housing and went directly to the discharge. A large percent of these impinged fish were alive as they entered the discharge. We submit, that ecological death is not inevitable, and that minor modifications suggested (comment #1) above would save many of these.

The theme of the last paragraph of this section was covered in comment #10.

47. Page 5-36

It is stated that "mechanical stress does not appear to be significant at moderate lake temperatures (50°-59°F), yet there is no statement of the effects of mechanical stress at other temperatures. The draft environmental statement should discuss these effects also.

48. Section 5.5.2 b. Entrainment Effects, Page 5-37

The last three sentences of this section, page 5-37, aptly sum up the subject of entrainment, particularly of fish eggs and larvae, at Nine Mile Point #1. This should be added to Summary and Conclusions, page i at the bottom of the page.

49. Section 5.5.2 c Thermal discharges Effects (1) Fishes. Page 5-37

The staff makes several references to preferred temperatures of fish. The statements are correct. However, it should be noted in this section, that these preferred temperatures are determined for the most part, by very short term laboratory experiments. And that they only indicate temperatures fish preferred over temperatures they were acclimated to at the time. Preferred temperatures in this context may or may not indicate biologically desirable temperatures for growth, maturation, reproduction, etc.

50. Section 5.5.2 c. (1) Fishes top of page 5-38.

The statement is made that occasional small fish may travel into lethal temperatures. This may or may not have any basis and references for this statement would be appreciated.

51. Section 6.1 Aquatic Monitoring Program. page 6-1

The 3rd sentence of the general statement infers that fish distributions and food preferences are known to some extent. This doesn't seem to be a fact. A better statement might be that..."Only since May 1970, has the applicant collected data that could lead to fish distribution, food..."

52. Section 6.1 c. Fishes 1st paragraph page 6-2.

In all biological monitoring programs, the need for standardization, where desirable, of methods of data recording and analysis with past and on-going

52. (continued)

Lake Ontario studies such as the International Field Year in the Great Lakes and the Department of Environmental Conservation, Cape Vincent studies should be stressed. There are considerable data available and being collected which would be valuable for evaluation of the Nine Mile Point monitoring. However, these could only be used when the Nine Mile Point data were comparable. For example, most studies on the Lake using gill nets indicate that an 11-mesh experimental gill net samples species and sizes the best. This is the gear used by the DEC, Federal studies, and others, however, the applicant has been using a 5-mesh net.

Toward the end of this paragraph, the Staff suggests seining along the shore. Trap nets (frequently tended) would be better to sample this situation.

In order to alleviate the possibility of an incomplete or distorted monitoring and assessment program, it is recommended, that the applicant review these programs with this Department, before starting studies, and periodically throughout the study.

53. Section 6.1 c. Fishes, page 6-3, 1st paragraph.

We fully agree with the Staff's statement on the value of echo sounder data. We recommend that further studies be designed to evaluate what data is actually being recorded by the echo sounder, e.g., species, size of fish recorded at various depths, size of fish that are not recorded at various depths, and conditions that alter recording patterns.

54. Section 6.1 c. Fishes, page 6-3, 3rd paragraph.

The food-preference study will have no value if gill netted fish are used. Fish in gill nets tend to loose food in the net and their gut contents give a

54. (continued)

biased view of food habits. Fish for this type of analysis need to be captured and worked up very fast to get an accurate picture of food habits.

In this same paragraph, the 5th line from the bottom, "important species" should not be limited to "commercial" importance.

55. Section 6.1 f. Entrainment Studies, page 6-4..

It should be emphasized that samples be taken with appropriate gear close to and at the level of the intake in the lake as well as the intake and discharge wells.

56. Page 9-9

It is stated that the Applicant has made a specific design study of natural and forced draft cooling towers and that one of the disadvantages of forced-draft towers is more noise. This disadvantage should be quantified in terms of the increased numbers of persons exposed to various sound levels if forced draft cooling towers were utilized.

ADVISORY COUNCIL
ON
HISTORIC PRESERVATION

WASHINGTON, D.C. 20240

50-220


September 4, 1973

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

Dear Mr. Muller:

This is in response to your request of July 5, 1973, for comments on the environmental statement for the Nine Mile Point Nuclear Station Unit 1. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comments to make.

Sincerely yours,


Ken Tapman
Compliance Officer



THE COUNCIL, an independent agency of the Executive Branch of the Federal Government, is charged by the Act of October 15, 1966, with advising the President and Congress in the field of Historic Preservation, commenting on Federal, federally assisted, and federally licensed undertakings having an effect upon properties listed in the National Register of Historic Places, recommending measures to coordinate governmental with private activities, advising on the dissemination of information, encouraging public interest and participation, recommending the conduct of special studies, advising in the preparation of legislation, and encouraging specialized training and education, and guiding the United States membership in the International Centre for the Study of the Preservation and the Restoration of Cultural Property in Rome, Italy.



A-42

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

7 SEP 1973

50-220



OFFICE OF THE
ADMINISTRATOR

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

Dear Mr. Muntzing:

The Environmental Protection Agency has reviewed the draft environmental impact statement for the Nine Mile Point Nuclear Station, Unit 1. This statement was issued in conjunction with the utility's application for conversion of its provisional operating license to a full-term license.

We concur with the AEC staff opinion that the existing monitoring program for assessing the extent of impingement and entrainment losses is inadequate. We agree with the AEC staff's recommendation that this program be substantially expanded. Because of this lack of information concerning the effects of the plant on the biota of the receiving waters, a complete assessment of the plant's environmental impact is not possible. Consequently, it is our recommendation that the final impact statement not be processed and the full-term operating license not be granted until after completion of the monitoring program and analysis of the results. In the interim, the plant should continue to operate under its provisional license.

The cooling system as now operated causes a violation of the New York State criteria for thermal discharges. We anticipate that this discharge would be in violation of a revision to Federal-State standards under the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) and would, in all probability, fail to meet effluent guidelines under the FWPCA when they are promulgated. We recommend, therefore, that the applicant evaluate alternative heat dissipation systems for this facility.

The fact that actual operating experience has resulted in higher liquid releases than those calculated leads us to

question the applicability of the AEC standard model for evaluating liquid radwaste systems. The final statement should address specifically what equipment deficiencies have occurred and what corrective actions have been taken, or what commitments have been made to take such actions, which will insure that the liquid radwaste equipment will perform as designed.

After an examination of the disparity between AEC estimates of curies released and the relative percentages of critical isotopes reported in the 1971 and 1972 operating reports for the station, we question the validity of some of the basic assumptions used by the AEC in their dose calculations for this nuclear station. Use of the standard AEC dose model is acceptable only if it adequately reflects reported operational releases from the station since 1972. This discrepancy should be rectified in the final statement.

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

Sincerely yours,

Rebecca W. Hammer
for Sheldon Meyers
Director
Office of Federal Activities

Enclosure

EPA# D-AEC-06112-HY

ENVIRONMENTAL PROTECTION AGENCY

Washington, D. C. 20460

September 1973

ENVIRONMENTAL IMPACT STATEMENT COMMENTS

Nine Mile Point Nuclear Station, Unit 1

TABLE OF CONTENTS

	PAGES
INTRODUCTION AND CONCLUSIONS	1
RADIOLOGICAL ASPECTS	3
Radioactive Waste Management	3
Dose Assessment	4
Reactor Accidents	5
NON-RADIOLOGICAL ASPECTS	7
Biological Considerations	7
Thermal Considerations	10
Other Water Quality Effects	12
Air Quality and Meteorology	12

INTRODUCTION AND CONCLUSIONS

The Environmental Protection Agency (EPA) has reviewed the draft environmental impact statement for the Hine Mile Point Nuclear Station Unit I prepared by the U.S. Atomic Energy Commission (AEC) and issued on July 5, 1973. Following are our major conclusions:

1. The proposed augmented radioactive waste management system is expected to limit radioactive releases to a level that can be considered "as low as practicable."
2. Operating data from this plant lead us to question the applicability of the AEC standard model for evaluating the liquid radwaste treatment systems. The final statement should address, specifically, what equipment deficiencies have occurred and what corrective actions have been taken or are committed to, which will insure that the liquid radwaste equipment will perform as designed.
3. After an examination of the curies released and the relative percentages of critical isotopes reported in the 1971 and 1972 operating reports for the station, we question the validity of some of the basic assumptions used by the AEC in their dose calculations for this nuclear station. Use of the standard AEC dose model is acceptable only if it adequately reflects reported operational releases from the station since 1972.
4. The existing monitoring program for assessing the extent of impingement and entrainment losses is inadequate. We concur with the AEC staff's recommendation that this program be substantially expanded.

5. Owing to the lack of information concerning the effects of the plant on the biota of the receiving water, a complete assessment of the plant's environmental impact is not possible. Consequently, it is our recommendation that the final statement not be processed and the full-term operating license not be granted until after completion of the monitoring program and analysis of the results. In the interim, the plant should continue to operate under its provisional license.

6. The cooling system as presently designed will cause New York State criteria for thermal effluents to be grossly exceeded.

RADIOLOGICAL ASPECTSRadioactive Waste Management

The radioactive waste management systems currently being utilized in the Nine Mile Point Nuclear Station Unit 1 are not representative of current practice. However, the proposed augmented radioactive waste systems include "state-of-the-art" technology and, if properly operated and maintained consistent with 10 CFR Part 50, the discharges should be "as low as practicable."

As noted on page 3-18 of the draft statement, "Operating experience to date has resulted in higher liquid releases than those calculated. The operating maintenance report indicates that the radwaste equipment has not performed according to design." These deficiencies could be due to a variety of causes, such as a lack of component reliability causing excess leakage, or failure to achieve expected decontamination factors. On the other hand, the problems that have occurred may be peculiar to the Nine Mile Point 1 station rather than the waste treatment equipment itself, due to operational factors. In view of the currently available operating experience, we are concerned with the applicability of the AEC standard model for evaluating the liquid radwaste system. The final statement should address specifically what deficiencies have occurred and the corrective actions that have been implemented, or are committed to, which will insure that the liquid releases will be "as low as practicable."

If corrective action has already been taken, then we would encourage the utilization of operating data taken subsequent to that action to

validate the AEC standard model for the analysis to be made in the final statement.

Dose Assessment

We are concerned with the validity of using the AEC standard assumptions in the dose calculations associated with liquid releases from the station in light of the available operating data. This concern is two-fold: 1) the operating data indicate a much greater total activity released and 2) large variations are evident in the percentages of critical long-lived isotopes (isotopic mix) observed in operating data versus the AEC predicted releases. The following table illustrates the problem:

Isotope	AEC estimate of existing system releases		1971 operating data adjusted to 80% load factor		1972 operating data adjusted to 80% load factor	
	1972 % total	Ci	1971 % total	Ci	1972 % total	Ci
Cs-134	0.9	0.036	1.5	0.70	11.1	5.85
Cs-137	0.8	0.032	4.5	1.47	29.1	15.51
Mn-54	0.11	0.0044	18.4	8.45	13.6	7.01
Co-60	0.9	0.037	20.0	9.30	26.0	13.65
I-133	15.75	0.63	0.9	0.37	1.95	1.01

Accordingly, the final statement should use either extrapolations from the existing operating data for the dose calculations, or justify the use of the standard AEC model in order to present a more realistic picture of the impact of this facility.

Transportation

EPA, in its earlier reviews of the environmental impact of transportation of radioactive material, agreed with the AEC that many aspects of this problem could best be treated on a generic basis. The

generic approach has reached the point where on February 5, 1973, the AEC published for comment in the Federal Register a rulemaking proposal concerning the "Environmental Effects of Transportation of Fuel and Waste from Nuclear Power Reactors." EPA commented on the proposed rulemaking by a letter to the AEC, dated March 22, 1973, and by an appearance at the public hearing on April 2, 1973.

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

Reactor Accidents

EPA has examined the AEC analysis of accidents and their potential risks which AEC has developed in the course of its engineering evaluation of reactor safety in the design of nuclear plants. Since these accidents are common to all nuclear power plants of a given type, EPA concurs with the AEC's approach to evaluate the environmental risk for each accident class on a generic basis. The AEC has in the past and still continues to devote extensive efforts to assure safety through plant design and accident analyses in the licensing process on a case-by-case basis. EPA, however, favors the additional step now being undertaken by the AEC of a thorough analysis on a more quantitative basis of the risk of potential accidents in all ranges. We continue to encourage this effort and urge the AEC to press forward to its timely

completion and publication. EPA believes this will result in a better understanding of the possible risks to the environment.

In order to provide a fuller understanding of the direction of these efforts, it is requested that the final statement (either directly or by publicly available reference) provide information on the nature, expected schedule, and level of effort of those generic studies which are expected to lead to a basis for a subsequent assessment by the AEC concerning the risk from all potential accidents classes in the Nine Mile Point Station. It is recognized that this subsequent assessment may be either generic or specific in nature, depending on the outcome of the generic studies. In addition, the final statement should include an AEC commitment that this assessment will be made publicly available within a reasonable time period following completion of the generic studies. Clearly, if the above efforts indicate that unwarranted risks are being taken at the Nine Mile Point Station we are confident that the AEC will assure appropriate corrective action. Similarly, if EPA's efforts related to the accident area uncover any environmentally unacceptable conditions related to the safety of the Nine Mile Point Station, we will make our views known.

NON-RADIOLOGICAL ASPECTSBiological Considerations

Nine Mile Point Unit 1 has been in operation for 3 1/2 years. During that period the applicant has had the opportunity to perform comprehensive monitoring of the biological effects of the once-through cooling system. In particular, complete analyses of losses by impingement and entrainment could have been performed and the results made available at this time. These could have been used as a basis for judging the acceptability of the present cooling system design as it affects the aquatic ecology. Instead, over the 3 1/2 years of the plant's operation, the applicant has carried out an incomplete and insufficient monitoring program, the results of which are inadequate for purposes of determining the environmental impact of the plant's operation.

The inadequacies of the present monitoring program were indicated by us in our review of the draft impact statement for Nine Mile Point Unit 2. To recapitulate these objections, they are:

- (1) the impingement study characterizes 90 hours out of the roughly 30,000 that the plant has been operative.
- (2) combined effects of operations with once-through cooling lead to estimates by this office (using data submitted) of very large fish losses at certain times of the year.
- (3) the impingement studies were only done over a limited time of year.

- (4) no studies at all were done on entrainment of fish, larvae and fry. This effect, coupled with impingement losses mentioned above, could conceivably be very severe.
- (5) the results of past entrainment studies are inadequate and not useful.
- (6) the effect of the plant's operation on the overall aquatic ecosystem of the area has not been assessed through monitoring, nor could it be in the absence of data on impingement and entrainment losses.

The result is that information does not exist which would allow a determination of the impact of the plant's cooling water system on aquatic organisms.

Indications are, however, that significant losses due to entrainment and impingement will occur. We concur with the AEC staff's conclusion that complete mortality will result to entrained organisms when exposed to a 32°F temperature rise and a transit time of 6 minutes. Fish which enter through the intake structure are likely to suffer 100% mortality also, and, since the structure is located in a region known to have high concentrations of fish, this loss could be substantial. The true extent of all these losses has not, as we indicated above, been quantified. Consequently, a judgement of the impact of the plant on the aquatic ecology cannot be made.

In the Summary and Conclusions section the staff recommends that the applicant undertake a much expanded environmental monitoring program for determining the plant's impact on the aquatic environment. We concur

with this recommendation.. Certain aspects of this program need further explanation, however. The portion dealing with intake effects does not describe the duration of the fish monitoring program. Also, the proposed laboratory entrainment studies consider the effect of temperature but totally ignore the mechanical stress experienced during a six minute transit time. This mechanical stress is probably more harmful than the thermal stress and the two in conjunction work synergistically to produce the actual loss. Thus, in order to accurately determine entrainment losses a technique should be developed to simulate the actual stress experienced by entrained organisms.

Since the goal of the proposed monitoring program is to determine the effect of entrainment and impingement losses on the lake ecosystem, the total impact of all plants in the area must be determined. Rather than separate monitoring programs for Nine Mile Point Units 1 and 2 and the FitzPatrick plant, a single monitoring effort for all three plants should be instituted. Thus, impingement and entrainment loss data from the three plants could be correlated with the data from a single lake population study and effects, if any, determined.

The staff precedes their recommendation of a monitoring program with the conclusion that the current provisional operating license should be converted to a full-term license. It is stated that this is the action called for under the National Environmental Policy Act (NEPA). It is our opinion, based on the lack of sufficient information with which to assess the environmental impact of the plant, that the requirements of NEPA have not been satisfied, and therefore that no action is called for.

Considering the lack of information, which is discussed above, an evaluation of the environmental impact of this action, sufficient under NEPA, is not possible. We do not see the requirements of NEPA being satisfied until the proposed monitoring program is completed and there are sufficient data available so that the effects of the plant can be assessed. Therefore, we recommend that the full-term license not be issued until such time as the environmental impact of the action can be fully evaluated. Only when the required information is available, should a final environmental impact statement be issued as a basis for the decision on the full-term operating license.

Thermal Considerations

As reported in the EIS, New York State thermal discharge criteria limit the rise in surface temperature in the receiving water to 3°F within a 300 foot radius area (6.5 acres). With the present discharge system, the area encompassed by the 3° isotherm of Unit 1 ranges from 50 to 400 acres. Even at the low end of the range, New York State thermal criteria are grossly exceeded. It can then be assumed that when the discharge from Unit 2 and the discharges from Unit 2 and the Fitz-Patrick plant are superimposed on the Unit 1 plume, the situation will be worse still.

This EIS barely mentions and neglects any discussion of the applicant's proposal, contained in the draft statement for Nine Mile Point Unit 2, to combine the Unit 1 and 2 discharges into a single submerged jet diffuser. This type of discharge has a significant effect on plume

size and would alter considerably the size of the plume encompassed by the 3° isotherm. The way that this might affect compliance with thermal criteria should have been completely analyzed in this draft statement. Also, the result of any interaction with the plume of the FitzPatrick plant should have been analyzed. Both of these analyses should be included in the final statement, and will be considerations in the issuance by EPA of a Section 402 discharge permit under the Federal Water Pollution Control Act (FWPCA).

In accordance with the FWPCA, discharges to navigable waters are subject to effluent limitations reflecting the "best practicable control technology currently available" by July 1, 1977, or to stricter limitations if they are necessary to meet applicable water quality standards. By July 1, 1983, dischargers must achieve effluent controls reflecting the "best available technology economically achievable." (For the thermal component of discharges, a reevaluation of the limitations imposed by the Administrator of EPA is possible under Section 316, FWPCA.)

Definitions of the technology-based terms are scheduled for promulgation in October 1973. The cooling system as now operated causes a violation of existing criteria, as noted above, and we anticipate that the discharge will be in violation of a revision to Federal-State standards now pending under the FWPCA. Furthermore, the discharge would, in all probability, fail to meet the effluent limitations guidelines, once promulgated. The applicant should, therefore, evaluate alternative heat dissipation systems for this facility, including closed-cycle system alternatives, taking into account the relationship of waste heat effects

from Unit II and FitzPatrick as well as Unit I. Such evaluation should be included in the final statement.

Other Water Quality Effects

The AEC staff has concluded (page 5-6) with respect to the increase in total dissolved solids as a result of plant operation, that "no lake-wide effect will be discernible." We recommend that the applicant include an evaluation of local impacts, and justify the non-compliance with requirements for total dissolved solids levels of the Minimum Federal Water Quality Criteria and the International Agreement on Great Lakes Water Quality (April 15, 1972). The draft statement also recognizes (page 5-7) the non-compliance of Nine Mile Point, Unit I, with requirements for the addition of phosphates to receiving waters of the Minimum Federal Water Quality Criteria and the International Agreement on Great Lakes Water Quality. The applicant should present, in the final statement, detailed justification for this non-compliance.

Air Quality and Meteorology

The impact statement should provide a discussion of the mechanical equipment at the facility which has a potential for emitting non-radio-logical air pollutants. Information for auxiliary boilers and diesel engines should be provided relating to size of equipment, fuel type, fuel analysis, fuel use rate and frequency of use for each type of equipment, and pollutant emission factors employed in estimating air pollutant emissions.

Information should be provided in the final statement relative to the impact of the high voltage transmission line ozone prediction rate and its potential environmental impacts.

The statement should provide a discussion of the existing ambient air quality and the anticipated ambient air quality with and without the facility in operation.

Meteorological material presented in this draft and environmental and the environmental statement for Unit 1 is essentially identical to that presented earlier for Unit 2. Our meteorological comments remain the same as those presented in our letter of May 25, 1973, on Hine Hile Point Nuclear Station, Unit II.

FEDERAL POWER COMMISSION
WASHINGTON, D.C. 20426

IN REPLY REFER TO:

50-220

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



SEP 6 1973

Dear Mr. Muller:

This is in response to your letter dated July 5, 1973, requesting comment on the AEC Draft Environmental Statement relating to the conversion of the current provisional operating license to a full-term license to the Niagara Mohawk Power Corporation for the Nine Mile Point Nuclear Station Unit 1 (Docket No. 50-220).

The following comments are made in compliance with the National Environmental Policy Act of 1969, and the April 23, 1971, Guidelines of the Council on Environmental Quality, and review the need for the capacity of the 610-megawatt Nine Mile Point Nuclear Unit 1 with regard to the adequacy and reliability of the affected electric power systems and related matters.

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

The Nine Mile Point Nuclear Unit 1 has been in commercial operation since December 1969. During the period from December 1969 to December 31, 1971, the unit produced 4,858 billion kilowatt-hours of electric energy, and during 1972 the unit produced an additional 3,242 billion kilowatt-hours.

Mr. Daniel R. Muller

The Applicant is a member of the New York Power Pool (NYPP), which coordinates the operation of members' bulk power systems whose combined service areas serve the entire State of New York. The Applicant is also a member of the Northeast Power Coordinating Council (NPCC), which coordinates the planning of the members' generating and transmission facilities in the area which includes the State of New York, New England and the provinces of New Brunswick and Ontario. NPCC has established a reliability criterion equivalent to a loss of load probability of one day in ten years. Members of the NYPP have agreed that to maintain this standard, each member system will maintain installed capacity at least equal to that required to meet an 18 percent reserve during its most recent annual peak load.

The Bureau of Power staff has analyzed the effect of the capacity of Nine Mile Point No. 1 on the winter-peaking Applicant's system for the 1973-1974 Winter Peak Period and the summer-peaking NYPP for the 1974 Summer Peak Period. The following tabulations show the effect of the Nine Mile Unit 1 on these systems.

NIAGARA MOHAWK SYSTEM ^{1/}
1973-74 WINTER PEAK LOAD PERIOD

	<u>With Unit 1</u>	<u>Without Unit 1</u>
Total Owned Capability, Dec. 31, 1972, MW	3,251	2,641
Share of Roseton No. 1, MW	240	240
Share of Roseton No. 2, MW	240	240
Share of Fitzpatrick No. 1, MW	295	295
Share of Blenheim-Gilboa, MW	550	550
Other Purchases	<u>1,646</u>	<u>1,646</u>
Total Capability, MW	6,222	<u>5,612</u>
Estimated Peak Load, MW	<u>5,200</u>	<u>5,200</u>
Reserve MW	1,022	412
Reserve, % of Peak Load	19.7	7.9

1/ Niagara Mohawk Form 12 Report For 1972.

Mr. Daniel R. Muller

NEW YORK POWER POOL
1974 SUMMER PEAK PERIOD ^{1/}

	<u>With Unit 1</u>	<u>Without Unit 1</u>
Total Capability - Megawatts	27,671	27,061
Net Peak Load - Megawatts	22,006 ^{2/}	22,006 ^{2/}
Reserve Margin - Megawatts	5,665	5,055
Reserve Margin - Percent of Peak Load	25.8	23.0

^{1/} Data Source: NPCC Report 383-2 dated April 1, 1973.

^{2/} Coincident Peak Load of 21,930 megawatts increased by 76 MW as a result of transactions with systems outside NYPP.

The Niagara Mohawk reserve of 19.7% with Nine Mile Point is within the range usually found satisfactory, but the bare numerical value is deceptive. Of the 1,646 MW listed under "Other Purchases," 270 MW is supplied by Rochester Gas & Electric Company, who in turn is relying on a purchase of 207 MW from Power Authority of the State of New York. However, Rochester Gas & Electric Company, according to its 1972 Form 12 Report to the Federal Power Commission, will only have a 5.2% reserve at the time of its 1973-74 winter peak. Consequently, of the 1,022 megawatt reserve that Niagara Mohawk appears to have with Nine Mile Point No. 1, 270 megawatts can be considered of doubtful reliability. Without Nine Mile Point, Niagara Mohawk would have only a 7.9% reserve, more than half of which would be dependent on a purchase of doubtful reliability. It is therefore essential for Niagara Mohawk's adequacy of service to have Nine Mile Point No. 1 in operation at its full rated 610 megawatts.

The Applicant's system is integrated with all New York State systems through the NYPP and the summer-peaking pool indicates reserves of 25.8 percent of peak load responsibility with the capacity of Unit 1 and 23.0 percent without the unit. During the week of the summer peaks in 1971 and 1972 the NYPP experienced unavailable capacity totalling 3,326 megawatts and 3,581 megawatts, respectively, due to scheduled maintenance, forced outages, delays in availability of new units and variation of hydro conditions from median values. If the average of the capacity losses experienced during the 1971 and 1972 summer peaks existed at the time of the 1974 summer peak, the reserves on the NYPP system would be reduced to 10.0 percent with Unit 1 and 7.3 percent without the unit.

Mr. Daniel R. Muller

During the 1974 summer period, the availability of emergency power supplies from the neighboring NEPOOL ^{1/} and PJM ^{2/} pools may be limited by the needs of those systems to maintain planned reserve levels. The limited capacity of the interconnections and the predominantly thermal systems of NEPOOL and PJM, which are subject to forced outages, fuel shortages and operating restrictions due to air quality limitations, indicate that little capacity reserve would be available from these areas. The winter-peaking Ontario Hydro system has indicated reserves after maintenance of 31.3 percent of peak load, totalling 3,490 megawatts, and is considered the only available source of emergency power supply.

The Nine Mile Point Unit 1 is completed and has been producing electric power since 1969. In view of the substantial purchases of power necessary by the Applicant to meet its system demands, the Bureau of Power staff recommends that the full-term operating license be issued to the Applicant for this unit. Power purchases are an expedient for meeting electric system demands during construction of new units; however, purchases are not a satisfactory substitute for adequate base-load owned generation. Regional reliability is greatly improved when each electric system has adequate installed generating capacity to meet its system demands and provide reserve capacity.

The use of geothermal power as an alternative to the nuclear unit, was not considered, according to the Draft Environmental Statement (page 9-1). In light of the fact that geothermal sources are known to exist in New York and neighboring states, ^{3/} a discussion of this alternate would be appropriate.

Hydroelectric power as a substitute for the Nine Mile Point Nuclear unit would be impractical and inadequate. Although the total generating capacity that could be made available in New York by the addition of generators at existing hydro sites and the development of new sites is some 1,292 megawatts, ^{4/} this capacity would be scattered over a large number of sites. The total average annual energy available from all the sites ^{4/} would be approximately equal to the annual energy obtainable

^{1/} New England Power Pool.

^{2/} Pennsylvania-New Jersey-Maryland Interconnection.

^{3/} Thermal Springs of the United States and Other Countries of the World - A Summary. Geological Survey Professional Paper 492. U. S. Government Printing Office, 1965.

^{4/} Hydroelectric Power Resources of the United States, January 1, 1972. Federal Power Commission, FPC P-42.

- 5 -

Mr. Daniel R. Müller

from Nine Mile Point No. 1. However, it is not considered feasible to develop a large number of small hydroelectric sites due to environmental considerations and public reaction.

The Bureau of Power staff considers that the Nine Mile Point Unit 1 is needed on the Applicant's system to meet the projected loads. In view of the substantial power purchases required by Niagara Mohawk Power Corporation to meet loads and the serious consequences of inadequate installed generating capacity, the staff considers it prudent that a full-term license be issued to the Applicant for the continued operation of the Nine Mile Nuclear Station Unit 1.

Very truly yours,

A handwritten signature in dark ink, appearing to read "T. A. Phillips". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

T. A. Phillips
Chief, Bureau of Power



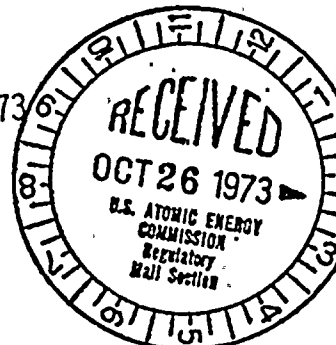
United States Department of the Interior

50-220

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240.

In reply refer to:
ER-73/946

OCT 26 1973



Dear Mr. Muller:

Thank you for your letter of July 5, 1973, transmitting copies of the Atomic Energy Commission's draft environmental statement dated July 1973, on environmental considerations for Nine Mile Point Nuclear Station, Unit 1, Oswego County, New York.

General

Nine Mile Point Nuclear Station, Unit 1, is the initial component of a 2,531 MWe power generating complex located along the shoreline of Lake Ontario near Syracuse, New York. Unit 1, a 610 MWe plant which began operation in December 1969, will be complemented by the James A. Fitzpatrick Nuclear Power Plant, scheduled to begin operation in October 1973, and Nine Mile Point Unit 2 which is expected to be completed in 1978. Each facility is designed for once-through cooling.

Fish stocks of Lake Ontario have undergone substantial changes because of modification of vegetation patterns in the watershed, damming of tributary streams, depletion of the fish stocks by commercial harvest, introduction of exotic fish species, and effects of municipal and industrial waste disposal. These kinds of changes interact to alter the competitive composition of fish stocks, generally favoring those having lesser value to man.

The evidence of environmental deterioration is far more marked inshore than offshore. By 1950 algae began to foul gill nets of commercial fisherman, yet oxygen depletions which are often associated with such dense algae growth were not detected until 1970. These conditions do not favor successful reproduction of fish species such as lake herring and white fish.

The individual and cumulative impacts of once-through power plant cooling in the area of Nine Mile Point will place an unwarranted and unacceptable burden on the lake's resources.



Technology for closed-cycle cooling systems has advanced to a point wherein the environmental effects, including drift and blowdown are minimal. Based on partial and incomplete studies on the environmental effects of Unit 1, we believe that continued use of the lake's water for power plant cooling at Nine Mile Point is not in the best public interest.

Our detailed comments are presented according to the format of the statement or according to specific subjects.

Summary and Conclusions

Based on the description of the thermal plume given in Section 5 and the locations of the intake and discharge facilities, it is probable that recirculation of the heated effluent will occur at Unit 1. We suggest that the impacts associated with recirculation should be identified in the Summary and Conclusions Section.

Outdoor Recreation

Our concerns for outdoor recreational development for this area have been expressed in our previous letters to the AEC in regard to the James A. Fitzpatrick Nuclear Power Plant and Unit 2 of Nine Mile Point. We believe that the subject statement should address the possibilities of developing an open space multiple-use plan for the lands of both power plants.

The plan could be developed by the joint efforts of the applicant, the Power Authority of the State of New York, the New York State Conservation Department, and the County of Oswego. Since the area is only 36 miles from the metropolitan area of Syracuse; an outdoor recreation plan for a major portion of the lands appears to be in the public interest. We are pleased that the applicant has established 130 acres of the site as a wildlife habitat by posting the northwest corner of the site.

Additionally, we suggest that consistent with general safety factors, consideration be given to developing secondary uses of the transmission right-of-way in the interest of outdoor recreation. This Department's Northeast Regional Office of the Bureau of Outdoor Recreation will welcome an opportunity to work with the applicant for such development. BOR's Northeast Region's office is located at the Federal Building, 1421 Cherry Street, Philadelphia, Pa. 19102.

Topography and Geology

The brief section on geology and topography is inadequate for an independent assessment of how these major elements of the environment relate to Unit 1. The distribution and thickness of surficial deposits and physical properties of rocks and soils should be summarized, particularly as they relate to design, construction, slope stability, and erosion. A topographic and geologic map should be included.

The seismic-design parameters and the methods of their derivation are not mentioned. Since at least 13 earthquakes have occurred within 50 miles of the station over a period of 110 years, including one with an intensity of VI on the modified Mercalli scale the final environmental statement should state specifically what seismic design criteria were used in construction of Unit 1, and what environmental effects are predicted from future earthquakes.

The statement is made on page 2-8 that "the relationship of site seismology to the safety of the Station, its design, and seismic design criteria have been considered in detail by the Staff in the safety review." We do not feel that environmental concerns related to seismology are satisfied by this statement or other discussions of seismology in the report.

The draft environmental statements for both the Nine Mile Point Nuclear Power Station Unit 2 and the James A. Fitzpatrick Nuclear Power Plant concluded that the site is located in an inactive seismic region. Our letter of April 1973, advised you that the Nine Mile Point Plant is shown in damage zone 2 (moderate damage) on a seismic zoning map dated 1969 (U.S. Coast and Geodetic Survey).

Based on these considerations we believe that this environmental statement should present a more comprehensive summary of the regional and local site geology, and should specify how the geologic and seismologic analyses have been taken into account. In this respect, we note that the AEC has published "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (Proposed Appendix A, 10 CFR 100, Federal Register, November 25, 1971) which prescribe the nature of required investigations. The impact statement should clearly specify whether these criteria have been applied to the Nine Mile Point site.

Lake Water Hydrology

Additional information should be included in this section to

describe the temperature stratifications and development of thermoclines in the area of Nine Mile Point. Descriptive information regarding this subject is included in Technical Report No. 14 from the Great Lakes Fishery Commission, entitled "Limnological Survey of Lake Ontario, 1964." This publication is dated April 1969, and is available from the Great Lakes Fishery Commission, Ann Arbor, Michigan.

Aquatic Ecology

Because this section is heavily dependent upon information available in the literature, we believe that data and information in Technical Report No. 23 from the Great Lakes Fishery Commission, entitled, "A Review of Changes in the Fish Species Composition of Lake Ontario" dated January 1973, should be referenced also. Information contained in this report relates to the spawning characteristics of the white fish and lake herring as well as other fishes. Also, fish species such as the white fish, lake herring and the yellow perch require temperatures less than 4°C during winter periods to successfully reproduce. Exposing adults and eggs and larvae to temperatures higher than those which naturally occur during winter periods may cause deformities to develop either in the egg or larval stages. Although data are not available on the requirements of closely related species such as sauger and walleye, these and other species may have their reproductive potential impaired by increases in seasonal temperatures. Reference to these and other potential impacts on fishery resources are described in a report entitled, "Review of Recent Technical Information Concerning the Adverse Effects of Once-Through Cooling on Lake Michigan," prepared by the U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Great Lakes Fishery Laboratory, Ann Arbor, Michigan, dated November 1, 1972. Much of this information is applicable to Lake Ontario.

Sanitary Wastes and Other Effluents

Copper and other heavy metals will erode and corrode from the cooling water system. The amounts of these materials and their potential environmental impacts should be described in this section of the environmental statement.

Solid Waste System

Solid radioactive wastes that result from operations of Unit 1 are described mainly by their gross character, as concentrates from radwaste evaporators, spent resins and filter sludge,

paper, air filters; rags, "and control rods, fuel channels, and contaminated replaced equipment." Their total quantity is roughly estimated as 11,000 cubic feet annually, with an activity of 2,700 curies. However, the draft statement does not specify the kinds of radionuclides, their physical states, or their concentrations in the wastes, nor has the location planned for offsite burial been identified. This information should be presented in the final environmental statement.

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

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

Thermal Studies

Thermal effects of cooling water discharged into Lake Ontario should be estimated for the combined effect of operation of both adjoining power plants. Data available from infrared radiometer measurements should be included. This type of data has been published in the final environmental statement for the Fitzpatrick Plant. We also recommend that the applicant utilize remote sensor data in monitoring the thermal plume due to the extensive area and the complexities involved when several large waste heat sources are operating in a small area.

Field temperature surveys of the thermal plume resulting from the operation of Unit 1 far exceed water-quality standards. Throughout earlier reports on this plant, we are assured through mathematical and hydraulic model test results that there will be no thermal problems. Previously, we questioned the results of these studies and stated that alternatives should be considered. The AEC in this draft responds with the statement given on page 5-11.

"The applicability of State and Federal Water Quality criteria related to the thermal discharge for Unit 1 is uncertain. However, it should be noted that no adverse effect on the aquatic biota due to the thermal discharge is expected."

We believe the New York State standard of 3 degrees Fahrenheit in 6.5 acres is too restrictive; but even if it were 5 degrees Fahrenheit, the heated water discharge from this unit would exceed the standard. Even though this draft statement covers Unit 1, it should recognize that the future operation of Unit 2 in a once-through mode will almost triple the waste heat from this plant compared to Unit 1 alone. This factor alone requires serious consideration of alternative cooling methods.

It is indicated on page 9-15 that no significant disadvantage of the existing discharge system has been identified. The AEC staff believes that modification of the existing system is not justified at this time even with the planned addition of Unit 2 with a once-through cooling system. Since a comprehensive evaluation of the expected thermal plumes from both units and from the neighboring James A. Fitzpatrick Plant has been performed, we find no basis to conclude that these three units can safely operate with once-through cooling at this site.

Transmission Line Environs

The use of herbicides for transmission line maintenance is briefly discussed. Since no specific herbicides are indicated, the following language should be added to this section, "It is essential that all herbicides, pesticides, and related chemicals must be registered in accordance with P.L. 92-516, The Federal Insecticide, Fungicide and Rodenticide Act. Application should be accomplished in a manner fully consistent with the protection of the entire environment. Any contemplative use of these chemicals must consider both known and possible environment effects. The applicant should consult with the Environmental Protection Agency, the Director of the State Conservation Agency, the County Agent and the nearest office of the Bureau of Sport Fisheries and Wildlife when chemical vegetation and pest control is contemplated. Such contact should be made early in the planning so that acceptable chemicals and methods of application known to be most effective can be used with the recommendations of the concerned agency.

Effects on Aquatic Environment

Table 5.1.2 contains data on studies conducted during June 1972 through January 1973. A comparison of this table with tables that were included in the environmental statement for Nine Mile Point Nuclear Station Unit 2, indicate that data collected prior to June were deleted from this table. Data were included on winter periods which would bias the information presented on impingement. We believe that all available information should be included to describe fish impingement.

As previously indicated, consideration should be given to the effects of increased temperature on the reproduction capabilities of various fish species, including that of yellow perch which are referred to in this section. Although species such as the yellow perch may be attracted to higher temperatures, the resulting effects may include reduced reproduction success. Also, it should be indicated that data from the Consumer's Power Company's report indicates that Steelhead Trout, Lake Trout, Coho, and Chinook Salmon do occur in the area of power plant intakes and thermal discharges and are subject to impingement. The potential impacts upon Federal and State sponsored programs to establish these species in Lake Ontario should be considered.

On page 5-38 of this section reference is made to the 6 degree Fahrenheit isotherm extending along about 1 mile of shoreline. On page 5-3 it is indicated that the 5 degree Fahrenheit isotherm extends along about 2 miles of shoreline. During periods of warmer natural lake water temperatures, a temperature rise much less than 5 or 6 degree Fahrenheit may inhibit fish movement, and discourage fish from entering important shallow water zones. Also, potential impacts of sinking plumes on fishes and fish reproduction potential should be mentioned in this section.

In discussing the environmental impact of plant operation on fish, plankton, benthos, and various aquatic organisms, it should be recognized that Lake Ontario is in a state of ecological change. This change is a result of the cumulative impact of man's activities on the lake and from recent introduction of exotic fish species which compete with the previously established fish populations. These considerations should be reflected in anticipating the environmental impacts of this development on the system in general.

The relationship of decomposing organic materials to the dissolved oxygen concentrations in the water should be described. Encouraging or accelerating the growth and reproduction of attached plants may compound problems which are presently occurring with the oxygen concentrations in the water. This section should discuss these aspects of the plant's operational impacts.

Environmental Monitoring Program

The Niagara Mohawk Power Company has conducted a monitoring program in the Nine Mile Point area since 1963. The AEC staff believes that studies, as they have been proposed and are being conducted by the applicant, will not provide information adequate to assess the operational effects of the station on the biota. For example, the collection of the data from July 1963 through December 1969 was infrequent. Only since May 1970 has the applicant collected data on fish distribution and food preferences of fish and benthos with some continuity. Sampling and observation of plankton from the intake discharge wells of Unit 1 during June-October 1971 provide neither estimates of plankton abundance in the area nor a base for reasonable assessment of damage due to entrainment. Sampling of lake water for the usual chemical and physical parameters is entirely wanting. Based on limited sampling information, it is apparent that Nine Mile Point Nuclear Station Unit 1, has caused damages to fishery resources. Continued operation of the Unit may cause unacceptable losses to local fish populations. It should be

noted that with the exception of the limits on total dissolved solids, phosphate concentrations in discharge sewage and the thermal plume size, the plant conforms to water quality standards. We believe that the applicant should be required to conform to existing standards and to adopt procedures which would require the environmental impact of the plant operation on the resources of the lake.

As a result of the Lake Michigan Enforcement Conference, specific guidelines are being developed for studies to determine the environmental impact of power plant cooling on Lake Michigan. It is anticipated that a draft outline of guidelines will be available by November 1973. Since the ecology of Lake Michigan and Lake Ontario are similar, techniques and studies that are suitable for Lake Michigan may be adaptable for Lake Ontario. We encourage the AEC staff to make use of these guidelines in developing any future plans for study of thermal discharges into Lake Ontario.

It is suggested that the thermal monitoring program be modified to include techniques developed in conjunction with the Surry Nuclear Power Station on the James River, Virginia. These studies should be designed and conducted to determine the impacts of once-through cooling in the Nine Mile Point area.

Nonradiological Effects on Ecological Systems

The concern for the possible impacts on fish and other aquatic life as a result of the maximum intake velocity of 2 fps is indicated on page 5-34. We share this concern since the applicant has not shown that fish losses will be low.

Environmental Impact of Postulated Accidents

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

We also think that class 9 accidents resulting in both air and water releases should be described and the impacts on human life and the remaining environment discussed as long as there is any possibility of occurrence. The consequences of an accident of this severity could have far-reaching effects on land and in Lake Ontario which could persist for centuries affecting millions of people.

Alternative Energy Sources

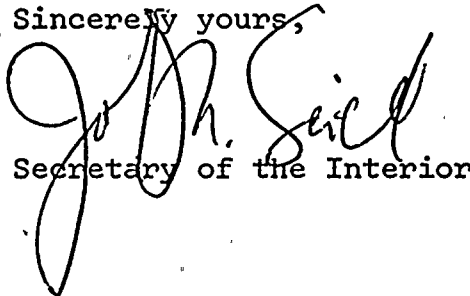
The expected emissions from alternative oil-fired and coal-fired power plants given on page 9-4 are misleading. Modern well-operated central stations discharge much smaller amounts of carbon monoxides and hydrocarbons than shown, since combustion is complete except for small amounts of unburned carbon in fly ash and bottom ash in coal-fired plants.

Environmental Cost

Although the total economic losses of the proposed action are difficult to estimate there are data and materials available which can be used to determine the replacement costs of resources. For example, the pollution committee of the American Fisheries Society, Southern Division, in 1970 estimated the monetary value of fish based on their replacement cost. Various states, including New York, Maryland and Washington have developed criteria for evaluating fish kill damages and computing fish kill damage claims. We believe the staff of the AEC should be aware of these criteria and whenever possible they should be used to determine economic or replacement cost for fish. In addition we believe that the impacts of this proposed action should not be related to entire lake alone but should also be compared to the production of the local area.

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

Sincerely yours,



Deputy Assistant

Secretary of the Interior

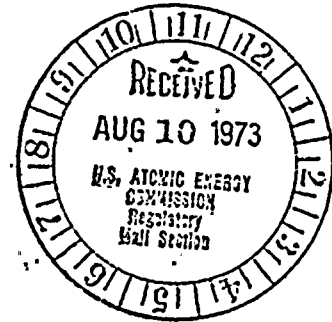
Mr. Daniel R. Muller
Assistant Director for
Environmental Projects
Directorate of Licensing
Atomic Energy Commission
Washington, D. C. 20545



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

50-220

August 8, 1973



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

Dear Mr. Muller:

The draft environmental impact statement for Nine Mile Point Nuclear Station, Unit 1, which accompanied your letter of July 5, 1973, has been received by the Department of Commerce for review and comment.

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

General Comments

In the Summary and Conclusions section, as well as in the main text, the staff concludes that the plant's operation will have no significant impact on the biota in Lake Ontario. This type of lakewide approach fails to adequately consider all the point sources of waste heat that should be included in the evaluation if the lake as a whole is used as the unit of measurement of significant impact. In addition, the statement should include a discussion of the plume interaction with Nine Mile Point Unit 2, and the nearby James A. Fitzpatrick Nuclear Power Plant. Secondly, consultation with appropriate State and Federal agencies should be included in the design of the comprehensive environmental monitoring program. These agencies should also be involved in the evaluation of the information collected.

- 2 -

Since this plant has been operating under a provisional license since 1969, actual measurements, rather than estimates, of environmental impact have been possible. This greatly increases the confidence one can place in the conclusions.

From our point of view, the statement is satisfactory with regard to consideration of this single power station's impact on the environment. It appears, for example, that the thermal effect on the lake will be negligible. But what about the big picture? How many plants of this type can be constructed before the cumulative effect is no longer negligible? We should not consider each case as a separate problem. The National Oceanic and Atmospheric Administration's International Field Year for the Great Lakes Project Office recently completed an extensive study of Lake Ontario and they can provide input to this aspect of the impact statement.

Section 2.7.2, Aquatic Ecology

Page 2-18. It is stated that "Despite the high nutrient content of Lake Ontario, the fish production is rather low." Although fish production is presently low for a lake with the productive capacity of Lake Ontario, the situation may be altered in the near future. The Great Lakes Fishery Commission treated all lamprey spawning streams last year, and the Canadian streams and several key streams in U.S. waters again this year. Moreover, fishery management agencies in New York and Ontario have been planting salmonid species in Lake Ontario, and these agencies plan to intensify this activity in years to come. Since the forage base in Lake Ontario is as good or better than that in Lake Michigan when the Lake's salmon stocking program was begun in 1965, it is expected that the fishery which would develop in Lake Ontario will be equally as good. New York has planted salmonids in the Salmon River (10 miles east) and the Little Salmon River (6 miles east). Both rivers are close enough to the plant site that the fish leaving and returning to them could conceivably pass the intake and discharge of the Nine Mile Point Nuclear Station.

With regard to the assertion that the reason the alewife has flourished is that large predators have not been present, it is now thought that the population of alewife, an early colonist

of the lake, stabilized prior to the decline of the large predators. This recent theory is supported by the resurgence of premium fish stocks in the 1920's and newspaper reports during the same era of two major alewife mortalities.^{1/}

Concerning the controversy between Smith (1970) and Christie (1972), Christie (pp. 920-921) provides the following analysis of the interactions between the colonists and the native species in Lake Ontario:

"Of the species of fish which invaded or were introduced into Lake Ontario in the last century, the carp and alewife were the most obviously successful. Both must have affected other species in important ways, but it is difficult to make judgments because of the early colonization of these species.

"ALEWIFE

"Smith (1970) has argued on the basis of the recent effects of alewife colonization of the upper Great Lakes, that the species effectively caused all the misfortunes of the Lake Ontario fish stocks subsequent to its establishment there in the 1870s. The view held by the present author however, is that whatever the initial impact, the resurgence of the premium fish stocks in the 1920s in the face of heavy alewife densities, argues in favor of a harmless role for the alewife. The resurgence of the deepwater ciscoes (Coregonus sp.) in the 1930s was also seemingly unaffected by the alewife. Equally important, the collapse of the ciscoes was not followed by a surge of alewife abundance as might have been expected if competition pressure had been a major consideration.

There are no statistics with which to evaluate trends in alewife abundance but it has been assumed by Pritchard (1929) and Graham (1956) that the frequency of heavy

^{1/} Christie, W.J. 1972. Lake Ontario: effects of exploitation, introductions, and eutrophication on the salmonid community. J. Fish. Res. Bd. Can. 29:913-929.

spring beach mortalities is at least a rough indication of alewife density. On this basis, newspaper reports of two major mortalities in the 1920 decade do not suggest that the alewife, like the ciscoes, were scarce during the period of peak predator abundance. Dymond (1928) found that the alewife was an important item in the diets of both lake trout and burbot, but noted alewife were not as often eaten by the trout after the alewife moved inshore in the early summer. Juveniles would have been largely protected from these species by reason of their inshore distribution, and it is possible that the post-spawning adult alewife did not extend lakeward very far into the range of these predators in late summer. Wells (1969) found that trawling in September in Lake Ontario produced 81.2 alewife per tow at 120 ft. (37 m) and less, and only 7.2 for tows at 180 ft. (55 m) and greater. This would certainly reduce it, and possibly enough to reduce the severity of the predation impact on alewife adults. Predation on both juveniles and adults in the inshore areas is on the other hand, heavy, and inflicted by many fish species. The lack of obvious change in the abundance of the alewife stocks after the 1940s is especially compelling evidence that the abundance is limited by inshore factors, and possibly by the effects of the mortalities themselves to some extent."

Section 2.7.2.a, Fishes

Page 2-19. With regard to the Applicant's echo-sounder survey, more information should be supplied concerning the type of fathometer used and what its capabilities were for detecting concentrations of fish larvae, fry, and young-of-the-year. In addition, an example of a fathometer recording should be provided, including an explanation of its interpretation.

Page 2-22. It is stated that "The Applicant has not seined in in the area and therefore no information on juveniles near the shore is available." Newly hatched young-of-the-year alewives

begin to show up in seine catches in the middle of August and remain inshore until late fall.^{2/} Therefore, from late spring until fall larval and juvenile alewives would be susceptible to entrainment. In addition, the spottail shiner, also abundant inshore, remains inshore (in depths of less than 50ft); this species is considered an excellent forage stock.

Section 2.7.2.d.(2), Phytoplankton

Page 2-25. It is stated that "Very few fish larvae were observed in the plankton samples. . .". The sampling equipment used to collect plankton, fish eggs, and larvae should be described, and available data and literature on the comparative efficiency and effectiveness of the various types of sampling methods and equipment should be evaluated and discussed. In our opinion, if information from reference 30 was used to determine the abundance and distribution of fish larvae, sample collection with a Nansen bottle, as used in this survey, virtually precluded any larval entrapment.

Section 3.4.1, Intake Structure

Page 3-7. An estimate for the intake velocity at the traveling screens should be provided.

Section 5.2.2, Thermal Studies

Page 5-2. The combined effects of Nine Mile Point Unit 1, Nine Mile Point Unit 2, and the James A. FitzPatrick Nuclear Power Plant should be evaluated by the thermal studies.

Section 5.5.2.a, Effect on Aquatic Environment - Intake Effects

Pages 5-31 through 5-35. Given the tendency for fish to concentrate along the 25-ft. depth contour and the location of the intake at about the 20-ft. contour, and given the numbers of fish entrained

^{2/} Dr. Wilbur L. Hartman, Personal Communication. (Project Leader, Ecology of Fish Populations of Lower Great Lakes, Bureau of Sport Fisheries and Wildlife, Sandusky Field Station, 2022 Cleveland, Road, Sandusky, Ohio 44870.)

- 6 -

and subsequently impinged according to studies to date, even though not sufficient to permit a valid quantitative assessment of the problems of impingement, it is apparent to us that a potentially serious impingement problem may develop. We believe that this situation may require corrective action to reduce the intake velocity to 1 ft/sec or less, in addition to conducting the monitoring program. We also recommend that evaluation of the fish-kill problem be coordinated with the appropriate State and Federal agencies. Finally, we consider the statement that "The Staff does not intend to imply that fish impingement at the Station will produce significant adverse effects on lakewide fish populations" to be misleading. This statement should be revised to consider the effects of all water intakes in the lake if the entire lake is to be the frame of reference for evaluating the effects of this power plant on fish populations in Lake Ontario.

Section 5.5.2.c, Thermal Discharge Effects

Page 5-37. This section should include information on the combined effects of the Nine Mile Point Unit 2 and James A. FitzPatrick plants.

Yellow perch, a common fish in the area, require a given period of time at 4°C or below for maturation. ^{3/} The possibility that those fish remaining in or near the plume may not receive this low-temperature exposure and that they would, therefore, not mature should be discussed. This discussion should include appropriate data and documentation.

Section 5.5.2.c.(1) Fishes

Page 5-38. We suggest that the tagging study referred to in the fourth paragraph be required, rather than simply recommended, by the Staff.

^{3/} Edsall, T. A. and T. G. Yocom. 1972. Review of recent technical information concerning adverse effects on once-through cooling on Lake Michigan. Prepared for the Lake Michigan Enforcement Conference, September 19-21, 1972, Chicago, Ill., U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Great Lakes Fishery Laboratory, Ann Arbor, Michigan 48107. 86 pages.

- 7 -

Section 5.5.2.c.(3), Benthos

Page 5-39. The impact of sinking plumes on the benthic community should be discussed in this section.

Section 6.1, Aquatic Monitoring Program

Page 6-1. Based on the Staff's assessment that the present environmental studies now proposed and being carried out by the Applicant are inadequate to assess the effects of operation of the Station, we recommend denial of the full-term operating license until an adequate environmental monitoring program has been established and coordinated with appropriate State and Federal agencies.

A map depicting the sampling transects and stations should be provided in the final environmental statement.

With reference to the Staff's recommendation for improvements in the monitoring program (pages 6-2 and 6-5), we basically agree with the proposed changes. However, we feel that some sort of tabular format should be used to summarize for the reader the improved program. In addition, this program should be coordinated with appropriate agencies, as suggested above.

With regard to a sampling procedure that would permit reporting the results in terms of biomass per unit area, the possible use of a Ponar dredge for benthic work should be discussed.

Section 6.3, Radiological Monitoring Program

Page 6-6. A list of organisms typically sampled and subjected to radioanalysis should be presented in the final environmental statement. In our opinion, the primary function of an environmental impact statement is to serve as a full disclosure document. Therefore, we do not believe it is sufficient to merely refer the reader to a document such as the Applicant's Environmental Report, which may or may not be readily available to the reader. If the Staff disagrees with our opinion on this matter, we would appreciate a full explanation in the final environmental statement.

Section 9, Alternatives to the Proposed Project

Page 9-1. This section should include a complete environmental analysis of each alternative so that informed conclusions can be drawn and decisions made by responsible officials and others who review this document.

The warm water plumes tend to be close to the lake shore, due to the exposed location and the lake currents flowing near the shore. This could have some effect in reducing nearshore ice cover. However, this will cause no adverse effects either on water intake or shore erosion. The calculated increase in average lake surface temperature of about 0.002° F has no physical meaning and may mask adverse local effects. Much more meaningful is the area affected by a significant temperature increase.

To reduce the fish entrapment in the intake system and thus fish kills, the report recommends that alternative intake structures be examined. It is suggested that in addition to the above, a fish replenishment program be considered. Samplings indicate that 82% of the fish killed are the alewives and smelts. This low quality fish could be replaced by more desirable fish from hatcheries in the same or significantly larger amounts.

As described on page 3-23, the major source of radioactivity released to the open atmosphere during reactor operation is the off gas from the main condenser air ejectors. These off-gases are allowed to flow through a 30-minute holdup pipe before being discharged through the main plant stack. Consequently, we would consider the release to be continuous throughout the year and, assuming a rather uniform source emission rate, average annual diffusion parameters can be appropriately used.

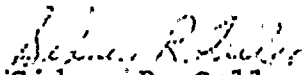
In our comments on the Final Safety Analysis Report for this facility sent to the Atomic Energy Commission Division of Reactor Licensing on December 18, 1967, we computed that the

- 9 -

highest off-site annual concentration is 5×10^{-8} sec m^{-3} at a distance of 2 km to the northeast corner of the site assuming the effluent is released from a 350-ft. stack. This is somewhat higher than the 1.9×10^{-8} sec m^{-3} computed by the staff in table 5.7.

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

Sincerely,


Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs


B-1

APPENDIX B

APPLICANT'S PARTIAL RESPONSE TO
COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT

B-2

NIAGARA MOHAWK POWER CORPORATION

NIAGARA  MOHAWK

300 ERIE BOULEVARD WEST
SYRACUSE, N. Y. 13202

October 31, 1973

Mr. W. H. Regan, Jr., Chief
Environmental Projects Branch No. 4
Directorate of Licensing
Office of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545

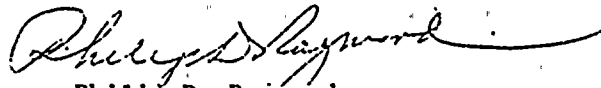
Re: Nine Mile Point Unit 1
Docket No. 50-220

Dear Mr. Regan:

As requested in your letter of September 10, 1973, we have reviewed comments of various governmental agencies concerning the Draft Environmental Statement for Nine Mile Point Unit 1. The enclosure to this letter contains responses which we deem appropriate.

As requested in your letter, we have included three signed originals and forty additional copies.

Very truly yours,



Philip D. Raymond
Vice President-Engineering

CVM/sjz

Enclosures

B-3

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT UNIT 1

APPLICANT'S RESPONSES
TO
GOVERNMENTAL AGENCY COMMENTS
ON
AEC DRAFT ENVIRONMENTAL STATEMENT

SUBMITTED TO
UNITED STATES ATOMIC ENERGY COMMISSION
DOCKET NO. 50-220

NOVEMBER 1, 1973

TABLE OF CONTENTS

	<u>Page No.</u>
U. S. Department of Commerce	1
Department of Health, Education, and Welfare .	25
Department of Transportation	36
U. S. Department of Agriculture	38
State of New York Department of Environmental Conservation	44
Advisory Council on Historic Preservation . .	108
Federal Power Commission	109
U. S. Environmental Protection Agency	110

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 1)

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Since this plant has been operating under a provisional license since 1969, actual measurements, rather than estimates, of environmental impact have been possible. This greatly increases the confidence one can place in the conclusions.

From our point of view, the statement is satisfactory with regard to consideration of this single power station's impact on the environment. It appears, for example, that the thermal effect on the lake will be negligible. But what about the big picture? How many plants of this type can be constructed before the cumulative effect is no longer negligible? We should not consider each case as a separate problem. The National Oceanic and Atmospheric Administration's International Field Year for the Great Lakes Project Office recently completed an extensive study of Lake Ontario and they can provide input to this aspect of the impact statement.

RESPONSE

With regard to the interaction of the thermal plume of Nine Mile Point Units 1 and 2 with the FitzPatrick plant, this matter has been discussed in the Final Environmental Statement for Nine Mile Point Unit 2, pages 3-6 to 3-23, 5-29 to 5-39 and 11-4 to 11-10. An analysis of the thermal inputs to Lake

RESPONSE TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 1).
CONTINUED

Ontario is provided in Appendix H of the Applicant's Environmental Report.

The Applicant has coordinated plans with the United States Atomic Energy Commission and other appropriate agencies to develop and conduct environmental programs for data collection which are mutually satisfactory for facility construction and operation. The information resulting from these programs will be available for agency review as requested.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 2)

Page 2-18. It is stated that "Despite the high nutrient content of Lake Ontario, the fish production is rather low." Although fish production is presently low for a lake with the productive capacity of Lake Ontario, the situation may be altered in the near future. The great Lakes Fishery Commission treated all lamprey spawning streams last year, and the Canadian streams and several key streams in U. S. waters again this year. Moreover, fishery management agencies in New York and Ontario have been planting salmonid species in Lake Ontario; and these agencies plan to intensify this activity in years to come. Since the forage base in Lake Ontario is as good or better than that in Lake Michigan when the Lake's salmon stocking program was begun in 1965, it is expected that the fishery which would develop in Lake Ontario will be equally as good. New York has planted salmonids in the Salmon River (10 miles east) and the Little Salmon River (6 miles east). Both rivers are close enough to the plant site that the fish leaving and returning to them could conceivably pass the intake and discharge of the Nine Mile Point Nuclear Station.

With regard to the assertion that the reason the alewife has flourished is that large predators have been present, it is now thought that the population of alewife, an early colonist of the lake, stabilized prior to the decline of the large predators. This recent theory is supported by the resurgence of premium fish stocks in the 1920's and newspaper reports during the same era of two major alewife mortalities.¹ (Footnote omitted by Applicant.)

Concerning the controversy between Smith (1970) and Christie (1972), Christie (pp. 920-921) provides the following analysis of the interactions between the colonists and the native species in Lake Ontario:

"Of the species of fish which invaded or were introduced into Lake Ontario in the last century, the carp and alewife were the most obviously successful. Both must have affected other species in important ways, but it is difficult to make judgements because of the early colonization of these species.

COMMENT TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 2)
CONTINUED

"ALEWIFE

"Smith (1970) has argued on the basis of the recent effects of alewife colonization of the upper Great Lakes, that the species effectively caused all the misfortunes of the Lake Ontario fish stocks subsequent to its establishment there in the 1870s.

The view held by the present author however, is what whatever the initial impact, the resurgence of the premium fish stocks in the 1920s in the face of heavy alewife densities, argues in favor of a harmless role for the alewife densities. The resurgence of the deepwater ciscoes (*Coregonus* sp.) in the 1930s was also seemingly unaffected by the alewife. Equally important, the collapse of the ciscoes was not followed by a surge of alewife abundance as might have been expected if competition pressure had been a major consideration.

There are no statistics with which to evaluate trends in alewife abundance but it has been assumed by Pritchard (1929) and Graham (1956) that the frequency of heavy spring beach mortalities is at least a rough indication of alewife density. On this basis, newspaper reports of two major mortalities in the 1920 decade do not suggest that the alewife, like the ciscoes, were scarce during the period of peak predator abundance. Dymond (1928) found that the alewife was an important item in the diets of both lake trout and burbot, but noted alewife were not as often eaten by the trout after the alewife moved inshore in the early summer. Juveniles would have been largely protected from these species by reason of their inshore distribution, and it is possible that the post-spawning adult alewife did not extend lakeward very far into the range of these predators in lake summer. Wells (1969) found that trawling in September in Lake Ontario produced 8.12 alewife per tow at 120 feet (37 m) and less, and only 7.2 for tows at 180 feet (55 m) and greater. This would certainly reduce it, and possibly enough to reduce the severity of the predation impact on alewife

COMMENT TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 2)
CONTINUED

adults. Predation on both juveniles and adults in the inshore areas is on the other hand, heavy, and inflicted by many fish species. The lack of obvious change in the abundance of the alewife stocks after the 1940s is especially compelling evidence that the abundance is limited by inshore factors, and possibly by the effects of the mortalities themselves to some extent."

RESPONSE

The following factors should be considered regarding the possibility of salmonids passing the intake and discharge of the Nine Mile Point Station:

a. Fifteen months of experience has now been obtained in monitoring the fish impingement rate at the traveling screens of Nine Mile Unit 1. This intake has a higher design approach velocity than the proposed intake for Unit 2. Data collected to date indicate that fish over approximately 7" long and in good condition are not entrained. In addition, since the inception of the screen monitoring program, no salmonids have been captured on the traveling screens.

b. Field data collected to date do not indicate that large numbers of salmonids pass the Nine Mile Point promontory in the vicinity of the intake and discharge

RESPONSE TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 2)
CONTINUED

structures as they leave or return to the Salmon and Little Salmon Rivers.

c. The Applicant will be continuing impingement and fish investigations during 1973 and 1974 which will provide additional data.

For a discussion of the alewife population of Lake Ontario in the historical context, refer to a report entitled "The Effect of Impingement at Nine Mile Point on the Fish Populations of Lake Ontario", October 1, 1973, submitted by the Applicant as Exhibit 3b, (AEC Docket No. 50-410) Nine Mile Point Unit 2 Public Hearings. This report states that the impact of the plant (as measured by studies at Unit 1) upon fish populations of Lake Ontario is not significant and does not constitute an environmental problem.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 3)

Page 2-19. With regard to the Applicant's echosounder survey, more information should be supplied concerning the type of fathometer used and what its capabilities were for detecting concentrations of fish larvae, fry, and young-of-the-year. In addition, an example of a fathometer recording should be provided, including an explanation of its interpretation.

RESPONSE

The instrument used is a Ross Fathometer (fine line 200-A) with a 7-1/2° conical transducer. The Applicant is not able to detect larval fish with this instrument. It is possible to detect young-of-the-year fish that are greater than 6" length; however, specific size analysis cannot be done with any degree of confidence.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 4)

Page 2-22. It is stated that "The Applicant has not seined in the area and therefore no information on juveniles near the shore is available." Newly hatched young-of-the-year alewives begin to show up in seine catches in the middle of August and remain inshore until late fall.^{2/} (Footnote omitted by Applicant) Therefore, from late spring until fall larval and juvenile alewives would be susceptible to entrainment. In addition, the spottail shiner, also abundant inshore, remains inshore (in depths of less than 50 ft.); this species is considered an excellent forage stock.

RESPONSE

Seining is recognized as a significant part of any fish population study, and has been included on a substantial scale in the aquatic biology program at Nine Mile Point as of June 1973.

It is performed twice each month at four shore locations corresponding to the four transects, i.e., West, Nine Mile Point Plant, FitzPatrick Plant, and East. This pattern will be continued at least through December 1973, to the extent weather permits.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 5)

Page 2-25. It is stated that "Very few fish larvae were observed in the plankton samples. . . ". The sampling equipment used to collect plankton, fish eggs, and larvae should be described, and available data and literature on the comparative efficiency and effectiveness of the various types of sampling methods and equipment should be evaluated and discussed. In our opinion, if information from reference 30 was used to determine the abundance and distribution of fish larvae, sample collection with a Nansen bottle, as used in this survey, virtually precluded any larval entrapment.

RESPONSE

During 1973, sampling for fish eggs and larvae was begun on a limited scale in March and April, continued more extensively in May, and established on an intensive basis from June and subsequently. The program will be run at this final level through 1974.

The sampling location pattern finally arrived at is as follows. Samples are collected at the surface, mid-depth and bottom, at five stations in each of the three areas defined by radii of 1/2 mile, 1 mile and 3 miles from the Nine Mile Point plant. The stations are:

1/2 Mile Radius

Station 1 - In 20 ft of water on the west
Station 2 - In 40 ft of water on the west
Station 3 - In 60 ft of water off the plant
Station 4 - In 40 ft of water on the east
Station 5 - In 20 ft of water on the east

RESPONSE TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 5)
CONTINUED

1 Mile Radius

Station 1 - In 20 ft of water on the west
Station 2 - In 40 ft of water on the west
Station 3 - In 80 ft of water off the plant
Station 4 - In 40 ft of water on the east
Station 5 - In 20 ft of water on the east

3 Mile Radius

Station 1 - In 20 ft of water on the west
Station 2 - In 40 ft of water on the west
Station 3 - In 100 ft of water off the plant
Station 4 - In 40 ft of water on the east
Station 5 - In 20 ft of water on the east

Collections are made on a weekly basis, during the day, from May through December and during both day and night from mid-June through mid-September. Samples are collected by towing a 1.0 meter diameter Hensen type plankton net of #0 mesh (570u aperture) with an attached TSK flow meter. Duration of the tow is 5 minutes, timed with a stop watch, covering approximately a distance of 0.2 miles at 2.0mph. The net is towed with a 200' line and is kept in position (at depth) by a system of float lines and depressors. It is hauled onto the boat, the bucket is washed and emptied into a collection container, and the sample is preserved and labelled.

An attempt is made to estimate viability of captured organisms, i.e., fish larvae by direct observation on the boat until such time that a vital stain can be employed.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 6)

Page 3-7. An estimate for the intake velocity at the traveling screens should be provided.

RESPONSE

The maximum approach velocity to the traveling screens is calculated to be 0.85 fps.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 7)

Page 5-2. The combined effects of Nine Mile Point Unit 1, Nine Mile Point Unit 2, and the James A. FitzPatrick Nuclear Power Plant should be evaluated by the thermal studies.

RESPONSE

Refer to Applicant's response to Department of Commerce
Comment No. 1.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 8)

Pages 5-31 through 5-35. Given the tendency for fish to concentrate along the 25-ft. depth contour and the location of the intake at about the 20-ft. contour, and given the numbers of fish entrained and subsequently impinged according to studies to date, even though not sufficient to permit a valid quantitative assessment of the problems of impingement, it is apparant to us that a potentially serious impingement problem may develop. We believe that this situation may require corrective action to reduce the intake velocity to 1 ft/sec or less, in addition to conducting the monitoring program. We also recommend that evaluation of the fish-kill problem be coordinated with the appropriate State and Federal agencies. Finally, we consider the statement that "The Staff does not intend to imply that fish impingement at the Station will produce significant adverse effects on lake-wide fish populations" to be misleading. This statement should be revised to consider the effects of all water intakes in the lake if the entire lake is to be the frame of reference for evaluating the effects of this power plant on fish populations in Lake Ontario.

RESPONSE

Refer to Applicant's response to New York State Department of Environmental Conservation Comment No.1 and U. S. Department of Commerce Comment No. 1.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 9)

- a. Page 5-37. This section should include information on the combined effects of the Nine Mile Point Unit 2 and James A. FitzPatrick plants.
- b. Yellow perch, a common fish in the area, require a given period of time at 4°C or below for maturation. 3 (Footnote omitted by Applicant) The possibility that those fish remaining in or near the plume may not receive this low-temperature exposure and that they would, therefore, not mature should be discussed. This discussion should include appropriate data and documentation.

RESPONSE

- a. Refer to Applicant's response to Department of Commerce Comment No. 1.
- b. Fish distribution studies, including fish netting for determination of species, physical condition of collected species and food preference of yellow perch in particular have shown that mature yellow perch frequent the area of the discharge plume of Unit 1. The fish move freely throughout the plume area and no effect upon their ability to mature has been observed.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 10)

Page 5-38. We suggest that the tagging study referred to in the fourth paragraph be required, rather than simply recommended, by the Staff.

RESPONSE

A fish tagging study to collect data regarding local fish movement and migration patterns has been conducted during the 1972 and 1973 lake study seasons (April - October). The Applicant will continue these fish tagging efforts.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 11)

Page 5-39. The impact of sinking plumes on the benthic community should be discussed in this section.

RESPONSE

The winter plume configuration resulting from the Unit 1 discharge depends on its velocity and buoyancy. When the Lake ambient temperature is coldest (near 32°F), the effluent will be discharged at a temperature near 73°F and at an exit velocity of about 4 fps. Thus, the effluent is buoyant under all Lake temperature conditions.

In the immediate vicinity of the Unit 1 discharge location the plume will respond similarly in summer and winter. As the effluent cools and spreads on the Lake surface the buoyancy is reduced. At a temperature between 39°F and 47°F (depending on the ambient temperature) the effluent is neutrally buoyant and mixes vertically.

Near locations where this occurs, some rise in bottom temperatures would be expected. A report of bottom temperature elevations was published by Hoglund and Spigarelli (1972 Great Lakes Research Conference). Areas outside the plume where temperatures are less than those associated with neutral buoyancy (less than 47°F) will experience minimal heating. The

RESPONSE TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 11)
CONTINUED

heating is small due to the vertical mixing induced in the neutrally buoyant portion of the plume. In this peripheral area, however, the effluent will be negatively buoyant. Thus, slightly warmer bottom than surface temperatures would be expected in this region.

Therefore, the phenomenon referred to as a "sinking plume" probably would not result in the Unit 1 plume being confined on the Lake bottom. The bottom temperature elevations near Nine Mile Point seldom exceed 10°F and are generally much less due to mixing in the plume.

In studies such as those by Hoglund and Spigarelli the effects of such temperature elevations on the aquatic ecology were discussed. The temperatures are believed to have minimal effects on the aquatic ecology in general and on the benthos in particular. The area exposed to heating by a sinking plume would be minimal and the temperatures would not be outside the range of temperatures normally experienced by the benthos.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 12)

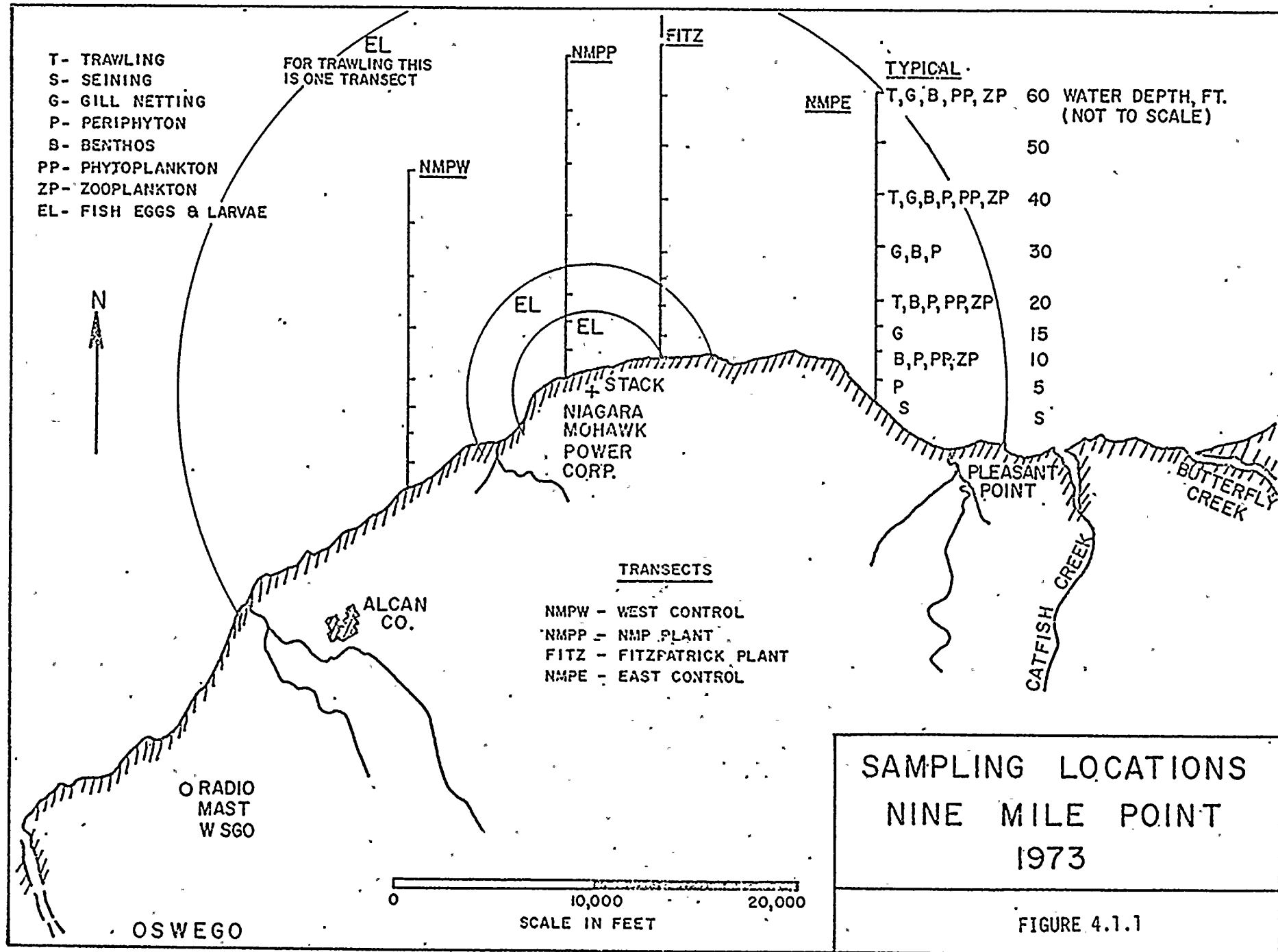
- a. Page 6-1. Based on the Staff's assessment that the present environmental studies now proposed and being carried out by the Applicant are inadequate to assess the effects of operation of the Station, we recommend denial of the full-term operating license until an adequate environmental monitoring program has been established and coordinated with appropriate State and Federal agencies.
- b. A map depicting the sampling transects and stations should be provided in the final environmental statement.
- c. With reference to the Staff's recommendation for improvements in the monitoring program (pages 6-2 and 6-5), we basically agree with the proposed changes. However, we feel that some sort of tabular format should be used to summarize for the reader the improved program. In addition, this program should be coordinated with appropriate agencies, as suggested above.
- d. With regard to a sampling procedure that would permit reporting the results in terms of biomass per unit area, the possible use of a Ponar dredge for benthic work should be discussed.

RESPONSE

- a. The comprehensive ecological program previously conducted for the Nine Mile Point promontory was expanded after intensive review and comment by the AEC. Various sampling operations had begun in March, 1973, but the expanded program, in substantially all its detail, was initiated in June, 1973.

RESPONSE TO U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 12)
CONTINUED

- b. The sampling stations are indicated in the attached map.
- c. The ecological program is summarized in the attached table.
- d. Three different benthic dredges were evaluated for this program, namely, Peterson, Ponar and Eckman. The bottom of Lake Ontario, in this area, is composed of slabs of sedimentary rock, largely exposed. Benthos thickness, where it occurs, is no more than an inch or two. Dredges, of whatever design, have limited use here, and benthos sampling for this program is performed by means of a pump device. This is used to "vacuum clean" an area of the Lake bottom 15 inches in diameter, the material so removed being discharged into a net carried in the boat on the surface.



SUMMARY OF ECOLOGICAL PROGRAMS - NINE MILE POINT, LAKE ONTARIO* 1973

<u>Operation</u>	<u>Frequency of Sampling</u>	<u>Duration of Sampling</u>	<u>Lab. Analysis Performed</u>
Trawling	Twice/month	April-Dec	Speciating, Weighing, Measuring, Condition factors, maturity coefficients, fecundity. Scale & stomach analysis, 3 important species.
Gill Netting	"	"	" " "
Seining	"	"	" " "
Periphyton Substrates on Lake Bottom	{ Once/month Once/month Twice/month	{ April Sept-Nov May-Aug }	Speciating Chlorophyll a Biomass
Periphyton Substrates Suspend- ed from Buoys	Once/month Once/month Twice/month	April Sept-Nov May-Aug	Speciating Chlorophyll a Biomass
Water Chemistry	Once/month	April-Dec	48 parameters and radioactivity (plus D.O. and pH in the field).
Water samples Associated with Biological Sampling	Twice/month	April-Dec	11 parameters (plus D.O., CO ₂ , pH and spec. conductivity in the field).
Lake Temperature	Once/week	March-Dec	Includes D.O., pH and spec. conductivity.
Benthos	Once/2months	April-Nov	Speciating, biomass.
Bottom Deposit Chem.	Once/year	-	Organics, nutrients, mercury, lead, copper & chromium.
Plant Sanitary and Storm Drains	Once/month	All year	24 parameters
Plant intake & Dis- charge Dissolved Oxygen (see Lake Temp)	Once each, spring, summer, winter	-	D.O.
Fish Impingement	Once/week for 24 hours	All year	Speciating, length & weight. Sex, sexual maturity, scale analysis for 2 important species.
Phyto. & Zooplankton	{ Once/month Once/month Twice/month	{ April Sept-Dec May-Aug }	Density and species. For phytoplankton, primary productivity.
Plankton in Windrows	{ Once/month Once/month Twice/month	{ April Sept-Dec May-Aug }	Density and species. For phytoplankton, primary productivity.

SUMMARY OF ECOLOGICAL PROGRAMS - NINE MILE POINT, LAKE ONTARIO* 1973 Cont'd

<u>Operation</u>	<u>Frequency of Sampling</u>	<u>Duration of Sampling</u>	<u>Lab. Analysis Performed</u>
Fish Eggs & Larvae	{ Once/week, days Once/week, nights }	April-Dec Mid-June to Mid-Sept	Density and species.
In-plant Entrain- ment Sampling	Twice/month for 24 hours	All year	As for lake samples.

*For sampling stations, see map.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 13)

Page 6-6. A list of organisms typically sampled and subjected to radioanalysis should be presented in the final environmental statement. In our opinion, the primary function of an environmental impact statement is to serve as a full disclosure document. Therefore, we do not believe it is sufficient to merely refer the reader to a document such as the Applicant's Environmental Report, which may or may not be readily available to the reader. If the Staff disagrees with our opinion on this matter, we would appreciate a full explanation in the final environmental statement.

RESPONSE

No comment.

U. S. DEPARTMENT OF COMMERCE (COMMENT NO. 14)

- a. Page 9-1. This section should include a complete environmental analysis of each alternative so that informal conclusions can be drawn and decisions made by responsible officials and others who review this document.
- b. The warm water plumes tend to be close to the lake shore, due to the exposed location and the lake currents flowing near the shore. This could have some effect in reducing nearshore ice cover. However, this will cause no adverse effects either on water intake or shore erosion. The calculated increase in average lake surface temperature of about 0.002°F has no physical meaning and may mask adverse local effects. Much more meaningful is the area affected by a significant temperature increase.
- c. To reduce the fish entrapment in the intake system and thus fish kills, the report recommends that alternative intake structures be examined. It is suggested that in addition to the above, a fish replenishment program be considered. Samplings indicate that 82% of the fish killed are the alewives and smelts. This low quality fish could be replaced by more desirable fish from hatcheries in the same or significantly larger amounts.
- d. As described on page 3-23, the major source of radioactivity released to the open atmosphere during reactor operation is the off gas from the main condenser air ejectors. These offgases are allowed to flow through a 30-minute holdup pipe before being discharged through the main plant stack. Consequently, we would consider the release to be continuous throughout the year and, assuming a rather uniform source emission rate, average annual diffusion parameters can be appropriately used.
- e. In our comments on the Final Safety Analysis Report for this facility sent to the Atomic Energy Commission Division of Reactor Licensing on December 18, 1967, we computed that the highest off-site annual concentration is $5 \times 10^{-8} \text{ sec m}^{-3}$ at a distance of 2 km to the northeast corner of the site assuming the effluent is released from a 350-ft. stack. This is somewhat higher than the $1.9 \times 10^{-8} \text{ sec m}^{-3}$ computed by the staff in table 5.7.

RESPONSE

a - e no comment.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (GENERAL
COMMENT NO. 1)

Our primary observation concerns the fact that the Nine Mile Point Nuclear Station Unit 1 is just one of three plants which are to operate essentially side by side on the southern shore of Lake Ontario. As stated in the introduction to the draft EIS, the applicant plans to construct a Unit 2 station adjacent to the Unit 1 site which will produce almost twice the amount of Unit 1's electrical power. In addition, the Power Authority of the State of New York is building the James A. FitzPatrick Nuclear Plant 3300 feet east of the Unit 1 Station. All three plants are to utilize once-through cooling systems with lake water. It is therefore necessary that cumulative thermal effects be addressed. Likewise other cumulative effects of the three plants must be considered.

RESPONSE

Refer to Applicant's response to U. S. Department of Commerce Comment No. 1.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (GENERAL
COMMENT NO. 2)

While the draft indicates that separate environmental statements have been prepared for these additional facilities, we have not received copies of them for review and have no way of knowing their content. . We are unable therefore, to assess the environmental effects the proposed action will bring about in its actual operational context.

RESPONSE

No comment.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (GENERAL
COMMENT NO. 3)

It would appear that a thorough analysis of the environmental impact of the Unit 1 Station requires consideration of the cumulative effects of all three nuclear plants including the effects of thermal discharges, gaseous effluents, liquid effluents, releases of radioactive materials, fish impingement, transmission lines, as well as the effects of increased populations on human services. This may, for reasons unknown to us, be unnecessary.

RESPONSE

No comment.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (COMMENT NO. 1)

It is suggested that the upgraded liquid waste systems referenced in Sections 3.5.1.2., 3.5.1.4., and 3.5.1.6., and the gaseous waste treatment system referenced in Section 3.5.2.2., should be operational before a full-term license is granted the Niagara Mohawk Power Corporation for the Nine Mile Point Nuclear Station Unit 1.

RESPONSE

No comment.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (COMMENT NO. 2)

In Section 2.7.1., describing the Terrestrial Ecology of the site, it is stated that the southern shore of Lake Ontario is a major migration route used by many birds including the American osprey and the bald eagle. Subsequently it is said that a terrestrial survey of the site found that no rare or endangered species of plants or animals were present. There seems to be an inconsistency here as the American osprey and the bald eagle are both listed as endangered species and as the site of the Unit 1 Station makes up part of the southern shore.

RESPONSE

The terrestrial survey referred to did not locate or indicate the presence of nesting sites of these birds nor is there any other evidence that they frequent the area. This is not to say that they do not pass over the site during their annual migration flights.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (COMMENT NO. 3)

The information provided on the operational effects of the Unit 1 Station on aquatic biota is lacking. It does not allow for a thorough assessment of the environmental impact of the proposed action and therefore, offsets the environmental effects to be weighed in the decision-making process.

RESPONSE

Refer to Applicant's response to U. S. Department of Commerce Comment No. 12.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (COMMENT NO. 4)

We note that the once-through cooling system utilized by the Unit 1 Station fails to meet the current New York State thermal criteria. These criteria "limit the rise in surface temperature to 3°F over the ambient temperature within 300-foot radius or equivalent area from the point of discharge". (5.2.2.) Studies of the thermal effects of the Unit 1 Station have shown that at times "even at a depth of 5 feet, approximately one and a quarter of shoreline had temperatures greater than 5°F above ambient". (5.2.2.) Further information should be provided as to the effects, including health effects, of this rise in temperature above the standard. It would also be useful to address legal ramifications of failing to meet the criteria.

RESPONSE

The New York State standards for thermal discharges specify that, "None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish life...or impair the waters for any other best usage..." (6NYCRR701.3 et seq.)

On July 25, 1969 New York State adopted thermal criteria that specify that the standard for State waters is as described above and that the standards shall be applied in accordance with these criteria (6NYCRR704). In Part 704.4 of these criteria there is a discussion of the extent of applicability of the criteria to existing discharges, i.e., discharges existing prior to July 25, 1969. This section of the criteria specifies that,

"In determining whether a discharge existing prior to the adoption of the above criteria complies with the applicable standard ('None alone or in combination with the substance or wastes in sufficient amounts or at such temperatures as to be injurious to fish life ... or

RESPONSE TO DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
(COMMENT NO. 4) CONTINUED

impair the waters for any other best usage')
(6NYCRR701.3 et seq.), these criteria are
intended only to be a frame of reference."

Since the discharge for Nine Mile Point Unit 1
was constructed prior to July 25, 1969, Part 704.4 applies
to this unit. In other words, the Nine Mile Point Unit 1
discharge does not have to meet the criteria for lakes

("The water temperature at the surface of a
lake shall not be raised more than 3°F over
the temperature that existed before the add-
ition of heat of artificial origin, except
that within a radius of 300 ft or equivalent
area from the point of discharge, this temp-
erature may be exceeded. In lakes subject
to stratification, the thermal discharges
shall be confined to the epilimnetic area").

The Nine Mile Point Unit 1 discharge, however, must comply
with the standard.

Data to date indicate that the discharge complies
with the standard even though it does not meet the specific
numerical criteria.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE (COMMENT NO. 5)

Given the information provided in the draft, we find that the Unit 1 Station fails to consistently meet the minimum Federal Water Quality Criteria for phosphorus concentrations. More precise information on phosphorus effects and the legal considerations of failing to meet the criteria should be included in the draft.

RESPONSE

Phosphorus limitations in Lake Ontario are cited in the Minimum Federal Water Quality Criteria. Phosphorus limits are not set by existing New York State discharge criteria. However, the proposed revisions of the New York State criteria do include limitations for phosphorus. The April 1972 Treaty, Great Lakes Water Quality Agreement, also prescribes limits for phosphorus in Lake Ontario. The provisions of these various criteria and regulations are outlined below.

1. New York State standards classify Lake Ontario as Class A Special. No specific limits are set on phosphorus concentrations although a general limit on chemical discharges states, "all wastes including sanitary sewage, storm water and industrial effluents shall be in such condition when discharged into any stream that they will not create conditions in the boundary waters which will adversely affect the use of those waters for the following purposes: source and domestic water supply, or industrial water supply, navigation, fish and wildlife, bathing, recreation, agriculture and other riparian activities." (6NYCRR 702.1)

RESPONSE TO DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
(COMMENT NO. 5) CONTINUED

2. New York State "Proposed Classifications and Standards for 6NYCRR 702.1" were discussed in public hearings in September 1973. The proposed limitations for phosphorus are "concentrations should be limited to the extent necessary to prevent nuisance growths of algae, weeds and slimes that are or may become injurious to any beneficial water use."

3. Minimum Federal Water Quality Criteria have set concentrations as goals of the waterbody purity. For Lake Ontario, the criterion is 0.05 mg per liter P for total phosphorus.

4. The Great Lakes Water Quality Agreement (April 1972) is an international treaty by which the United States and Canada agreed to certain limitations on phosphorus in Lake Erie and Lake Ontario. The limits set for these two lakes and discharges thereto are 1 mg per liter. The deadline for compliance with this criterion is January 1, 1975.

Phosphate measurements have been made in the Lake in the vicinity of Oswego and near Nine Mile Point. Phosphate concentrations near Oswego averaged 0.2 mg per liter as P. By comparison, the observations near Nine Mile Point averaged 0.06 mg per liter as P. These levels are attributable to the relatively high phosphate concentrations found in the Oswego

RESPONSE TO DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
(COMMENT NO. 5) CONTINUED

River. Levels in the Lake as a whole typically range from 0.01 to 0.03 mg/l P in the central portion of the Lake, with much higher values frequently being recorded near the shoreline due to runoff from the adjacent land areas.

The effluent from the Nine Mile Point sanitary sewage secondary treatment plant is less than 8 ozs. per second (3.75 gpm). The concentration of phosphate as the liquid leaves the treatment complex is approximately 4 mg per liter P. The effluent dribbles down to a natural drainage ditch in a wet wooded area, which is separated from the Lake by an expanse of gravel and boulders forming the shoreline of Lake Ontario. Following heavy rains, the drainage ditch is flushed into Lake Ontario along with a high volume of runoff water.

Adjacent to the treatment plant effluent is a storm-yard drain line which normally flows at a much higher rate (estimated at 100 gpm). The total phosphorus content of this flow has been measured at 0.04 mg per liter P.

DEPARTMENT OF TRANSPORTATION - FEDERAL RAILROAD ADMINISTRATION
(COMMENT NO. 1)

The Federal Railroad Administration commented at some length (6 Feb. 1973) regarding the applicants request for licensing of Nine Mile Nuclear Station Unit No. 2. Our continual concern over the inductive coordination problem with railroad signal and communication lines is also applicable to this more recent statement for Unit No. 1.

RESPONSE

When designing transmission lines which parallel railway facilities, it is the standard practice of the Applicant to contact the owners of such facilities advising them of their plans. The impact of the Applicant's proposal is determined by the owners of the railway facilities. If the possibility of excessive voltages is indicated, corrective action is taken to preclude the possibility of hazard.

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD (COMMENT NO. 1)

It is noted that there may be a necessity to mark the intake and discharge points. It is recommended that the applicant contact Commander, Ninth Coast Guard District (oan) at 1240 E. Ninth Street, Cleveland, Ohio, 44199, for further amplification.

RESPONSE

When the United States Corps of Engineer's Permit to construct the Unit 1 intake and discharge facilities was received (October 19, 1964), the accompanying U. S. Coast Guard Notification Form was transmitted to the Cleveland Coast Guard district. Their review (November 3, 1964) indicated that it was not necessary to mark the intake and discharge facilities. Copies of this correspondence are included in Applicant's Environmental Report - Appendix G, items 3 and 4.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
(COMMENT NO. 1)

The major proposed action concerns conversion of a current operating license to a full-term license which, in itself, will not have any significant effect on areas of interest to SCS.

RESPONSE

No comment.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
(COMMENT NO. 2)

Paragraph 4.1.1 Station Site

Construction of a new radwaste building is discussed. In the third paragraph a discussion should include a statement that topsoil will be salvaged, protected and respread during the grading operation. Prompt vegetating will be undertaken to prevent erosion of soil during construction of the building.

RESPONSE

The material being removed as a result of the new radwaste building consists of back fill soil gravel mix with a covering of crushed stone. No topsoil is involved.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
(COMMENT NO. 3)

Paragraph 5.1.2 Transmission-line Environs (a)

"Only selective application of herbicides should be permitted ...". This is not only to encourage wildlife-habitat growth but to maintain a good vegetative cover to prevent soil erosion.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 1)

After reviewing the Applicant's Environmental Report and the AEC's draft statement, and observing the fish impingement study at the plant, three things are apparent:

1. A large number of fish have been impinged on the traveling screens;
2. A varying, but considerable portion of these come off the screens alive;
3. The process of returning impinged fish to the lake probably kills the remaining fish.

Three changes in plant and its operation would appear to reduce the kill of impinged fish. First, the normal schedule calls for the traveling screens to be stationary 57 minutes of each hour. Therefore, impinged fish are held against the screens for a considerable time. If the screens were traveling continuously, the impingement time would be greatly reduced with fewer fish dying on the screens. Second, the screens are cleaned with a very high velocity spray, which removes fish from the screens and slams them against the housing. It is felt, that the spray velocity could be reduced substantially and still insure cleaning of the screens. If the fish were removed gently, fewer would die in this process. Third, the fish and debris from the screens flow directly into the discharge, with a temperature as much as 31.2°F above the water they just left. The fish are in the discharge tunnel at this temperature for about two minutes, and at reduced temperatures of the plume for an additional varying period. This same discharge is periodically used for disposal of chemical wastes from the laundry, regeneration wastes (page 3-33), floor drains (page 3-16), and waste collector system (page 3-13).

It is felt, that the combined effect of being held for up to 57 minutes on the screens, being slammed against the housing, and then placed in the heated and chemical discharge for two plus minutes, kills most of the impinged fish. Further, it is felt, that this kill could be reduced substantially, by cleaning the screens continuously with a reduced spray velocity and returning the fish through a separate sluiceway to the lake away from the intake and discharge areas.

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE (COMMENT NO. 2)

We are interested in the Staff's recommendations on the use of herbicides for transmission-line maintenance, and are particularly intrigued by the last one: "No stands of potentially poisonous plants should be sprayed with herbicides." We are curious about the basis for this recommendation.

RESPONSE

No comment.

U. S. DEPARTMENT OF AGRICULTURE FOREST SERVICE (COMMENT NO. 1)

We have no information to indicate that the continued operation of Nine Mile Point Nuclear Station Unit 1 will have any further adverse effect on forest land beyond that which has already occurred as a result of construction.

RESPONSE

No comment.

U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE
(COMMENT NO. 4)

Paragraph 10.3.1 Land Use

This paragraph is summarized by a statement which says the recreational potential of the area is meager. In terms of public development, this statement may be true, but in terms of private recreation, there is more than meager potential. The paragraph might be modified to reflect this.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 1) CONTINUED

It should be noted, that such measures will not insure that all fish will survive. Some impinged fish will die, and studies will have to be carried out after these modifications go in effect to determine the magnitude and significance of fish killed by impingement.

Any decision on alternate intake designs should, however, be made following the submittal by the applicant of information on alternate intake systems as suggested on Page 9-17. The above recommendations, however, should be implemented to reduce the fish kills until such decisions are made.

RESPONSE

The Applicant has performed, and is continuing to perform, detailed studies regarding fish impingement at Nine Mile Point Unit 1. These studies are addressed in some length in a report entitled "The Effect of Impingement at Nine Mile Point on the Fish Populations of Lake Ontario", October 1, 1973. This report was submitted by the Applicant as Exhibit 3b (AEC Docket No. 50-410) at the Nine Mile Point Unit 2 Public Hearings. The report states that the impact of the plant (as measured at Unit 1) upon fish populations of Lake Ontario is not significant and does not constitute an environmental problem.

In the course of fish impingement studies performed to this date, judgment as to the chances of survival of impinged fish backwashed off the screens has been based on visual inspection only. The fact that a fish appears to be in good condition

RESPONSE TO STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL
CONSERVATION (COMMENT NO. 1) CONTINUED

after being subjected to this treatment is no guarantee that it will survive when returned to the Lake, however. The Applicant has authorized studies to carry out analyses of such fish, in order to better determine their viability. The Applicant has also authorized studies of operational changes in the screenwell area to reduce impinged fish mortality along the lines recommended in this comment. Furthermore modifications to the existing intake structure, to reduce fish entrainment, are being considered in regard to the recommendations of the Draft Environmental Statement.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 45)

Section 5.5.2 a. Intake Effects, page 5-31.

The fourth sentence, 2nd paragraph implies that alewives and smelt amounted to 82% of the fish species which are impinged. Actually, these 2 species are only 6.7% of the 30 species collected. Of the 12,987 fish collected during the impingement studies, 82% were smelt or alewives.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 44)

Page 5-31

The environmental technical specifications for Nine Mile Point Unit 1 should include the following:

OBJECTIVES

To determine the sound levels created during normal plant operations at and beyond the plant boundaries.

SPECIFICATIONS

A sound survey shall be made around the plant in accordance with Part 75 of Subchapter E of the Interim Rules for Certificates of Environmental Compatibility and Public Need for Steam Electric Generation Facilities of the Public Service Commission. These measurements shall be taken following initial full power operation. The results shall be evaluated by the applicant and a report with the appropriate recommendations as to the future of the program shall be submitted to the Directorate of Licensing and the New York State Environmental Conservation Department for consideration.

BASES

The sound survey shall show the extent to which the plant affects the ambient noise in surrounding land uses. This information is needed to insure that the plant conforms to noise rules and regulations of the New York State Environmental Conservation Department. The information will also be useful to the surrounding communities for land use planning decisions. In addition, if a second plant is proposed the data will be needed for preparation of the Environmental Impact Statement for that plant.

The above sound survey and subsequent evaluation should be completed prior to issuance of a Full Term License.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 43)

Page 5-31

It is stated that, "The Applicant's measurements of sound intensity indicated that the maximum sound produced at the site boundaries was from the transformer at all locations; sound intensity from the transformer was equal to or less than the background noise." The acoustical environmental impact evaluation should be presented in accordance with Part 75 of Subchapter E of the NYS Public Service Commission Interim Rules for Certificates of Environmental Compatibility and Public Need for Steam Electric Generation Facilities. It is noted that transformers generally radiate pure tones which are more annoying than broad band noise of the same energy content.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 42)

Section 5.5.1, Page 5-31

The discussion of environmental noise is inadequate. A survey should be made of sound levels in and around the plant to determine sound levels created during various modes of plant operation. The survey should include sound levels associated with high voltage transmission facilities. Results of the survey would permit an evaluation of the sound level impact from this plant, and would be useful in evaluating the potential impact of proposed Unit 2. It is suggested that a sound level study be required of the applicant, and that a statement to that effect (as recommended in comment No. 44) could be added to the Technical Specification Requirements on page iv of the Draft Environmental Statement.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 41)

Section 5.2.4, Page 5-12

In paragraphs two, the maximum allowable gross beta activity should be corrected to 1000 picocuries per liter rather than the stated 100 picocuries..

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 40)

Section 5.1.2, Page 5-2

It is stated that "No stands of potentially poisonous plants should be sprayed with herbicides." We are curious about the basis for this recommendation.

Recommendation (j) should be expanded to include a list of potentially poisonous plants.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 39)

Section 5.1.2

The following are recommended modifications to Section 5.1.2 of the Draft Environmental Statement for Nine Mile Point Unit 1. A Technical Specification for the Nine Mile Point Unit 1. should be developed using this section as modified:

- a. Section 5.1.2 (b) - change "should" to "shall"
- b. Section 5.1.2 (c) - change to "Treatment shall not be More than once every 4 years."
- c. Section 5.1.2 (d) - change "should" to "shall"
- d. Section 5.1.2 (e) - " " " "
- e. Section 5.1.2 (f) - " " " "
and add at end "and their written approval secured."
- f. Section 5.1.2 (g) - Add sentence at end - "All pesticide applicators shall be certified applicators under State provisions and shall comply with applicable State standards."
- g. Section 5.1.2 (h) - No "safe" dioxin level has been established.
- h. Section 5.1.2 (i) - Add phrase at end - "and action taken to ensure that drift or volatilization be held to a minimum for future applications."

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
COMMENT NO. 38 CONTINUED

- f.) The prevention and control of environmental noise pollution resulting from maintenance operations and the operation of the high voltage transmission line should conform with New York State's proposed regulations.
- g.) Maintenance or land management of the right-of-way in many instances can be best accomplished by encouraging the owner or former owner to continue his land use insofar as it is compatible with the Applicant's objectives. Such land use might be the raising of various crops, grazing, and recreational uses.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 38)

Section 5.1.2 Transmission Lines

We concur with the fact that the Applicant did not have the benefit of the State of New York Department of Environmental Conservation guidelines and recommendations for transmission line location and construction (as stated in Section 4.1.2) when the original 500 ft. corridor was selected and cleared (the Nine Mile Point Unit-Clay Circuit). However, this does not preclude the use of said guidelines in the maintenance of the transmission lines which are a part of the referenced documents.

Accordingly, kindly consider the following in the preparation of an environmental maintenance management plan for this installation:

- a.) "It is recognized that it will be necessary for the applicant to periodically inspect the transmission line and the roadway and to maintain said line and roadway to insure the safe transmission of power."
- b.) Danger trees, as determined by the designated representatives of the applicant and the regulatory agency, may be cut as long as conditions and limitations for such cutting are established prior to the start of operation.
- c.) Native vegetation, particularly that of value to fish and wildlife, which was saved during construction or has since reproduced to natural growing conditions and does not pose a hazard to the facility should be allowed to grow, and in critical areas should be planted in the right-of-way.
- d.) Access roads and service roads should be maintained with native grass cover, water bars and proper slope in a manner which the designated representatives of the applicant and the regulatory agency deem sufficient to prevent soil erosion.
- e.) Burning will not be permitted during maintenance operation.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 37)

Section 4.1.2, Page 4-2

It should be noted that the existing 500-foot corridor accommodates two 345-kV transmission lines to the Clay Substation. In addition, it should also be noted that with construction of proposed Nine Mile Point Unit 2, at least a portion of the eastern edge of the existing corridor would have to be extended to accommodate a new 765-kV transmission line.

RESPONSE

No comment.

TABLE 1

CATEGORY CLASSIFICATION AND SUGGESTED NOISE CRITERION RANGE
FOR INTRUDING NOISE AS HEARD IN VARIOUS INDOOR FUNCTIONAL
ACTIVITY AREAS

Category	Area (and Acoustic Requirements)	Noise Criteria
1	Bedrooms, sleeping quarters, hospitals, residences, apartments, hotels, motels, etc. (for sleeping, resting, relaxing).	NC-20 to NC-30
2	Auditoriums, theaters, large meeting rooms, large conference rooms, churches, chapels, etc. (for very good listening conditions).	NC-20 to NC-30
3	Private offices, small conference rooms, classrooms, libraries, etc. (for good listening conditions).	NC-30 to NC-35
4	Large offices, reception areas, retail shops and stores, cafeterias, restaurants, etc. (for fair listening conditions).	NC-35 to NC-40
5	Lobbies, laboratory work spaces, drafting and engineering rooms, maintenance shops such as for electrical equipment, etc. (for moderately fair listening conditions).	NC-40 to NC-50
6	Kitchens, laundries, shops, garages, machinery spaces, power plant control rooms, etc. (for minimum acceptable speech communication, no risk of hearing damage).	NC-45 to NC-65

18 AUGUST 1970

PROJECT NO. 18500

Bolt Beranek & Newman Inc.

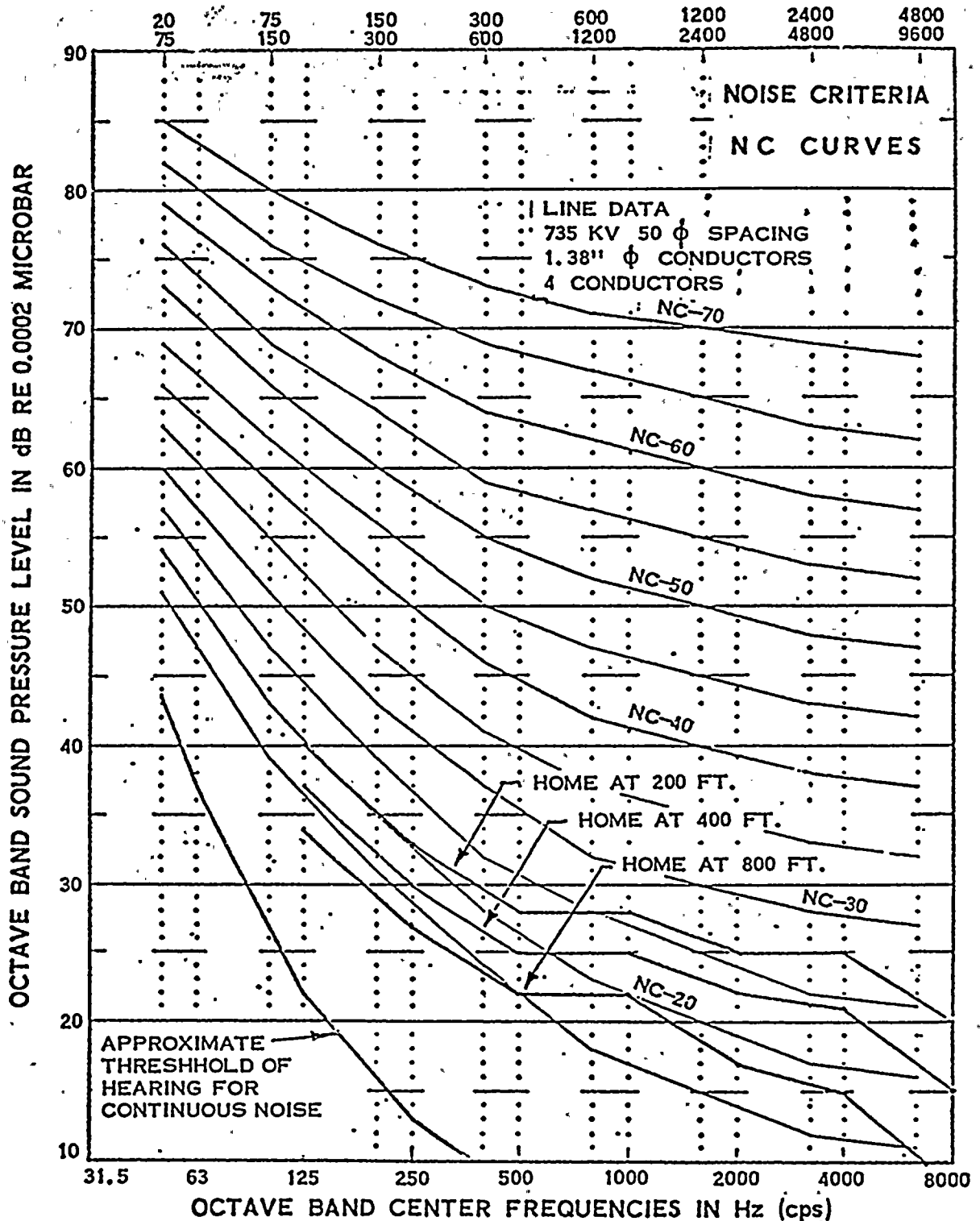


FIG. 1 DESIGN TRANSMISSION LINE SPUS INSIDE RESIDENCES WITH OPEN WINDOWS FACING THE LINE (DAMP WEATHER).

RESPONSE TO STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL
CONSERVATION COMMENT NO. 36 CONTINUED

area the NC-20 Noise Criterion is normally applied for night-time indoor conditions; but in city areas, or in apartments, dormitories, or motels for sleeping areas, an NC-30 Noise Criterion is normally used.

Figure 1 demonstrates how the noise fits the Noise Criterion curves at several distances from the outer phase. This shows that only houses at about 200 feet from the outer phase would be subjected to the low noise level (NC-25 to NC-30). This low noise level would be heard only in damp weather, with windows nearest the line open, and with a low ambient noise level (including the masking of rain noise).

When the system is energized to 765-kV the Applicant will test for audible noise and evaluate feasible methods of noise reduction if required.

At this date the Applicant does not intend to install any higher voltage lines greater than 765-kV.

RESPONSE TO STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL
CONSERVATION COMMENT NO. 36 CONTINUED

The measurements made by Bolt, Beranek and Newman (BB & N) were conducted during two occasions near Quebec City, Canada, where Hydro Quebec operates a 735-kV transmission line which has a four (4) conductor bundle configuration with 1.38 inch diameter conductor and a fifty foot phase spacing. This arrangement is similar to our 765-kV conductor size and bundle arrangement, and thus was ideal for audible noise measurements. Measurements were taken directly beneath the mid-span of the conductors and at various distances from the outer phase. During fair weather the audible noise from the transmission line was lower than the background noise from insects and other sources so that readings were difficult to obtain.

Bolt, Beranek and Newman have made up category classification and Noise Criterion curves (Fig. 1 and Table I). This family of Noise Criterion (NC) curves has been used in noise control work for over fifteen years for design and evaluation of existing noise conditions. These curves accurately correlate the subjective response of the average human ear to acoustic levels at various frequencies and intensities as measured by instrumentation. Thus, the lower curves can describe noise levels that are considered quiet enough for resting or sleeping or for excellent listening conditions in concert halls or auditoriums, while the upper curves can describe noisy work areas. For a quiet or rural community

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 36)

Section 4.1.2, Page 4-1

We note that the station is connected to the Applicant's system by two 345-kV transmission lines and the right-of-way is planned for an additional 765-kV line. The Final Environmental Statement should present data on the sound levels produced by these lines. The intention of the Applicant with regard to the possible installation of higher voltage lines and the resulting potential for increased sound levels should also be stated in the Final Environmental Statement.

RESPONSE

Applicant has a 765-kV transmission line (presently operated at 345-kV) in service.

To gain a better understanding of the audible noise which the bundle arrangement and conductor selection for this circuit would give, Applicant retained, the professional services of Acres American, Inc., Bolt, Beranek and Newman of Cambridge, Massachusetts, consultants in the field of audible noise phenomena, and Westinghouse Electric Corporation to study audible noise on high voltage transmission lines.

Westinghouse Electric Corporation conducted audible noise measurements indoors at the Trafford High Voltage Laboratory and field measurements at the 750-kV project at Apple Grove, West Virginia. However, there was little valid agreement between laboratory and field data because acoustical measurements in an indoor laboratory are affected by the enclosure.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 35)

Section 4.1.1, Page 4-1

It is stated that no impacts on neighboring lands will result from construction of the radwaste building and that the effects will be temporary. Yet, the radwaste building will take approximately two years to complete, the James A. FitzPatrick plant will be under construction nearby and additional plants may be constructed in the vicinity. The synergistic effect might be a continuing environmental impact from construction noise.

RESPONSE

Since construction is presently underway on the James A. FitzPatrick Nuclear Power Plant to the east, the modifications to the Nine Mile Point Unit 1 radwaste system (east side of the building) will result in only modest incremental disturbance to the area.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 34)

Section 4.1.1, Page 4-1

The first paragraph states, "The applicant established 130 acres of the site as a wildlife habitat in 1969 by posting the northwest corner of the site." Supplement 1, of the applicant's environmental report refers to this area as a "natural wildlife refuge" (page Sl.5-1). The problem here is use of terms and intent. It would seem that the reason for posting was safety concerns for the visitor center and there is no argument against that. However, if that is the case, state it. They certainly did not "...establish ... wildlife habitat ... by posting ..." and it is questionable that they established a natural wildlife refuge with an active visitor center involved. It would be very desirable at some time to have an active wildlife management program on the 855 acres available, but until this is the case, no such inference should be made.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 33)

Section 3.8, Page 3-35

It is stated that to allow for probable need for a future 345-kV transmission line, a 500-foot right-of-way was purchased. The future 345-kV transmission line is questioned, since applicant's testimony (Garcy, NYS Public Service Commission Case 26251, Tr Page Sm 4657 of January 26, 1973), and the Final Environmental Statement for Unit 2 note that the proposed future transmission line is 765-kV.

RESPONSE

The future 345-kV transmission line mentioned in Section 3.8, page 3-35 of the Draft Environmental Statement could extend from a new Volney Station south to the Syracuse area. Volney Station will be located approximately nine miles south from Nine Mile Point on one of the existing 345-kV Nine Mile Point - Clay transmission circuits. The 765-kV transmission line mentioned by Garcy (NYS Public Service Commission Case 26251, Tr Page Sm 4657 of January 26, 1973) could extend from Nine Mile Point to Volney.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 32)

Section 3.5.3, Page 3-30

The staff estimate of solid waste based upon experience at other operating BWR plants is given as 11,000 cubic feet with an activity of 2700 curies. The actual experience at Nine Mile Point Unit No. 1 indicates about the same order of magnitude of total cubic feet with an activity of approximately 10% of the staff estimate. The reason or significance of this difference should be discussed.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 31)

Section 3.5.3, Page 3-28 .

The section on solid waste should consider the disposal problem as this was not covered in the "Survey of the Nuclear Fuel Cycle". To better evaluate the disposal problem, the isotopic breakdown, particularly the alpha content, should be presented in order to demonstrate these wastes will meet burial criteria.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 30)

Table 3.6, Page 3-27

The isotope ^{83m}Kr is listed twice. The second entry should be ^{85m}Kr .

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 29)

The upgraded gaseous waste treatment system shows a single catalytic recombiner system. Apparently the Table 3.7 does not consider down time for the recombiner system. For the draft environmental statement of the FitzPatrick plant, a down time of ten days per year was considered and considerable noble gases were estimated to be released.

RESPONSE

Table 3.7 does not show the redundancy of the upgraded off-gas system. All components are redundant in the system except for the charcoal tanks, mixing nozzle, and preheater.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 28)

Table 3.3, Page 3-20

In column five, the 0.0014 should be replaced
by TC-99m.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 27)

Section 3.5.1.6, Page 3-18

The applicant's calculations regarding the present liquid waste treatment system underestimated the actual reported radioactivity, excluding tritium, in liquid releases by a factor of about fifteen thousand. The Environmental Statement should therefore provide more than calculational evidence to support the contention that radioactivity released from the upgraded liquid waste treatment system will meet the "as low as practicable" guidelines.

RESPONSE

The number identified in table 3.5, <0.002 ci/yr, for the existing system is not correct. The numbers were reported for individual isotopes. Based on that, the average yearly release would be about 45 ci/yr. exclusive of tritium. Therefore, the comment appears to be valid.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 26)

Table 3.3, Page 3-20 and Table 3.7; Page 3-29

A license condition notes that the applicant will complete construction of a new radwaste building onsite (expected to be fully operational in late 1975 with the liquid effluent portion being operational in September 1974) to assure compliance with the "as low as practicable" criteria contained in 10 CFR 50. Tables 3.3 and 3.7 tabulate estimated annual release of radioactivity in liquid and gaseous effluents for the upgraded radwaste system. It is questioned if these releases meet the conditions of WASH-1258 - (numerical Guides for Design Objectives And Limiting Conditions for Operation To Meet The Criteria "As Low as Practicable" For Radioactive Material In Light-Water Cooled Nuclear Reactor Effluents) for the proposed treatment provided in the upgraded radwaste system waste streams. If WASH-1258 criteria and conditions are met, it is recommended that this be noted on the concerned tables and, in addition, briefly discussed in Section 3.

RESPONSE

The upgraded radwaste system will meet the stated guidelines.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 25)

Table 3.2, Page 3-19

The isotope Ru-103 is incorrectly identified
as Ra-103.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 24)

Table 3.2, Page 3-19

Lists the estimated annual release of radioactivity in liquid effluents. The table does not include dissolved noble gases.

Appendix I 10CFR50 states:

"The design objectives guides for liquid effluents include limitations on both quantities and concentrations of radioactive material in effluents. The estimated annual quantity of radioactive material, except tritium, released to unrestricted areas would be limited to not more than five curies per power reactor at a site."

The quantities and environmental effects of dissolved noble gases should be evaluated.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 23)

Figure 3.6, Page 3-9

The service water and fire pumps should be labeled on Figure 3.6, since paragraphs 3.4.1 refers to them as being shown on Figure 3.6.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 22)

Section 3.4.2, Page 3-7

The following clarifications and corrections should be made:

- a. It should be noted that the discharge tunnel is 10 feet in diameter.
- b. It is stated that the effluent has an initial velocity of approximately 4 fps. It is not clear where in the discharge flow path this effluent velocity exists.

RESPONSE

- a. No comment.
- b. The stated 4 fps velocity occurs at the faces of the ports of the six sided discharge structure.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 21)

Section 3.4.1, Page 3-7

The following clarifications and corrections should be made:

- a. For clarity and for consistency with Section 3.4.2, it should be noted that the intake structure is located about 850 feet offshore.
- b. It is stated that the intake tunnel has a 74 square-foot cross section. About 78 square-feet more accurately describes the cross section of the 10-foot diameter intake tunnel.
- c. "Diagrammatic Sketch" better describes the screenwall shown in Figure 3.6 than "Schematic Diagram." Schematic Diagram intonates single line (wiring, piping, etc.) depictions. The title of Figure 3.6 should also be changed.
- d. It should be clarified that the noted 8 fps velocity through the intake tunnel is a design velocity based on the cooling water flow requirements for maximum power output.
- e. A description of the traveling screen's backwashing sequence and sluicing operation should be included.

RESPONSE

No comment items a - d.

- e. Refer to Applicant's Environmental Report - Construction Permit Stage - Nine Mile Point Nuclear Station Unit 2, Supplement 3, which discusses the sequencing and operation of the Unit 1 traveling screens.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 20)

Figure 3.4, Page 3-6

Figure 3.4 is entitled "Circulating Water System: Plan." It is recommended that this title be modified to "Intake and discharge structure locations: Plan." This title more correctly describes that portion of the cooling water system depicted, and is consistent with the description contained in Section 3.4. In addition, for clarity (Reference Figure 3.4 of FitzPatrick's Final Environmental Statement dated March, 1973) the intake and discharge tunnels should be labeled, and after "intake" and "discharge" the word "structure" added.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 19)

Figure 3.3, Page 3-5

The figure appears to depict the existing, and not the upgraded, liquid radwaste system because floor drain sample tank drains are shown going directly to the circulating water system discharge. Thus it should be noted, at least for the radwaste portion of the water-usage flow figure, that the existing system is depicted. In addition, the discharge canal, screen house and discharge tunnel should be labeled to clarify where effluent discharges interface with the circulating water discharge system.

RESPONSE

The diagrams (Fig. 3.8 and 3.9) are correct in that about 10 percent of the Waste collector low conductivity, low activity waste is discharged as an excess. The diagrams are incorrect in that Figure 3.9 does not show a discharge from the floor drain sample tanks to discharge. This discharge is 2,700 gal. per day as delineated in the Environmental Report.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 18)

Section 3.3, Page 3-4

It is stated that the applicant proposes to use a high pressure water flush or other mechanical means to prevent fouling of the condensers. This is not clear, since high pressure water flushing is not considered mechanical cleaning.

RESPONSE

In Supplement No. 1 of its Environmental Report, P. Sl.3-1, the Applicant notes "There will be no chemical cleaning".

High pressure water flushes or mechanical cleaning methods will be used.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 17)

Section 3.2, Page 3

It is stated that the reactor has a Stretch rating of 1850 MWt, corresponding to a net electrical output of 610 MWe. This is questioned, since preceding sections (Page 1-1 and i) note that these are rated values.

RESPONSE

The Nine Mile Point Unit 1 output is rated at 610 MWe net for 1850 MWt.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 16)

Section 2.5.2, Pages 2-10 and 2-11

Paragraph 3 and Figure 2.6 note that Lake Ontario has a maximum surface temperature of 72°F during summer. Paragraph 2 of Section 3.4 (Page 3-7) states that the intake water temperature varies with the season from 33 to 77°F. Initial impact implies a discrepancy (this impact is further substantiated by statements that vertical thermal stratification exists during the summer, and that the intake structure is a minimum of 15 feet below the surface) unless it is clarified (as in the FitzPatrick Environmental Technical Specifications) that: (1) the 77°F temperature is the maximum recorded Lake temperature, and (2) that 77°F is the conservative design basis for establishing the maximum allowable discharge temperature.

RESPONSE

The temperature plotted in Figure 2.6 of the Draft Statement are the values for a given day of the year, averaged over the years of record through 1971. The resultant curve has a maximum point early in August, with a value of 72°F. However, this value is itself the average of a recorded range not an actual maximum.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 15)

Section 2.4, Page 2-8

The phenomena of bedrock "pop-up" should be briefly discussed in this section. The discussion should include statements that the applicant (PSAR for Unit 2) observed no "pop-up" features of consequence during Unit 1 excavation, and that the closest reported features of consequence are near Lowville, approximately 50 miles northeast of the site.

RESPONSE

A description of the bedrock "pop up" phenomenon is contained on page C4 of Appendix I of the Nine Mile Point Unit 2 PSAR, Docket Number 50-410.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 14)

Section 2.2, Page 2-7

It is stated that the entire shoreline north of Unit 1 will be accessible to the public. This is not clear, since the Environmental Report notes that most of the site area has only recreational possibilities, except for that restricted area in the immediate vicinity of the generating station which included the Station's immediate shoreline.

RESPONSE

The entire shoreline north of Unit 1 is accessible to the public. However the shoreline area consists of large rocks which make up a shoreline protection dike. The extensive rockiness of this dike limits its recreational potential although it is used by shoreline fishermen.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 13)

Table 1-1, Page 1-4

Permits from the N.Y.S. Department of Environmental Conservation are needed for the standby diesel generators and fire pump.

RESPONSE

Application forms (NYSDEC-AIR 100C) for the appropriate permits were filed with the Department on October 17, 1973.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 12)

Summary and Conclusions, Page iii - License Conditions

The 500-foot wide cleared transmission line corridor has a significant and disturbing visual impact. The applicant should be required, as a condition of full-term licensing, to alleviate this situation by means of planting. Trees of limited height potential, and shrubs, planted in groups at selected spots where long, straight sections of the corridor occur, will reduce the tunnel-like aspect. Species of trees and shrubs having wildlife benefits should be used.

Similar plantings should be made at points where the corridor is intersected by a road or stream.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 11)

Summary and Conclusions, Page iv

The fifth Technical Specification Requirement should be expanded to read, "The Applicant will conduct a terrestrial monitoring program to determine the environmental effects of the use of herbicides for line maintenance. Particular attention should be given to vegetation which figures significantly in the life-cycle of valued wildlife species which may occupy this right-of-way. The program . . ."

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 10)

Summary and Conclusions, B, Page iv, suggests that studies be conducted to "...evaluate the magnitude of the fish-kill problem." We submit that the fish kill is large (Table 5.12, page 5-33) and that some steps, as outlined above, be taken to reduce the kill immediately. Then, conduct a monitoring program to determine the extent to which Nine Mile Point is still killing fish, and the effect of this kill on the local populations and on Lake Ontario.

RESPONSE

Refer to Applicant's response to DEC Comment No. 1

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 9)

Summary and Conclusions, Page i and Introduction, Page 1-1
(not page numbered)

These sections note that 1850 MWt is required to produce 610 MWe net. The 610 MWe net is questioned, since other Nine Mile Point Unit No. 1 documents (i.e., U. S. AEC RO Inquiry Report No. 50-220/72-110 of 11/21/72) note a higher than 610 MWe output.

RESPONSE

The Nine Mile Point Unit 1 rated output is 610 MWe net.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 8)

There are numerous editorial oversights throughout the document. For example:

- a. Page Numbering - The page beginning each section should be numbered, i.e. 1-1, 2-1, etc. This is consistent with other environmental statements such as Ginna's Draft of April 1973, and FitzPatrick's Final of March 1973.
- b. Cover - the word "Energy" is missing in the title "United States Atomic Energy Commission."
- c. Section 3.5.1.2, Page 3-16 - The first word of the paragraph should be "In" instead of "An."
- d. Figure 2.5, Page 2-9; Figure 3.2, Page 3-3, and Figure 3.14, Page 3-38 - The poor quality of the photographs in Figures 2.5, 3.2 and 3.14 does little to promote the aesthetic features of the facility.
- e. Nuclide Symbols - A consistent set of symbols should be used to identify radionuclides in Tables 3.2, 3.3, 3.6, 3.7, and 5.3
- f. Section 3.7.2, page 2-18. Second from last paragraph, third line introduces a new fish to the Lake Ontario fishery, the "alleye."

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 7)

A discussion of the effects that the construction and operation of the station has had on the local community should be included in the Environmental Statement. The impact on schools, housing, local roads, etc., with a statement on the net societal impact should be addressed in this discussion.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 6)

Most of the comments the State previously forwarded to the U. S. Atomic Energy Commission on the Nine Mile Point Unit 2 and James A. FitzPatrick Plant draft environmental statements regarding thermal/hydraulic water quality considerations are applicable to this draft environmental statement.

RESPONSE

No comment.

RESPONSE TO NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL
CONSERVATION (COMMENT NO. 5) CONTINUED

maintenance personnel emphasizing the prudent use of electricity and natural gas. Further, we are working closely with architects and engineers to insure that energy systems in new buildings and factories are designed to minimize consumption without reducing performance. At the same time, assistance is provided commercial, industrial and agricultural customers in solving pollution- control and waste-management problems by recommending appropriate energy applications."

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 5)

A discussion of the applicant's present and proposed energy conservation efforts should be included in the Environmental Statement.

RESPONSE

The applicant's policy regarding electric energy utilization and conservation is represented in the following quote from the Niagara Mohawk Annual Report for 1972:

"Realizing the critical importance of using energy wisely, Niagara Mohawk today as never before is stressing efficient use of electricity and gas and urging customers in all categories to conserve energy.

This is a dominant theme in our public relations and customer communications. Speakers Bureau presentations, brochures, bill enclosures and newspaper advertisements listing energy-saving suggestions are all part of a campaign to encourage conservation. During the year, our Marketing Department expanded a program in which Company representatives visit customer facilities, examine their energy systems and equipment and make recommendations for improvement. This helpful service includes analyzing and testing to determine the efficiency of industrial equipment and making necessary field adjustments wherever possible.

We are also advising customers on an increasing basis to employ waste heat reclamation as a method of conservation and economy. Throughout the year, our marketing representatives made numerous presentations to industrial and trade organizations, commercial building owners and

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 4)

With the construction of proposed Nine Mile Point Unit No. 2, the circulating water system for Unit No. 1 will be modified to a combined discharge system for both units. A discussion should be presented of the projected combined discharge velocity and thermal dilution improvements of the combined discharge system. The State's review of this report is obviously influenced by the fact that the applicant has this commitment.

RESPONSE

Refer to Applicant's response to U. S. Department of Commerce Comment No. 1.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 3)

It is stated that the staff is of the opinion that the applicant's monitoring program to date has not shown that the intake system will avoid substantial fish kills, with subsequent lack of confidence on the impact of fish populations in the Nine Mile Point area. It is further stated that the applicant will be required to perform intensive monitoring at some unstated future time to determine the seriousness of this fish-kill problem. In addition, it is stated that the applicant has presented no alternatives to the design of the present intake system. Based on these statements, and the conservation assumption that the intensive monitoring program will reflect that the present intake system will not prevent "substantial" fish kills, it is considered prudent that the U. S. AEC require that the applicant implement the intensive monitoring program as soon as possible, so that redesign of the intake system, if required, can be accomplished with appropriate dispatch.

RESPONSE

Refer to Applicant's response to DEC Comment No. 1.

The fish impingement study evaluated in the draft environmental statement of Nine Mile Point Unit 1 has been upgraded as of March 14, 1973. From that date, fish impingement monitoring has been performed once a week, for 24 hours continuously. The Applicant's report (Applicant's Exhibit 3b - Nine Mile Point Unit 2 Public Hearings, AEC Docket 50-410) has evaluated the significance of the measured impinged fish kill upon the lake population and concludes the totals to be insignificant as evaluated in the context of available lake populations.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 2)

Summary and Conclusions, Page iii - License Conditions

Any Commission full term operating license for this facility should be appropriately conditioned to assure that the upgraded radwaste systems are installed in the most timely manner and further proven to operate within their design parameters.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 46)

Section 5.5.2 a. Intake Effects page 5-34, 3rd paragraph.

The description given here of removal of fish from the traveling screens differs from the process observed at the plant. This statement infers that impinged fish removed from the traveling screens "...collect in the trash pit along with the debris," and that "The 'ecological death' of these stressed and disabled fish appears inevitable." In observation of this process, the fish were removed from the screens by a high velocity spray, slammed against the housing and went directly to the discharge. A large percent of these impinged fish were alive as they entered the discharge. We submit, that ecological death is not inevitable, and that minor modifications suggested (comment #1) above would save many of these.

The theme of the last paragraph of this section was covered in comment #10.

RESPONSE

Refer to Applicant's response to State of New York Department of Environmental Conservation Comment No. 1 regarding intake-traveling screen studies.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 47)

Page 5-36

It is stated that "mechanical stress does not appear to be significant at moderate lake temperatures (50°-59°F), yet there is no statement of the effects of mechanical stress at other temperatures. The draft environmental statement should discuss these effects also.

RESPONSE

Studies by the Applicant indicate mechanical stress produces a plankton kill rate on the order of 10 to 20 percent regardless of water temperature. These studies were performed while the circulating water system was operating but no heat was being discharged since the reactor was shutdown at the time.

Refer also to Applicant's response to EPA Comment No. F.2.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 48)

Section 5.5.2 b. Entrainment Effects, Page 5-37

The last three sentences of this section, page 5-37, aptly sum up the subject of entrainment, particularly of fish eggs and larvae, at Nine Mile Point #1. This should be added to Summary and Conclusions, page i at the bottom of the page.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 49)

Section 5.5.2 c Thermal discharges Effects (1) Fishes.
Page 5-37

The staff makes several references to preferred temperatures of fish. The statements are correct. However, it should be noted in this section, that these preferred temperatures are determined for the most part, by very short term laboratory experiments. And that they only indicate temperatures fish preferred over temperatures they were acclimated to at the time. Preferred temperatures in this context may or may not indicate biologically desirable temperatures for growth, maturation, reproduction, etc.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 50)

Section 5.5.2 c. (1) Fishes top of page 5-38.

The statement is made that occasional small fish may travel into lethal temperatures. This may or may not have any basis and references for this statement would be appreciated.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO: 51)

Section 6.1 Aquatic Monitoring Program. page 6-1

The 3rd sentences of the general statement infers that fish distributions and food preferences are known to some extent. This doesn't seem to be a fact. A better statement might be that ... "Only since May 1970, has the applicant collected data that could lead to fish distribution, food..."

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 52)

Section 6.1 c. Fishes 1st paragraph page 6-2.

In all biological monitoring programs, the need for standardization, where desirable, of methods of data recording and analysis with past and on-going Lake Ontario studies such as the International Field Year in the Great Lakes and the Department of Environmental Conservation, Cape Vincent studies should be stressed. There are considerable data available and being collected which would be valuable for evaluation of the Nine Mile Point monitoring. However, these could only be used when the Nine Mile Point data were comparable. For example, most studies on the Lake using gill nets indicate that an 11-mesh experimental gill net samples species and sizes the best. This is the gear used by the DEC, Federal studies, and others, however, the applicant has been using a 5-mesh net.

Toward the end of this paragraph, the Staff suggests seining along the shore. Trap nets (frequently tended) would be better to sample this situation.

In order to alleviate the possibility of an incomplete or distorted monitoring and assessment program, it is recommended, that the applicant review these programs with this Department, before starting studies, and periodically throughout the study.

RESPONSE

The experimental gill-net being used in the 1973 ecological program at Nine Mile Point consists of panels of six different mesh sizes, namely, 1/2", 3/4", 1", 1 1/2", 2" and 2 1/2".

Gill nets are passive collection devices, and their performance cannot be evaluated quantitatively. That is to say, it is not possible to compare numbers of fish caught by identical nets, let alone nets of different sizes.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 53)

Section 6.1 c. Fishes, page 6-3, 1st paragraph.

We fully agree with the Staff's statement on the value of echo sounder data. We recommend that further studies be designed to evaluate what data is actually being recorded by the echo sounder, e.g., species, size of fish recorded at various depths, size of fish that are not recorded at various depths, and conditions that alter recording patterns.

RESPONSE

No comment.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 54)

Section 6.1 c. Fishes, page 6-3, 3rd paragraph.

The food-preference study will have no value if gill netted fish are used. Fish in gill nets tend to lose food in the net and their gut contents give a biased view of food habits. Fish for this type of analysis need to be captured and worked up very fast to get an accurate picture of food habits.

In this same paragraph, the 5th line from the bottom, "important species" should not be limited to "commercial" importance.

RESPONSE

Normal gill-netting procedure usually involves leaving nets in the Lake for 12 hours at a time. Under those conditions, netted fish will indeed often regurgitate food. However, for food preference studies, gill nets, when used, are installed for no more than one hour before being hauled. The fish collected are immediately cooled with ice and rock salt, and removed to the laboratory at once. Fish used in these studies are also captured by seining.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 55)

Section 6.1 f. Entrainment Studies, page 6-4.

It should be emphasized that samples be taken with appropriate gear close to and at the level of the intake in the lake as well as the intake and discharge wells.

RESPONSE

For procedures and locations involved in the sampling of entrainable organisms in the Lake, refer to Applicant's response to Department of Commerce Comment No. 5.

Sampling in the plant screenwell utilizes a 0.5 meter net, and the flowing water in the forebays make towing unnecessary. Other screenwell plankton sampling activities are performed similarly to those in the lake.

STATE OF NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
(COMMENT NO. 56)

Page 9-9:

It is stated that the Applicant has made a specific design study of natural and forced draft cooling towers and that one of the disadvantages of forced-draft towers is more noise. This disadvantage should be quantified in terms of the increased numbers of persons exposed to various sound levels if forced draft cooling towers were utilized.

RESPONSE

The Applicant evaluated noise levels for both types of cooling towers and it was determined that no residences, schools, or hospitals would receive a sound level greater than 65 dbA. Ten residences would be within the 45 to 65 dbA range with a natural draft cooling tower and forty residences would be within this range with a mechanical draft cooling tower.

It should be noted that the estimates used to determine the sound level contours are conservative and do not include attenuation from trees, terrain, or meteorological conditions which would reduce the offsite noise.

ADVISORY COUNCIL ON HISTORIC PRESERVATION (COMMENT NO. 1)

Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comments to make.

RESPONSE

No comments.

FEDERAL POWER COMMISSION (COMMENT NO. 1)

The use of geothermal power as an alternative to the nuclear unit was not considered, according to the Draft Environmental Statement (Page 9-1). In light of the fact that geothermal sources are known to exist in New York and neighboring states, ^{3/} a discussion of this alternate would be appropriate. (Footnote omitted by Applicant)

RESPONSE

The only warm water spring listed for the State of New York in the above reference, "Thermal Springs of the United States and Other Countries of the World - A Summary", is a spring at Lebanon, New York. This has a temperature of only 76°F which is unsuitable for steam production.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
A. INTRODUCTION AND CONCLUSIONS (COMMENT NO. 1)

The proposed augmented radioactive management system is expected to limit radioactive releases to a level that can be considered "as low as practicable."

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
A. INTRODUCTION AND CONCLUSIONS (COMMENT No. 2)

Operating data from this plant lead us to question the applicability of the AEC standard model for evaluating the liquid radwaste treatment systems. The final statement should address, specifically, what equipment deficiencies have occurred and what corrective actions have been taken or are committed to, which will insure that the liquid radwaste equipment will perform as designed.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
A. INTRODUCTION AND CONCLUSIONS (COMMENT NO. 3)

After an examination of the curies released and the relative percentages of critical isotopes reported in the 1971 and 1972 operating reports for the station, we question the validity of some of the basic assumptions used by the AEC in their dose calculations for this nuclear station. Use of the standard AEC dose model is acceptable only if it adequately reflects reported operational releases from the station since 1972.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS

A. INTRODUCTION AND CONCLUSIONS (COMMENT NO. 4)

The existing monitoring program for assessing the extent of impingement and entrainment losses is inadequate. We concur with the AEC staff's recommendation that this program be substantially expanded.

RESPONSE

Refer to Applicant's response to State of New York Department of Environmental Conservation Comment No. 3 and Department of Commerce Comment No. 12.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS.
A. INTRODUCTION AND CONCLUSIONS (COMMENT NO. 5)

Owing to the lack of information concerning the effects of the plant on the biota of the receiving water, a complete assessment of the plant's environmental impact is not possible. Consequently, it is our recommendation that the final statement not be processed and the full-term operating license not be granted until after completion of the monitoring program and analysis of the results. In the interim, the plant should continue to operate under its provisional license.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
A. INTRODUCTION AND CONCLUSIONS (COMMENT No. 6)

The cooling system as presently designed with cause New York State criteria for thermal effluents to be grossly exceeded.

RESPONSE

Refer to Applicant's response to U. S. Department of Health, Education, and Welfare Comment No. 4

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
B. RADIOACTIVE WASTE MANAGEMENT (COMMENT NO. 1)

The radioactive waste management systems currently being utilized in the Nine Mile Point Nuclear Station Unit 1 are not representative of current practice. However, the proposed augmented radioactive waste systems include "state-of-the-art" technology and, if properly operated and maintained consistent with 10 CFR Part 50, the discharges should be "as low as practicable."

As noted on page 3-18 of the draft statement, "Operating experience to date has resulted in higher liquid releases than those calculated. The operating maintenance report indicates that the radwaste equipment has not performed according to design." These deficiencies could be due to a variety of causes, such as a lack of component reliability causing excess leakage, or failure to achieve expected decontamination factors. On the other hand, the problems that have occurred may be peculiar to the Nine Mile Point 1 station rather than the waste treatment equipment itself, due to operational factors. In view of the currently available operating experience, we are concerned with the applicability of the AEC standard model for evaluating the liquid radwaste system. The final statement should address specifically what deficiencies have occurred and the corrective actions that have been implemented, or are committed to, which will insure that the liquid releases will be "as low as practicable."

If corrective action has already been taken, then we would encourage the utilization of operating data taken subsequent to that action to validate the AEC standard model for the analysis to be made in the final statement.

RESPONSE

Based on operating experience changes are being made to the liquid and gaseous radioactive waste systems. These modifications will result in discharges being well within, "as low as practicable" numerical guidelines.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
C. DOSE ASSESSMENT (COMMENT NO. 1)

We are concerned with the validity of using the AEC standard assumptions in the dose calculations associated with liquid releases from the station in light of the available operating data. This concern is two-fold: 1) the operating data indicate a much greater total activity released and 2) large variations are evident in the percentages of critical long-lived isotopes (isotopic mix) observed in operating data versus the AEC predicted releases. The following table illustrates the problem:

Isotope	AEC estimate of existing system releases		1971 operating data adjusted to 80% load factor		1972 operating data adjusted to 80% load factor	
	1972 % total	Ci	1971 % total	Ci	1972 % total	Ci
Cs-134	0.9	0.036	1.5	0.70	11.1	5.85
Cs-137	0.8	0.032	4.5	1.47	29.1	15.51
Mn-54	0.11	0.0044	18.4	8.45	13.6	7.01
Co-60	0.9	0.037	20.0	9.30	26.0	13.65
I-133	15.75	0.63	0.9	0.37	1.95	1.01

Accordingly, the final statement should use either extrapolations from the existing operating data for the dose calculations, or justify the use of the standard AEC model in order to present a more realistic picture of the impact of this facility.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
D. TRANSPORTATION (COMMENT NO. 1)

EPA, in its earlier reviews of the environmental impact of transportation of radioactive material, agreed with the AEC that many aspects of this problem could best be treated on a generic basis. The generic approach has reached the point where on February 5, 1973, the AEC published for comment in the Federal Register a rule-making proposal concerning the "Environmental Effects of Transportation of Fuel and Waste from Nuclear Power Reactors." EPA commented on the proposed rulemaking by a letter to the AEC, dated March 22, 1973, and by an appearance at the public hearing on April 2, 1973.

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

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
E. REACTOR ACCIDENTS (COMMENT NO. 1)

EPA has examined the AEC analysis of accidents and their potential risks which AEC has developed in the course of its engineering evaluation of reactor safety in the design of nuclear plants. Since these accidents are common to all nuclear power plants of a given type, EPA concurs with the AEC's approach to evaluate the environmental risk for each accident class on a generic basis. The AEC has in the past and still continues to devote extensive efforts to assure safety through plant design and accident analyses in the licensing process on a case-by-case basis. EPA, however, favors the additional step now being undertaken by the AEC of a thorough analysis on a more quantitative basis of the risk of potential accidents in all ranges. We continue to encourage this effort and urge the AEC to press forward to its timely completion and publication. EPA believes this will result in a better understanding of the possible risks to the environment.

In order to provide a fuller understanding of the direction of these efforts, it is requested that the final statement (either directly or by publicly available reference) provide information on the nature, expected schedule, and level of effort of those generic studies which are expected to lead to a basis for a subsequent assessment by the AEC concerning the risk from all potential accidents classes in the Nine Mile Point Station. It is recognized that this subsequent assessment may be either generic or specific in nature depending on the outcome of the generic studies. In addition, the final statement should include an AEC commitment that this assessment will be made publicly available within a reasonable time period following completion of the generic studies. Clearly, if the above efforts indicate that unwarranted risks are being taken at the Nine Mile Point Station we are confident that the AEC will assure appropriate corrective action. Similarly, if EPA efforts related to the accident area uncover any environmentally unacceptable conditions related to the safety of the Nine Mile Point Station, we will make our views known.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATIONS (COMMENT NO. 1)

- a. Nine Mile Point Unit 1 has been in operation for 3 1/2 years. During that period the applicant has had the opportunity to perform comprehensive monitoring of the biological effects of the once-through cooling system. In particular, complete analyses of losses by impingement and entrainment could have been performed and the results made available at this time. These could have been used as a basis for judging the acceptability of the present cooling system design as it affects the aquatic ecology. Instead, over the 3 1/2 years of the plant's operation, the applicant has carried out an incomplete and insufficient monitoring program, the results of which are inadequate for purposes of determining the environmental impact of the plant's operation.
- b. Indications are, however, the significant losses due to entrainment and impingement will occur. We concur with the AEC staff's conclusion that complete mortality will result to entrained organisms when exposed to a 32°F temperature rise and a transit time of 6 minutes. Fish which enter through the intake structure are likely to suffer 100% mortality also, and, since the structure is located in a region known to have high concentrations of fish, this loss could be substantial. The true extent of all these losses has not, as we indicated above, been quantified. Consequently, a judgment of the impact of the plant on the aquatic ecology cannot be made.

In the Summary and Conclusions section the staff recommends that the applicant undertake a much expanded environmental monitoring program for determining the plant's impact on the aquatic environment. We concur with this recommendation. Certain aspects of this program need further explanation, however. The portion dealing with intake effects does not describe the duration of the fish monitoring program.

RESPONSE

Since 1968 the Applicant has been conducting aquatic biota studies in the area which would be affected by the thermal discharge and has continued to expand data collection with new technology.

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATIONS (COMMENT NO. 1) CONTINUED

The Applicant has taken advantage of the opportunity to conduct fish impingement studies and evaluate fish entrapment at Nine Mile Point Unit 1. The fish impingement study began in May 1972 and efforts through November 7, 1972 were reported in Supplement 3 of the Applicant's Environmental Report. This study will continue throughout 1974. Since March 1973, sampling has been performed at weekly intervals, which is double the sampling frequency in 1972, but each sample run is for a 24 hour period rather than for a few hours per day.

The Applicant has conducted studies at Nine Mile Point Unit 1 regarding the effect of condenser passage upon mortality of phytoplankton and zooplankton. Results of these studies were reported in Supplement 2 of the Applicant's Environmental Report.

Additional entrainment studies are included in the 1973 surveillance program to continue to evaluate the behavior of organisms passing through Nine Mile Point Unit 1. For details of lake ichthyoplankton sampling, refer to Applicant's response to Department of Commerce Comment No. 5.

Phyto and zooplankton will be sampled monthly in four different depths of water on four transects, two located at Nine Mile Point Unit 1 and the James A. FitzPatrick plant, and the other two at the west and east ends of the Nine Mile Point promontory.

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATIONS (COMMENT NO. 1) CONTINUED

The general objectives of the entrainment studies are:

1. To expand the existing data base with respect to the limnological aspects of Lake and resident plankton populations in the vicinity of the Nine Mile Point area. These studies will include the diurnal and seasonal distributions of ichthyoplankton and phytoplankton.
2. To determine the rate of entrainment of such organisms in this area.
3. To measure mortality rates of the organisms entrained at the Nine Mile Point Unit 1 at various times during the year.
4. To estimate the effect that entrainment and the mortality rate have on the ichthyoplankton populations.

With regard to the effect on lake fish populations of fish impingement, refer to Applicant's response to DEC Comment No. 1.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATION (COMMENT NO. 2)

Also, the proposed laboratory entrainment studies consider the effect of temperature but totally ignore the mechanical stress experienced during a six minute transit time. This mechanical stress is probably more harmful than the thermal stress and the two in conjunction work synergistically to produce the actual loss. Thus, in order to accurately determine entrainment losses a technique should be developed to simulate the actual stress experienced by entrained organisms.

RESPONSE

Entrainment sampling is being performed in both the intake and discharge forebays of Nine Mile Point Unit 1. The procedure involves sampling first in the intake, and then, three minutes later, in the discharge. Three minutes is approximately the transit time between the two sampling locations. The differences between the two sets of samples disclosed by laboratory analysis can therefore be attributed to passage through the screens, pumps and condenser.

Samples collected and analyzed during periods of pump operation without the addition of heat (reactor shutdown) indicate mechanical stress (plankton kill rate) to be in the range of 10-20 percent. Thermal stress (plankton kill rate) of course varies with temperature and plant studies indicate this rate varies from approximately 30 percent at discharge water temperature of 95°F to approximately 100 percent at discharge water temperature of 105°F while condenser delta T equals 32°F.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATIONS (COMMENT NO. 3)

Since the goal of the proposed monitoring program is to determine the effect of entrainment and impingement losses on the lake ecosystem, the total impact of all plants in the area must be determined. Rather than separate monitoring programs for Nine Mile Point Units 1 and 2 and the FitzPatrick plant, a single monitoring effort for all three plants should be instituted. Thus, impingement and entrainment loss data from the three plants could be correlated with the data from a single lake population study and effects, if any, determined.

RESPONSE

The Applicant concurs that the entire Nine Mile Point promontory (the site of the three plants) be included in the ecological program, and this has indeed been done. Refer to Applicant's response to Department of Commerce No. 12. It is also planned to conduct impingement studies at the three plants. Since the delta T for each plant is approximately the same, entrainment study data on Nine Mile Unit 1 can be extrapolated to the other plants.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
F. BIOLOGICAL CONSIDERATIONS (COMMENT NO. 4)

The staff precedes their recommendation of a monitoring program with the conclusion that the current provisional operating license should be converted to a full-term license. It is stated that this is the action called for under the National Environmental Policy Act (NEPA). It is our opinion, based on the lack of sufficient information with which to assess the environmental impact of the plant, that the requirements of NEPA have not been satisfied, and therefore that no action is called for. Considering the lack of information, which is discussed above, an evaluation of the environmental impact of this action, sufficient under NEPA, is not possible. We do not see the requirements of NEPA being satisfied until the proposed monitoring program is completed and there are sufficient data available so that the effects of the plant can be assessed. Therefore, we recommend that the full-term license not be issued until such time as the environmental impact of the action can be fully evaluated. Only when the required information is available, should a final environmental impact statement be issued as a basis for the decision on the full-term operating license.

RESPONSE

No comment.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS

G. THERMAL CONSIDERATION (COMMENT NO. 1)

As reported in the EIS, New York State thermal discharge criteria limit the rise in surface temperature in the receiving water to 3°F within a 300 foot radius area (6.5 acres). With the present discharge system, the area encompassed by the 3° isotherm of Unit 1 ranges from 50 to 400 acres. Even at the low end of the range, New York State thermal criteria are grossly exceeded. It can then be assumed that when the discharge from Unit 2 and the discharges from Unit 2 and the FitzPatrick plant are superimposed on the Unit 1 plume, the situation will be worse still.

This EIS barely mentions and neglects any discussion of the applicant's proposal, contained in the draft statement for Nine Mile Point Unit 2, to combine the Unit 1 and 2 discharges into a single submerged jet diffuser. This type of discharge has a significant effect on plume size and would alter considerably the size of the plume encompassed by the 3° isotherm. The way that this might affect compliance with thermal criteria should have been completely analyzed in this draft statement. Also, the result of any interaction with the plume of the FitzPatrick plant should have been analyzed. Both of these analyzes should be included in the final statement, and will be considerations in the issuance by EPA of a Section 402 discharge permit under the Federal Water Pollution Control Act (FWPCA).

RESPONSE

Refer to Applicant's response to U. S. Department of Commerce Comment No. 1 and U. S. Department of Health, Education, and Welfare Comment No. 4.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
G. THERMAL CONSIDERATIONS (COMMENT NO. 2)

A. In accordance with the FWPCA, discharges to navigable waters are subject to effluent limitations reflecting the "best practicable control technology currently available" by July 1, 1977, or to stricter limitations if they are necessary to meet applicable water quality standards. By July 1, 1983, discharges must achieve effluent control reflecting the "best available technology economically achievable." (For the thermal component of discharges, a reevaluation of the limitations imposed by the Administrator of EPA is possible under Section 316, FWPCA.)

Definitions of the technology-based terms are scheduled for promulgation in October 1973. The cooling system as now operated causes a violation of existing criteria, as noted above, and we anticipate that the discharge will be in violation of a revision to Federal-State standards now pending under the FWPCA.

B. Furthermore, the discharge would, in all probability, fail to meet the effluent limitations guidelines, once promulgated. The applicant should, therefore, evaluate alternative heat dissipation systems for this facility, including closed-cycle system alternatives, taking into account the relationship of waste heat effects from Unit II and FitzPatrick as well as Unit I. Such evaluation should be included in the final statement.

RESPONSE

A. The cooling system as now operated does not cause a violation of existing criteria, as discussed in Applicant's response to U. S. Department of Health, Education and Welfare Comment No. 4.

B. Cooling system alternatives were considered in accordance with the published guidelines for cost-benefit analysis (section 9.5) of the Applicant's Environmental Report and have been described in section 9.2-1 of the Draft Environmental Statement.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
H. OTHER WATER QUALITY EFFECTS (COMMENT NO. 1)

The AEC staff has concluded (Page 5-6) with respect to the increase in total dissolved solids as a result of plant operation, that "no lake-wide effect will be discernible." We recommend that the applicant include an evaluation of local impacts, and justify the non-compliance with requirements for total dissolved solids levels of the Minimum Federal Water Quality Criteria and the International Agreement on Great Lakes Water Quality (April 15, 1972).

RESPONSE

The international Agreement on Great Lakes Water Quality set a limit on the discharge of total dissolved solids. These standards specify that the dissolved solids in a discharge should not exceed 200mg/l. The total dissolved solids level in Lake Ontario is approximately 233mg/l near the Nine Mile site under natural conditions. Total dissolved solids levels in the Lake along the Oswego to Nine Mile Point shoreline area have been measured as generally higher than those in Lake Ontario as a whole evidently due to runoff from the large solids load carried by the Oswego River. The IJC Report of 1969 (Pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River) cites lakewide values of total dissolved solids approaching 200mg/l in 1960, rising at a rate of approximately 10mg/decade.

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
H. OTHER WATER QUALITY EFFECTS (COMMENT NO. 1) CONTINUED

In a document issued in July 1973 entitled "Proposed Classifications and Standards Governing the Quality and Purity of Waters of New York State", the recommended value for dissolved solids content in Class "A" (Lake Ontario) waters was stated: "Shall not exceed 500 mg/l or one-third above natural characteristic levels, whichever is less".

Measurements of total dissolved solids have been made in both the oxidation pond and the storm drain effluents at Nine Mile Point.

The oxidation pond effluent had total dissolved solids of 400 and 500mg/l in 24 hour composite samples taken on September 5-6 and September 26-27, 1973, respectively. The low volume of effluent from this source and the exceptional possibilities of dilution or dispersion prior to entering Lake Ontario indicate that it is unlikely this source would have an effect upon Lake Ontario water quality.

Composite samples of the storm drain effluent were also collected. The 24-hour mean value on September 5-6 was 195mg/l, while the average for this 24-hour period on September 26-27 was 240mg/l. Neither of these values is inconsistent with the natural variations of dissolved solid content measured in the Lake.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
H. OTHER WATER QUALITY EFFECTS (COMMENT NO. 2)

The draft statement also recognizes (Page 5-7) the non-compliance of Nine Mile Point, Unit 1, with requirements for the addition of phosphates to receiving waters of the Minimum Federal Water Quality Criteria and the International Agreement on Great Lakes Water Quality. The applicant should present, in the final statement, detailed justification for this non-compliance.

RESPONSE

Refer to Applicant's response to U. S. Department of Health, Education, and Welfare Comment No. 5.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 1)

The impact statement should provide a discussion of the mechanical equipment at the facility which has a potential for emitting non-radiological air pollutants. Information for auxiliary boilers and diesel engines should be provided relating to size of equipment, fuel type, fuel analysis, fuel use rate and frequency of use for each type of equipment, and pollutant emission factors employed in estimating air pollutant emissions.

RESPONSE

The diesel-driven fire pump and two standby diesel generators are operated when required on an emergency basis and are tested periodically to determine availability. The auxiliary boilers are electric and powered from the Applicant's generation system. They are normally secured while the station is in operation.

The fire pump diesel was in operation for a period of 18 hours during 1972 and consumed an average of 21.8 gallons of fuel per hour of operation. Each standby generator was operated for a period of approximately 15 hours during 1972 with an average fuel consumption rate of 190 gallons per hour. These figures are representative of normal plant operation.

The diesel-driven fire pump is powered by a 300 HP diesel engine fueled by No. 2 diesel fuel. This pump and diesel set is a standby unit and will be tested once a week for a period of approximately 30 minutes. The fuel consumption at rated rpm operation is 23 gal/hr.

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 1) CONTINUED

Standby power is supplied by two diesel generator sets--both rated at approximately 2500 KW. Conservatively assuming that:

a) Both diesel engines use commercial grade No. 2 diesel fuel at a consumption rate of approximately 220 gal/hr. each.

b) Each of these units are tested once per month with a test duration of approximately 4 hours, and

c) The fuel analysis for No. 2 diesel fuel is as follows:

sulfur	0.05-1.0 percent by weight
hydrogen	11.8-13.9 percent by weight
carbon	86.1-88.2 percent by weight
nitrogen	negligible - 0.1 percent by weight

The concentrations of pollutants expected to be emitted by the diesel engines during their operating periods are tabulated below:

	Fire Pump Diesel	Emergency Diesels
Hydrocarbon	0.58 lb/hr	5.2 lb/hr
Particulate	2.4 lb/hr	23 lb/hr
SO ₂	3.4 lb/hr	32 lb/hr
CO	1.5	13.8 lb/hr
NO _x	12.2	112 lb/hr

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 2)

Information should be provided in the final statement relative to the impact of the high voltage transmission line ozone prediction rate and its potential environmental impacts.

RESPONSE

The Applicant has investigated and evaluated studies* directed at Ozone production and subsequent environmental effects associated with high voltage transmission lines. These studies concluded that although Ozone as well as Nitrogen Oxides are produced during high voltage transmission line operation, their dilution and decay is such that it is essentially impossible to detect and measure differences in concentration at ground level for "line energized" and "line deenergized" conditions. It was also concluded that the operation of 765 kV systems does not create any adverse effects on vegetation or animals in respect to oxidants even during foul weather conditions under which the heaviest corona loss and maximum oxidant production occurs.

* Juette, G. W., "Corona - Caused Air Pollution" Project UHV., Tech. Report No. TIS-71-EU-13, 3/18/71.

Juette, G. W., Zaffanella, L. E., "Test Results of the Energization of Project UHV Test Lines" 36 in. Diam. bundle (Report No. TIS-71-EU-15, 5/28/71) 56 in. Diam. bundle (Report No. TIS-71-EU-39, 8/19/71)

Scherer Jr., H. N., Ware, B. J., Shih, C. H., "Gaseous Effluents due to EHV Transmission Line Corona" IEEE Transactions Paper No. T 72 550-2 presented at Summer Meeting-July 9-14, 1972.

Frydman, M., Levy, A., Miller, S. E. "Oxidant Measurements in the Vicinity of Energized 765 kV Lines" - IEEE Transactions Paper No. T 72 441-0 presented at Summer Meeting - July 9-14, 1972.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 3)

The statement should provide a discussion of the existing ambient air quality and the anticipated ambient air quality with and without the facility in operation.

RESPONSE

The operation of the nuclear facilities will not affect the existing ambient air quality of the Nine Mile Point area. New York State Department of Environmental Conservation had classified this area as level I under Section 256.1 NYCRR. Level I is defined as "predominantly used for timber, agricultural crops, dairy farming, or recreation. Habitation and Industry Sparse." Under this classification the following air quality standards are required:

- A. SO₂ Concentrations, - During Any 12 Consecutive Months
- 1) 99% of one hour average concentrations shall not exceed - 650 ug/ m^3 (0.25 ppm)
 - 2) No one hour average concentration shall exceed - 1300 ug/ m^3 (0.50 ppm)
 - 3) 99% of the 24 hour average concentration shall not exceed - 260 ug/ m^3 (0.10 ppm)
 - 4) No 24 hour average concentration shall exceed - 365 ug/ m^3 (0.14 ppm)
 - 5) The annual average of the 24 hour average concentration shall not exceed - 80 ug/ m^3 (0.03 ppm)

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 3) CONTINUED

B. Particulates (Suspended)

1) Short Term value:

For any 24 hour period
the average concentration
shall not exceed -

250 ug/ m³

2) Long term value:

a) During any 12 consecutive
months, 50% of the values
of the 24 hour average
concentrations shall not
exceed -

45 ug/ m³

b) During any 12 consecutive
months, 84% of the values
of the 24 hour average
concentrations shall not
exceed

70 ug/ m³

C. Nitrogen Dioxide

During any 12 consecutive months,
the annual average of the 24 hour
concentrations shall not exceed

100 ug/ m³ (0.05 ppm)

D. Carbon Monoxide

1) For an 8 hour period, the
average concentration shall
not exceed

10 mg/ m³ (9 ppm)

2) For a 1 hour period, the
average concentration shall
not exceed

40 mg/ m³ (35 ppm)

As noted in Applicant's response to EPA Comment No. I-1
emissions from mechanical equipment at the site are extremely
limited. Permits to operate stationary sources such as

RESPONSE TO U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 3) CONTINUED

auxiliary boilers and diesel engines are requested from the New York State Department of Environmental Conservation and their operation is subject to appropriate emission regulations. Mobile sources, ie, truck traffic and construction equipment do not constitute major sources of emissions. Site construction activity will contribute to periods of increased suspended particulate concentrations, however this contribution is considered short term and precautions such as wetting of roads and construction areas are followed to reduce fugitive dust concentrations.

U. S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS
I. AIR QUALITY AND METEOROLOGY (COMMENT NO. 4)

Meteorological material presented in this draft and environmental and the environmental statement for Unit 1 is essentially identical to that presented earlier for Unit 2. [sic] Our meteorological comments remain the same as those presented in our letter of May 25, 1973, on Nine Mile Point Nuclear Station, Unit II.

RESPONSE

Annual averages of site meteorological conditions were presented to the AEC as part of Docket No. 50-220 (Nine Mile Point Unit 1 Final Safety Analysis Report, Vol. II). These data were also employed for Unit 2 and James A. FitzPatrick Nuclear Power Plant and are readily available.

The Applicant's responses to other meteorological comments are set out at pages J-191 through J-197 of the Final Environmental Statement related to construction of Nine Mile Point Nuclear Station Unit 2.

C-1

APPENDIX C

APPLICANT'S PARTIAL RESPONSE TO
COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT

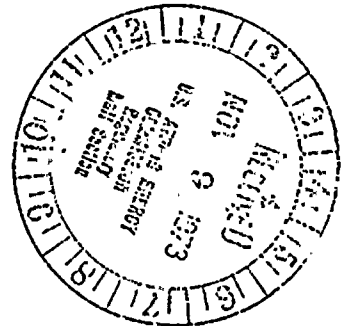
NIAGARA MOHAWK POWER CORPORATION



300 ERIE BOULEVARD WEST
SYRACUSE, N. Y. 13202

November 9, 1973

Mr. W. H. Regan, Jr., Chief
Environmental Projects Branch No. 4
Directorate of Licensing
Office of Regulation
U. S. Atomic Energy Commission
Washington, D. C. 20545



Re: Nine Mile Point Unit 1
Docket No. 50-220

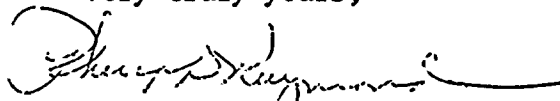
Dear Mr. Regan:

Your letter of October 30, 1973 included comments from various governmental agencies concerning the Draft Environmental Statement for Nine Mile Point Unit 1.

Our responses to the Department of the Interior comments are attached. As requested in your letter, the reply consists of three signed originals and forty additional copies.

Responses to all other agency comments were transmitted to you by my letter of October 31, 1973.

Very truly yours,



Philip D. Raymond
Vice President-Engineering

CVM/sjz
Attachment

8146

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT UNIT 1

APPLICANT'S RESPONSES
TO
U. S. DEPARTMENT OF THE INTERIOR
ON
AEC DRAFT ENVIRONMENTAL STATEMENT

SUBMITTED TO
UNITED STATES ATOMIC ENERGY COMMISSION
DOCKET NO. 50-220

November 9, 1973

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 1)General

Nine Mile Point Nuclear Station, Unit 1, is the initial component of a 2,531 MWe-power generating complex located along the shoreline of Lake Ontario near Syracuse, New York. Unit 1, a 610 MWe plant which began operating in December 1969, will be complemented by the James A. Fitz-Patrick Nuclear Power plant, scheduled to begin operation in October 1973, and Nine Mile Point Unit 2 which is expected to be completed in 1978. Each facility is designed for once-through cooling.

Fish stocks of Lake Ontario have undergone substantial changes because of modification of vegetation patterns in the watershed, damming of tributary streams, depletion of the fish stocks by commercial harvest, introduction of exotic fish species, and effects of municipal and industrial waste disposal. These kinds of changes interact to alter the competitive composition of fish stocks, generally favoring those having lesser value to man.

The evidence of environmental deterioration is far more marked inshore than offshore. By 1950 algae began to foul gill nets of commercial fisherman, yet oxygen depletions which are often associated with such dense algae growth were not detected until 1970. These conditions do not favor successful reproduction of fish species such as lake herring and white fish.

The individual and cumulative impacts of once-through power plant cooling in the area of Nine Mile Point will place an unwarranted and unacceptable burden on the lake's resources.

Technology for closed-cycle cooling systems has advanced to a point wherein the environmental effects, including drift and blowdown are minimal. Based on partial and incomplete studies on the environmental effects of Unit 1, we believe that continued use of the lake's water for power plant cooling at Nine Mile Point is not in the best public interest.

RESPONSE

No comment.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 2)Summary and Conclusions

Based on the description of the thermal plume given in Section 5 and the locations of the intake and discharge facilities, it is probable that recirculation of the heated effluent will occur at Unit 1. We suggest that the impacts associated with recirculation should be identified in the Summary and Conclusions Section.

RESPONSE

Three dimensional thermal surveys which have been conducted in the area of Nine Mile Point Unit 1 cooling water discharge have included measurements of the plants intake temperature as well as temperature in the thermal plume. Recirculation has not been measurable. The major difficulty in discerning small amounts of recirculation is natural variability in the ambient temperature. Temperature variations of 1°F have commonly been observed over horizontal distances of a fraction of a mile. In addition to the horizontal differences in temperature near the site, the ambient temperature frequently varies by a few degrees in the vertical water depths shallower than 50 feet. Since slightly cooler water is usually found below the surface, the intake experiences no measurable recirculation.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 3)Outdoor Recreation

Our concerns for outdoor recreational development for this area have been expressed in our previous letters to the AEC in regard to the James A. FitzPatrick Nuclear Power Plant and Unit 2 of Nine Mile Point. We believe that the subject statement should address the possibilities of developing an open space multiple-use plan for the lands of both power plants.

The plan could be developed by the joint efforts of the applicant, the Power Authority of the State of New York, the New York State Conservation Department, and the County of Oswego. Since the area is only 36 miles from the metropolitan area of Syracuse; an outdoor recreation plan for a major portion of the lands appears to be in the public interest. We are pleased that the applicant has established 130 acres of the site as a wildlife habitat by posting the northwest corner of the site.

Additionally, we suggest that consistent with general safety factors, consideration be given to developing secondary uses of the transmission right-of-way in the interest of outdoor recreation. This Department's Northeast Regional Office of the Bureau of Outdoor Recreation will welcome an opportunity to work with the applicant for such development. BOR's Northeast Region's office is located at the Federal Building, 1421 Cherry Street, Philadelphia, Pennsylvania 19102.

RESPONSE

The Applicant is presently devoting portions of the site land to multiple use. A Progress Center within the mentioned 130 acre area provides an array of educational exhibits concerned with electricity generation, nuclear power and environmental awareness. The facility site offers picnic areas and nature trails for public use. The Progress Center is visited by approximately fifty thousand visitors per year.

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 3)
CONTINUED

The Applicant continues to recognize the potential for further multiple land use here and throughout his sytem and continues to consider the subject where public use justifies such plans.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 4)Topography and Geology

The brief section on geology and topography is inadequate for an independent assessment of how these major elements of the environment relate to Unit 1. The distribution and thickness of surficial deposits and physical properties of rocks and soils should be summarized, particularly as they relate to design, construction, slope stability, and erosion. A topographic and geologic map should be included.

The seismic-design parameters and the methods of their derivation are not mentioned. Since at least 13 earthquakes have occurred within 50 miles of the station over a period of 110 years, including one with an intensity of VI on the modified Mercalli scale the final environmental statement should state specifically what seismic design criteria were used in construction of Unit 1 and what environmental effects are predicted from earthquakes.

The statement is made on page 2-8 that "the relationship of site seismology to the safety of the Station, its design, and seismic design criteria have been considered in detail by the Staff in the safety review." We do not feel that environmental concerns related to seismology are satisfied by this statement or other discussions of seismology in the report.

The draft environmental statements for both the Nine Mile Point Nuclear Power Station Unit 2 and the James A. FitzPatrick Nuclear Power Plant concluded that the site is located in an inactive seismic region. Our letter of April 1973, advised you that the Nine Mile Point Plant is shown in damage zone 2 (moderate damage) on a seismic zoning map dated 1969 (U.S. Coast and Geodetic Survey).

Based on these considerations we believe that this environmental statement should present a more comprehensive summary of the regional and local site geology, and should specify how the geologic and seismologic analyses have been taken into account. In this respect, we note that the AEC has published "Seismic and Geologic Siting Criteria for Nuclear Power Plants" (Proposed Appendix A, 10 CFR 100, Federal Register, November 25, 1971) which prescribe the nature of required investigations. The impact statement should clearly specify whether these criteria have been applied to the Nine Mile Point site.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 4)

RESPONSE

The subjects of this comment are discussed in considerable detail in "Final Safety Analysis Report - Nine Mile Point Unit 1, AEC Docket No. 50-220" and "Preliminary Safety Analysis Report - Nine Mile Point Unit 2, AEC Docket 50-410".

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 5)

Lake Water Hydrology

Additional information should be included in this section to describe the temperature stratifications and development of thermoclines in the area of Nine Mile Point. Descriptive information regarding this subject is included in Technical Report No. 14 from the Great Lakes Fishery Commission, entitled "Limnological Survey of Lake Ontario, 1964." This publication is dated April 1969, and is available from the Great Lakes Fishery Commission, Ann Arbor, Michigan.

RESPONSE

No comment.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 6)Aquatic Ecology

Because this section is heavily dependent upon information available in the literature, we believe that data and information in Technical Report No. 23 from the Great Lakes Fishery Commission, entitled, "A Review of Changes in the Fish Species Composition of Lake Ontario" dated January 1973, should be referenced also. Information contained in this report relates to the spawning characteristics of the white fish and lake herring as well as other fishes. Also, fish species such as the white fish, lake herring and the yellow perch require temperatures less than 4°C during winter periods to successfully reproduce. Exposing adults and eggs and larvae to temperatures higher than those which naturally occur during winter periods may cause deformities to develop either in the egg or larval stages. Although data are not available on the requirements of closely related species such as sauger and walleye, these and other species may have their reproductive potential impaired by increases in seasonal temperatures. Reference to these and other potential impacts on fishery resources are described in a report entitled, "Review of Recent Technical Information Concerning the Adverse Effects of Once-Through Cooling on Lake Michigan," prepared by the U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Great Lakes Fishery Laboratory, Ann Arbor, Michigan, dated November 1, 1972, Much of this information is applicable to Lake Ontario.

RESPONSE

The Applicant has observed yellow perch in the discharge plume area of Unit 1 (refer to Applicant's response to Department of Commerce Comment No. 9, submitted to the AEC October 31, 1973.) Regarding the other species mentioned in this comment, none is as delicate as the alewife, and the alewife's reproduction and growth have evidently not been affected since the plant went into operation late in 1969.

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 6)
CONTINUED

The alewife exists in fresh water under such osmotic stress that the hormonal control mechanisms (e.g., Thyroid) are exhausted (1). No other species in Lake Ontario exists in a like state, yet sampling cruises in 1972 (2) show no evidence of alewife depletion in numbers or quality.

The thermal plume is largely restricted to the nearshore waters by the influence of prevailing winds and currents. However, in winter, adult fish retreat offshore to the deeper warmer waters, and eggs and larvae are not normally found inshore at this time of year.

With reference to the information review of the Great Lakes Fishery Laboratory (3), this is first addressed to a documentation of fish kills at sites on Lake Michigan, none of which is strictly comparable, either biologically or physically, to Nine Mile Point area. It is a review of laboratory experimentation, detailing responses to temperature changes of species not impacted by Nine Mile Point Unit 1, either because of impingement or discharge.

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 6)
CONTINUED

- (1) Hoar, W.S., "Thyroid Function in Some Andronomous and Landlocked Teleosts." Trans. Roy. Soc. Canada, Vol. 46(3), Sec. 5, pp. 39-53, 1952.
- (2) Great Lakes Fishery Laboratory, B.S.F.W., Ann Arbor, Michigan, R/V Kaho Cruise Reports 1972.
- (3) Edell, T.A., and Yokum, T.G., "Review of Recent Technical Information Concerning the Adverse Effects of Once-through Cooling on Lake Michigan." Report for Lake Michigan Enforcement Conf., Ann Arbor. U. S. Fish & Wildlife Service, B.S.F.W., Great Lakes Fishery Lab., 1972.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 7)

Sanitary Wastes and Other Effluents

Copper and other heavy metals will erode and corrode from the cooling water system. The amounts of these materials and their potential environmental impacts should be described in this section of the environmental statement.

RESPONSE

A number of Lake Ontario water quality parameters were analyzed in the vicinity of Nine Mile Point and in the Unit 1 cooling water discharge during 1972. These data were presented in a report submitted to the New York State Department of Environmental Conservation in February 1973. (Effect of Circulating Water Systems on Lake Ontario Water Temperature and Aquatic Biology - Nine Mile Point Unit 2, QLM Project No. 191-9).

The minimum and maximum values of six samples collected monthly during the period April to November 1972 (May and October excluded) and analyzed for heavy metals, are presented in the attached table. Evaluation of these values indicates a negligible contribution of the plant to lake water concentrations of heavy metals.

NINE MILE POINT
HEAVY METALS ANALYSIS

LAKE ONTARIO VICINITY OF NINE MILE POINT

		30-foot Water Depth				40-foot Water Depth				Unit 1					
		Surface		Bottom		Surface		Bottom		Intake		Discharge		Composite**	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Beryllium	µg/l	<1	5	<1	<1	<1	15	<1	<1	8	8	<1	<1	<1	13
Cadmium	µg/l	<1	12	<1	10	<1	4	<1	4	1	4	<1	7	<1	4
Chromium	µg/l	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15	<15
Copper	µg/l	<2	<2	<2	17	<2	<2	<2	<2	<2	68	<2	<2	<2	13
Lead	µg/l	<20	164	<20	<20	<20	<20	<20	<20	<20	25	<20	50	<20	<20
Mercury	µg/l	<1	1	<1	2	<1	1	<1	2	<1	17	<1	5	<1	2
Vanadium	µg/l	<60	<60	<60	429	<60	353	<60	404	<60	353	<60	93	<60	116
Zinc	µg/l	<2	<2	18	28	<2	75	22	24	<2	52	8	20	26	32

* single value

** taken at screenhouse discharge channel

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 8)Solid Waste System

Solid radioactive wastes that result from operations of Unit 1 are described mainly by their gross character, as concentrates from radwaste evaporators, spent resins and filter sludge, paper, air filters, rags, "and control rods, fuel channels, and contaminated replaced equipment." Their total quantity is roughly estimated as 11,000 cubic feet annually, with an activity of 2,700 curies. However, the draft statement does not specify the kinds of radionuclides, their physical states, or their concentrations in the wastes, nor has the location planned for off-site burial been identified. This information should be presented in the final environmental statement.

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

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

RESPONSE TO U. S. DEPARTMENT OF INTERIOR (COMMENT NO. 8)
CONTINUED

environmental consideration given on pages G-18 through G-21 are not specific to a particular site or to particular wastes.

RESPONSE

No comment.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 9)Thermal Studies

Thermal effects of cooling water discharged into Lake Ontario should be estimated for the combined effect of operation of both adjoining power plants. Data available from infrared radiometer measurements should be included. This type of data has been published in the final environmental statement for the FitzPatrick Plant. We also recommend that the applicant utilize remote sensor data in monitoring the thermal plume due to the extensive area and the complexities involved when several large waste heat sources are operating in a small area.

Field temperature surveys of the thermal plume resulting from the operation of Unit 1 far exceed water-quality standards. Throughout earlier reports on this plant, we are assured through mathematical and hydraulic model test results that there will be no thermal problems. Previously, we questioned the results of these studies and stated that alternatives should be considered. The AEC in this draft responds with the statement given on page 5-11.

"The applicability of State and Federal Water Quality criteria related to the thermal discharge for Unit 1 is uncertain. However, it should be noted that no adverse effect on the aquatic biota due to the thermal discharge is expected."

We believe the New York State standard of 3 degrees Fahrenheit in 6.5 acres is too restrictive; but even if it were 5 degrees Fahrenheit, the heated water discharge from this unit would exceed the standard. Even though this draft statement covers Unit 1, it should recognize that the future operation of Unit 2 in a once-through mode will almost triple the waste heat from this plant compared to Unit 1 alone. This factor alone requires serious consideration of alternative cooling methods.

It is indicated on page 9-15 that no significant disadvantage of the existing discharge system has been identified. The AEC staff believes that modification of the existing system is not justified at this time even with the planned addition of Unit 2 with a once-through cooling system. Since a comprehensive evaluation of the expected thermal plumes from both units and from the neighboring James A. FitzPatrick Plant has been performed, we find no basis to conclude that these three units can safely operate with once-through cooling at this site.

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 9)

Data are recorded for the Unit 1 discharge on pages 5-4 and 5-5 of the Draft Environmental Statement which supplement the data presented in the FitzPatrick Final Environmental Statement. The environmental monitoring program for Nine Mile Point Unit 1 and FitzPatrick as outlined in the Environmental Technical Specifications will provide additional data on the Nine Mile Point Unit 1 plume.

Interpretation of the Nine Mile Point Unit 1 plume relative to New York State criteria and standards requires an understanding of the legal history of the New York State criteria. When Nine Mile Point Unit 1 was constructed, regulations restricted discharge of heated liquids by the following specifications: "None alone or in combination with other substances or wastes in sufficient amounts or at such temperatures as to be injurious to fish life, make the waters unsafe or unsuitable as a source of water supply for drinking, culinary or food processing purposes or impair the waters for any other best usage as determined for the specific waters which are assigned to this class." The Unit 1 discharge system has been constructed to meet the standard and continues to meet that standard as documented by the studies which have been completed near the site.

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RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 9)

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RESPONSES TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 9)
CONTINUED

standard cited above. Section 704.4 of the New York Codes Rules and Regulations describes "Extent of Applicability of Criteria to Existing Discharges: In determining whether any discharge existing prior to the adoption of the above criteria complies with the applicable standard for thermal discharges, ... these criteria are intended to be only a frame of reference." Thus, it is concluded that the Unit 1 thermal discharge does not "far exceed water quality standards" but rather complies with the applicable regulations.

The Applicant has investigated and evaluated alternative cooling systems for Nine Mile Point Unit 1 in the Nine Mile 1 Environmental Report Section 9.5. Similarly alternatives to a combined once through cooling system were evaluated in the Nine Mile Point Unit 2 Applicant's Environmental Report, Section 8.5.

It should also be noted that the Nine Mile Point Unit 1 discharge will be combined with the planned Unit 2 discharge and that all the evaluations for the Unit 2 at its Construction Stage hearing included combined effects with Nine Mile Point Unit 1 in operation. The continued operation of the Unit 1 discharge system is contingent upon completion of the Unit 2 discharge system and hence does not represent a permanent continuing operation configuration.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 10)Transmission Line Environs

The use of herbicides for transmission line maintenance is briefly discussed. Since no specific herbicides are indicated, the following language should be added to this section, "It is essential that all herbicides, pesticides, and related chemicals must be registered in accordance with P.L. 92-516, The Federal Insecticide, Fungicide and Rodenticide Act. Application should be accomplished in a manner fully consistent with the protection of the entire environment. Any contemplative use of these chemicals must consider both known and possible environment effects. The applicant should consult with the Environmental Protection Agency, the Director of the State Conservation Agency, the County Agent and the nearest office of the Bureau of Sport Fisheries and Wildlife when chemical vegetation and pest control is contemplated. Such contact should be made early in the planning so that acceptable chemicals and methods of application known to be most effective can be used with the recommendations of the concerned agency."

RESPONSE

No comment.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 11)Effects On Aquatic Environment

a. Table 5.1.2 contains data on studies conducted during June 1972 through January 1973. A comparison of this table with tables that were included in the environmental statement for Nine Mile Point Nuclear Station Unit 2, indicate that data collected prior to June were deleted from this table. Data were included on winter periods which would bias the information presented on impingement. We believe that all available information should be included to describe fish impingement.

b. As previously indicated, consideration should be given to the effects of increased temperature on the reproduction capabilities of various fish species, including that of yellow perch which are referred to in this section. Although species such as the yellow perch may be attracted to higher temperatures, the resulting effects may include reduced reproduction success. Also, it should be indicated that data from the Consumer's Power Company's report indicates that Steelhead Trout, Lake Trout, Coho, and Chinook Salmon do occur in the area of power plant intakes and thermal discharges and are subject to impingement. The potential impacts upon Federal and State sponsored programs to establish these species in Lake Ontario should be considered.

c. On page 5-38 of this section reference is made to 6 degrees Fahrenheit isotherm extending along about 1 mile of shoreline. On page 5-3 it is indicated that the 5 degrees Fahrenheit isotherm extends along about 2 miles of shoreline. During periods of warmer natural lake water temperatures, a temperature rise much less than 5 or 6 degrees Fahrenheit may inhibit fish movement, and discourage fish from entering important shallow water zones. Also, potential impacts of sinking plumes on fishes and fish reproduction potential should be mentioned in this section.

d. In discussing the environmental impact of plant operation on fish, plankton, benthos, and various aquatic organisms, it should be recognized that Lake Ontario is in a state of ecological change. This change is a result of the cumulative impact of man's activities on the lake and from recent introduction of exotic fish species which compete with the previously established fish populations. These considerations should be reflected in anticipating the environmental impacts of this development on the system in general.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 11) CONTINUED

e. The relationship of decomposing organic materials to the dissolved oxygen concentrations in the water should be described. Encouraging or accelerating the growth and reproduction of attached plants may compound problems which are presently occurring with the oxygen concentrations in the water. This section should discuss these aspects of the plant's operational impacts.

RESPONSE

a. For a complete record of fish impingement data collected at Nine Mile Point Unit 1 through August 31, 1973, refer to Exhibit 3b, (AEC Docket No. 50-410) Nine Mile Point Unit 2 Public Hearings. This document is a report written for Nine Mile Point Unit 2 on the subject of the effect of fish impingement at this site on the fish populations of Lake Ontario.

b. Refer to Applicant's response to Comment No. 2 of the U. S. Department of Commerce, submitted to the AEC on October 31, 1973.

c. Refer to Applicant's response to Comment No. 11 of the U. S. Department of Commerce, submitted to the AEC on October 31, 1973.

d. Assuming alewives are considered as "exotic species" in Lake Ontario, they were probably able to establish themselves (since 1860, approximately) because endemic piscivores, such as Lake Trout, and Atlantic Salmon, etc., were already in decline.

RESPONSE TO U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 11)
CONTINUED

It is also probable that the alewife competes with endemic planktivores for most zooplanktonic crustacea.

Documentation of feeding habits of smelt (established in the Great Lakes 1915, approximately) shows competition with, and predation upon Cyprinids (e.g., Emerald Shiner) and itself.

Coho Salmon (established 1968, approximately) are partially filling the gap left by depleted Lake Trout and Atlantic Salmon populations.

e. Continuing measurements of dissolved oxygen in the Lake off Nine Mile Point show consistently high values, often above saturation.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 12)Environmental Monitoring Program

The Niagara Mohawk Power Company has conducted a monitoring program in the Nine Mile Point area since 1963. The AEC staff believes that studies, as they have been proposed and are being conducted by the applicant, will not provide information adequate to assess the operational effects of the station on the biota. For example, the collection of the data from July 1963 through December 1969 was infrequent. Only since May 1970 has the applicant collected data on fish distribution and food preferences of fish and benthos with some continuity. Sampling and observation of plankton from the intake discharge wells of Unit 1 during June-October 1971 provide neither estimates of plankton abundance in the area nor a base for reasonable assessment of damage due to entrainment. Sampling of lake water for the usual chemical and physical parameters is entirely wanting. Based on limited sampling information, it is apparent that Nine Mile Point Nuclear Station Unit 1, has caused damages to fishery resources. Continued operation of the Unit may cause unacceptable losses to local fish populations. It should be noted that with the exception of the limits on total dissolved solids, phosphate concentrations in discharge sewage and the thermal plume size, the plant conforms to water quality standards. We believe that the applicant should be required to conform to existing standards and to adopt procedures which would require the environmental impact of the plant operation on the resources of the lake.

As a result of the Lake Michigan Enforcement Conference, specific guidelines are being developed for studies to determine the environmental impact of power plant cooling on Lake Michigan. It is anticipated that a draft outline of guidelines will be available by November 1973. Since the ecology of Lake Michigan and Lake Ontario are similar, techniques and studies that are suitable for Lake Michigan may be adaptable for Lake Ontario. We encourage the AEC staff to make use of these guidelines in developing any future plans for study of thermal discharges into Lake Ontario.

It is suggested that the thermal monitoring program be modified to include techniques developed in conjunction with the Surry Nuclear Power Station on the James River, Virginia. These studies should be designed and conducted to determine the impacts of once-through cooling in the Nine Mile Point area.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 12)RESPONSE

The Applicant's Aquatic Monitoring Program is described in the response to Department of Commerce Comment No. 12 submitted to the AEC October 31, 1973. Similar responses to questions on dissolved solids, phosphate concentrations and thermal plume size were also submitted to the AEC on that date in responses to Environmental Protection Agency Comment No. H-1, Department of Health, Education and Welfare Comment No. 5 and Department of Health, Education and Welfare Comment No. 4, respectively.

The Applicant's present thermal plume mapping program consists of ten to fifteen surveys a year under varying weather conditions. Three dimensional (surface and depth) surveys are performed from a boat traversing the plume area using shore mounted grid markers for boat location during survey performance. Temperature data is reduced and plotted to define isotherms with depth to the nearest 0.5°F.

Any monitoring devices that require permanent installations in this part of Lake Ontario are liable to heavy damage. On the one hand, the Lake is subject to very sudden increases in wave motion, which place considerable strains on any anchored device. On the other hand, the Nine Mile Point promontory is an area of heavy ice action, which can dislodge the most massive of anchors located in the water depth of interest, i.e., down to about 30 feet.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 13)

Nonradiological Effects on Ecological Systems

The concern for the possible impacts on fish and other aquatic life as a result of the maximum intake velocity of 2 fps is indicated on page 5-34. We share this concern since the applicant has not shown that fish losses will be low.

RESPONSE

Refer to Applicant's response to U. S. Department of Commerce Comment No. 2 and New York State Department of Environmental Conservation Comment No. 1.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 14)

Environmental Impact of Postulated Accidents

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

We also think that class 9 accidents resulting in both air and water releases should be described and the impacts on human life and the remaining environment discussed as long as there is any possibility of occurrence. The consequences of an accident of this severity could have farreaching effects on land and in Lake Ontario which could persist for centuries affecting millions of people.

RESPONSE

Postulated accidents which could result in liquid releases to Lake Ontario have been discussed and evaluated in Section 6, pages 6.3-1 and 6.8-5 of the Applicant's Environmental Report.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 15)

Alternative Energy Sources

The expected emissions from alternative oil-fired and coal-fired power plants given on page 9-4 are misleading. Modern well-operated central stations discharge much smaller amounts of carbon monoxides and hydrocarbons than shown, since combustion is complete except for small amounts of unburned carbon in fly ash and bottom ash in coal-fired plants.

RESPONSE

No comment.

U. S. DEPARTMENT OF THE INTERIOR (COMMENT NO. 16)Environmental Cost

Although the total economic losses of the proposed action are difficult to estimate there are data and materials available which can be used to determine the replacement costs of resources. For example, the pollution committee of the American Fisheries Society, Southern Division, in 1970 estimated the monetary value of fish based on their replacement cost. Various states, including New York, Maryland and Washington have developed criteria for evaluating fish kill damages and computing fish kill damage claims. We believe the staff of the AEC should be aware of these criteria and whenever possible they should be used to determine economic or replacement cost for fish. In addition, we believe that the impacts of this proposed action should not be related to entire lake alone but should also be compared to the production of the local area..

RESPONSE

No comment.

