CONSUMERS ENERGY COMPANY
JACKSON, MICHIGAN

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DETROIT, MICHIGAN

PRE-APPLICATION DOCUMENT FOR THE LUDINGTON PUMPED STORAGE HYDROELECTRIC PROJECT (FERC NO. 2680)

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DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

ADCP	Acoustic Doppler Current Profilers
af	Acre-foot, the amount of water needed to cover one acre to a depth of one foot.
ANOVA	Analysis of variance
APE	Area of Potential Effect as pertaining to Section 106 of the National Historic Preservation Act
Applicant	Consumers Energy Company and DTE Electric Company
CADD	Computer Aided Drafting and Design
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BP	Before Present
°C	Temperature in Degrees Celsius
CE	Consumers Energy Company, formerly known as Consumers Power Company
CFR	Code of Federal Regulations
cfs	Cubic Feet per Second
Chl-a	Chlorophyll-a
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
DLA	Draft License Application
DO	Dissolved Oxygen
DOE	US Department of Energy
DOI	US Department of Interior
DTEE	DTE Electric Company, formerly known as The Detroit Edison Company
EA	Environmental Assessment
EAP	Emergency Action Plan
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
El	Elevation
ESA	Federal Endangered Species Act
°F	Temperature in Degrees Fahrenheit
FEA	Final Environmental Assessment
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
fps	Feet per second
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information Systems
GLEC	Great Lakes Environmental Center
GLFT	Great Lakes Fisheries Trust

DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

GPA	Great Pond classification A
GWh	Gigawatt-hour (equals one million kilowatt-hours)
hp	Horsepower
HPMP	Historic Properties Management Plan
ILP	Integrated Licensing Process
Installed Capacity	The nameplate MW rating of a generator or group of generators
Interested Parties	The broad group of individuals and entities that may have an interest in a proceeding
kW	Kilowatt
kWh	Kilowatt-hour
kV	Kilovolts
License Application	Application for New License submitted to FERC no less than two years in advance of expiration of an existing license.
Licensees	Consumers Energy Company and DTE Electric Company
LPSP	Ludington Pumped Storage Project
LRBOI	Little River Band of Ottawa Indians
MDOT	Michigan Department of Transportation
mg/L	Milligrams per liter which is equivalent to ppm
Michigan DEQ	Michigan Department of Environmental Quality
Michigan DNR	Michigan Department of Natural Resources
Michigan WQS	Michigan Water Quality Standards
MNFI	Michigan Natural Features Inventory
MW	Megawatt
MWh	Megawatt-hour
MSA	Metropolitan Statistical Area
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Services, same as NOAA Fisheries
NOAA	National Oceanic Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NOI	Notice of Intent
NRECA	National Rural Electric Cooperative Association
NRHP	National Register of Historic Places
NTU	Nephelometric turbidity units
NWI	National Wetlands Inventory
PAD	Pre-Application Document
Peaking	Operation of generating facilities to meet maximum instantaneous electrical demands
PIT	Passive Integrated Transponder

DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

PDF	Portable Document Format
PLP	Preliminary Licensing Proposal
PM&E	Protection, Mitigation, and Enhancement Measures
PMF	Probable Maximum Flood
ppm	Parts per million which is equivalent to mg/L
Project	Ludington Pumped Storage Project
Project Area	The area within the FERC Project boundary.
Project Boundary	The boundary line defined in the Project license issued by FERC that surrounds those areas necessary for safe and efficient operation and maintenance of the Project or for other specified Project purposes.
Pumped Storage	A hydroelectric system in which electricity is generated during periods of high demand by the use of water that has been pumped into a reservoir at a higher altitude during periods of low demand.
Relicensing	The process of acquiring a subsequent FERC license for an existing hydroelectric Project upon expiration of the existing FERC license.
Relicensing Participants	Individuals and entities that are actively participating in a proceeding
Resource Affected Area	The geographic area in which a specific resource potentially is affected by the Project.
RPS	Renewable portfolio standards
RTE Species	Rare, threatened, and endangered species, which for purposes of this PAD is defined to include (1) all species (plant and animal) listed, proposed for listing, or candidates for listing under the Federal and State Endangered Species Acts and (2) those listed by the USFWS as sensitive, special status or watch list.
SAT	Scientific Advisory Team
SCORP	State Comprehensive Outdoor Recreation Plan
SD	Scoping Document
Service List	A list maintained by FERC of parties who formally have intervened in a proceeding.
SHPO	State Historic Preservation Officer
Tailrace	Channel through which water is discharged from the powerhouse turbines.
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
TU	Trout Unlimited
UPEJ	Upper Penstock Encasement Joint
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
WQC	Water Quality Certification

1.0 INTRODUCTION

Consumers Energy Company (Consumers Energy) and DTE Electric Company (DTEE) (Applicants or Licensees), the Licensees for the Ludington Pumped Storage Project (FERC No. 2680) hereby file with the Federal Energy Regulatory Commission (FERC or Commission) the required Pre-Application Document (PAD) for the relicensing of the existing Project.

1.1 Background

The Ludington Pumped Storage Project (Project) is located along the Lake Michigan shoreline, in the townships of Pere Marquette and Summit in Mason County, Michigan and in Port Sheldon in Ottawa County, Michigan[1]. The Ottawa County portion is limited to a 1.8 acre satellite recreation site (established as part of the Settlement Agreement discussed below).

The original application for license was submitted on June 24, 1968 to the Federal Power Commission. The license was issued on July 30, 1969 effective from July 1, 1969 to June 30, 2019. Project construction began in July, 1969 and was completed in 1973. Water was first pumped into the reservoir on October 23, 1972 following completion of reservoir construction. By the end of November 1972, the reservoir was filled, and on January 18, 1973, Unit 1 went into commercial operation. The remaining pump-turbines were completed on the following dates: Unit 2, March 16; Unit 3, April 30; Unit 4, June 11; Unit 5, August 7; and, Unit 6, September 28.

On February 28, 1995, to resolve outstanding issues concerning fish mortality resulting from operation of the Project and site access, Consumers Energy and DTEE filed an Offer of Settlement with FERC (FERC Settlement Agreement) The FERC Settlement Agreement was approved by Commission Order dated January 23, 1996 (74 FERC ¶ 61055). Another settlement (State Settlement Agreement) was concurrently reached by the courts and non-FERC agencies. The combined settlements (collectively, "Settlement") provided for the establishment of the Great Lakes Fisheries Trust (GLFT) and Scientific Advisory Team (SAT). The purpose of the Trust was to mitigate Lake Michigan fishery resources forgone as a result of Project operation. Funding for the Trust is provided annually by the Project through compensation payments for unavoidable fish loss. The Trust is administered by a Board of Trustees as defined in the

[1] Pigeon Lake North Pier, a recreation site associated with the Project, is located in Port Sheldon, Ottawa County, approximately 70 miles south of the pump storage facility. This is the only portion of the Project in Ottawa County and consists of approximately 1.8 acres. This recreation site was developed as part of the FERC's January 23, 1996 order approving a settlement agreement and provides amenities including a parking lot, boardwalk and Lake Michigan fishing access. The site is open from spring through fall. While the land associated with this recreation site is not contiguous with the Project boundary, the recreation site is discussed in Section 5 under recreation (5.8) and aesthetics (5.9).

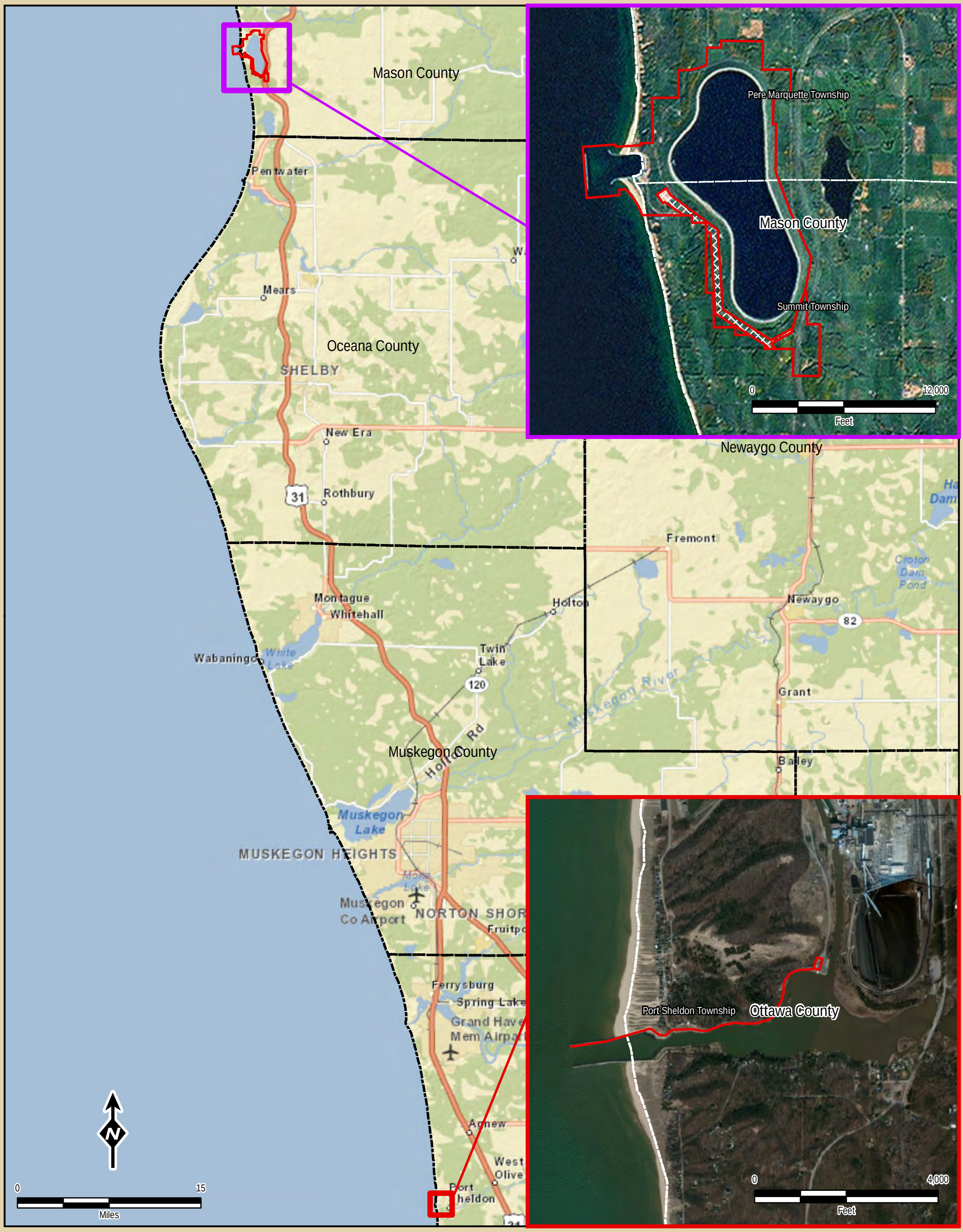
Settlement. The SAT evaluates the data and information upon which the Settlement is based, the scientific activities established by the Settlement and proposals submitted to the GLFT.

The Project consists of an 842-acre upper reservoir within a man-made embankment and uses Lake Michigan as the lower reservoir. The upper reservoir holds 28,300 acre-feet at a minimum elevation of 875 feet NGVD and 82,300 acre-feet at a maximum elevation of 942 feet NGVD. The usable volume is 54,000 acre-feet with a maximum drawdown of 67 feet. There are six (6) penstocks each of which are 1,300 feet long. There is a 2,715-foot long tailrace area in the lower reservoir area (Lake Michigan). The powerhouse is protected from wave action by two parallel, 1,600-foot long jetties and an outer 1,700-foot long breakwater. A 12,850-foot long barrier net that extends from the lake bottom to the surface is installed seasonally from approximately mid-April to mid-October outside of the tailrace structures to prevent fish from approaching the units during pumping. Consistent with License Article 26 (see Section 4.5.1), the Coast Guard approved navigation lighting for the Project in 1973 and subsequently approved the lighted navigational and warning buoys which are secured around the outer perimeter of the seasonal barrier net in 1988

There are six (6) generating units with a total authorized installed capacity of 1,657.5 MW[2] with an average annual generation from 1998-2012 was 2,524,644 MWh. The Project is operated to provide power during peak electrical demand periods which typically occurs during daytime hours. The upper reservoir is refilled at night by pumping from Lake Michigan.

The current FERC license expires June 30, 2019. The Licensees are using FERC's Integrated Licensing Process (ILP) as established in regulations issued by FERC on July 23, 2003 and found in Title 18 of the US Code of Federal Regulations (CFR), Part 5. This PAD accompanies the Licensees' Notice of Intent (NOI) to seek a new license for the Project. The Licensees distributed this PAD and NOI to File a License Application simultaneously to Federal and State resource agencies, local governments, Native American tribes, non-governmental organizations (NGOs), members of the public, and other parties potentially interested in the relicensing proceeding. Appendix A details the distribution list for the NOI and PAD. The PAD provides FERC and the entities listed above with summaries of existing, relevant, and reasonably available information related to the Project in the Licensees' possession or obtained through due diligence. The information required in the PAD is specified in 18 CFR §5.6(c) and (d).

[2] On May 7, 2012, FERC issued an Order Amending License to upgrade and overhaul all six pump-turbine/motor generating units at the Project, one unit at a time over the years 2013 through 2019. The proposed overhaul will increase the authorized installed capacity of the Project from 1,657.5 MW to 1,785 MW.



Legend

- Project Boundary
- Non-Project Land
- County Boundary
- Township Boundary

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY

DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT

LOCATION MAP

FIGURE 1-1

Revised: 1/7/2014

TRC
14 Gabriel Drive
Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers_Energy_Company\Ludington_Pump_Storage_PAD\Figure_1_1_Ludington_Location_Map_11x17_Portrait.mxd

The Licensees exercised due diligence in preparation of this PAD by contacting appropriate governmental agencies, Native American tribes and others potentially having relevant information and by conducting extensive searches of publicly available databases and its own records. Appendix B provides a summary of contacts made by the Licensees in preparing this PAD.

The information presented in this PAD provides interested parties with information necessary to identify issues and related information needs; develop study requests and study plans; and to prepare documents analyzing the Licensees' Application for New License (License Application) that must be filed with FERC on or before June 30, 2017.

The PAD is the precursor to the environmental analysis section of the License Application and to FERC's Scoping documents, as well as the Environmental Assessment (EA) under the National Environmental Policy Act (NEPA). Filing the PAD and NOI concurrently enables those who plan to participate in the relicensing to familiarize themselves with the Project at the start of the proceeding.

1.2 Agent for the Licensee

The following people are authorized to act as agents for the applicants pursuant to 18 CFR § 5.6(d)(2)(i):

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1.3 PAD Content

This PAD follows the content and form requirements of 18 CFR § 5.6(c) and (d) for distribution to Federal and State resource agencies, local governments, Native American tribes, NGOs, members of the public, and others likely to be interested in the relicensing proceeding.

The PAD is organized as follows:

Table of Contents; List of Tables; List of figures; List of Photographs; List of Appendices; and Definitions of Terms, Acronyms, and Abbreviations.

Section 1.0 – Introduction and Background Information.

Section 2.0 – Process, Plan and Schedule, Communications Protocol, and ILP Flow Chart.

Section 3.0 – General Description of the Watershed, per 18 CFR§ 5.6(d)(3)(xiii).

Section 4.0 – Description of Project Location, Facilities, and Operation, per 18 CFR§ 5.6(d)(2).

Section 5.0 – Description of the Existing Environment by Resource Area, per 18 CFR§ 5.6(d)(3)(ii)-(xii).

Section 6.0 – Description of Effects, Issues, Study and Information Needs, Resource Measures, and Existing Plans, per 18 CFR§ 5.6(d)(3) and (4).

Appendices

Appendix A – Ludington Pumped Storage Project Distribution List

Appendix B – Summaries of Contacts and Consultations

Appendix C – Current License Requirements

Appendix D – Public Safety Plan

As set forth in the ILP regulations, the Licensees understand that FERC will issue Scoping Document 1 (SD1) within 60 days of the filing date of the NOI and PAD, and will hold a site visit and public Scoping meeting within 30 days of issuing the SD1. The Process Plan (Table 2-1) for the relicensing provides preliminary dates for various aspects of the Ludington Pumped Storage Project ILP. It is expected that FERC will notice the final dates, times, and locations of the FERC Scoping Meetings and publish that information in local papers shortly after filing of the NOI and PAD.

1.4 References

Federal Energy Regulatory Commission (FERC). 1969. Order Issuing License (FERC No. 2680). 42 FPC ¶274. Issued July 30, 1969

Federal Energy Regulatory Commission (FERC). 1996. Order Amending License (FERC No. 2680). 74 FERC ¶61,055. Issued January 23, 1996.

Federal Energy Regulatory Commission (FERC). 2012. Order Amending License (FERC No. 2680). 139 FERC ¶62,101. Issued May 7, 2012.

U.S. Code of Federal Regulations. 2012. Title 18, Part 5. Revised April 1, 2012.

2.0 PLANS, SCHEDULE AND PROTOCOLS

The ILP regulations define specific procedures and timelines for the relicensing process. FERC designed the ILP to be a transparent process that involves all interested parties including Native American tribes, agencies, NGOs, and the public. As such, the Licensees will document the entire process including any information received from the interested parties, as well as records of communications. To keep the interested parties informed of the process, the Licensees will maintain records of relicensing and other information that will be available to the public at:

Consumers Energy Company
Cadillac Service Center
330 Chestnut Street
Cadillac, MI 49601

A copy the PAD will be available at the Mason County Library in Ludington, Michigan. Records will also be available at the Project web page:

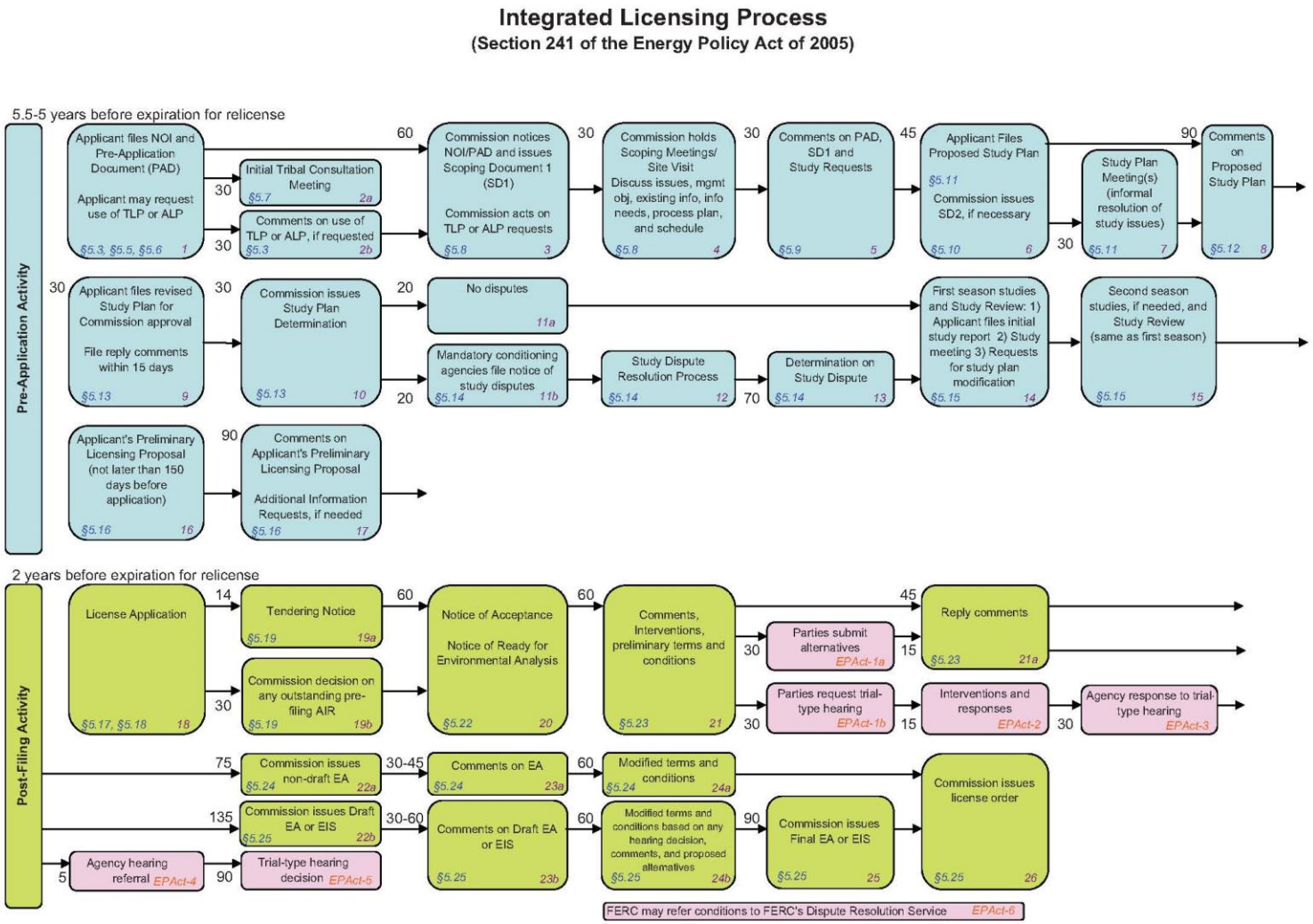
http://www.consumersenergy.com/ludingtonrelicensing

2.1 Process Plan and Schedule through Filing of the License Application

Figure 2-1, prepared by FERC, illustrates the major milestones in the ILP. The Process Plan and Schedule outlines actions by FERC, the Licensees, and other participants in the ILP relicensing process through filing of the License Application. The Licensees developed the Process Plan and Schedule using the timeframes set forth in 18 CFR Part 5. The Process Plan and Schedule are based upon the NOI/PAD filing target date of January 20, 2014 and all subsequent dates given derive from that date. The License Application must be filed no later than two years before license expiration, but may be filed earlier. Additionally, in developing the Process Plan and Schedule, the Licensees have included timeframes for Formal Dispute Resolution (18 CFR § 5.14) even though any study disputes may be resolved through informal dispute resolution. Because there is flexibility in the dates given, the Process Plan and Schedule is subject to change throughout the relicensing process.

As noted in Section 1.0, FERC will issue SD1 within 60 days of the filing date of the NOI and PAD. In addition, pursuant to 18 CFR § 5.8(b)(3)(viii), FERC will provide public notice and schedule a Public Scoping meeting and a Project site visit within 30 days of issuing SD1.

Figure 2-1: FERC Integrated Licensing Process



*Section 241 of the Energy Policy Act of 2005 in pink.

Table 2-1: Ludington Pumped Storage Project Process Plan and Schedule

Activity	Responsibility	Timeframe and Regulations	Dates
File NOI and Pre-Application Document (PAD)	Licensees	18 CFR § 5.5, 5.6	January 20, 2014
Initial Tribal Consultation Meeting	FERC	18 CFR § 5.7	February 19, 2014
Commission notices NOI/PAD and issues Scoping Document 1	FERC	Within 60 days of filing NOI & PAD 18 CFR § 5.8	March 21, 2014
Commission holds Scoping Meetings/Site Visit	FERC	Within 30 days of NOI & PAD notice & issuance of SD1 18 CFR § 5.8(b)(viii)	April 20, 2014
Comments on NOI, PAD, SD1, and Study Requests Due	All Stakeholders	Within 60 days of NOI & PAD notice & issuance of SD1 18 CFR § 5.9	May 20, 2014
File Proposed Study Plan	Licensees	Within 45 days of deadline for filing comments on SD1 18 CFR § 5.11(a)	July 4, 2014
Hold Study Plan Meeting(s)	All Stakeholders	Within 30 days of deadline for filing proposed Study Plan 18 CFR § 5.11(e)	August 3, 2014
Comments on Proposed Study Plan Due	All Stakeholders	Within 90 days after Proposed Study Plan is filed 18 CFR § 5.12	October 2, 2014
File Revised Study Plan (if necessary)	Licensees	Within 30 days of deadline for comments on Proposed Study Plan 18 CFR § 5.13(a)	November 1, 2014
Comments on Revised Study Plan	All Stakeholders	Within 15 days following Revised Study Plan 18 CFR § 5.13(b)	November 16, 2014
Director's Study Plan Determination Issued	FERC	Within 30 days following Revised Study Plan 18 CFR § 5.13(c)	December 1, 2014
Mandatory conditioning agencies file notice of study disputes, if applicable	Agencies with Mandatory Conditioning Authority	Within 20 days of Director's Study Plan Determination 18 CFR § 5.14(a)	December 21, 2014
Formal Study Dispute Resolution Process (if necessary)	Stakeholders, FERC, Licensees	Study Dispute Resolution Process and Determination on Study Dispute 18 CFR § 5.14	March 1, 2015

Activity	Responsibility	Timeframe and Regulations	Dates
Conduct First Studies Season	Licensees	Potential applicant must gather information and conduct studies as provided for in the approved study plan and schedule. 18 CFR § 5.15(a)	December 1, 2015
Submit Initial Study Report	Licensees	Pursuant to the Commission-Approved study plan and schedule provided in § 5.13 OR no later than 365 days from Study Determination 18 CFR § 5.15(c)(1)	December 1, 2015
Hold Initial Study Report Meeting	All Stakeholders	Within 15 days from Initial Report 18 CFR § 5.15(c)(2)	December 16, 2015
File Initial Study Report Meeting Summary	Licensees	Within 15 days following the Initial Study Report meeting 18 CFR § 5.15(c)(3)	December 31, 2015
Study Disputes/Request to Modify Study Plan	All Stakeholders	Within 30 days of Study Report Meeting Summary 18 CFR § 5.15(f)	January 30, 2016
Responses to Disputes/Study Requests	All Stakeholders	Within 30 days of filing of Meeting Summary Disagreements 18 CFR § 5.15(c) (5)	February 29, 2016
Director's Resolution on Disagreement and Amended Study Plan Approval Issued	FERC	Within 30 days of filing Responses to Disputes/Study Requests 18 CFR § 5.15(c)(5)	March 30, 2016
Second Study Season	Licensees	8 CFR § 5.15(a)	December 1, 2016
Issue Updated Study Report	Licensees	Pursuant to the Commission-Approved study plan and schedule provided in § 5.13 OR no later than two years after Commission approval of study plan and schedule 18 CFR § 5.15(f)	December 1, 2016
Hold Updated Study Report Meeting	All Stakeholders	Within 15 days of Updated Study Report 18 CFR § 5.15(f)	December 16, 2016

Activity	Responsibility	Timeframe and Regulations	Dates
File Updated Study Report Meeting Summary	Licensees	Within 15 days of Study Results Meeting 18 CFR § 5.15(f)	December 31, 2016
Provide Study Disputes/Request to Modify Study Plan	All Stakeholders	Within 30 days of Study Report Meeting Summary 18 CFR § 5.15(f)	January 30, 2017
Provide Responses to Disputes/Study Requests	All Stakeholders	Within 30 days of filing of Meeting Summary Disagreements 18 CFR § 5.15(f)	March 1, 2017
Director's Resolution on Disagreement and Amended Study Plan Approval Issued	FERC	Within 30 days of filing Responses to Disputes/Study Requests 18 CFR § 5.15(f)	March 31, 2017
File Preliminary Licensing Proposal	Licensees	No later than 150 days prior to the deadline for filing a new application 18 CFR § 5.16(a)	January 30, 2017
Comments on Applicant's Preliminary Licensing Proposal, Additional Information Requests (if necessary)	All Stakeholders	Within 90 days of filing PLP or draft license application 18 CFR § 5.16(e)	May 1, 2017
License Application Filed	Licensees	18 CFR § 5.17	June 30, 2017
License Expires			June 30, 2019

2.2 Proposed Communications Protocols

Effective communication is essential for meeting the defined schedule of the ILP. The Licensees anticipate that the primary means of communication will be meetings, documents, email, and telephone. In addition, Consumers Energy has developed a website for the licensing process. The website will contain updated schedules, contact information, relicensing documents, and other information. The address for this website is (http://www.consumersenergy.com/ludingtonrelicensing). The contact information for the Licensee is listed below.

2.2.1 General Communications

Communications include written correspondence, emails, and notes from individual and conference telephone calls. The Licensees' goal is to keep open communications during the relicensing process and provide relicensing participants with easy access to relicensing information.

2.2.2 Meetings

The Licensees recognize a number of tribes, agencies, groups and individuals may want to participate in the process. The Licensees will work with all Interested Parties to develop meeting schedules that include practical locations and times to accommodate the majority of participants. In general, the Licensees will schedule meetings, other than FERC Scoping Meetings, between the hours of 9:00 a.m. and 5:00 p.m. The Licensees will endeavor to begin and end meetings in a timely manner. FERC Scoping meetings will include at least one evening meeting.

To the extent possible, the Licensees will notify all Interested Parties at least two weeks in advance of the next planned public meeting. At that time, the Licensees will provide a meeting agenda via mail and/or by email. The Licensees will also distribute any documents or other information that will be the subject of meeting discussions.

2.2.3 Documents

The Licensees will maintain copies of all public information including mailing lists, announcements, notices, communications, and other documents related to the relicensing of the Project at:

Consumers Energy Company
Cadillac Service Center
330 Chestnut Street
Cadillac, MI 49601

Additionally, public information will be available on the LPSP Relicensing website at http://www.consumersenergy.com/ludingtonrelicensing. Public files will be updated regularly to ensure the public has up-to-date information related to the relicensing process available to them. Anyone may obtain documents by contacting Consumers Energy.

The Licensees prefer to receive all documents electronically in either PDF or an appropriate MS Office format. Email electronic documents to Consumers Energy at the designated email address on the LPSP Relicensing website. Hard copy documents may be mailed to The Senior Licensing Engineer at Consumers Energy's Cadillac Service Center address listed above.

In either case, all applicable documents received will be incorporated into the consultation record for the relicensing and made available for distribution to the public.

2.2.3.1 Public Reference File

The Licensees will maintain a public reference file for the Ludington Pumped Storage Project relicensing at Consumers Energy. The public reference file is a listing of important materials pertaining to the relicensing. This includes background reference material as well as the

consultation record, all relevant studies and data collected during the development of the Pre-Application Document, meeting summaries, notices, reports as well as Project documents such as the current FERC license. For a nominal fee, public documents will be made available as hard copies or electronic copies on Compact Disc upon written request. In addition to the relicensing website, documents are available for inspection at Consumers Energy office in Cadillac, MI during regular office business hours, by appointment only.

2.2.3.2 Restricted Documents

Certain Project-related documents are restricted from public viewing in accordance with FERC regulations. Critical Energy Infrastructure Information (CEII) (18 CFR 388.113) relates to the design and safety of dams and appurtenant facilities. Access to CEII documents is restricted to protect national security and public safety. Anyone seeking CEII information from FERC must file a CEII request. FERC's website at http://www.ferc.gov/help/filing-guide/ceii-request.asp contains additional details related to CEII.

Information related to protecting sensitive information is also restricted from public viewing. Archaeological or other culturally important information is restricted under Section 106 of the National Historic Preservation Act. Endangered and threatened species are protected by the federal Endangered Species Act of 1973 (16 USCA §§ 1531-1543, P.L. 93-205) and the Michigan Endangered Species Law (part 365 of PA 451 of 1994). While migratory birds are protected by the Migratory Bird Treaty Act of 1918 (16 U.S.C. §§ 703-712, July 3, 1918, as amended) and eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d, 54 Stat. 250, as amended), specific species locations are not restricted. Anyone seeking this information from FERC must file a Freedom of Information Act (FOIA) request. Instructions for FOIA are available on FERC's website at http://www.ferc.gov/help/filing-guide/foia-request.asp.

2.2.3.3 Study Requests

In developing the PAD, the Licensees have collected and summarized readily available information regarding the Ludington Pumped Storage Project and its effects on the human and natural environments. The PAD, however, may also indicate areas where there is little or no information related to areas of potential concern regarding the Project's operation. In those cases, Relicensing Participants may request additional studies or investigations, as detailed below, to add to the knowledge of the Project.

The ILP requires specific information from parties requesting studies related to the relicensing. Study requests must follow the format required by FERC regulations and must have a clear connection to the Ludington Pumped Storage Project. Because the Project's upper reservoir does

not impound a natural waterbody or utilize the flows of a stream, typical relicensing studies may not provide relevant and useful information.

As specified by 18 CFR § 5.9(b) of FERC's ILP regulations, any study request must:

- Describe the goals and objectives of each study proposal and the information to be obtained;
- If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied;
- If the requestor is not a resource agency, explain any relevant public interest considerations in regard to the proposed study;
- Describe existing information concerning the subject of the study proposal, and the need for additional information;
- Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements;
- Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge; and
- Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Parties submitting requests should also describe any available cost-share funds or in-kind services that the sponsor of the request may contribute towards the study effort.

Email draft study requests should be formatted in MS Word or PDF format and sent to Consumers Energy at hydro@cmsenergy.com.

2.2.3.4 Document Distribution

The Licensees will distribute, whenever possible, all documents electronically in standard MS Word format or PDF. Some documents may be distributed in hard copy for convenience or by request. Distribution of information will follow the guidelines presented in (Table 2-2).

Table 2-2: Document Distribution for the Ludington Pumped Storage Project Relicensing FERC Project No. 2680

Document	Method	Distribution
Pre-Application Document (PAD) Request for Information from Agencies	US Mail or other delivery method that provides confirmation of delivery	Agencies
Public Meeting Notices	Initial meeting by US Mail, Newspapers and website. Thereafter by Email, website and/or newspaper	Interested Parties
Meeting Agendas	Email or US Mail	Relicensing Participants
Meeting Summaries	Email or US Mail	On Request
Process Plan & Schedule	Email or US Mail	On Request
Major Documents: PAD, FERC Scoping Documents, Proposed Study Plans, Study Reports, Draft license Application, etc.	Email or US Mail; available at Licensee's Cadillac, MI office	Interested Parties
PAD support documents	Email or US Mail; available Licensee's Cadillac, MI office	On Request

2.2.3.5 Mailing Lists

FERC encourages citizen participation in the relicensing process and provides guidelines for participation (http://www.ferc.gov/for-citizens/get-involved.asp). There are two categories of participation in a FERC relicensing – Interested Parties and Relicensing Participants.

Interested Parties are a broad group of individuals, agencies, and NGOs that have an interest in the relicensing. Sometimes this group is referred to as "stakeholders." The Licensees will maintain a Ludington Pumped Storage Project Relicensing Mailing List of all Interested Parties. The list will include both standard US Post Office addresses and available email addresses for distributing notices and documents for public review (Table 2-2).

Relicensing Participants are a subset of Interested Parties. Relicensing Participants are the individuals and entities that actively participate in the relicensing process. Any Interested Party may elect to be a Relicensing Participant. Relicensing Participants generally are active on committees or have a specific interest in the relicensing, and often receive additional communications relative to their specific interest.

After the Licensees file the License Application (scheduled for 2017), FERC will establish an official Service List (Table 2-3) for parties who formally intervene in the proceeding. Intervention is a formal legal process in the FERC regulations. Additional information may be found on FERC's website at http://www.ferc.gov/help/how-to/intervene.asp. Once FERC

establishes a Service List, any written documents filed with FERC must also be sent by the originator to the Service List. A Certificate of Service must be included with documents filed with FERC.

Table 2-3: Ludington Pumped Storage Project Relicensing FERC Project No. 2680 Mailing Lists

Entity that maintains the list	Type	Description
FERC and Licensee	Project No. 2680 Mailing List	A mailing list of potentially interested parties, which will be used throughout the Project relicensing proceeding. The mailing list is based on current Federal and State agency contacts, parties having intervened in past proceedings, and parties expressing interest about the Project to the FERC and/or Licensee.
FERC	Project No. 2680 Service List	A mailing list of parties that have formally intervened in the relicensing proceeding. The service list is prepared and maintained by FERC after it accepts the License Application.

2.2.4 Telephone

The Licensees anticipate that routine telephone calls among relicensing participants will be treated informally, with no specific documentation.

It is anticipated that FERC will distribute to the FERC Project No. 2680 Mailing List summaries of any decisional telephone calls in which it participates prior to acceptance of the License Application. FERC will provide prior public notice of any decisional telephone calls in which it participates after the Commission formally accepts the License Application.

3.0 GENERAL DESCRIPTION OF PROJECT AREA

3.1 Overview

The Ludington Pumped Storage Project (Project) is located along the east shore of Lake Michigan, near Ludington, Michigan in the Lake Michigan basin, and a satellite recreation site located in Port Sheldon, Michigan. The Project uses Lake Michigan as its lower reservoir while the upper reservoir is a man-made reservoir constructed solely for Project operations. There are no rivers, streams or other means of in-flow to the Project other than direct precipitation and the water that is pumped from Lake Michigan.

3.2 Major Land Uses

Major land uses in the Project vicinity include industrial/commercial, agricultural and residential. The land adjacent to the Project is primarily, wooded and agricultural with some residential use primarily along the Lake Michigan shoreline. More concentrated residential and industrial/commercial land use is found in the communities close to the Project, including the City of Ludington.

3.3 Major Water Uses

Since the Project's watershed is associated with Lake Michigan, and not a river or stream, the major water uses are associated with use of Lake Michigan near the Project. Major water uses of Lake Michigan include recreational, industrial, and commercial uses. The Lake has a long history of providing an area to pursue many forms of water-based recreation (e.g. fishing, boating, and swimming) and, as such, the area is a popular tourist destination. The City of Ludington is also the homeport of the *SS Badger*, a coal-fired car ferry with daily service in the summer from Ludington to Manitowoc, Wisconsin. None of these water uses are associated with or impacted by operation of the Project.

The Project uses Lake Michigan water for power generation. A typical generation cycle consists of pumping water from Lake Michigan to the Project's upper reservoir through six reversible pump-turbines in pump mode. This pumping occurs during times of low electricity demand, which normally occurs at night and on the weekends. During periods of high electricity demand, the water is released from the upper reservoir through the six reversible pump-turbines for power generation. After passing through the pump-turbines, this water flows back into the Lake. In short, the cycle consists of passing water back and forth between Lake Michigan and the upper reservoir. Consumptive use does not occur at any point. This water is stored in the upper reservoir only for a relatively short time period. Based on a total impoundment volume of 82,300 acre-feet and an average weekly pumping rate of 200,000 acre-feet the weekly turnover rate is about 2.4.

3.4 Project Reservoir and Storage

The Project's lower reservoir is Lake Michigan and the upper reservoir was constructed for water storage only, and is not connected to any streams, rivers, or lakes. The upper reservoir, described in Section 4.2, is a man-made reservoir for the sole purpose of Project operations. Project construction began in July 1969, and was completed in 1973. Water was first pumped into the upper reservoir in October 1972, following completion of reservoir construction. By the end of November 1972, the reservoir was filled to elevation 936 feet, and on January 18, 1973, Unit 1 went into commercial operation. The remaining pump-turbines were completed between March and September 1973.

3.5 Climate

The Project region experiences a moderate climate with well-defined seasons. The mean monthly maximum air temperature in the region ranges from 29.8 °F (-1.22 °C) in January to 80.0 °F (26.67 °C) in July, while the mean monthly minimum temperatures range from 17.1 °F (-8.3 °C) in January to 59.8 °F (15.47 °C) in July. Overall monthly average temperatures are approximately 23.5 °F (-4.72 °C) in January and 69.9 °F (21.06 °C) in July. The average annual snowfall total for Ludington is 66.8 inches and the annual average total precipitation (rainfall) is 16.65 inches. (NOAA.gov 2014).

The State of Michigan is taking a proactive approach to climate change. On October 6, 2008, Public Act 295 was signed into law. The Act, known as The Clean, Renewable and Efficient Energy Act, established a Renewable Energy Standard in the State of Michigan. The Renewable Energy Standard requires Michigan electric providers to achieve a retail supply portfolio that includes at least ten percent renewable energy by 2015. In addition, Governor Jennifer Granholm established the Michigan Climate Action Council (MCAC) in 2007. A MCAC Climate Action Plan was published in 2009 (Michigan DEQ, 2009), also referencing Public Act 295. MCAC recommends the State of Michigan take a strong leadership role in promoting efficient, effective policies to address climate change at the national, regional, and state levels. The report cites increased renewable energy generation in Michigan driven by renewable portfolio standards (RPS) as one mechanism for reducing greenhouse gas emissions. Wind, solar and distributed renewable energy resources are a focus of the RPS. Pumped storage projects, such as the Ludington Project, play a key role in storing energy generated by intermittent renewable resources, such as wind, that generate during periods of low electrical demand. This energy is stored for use during periods of peak demand, thus improving the value and ability to dispatch these renewable resources.

3.6 References

Public Act 295, The Clean, Renewable and Efficient Energy Act. Available online: http://www.michigan.gov/mpsc/0,4639,7-159-16393---,00.html

Michigan DEQ, 2009. Michigan Climate Action Council Climate Action Plan. 125 pp, available online: http://www.michigan.gov/documents/deq/deq-miclimateactionplan-part1_276563_7.pdf.

NOAA.gov. Climate Normals 198102010 compared with 1971-200. Muskegon. Available online: http://www.crh.noaa.gov/grr/climate/

4.0 PROJECT LOCATION, FACILITIES, AND OPERATIONS

4.1 Project Location

The Ludington Pumped Storage Project is located on the east shore of Lake Michigan in Summit and Pere Marquette Townships, Mason County, Michigan (Figure 1-1).

4.2 Project Facilities

Reservoirs: The lower reservoir is Lake Michigan. Lake Michigan has a surface area of approximately 22,300 square miles and a mean depth of 279 feet (http://www.epa.gov/glnpo/factsheet.html). The upper reservoir is a man-made water storage structure with a perimeter of approximately 5.7 miles in length. The elevation of the top of the 842-acre upper reservoir is 950 feet NGVD and the water level of a full reservoir is at 942 feet NGVD. The upper reservoir is enclosed by an approximately 5.7 -mile long asphaltic-concrete lined earth embankment with an average height of 108 feet and a maximum height of 170 feet.

Upper Reservoir Intake Structure and Penstocks: A concrete intake structure located in the upper reservoir provides a separate inlet for each generating unit. Six 1,300-foot long steel penstocks connect the intake structure to the powerhouse. Each penstock varies in diameter from 28.5 feet at the intake to 24 feet at the powerhouse. The penstocks are encased in concrete as they pass through the embankment. They are supported on concrete saddles and buried in fill sand as they emerge from the top of the slope near the powerhouse.

Powerhouse: The concrete powerhouse consists of six bays which house the pump-turbine motor-generator units. Approximately 85% of the powerhouse structure is below Lake Michigan water level. The building has four main floors. The three main transformer banks (two units per bank), station power transformers, gantry crane, heating and ventilation units, and the motor-generator collector rings are located on the roof of the powerhouse.

The first floor (also considered the operating floor) contains the motor-generators load break switches (connects the motor-generators to the main transformer banks), 4,160 volt switchgear, governors, main control room, machine shop and other miscellaneous equipment. The next two floors have auxiliary water equipment, air compressors, air and oil storage facilities, and other miscellaneous equipment.

Jetties and Breakwater: Because the powerhouse is located on Lake Michigan's shoreline, the Licensees constructed two jetties and a breakwater to protect the powerhouse against waves. Each jetty extends about 1,600 feet into Lake Michigan. The breakwater is approximately 1,850 feet long and is about 2,700 feet from shore.

Project facilities are shown on Figure 4-1.

Legend

- Project Boundary
- Non-Project Land
- Township Boundary

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY
DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT RESERVOIR

FIGURE 4-1

Created: 1/7/2014

TRC
14 Gabriel Drive
Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers_Energy_Company\Ludington_Pump_Storage_PAD\Figure_4-1_Reservoir_Facility_Map_8x11.mxd

Legend

- Project Boundary
- Township Boundary

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY

DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT
PORT SHELDON

FIGURE 4-2

Created: 11/25/2013

TRC 14 Gabriel Drive Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers Energy Company\Ludington Pump Storage_PAD\Figure 4-2 Port Sheldon Facility Map 8x11.mxd

Other appurtenant facilities include:

- Service building,
- Guardhouse,
- Maintenance building,
- Barrier net storage and repair building,
- Training building,
- Construction office complex, and
- Reservoir overlook building.

Port Sheldon Recreational Facility: In addition to the Project facilities located at the powerhouse, a satellite recreational facility is located 70 miles south of the powerhouse. This facility includes a parking area, a 4,600-foot long boardwalk, and Lake Michigan fishing access along the boardwalk. The Project boundaries for this facility are limited to the footprint of the parking area and boardwalk (Figure 4-2).

The upper reservoir has a gross storage capacity of 82,300 acre-feet (or approximately 26.8 billion gallons of water) at the maximum water surface elevation of 942 feet NGVD. The usable volume is 54,000 acre-feet (about 17.5 billion gallons of water) with a maximum drawdown of 67 feet to the minimum water surface elevation of 875 feet NGVD. The maximum upper reservoir drawdown rate is approximately 8 feet per hour with all six units generating. During normal operation the upper reservoir water surface elevations rises or falls about 1 foot per hour per operating unit.

The original installed capacity of the Project was 1,872 MW, supplied by six reversible pump-turbine motor-generator units designed and manufactured by Hitachi Ltd. of Tokyo, Japan. Each unit was nominally rated at 270 MW with a maximum rating of 312 MW. A 1981 license amendment order (16 FERC ¶ 62,596) revised the authorized installed capacity of the Project from 1,872 MW to 1,657.5 MW.[3] The order also revised the Project description to state that the nameplate rating for each of the six units was 276.25 MW.

In 2012, Licensees initiated construction at the site to support replacement of the six original pump-turbine runners motor-generator stators pursuant to a 2012 license amendment. The new pump-turbine runners are to be manufactured by Toshiba. Following completion, the units are expected to have a combined authorized installed capacity of 1,785 MW. The rating of each unit would be upgraded to 297.5 MW. Upgrade of the first unit began in November 2013. Upgrade of the final unit is scheduled to be complete by the second quarter of 2019.

[3] Unless otherwise noted, and consistent with FERC's definition at 18 C.F.R. §11.1(i), the generating and hydraulic capacities provided correspond to best gate opening and average head or "mid pond." (Since the level of the lower reservoir, Lake Michigan, does not vary due to operation, average head occurs when the upper reservoir is at mid pond level.)

The original hydraulic capacity data for the existing generating units on file with the Commission is the 1969 Hitachi Stepped-Up Performance of Pump-Turbine for Turbine Operation-Curves, which were developed during the design stage of the Ludington Pumped Storage Project. The 1969 Hitachi performance curves indicate that at a net mean head of 320 feet, the hydraulic capacity for each unit at the best gate setting (maximum efficiency point) would be 11,100 cfs (Table 4-1).

Table 4-1: Licensed Generating Capacities for the Ludington Project

Unit No.	Turbine (MW)[4]	Generator (MW)[a]	Hydraulic Capacity (cfs)[4]
1	276.25	276.25	11,100
2	276.25	276.25	11,100
3	276.25	276.25	11,100
4	276.25	276.25	11,100
5	276.25	276.25	11,100
6	276.25	276.25	11,100

[a] At 60 degrees Celsius (°C) and PF = 0.85

The power-generating enhancements for the Project will add 127.5 MW of installed capacity and will increase the Project's total hydraulic capacity at the best efficiency point and a mid-range net head by 9,690 cubic feet per second (cfs). This represents a 14.5-percent increase over the installed hydraulic capacity of 66,600 cfs[4]. (Table 4-2)

Table 4-2: Generating Capacities for the New Pump-Turbines

Unit No.	Turbine (kW)[4]	Generator (kW)[a]	Hydraulic Capacity (cfs)[4]	Scheduled Completion Date
1	311	297.5	12,715	2nd quarter 2017
2	311	297.5	12,715	3rd quarter 2014
3	311	297.5	12,715	2nd quarter 2019
4	311	297.5	12,715	2nd quarter 2015
5	311	297.5	12,715	2nd quarter 2016
6	311	297.5	12,715	2nd quarter 2018

[a] At 60 °C and PF = 0.85

[4] Consistent with FERC's definition at 18 C.F.R. §11.1(i), the hydraulic capacities provided in this Application correspond to best gate opening. To date, the hydraulic capacity that corresponds to the installed capacity of the Project has not been formally established in any license exhibits or orders. As described in Section 1 of this Application, the Licensees, upon the recommendation of Commission staff, have provided the hydraulic capacity at the best efficiency point for a mid-range net head predicted on the original turbine manufacturer's performance curve.

Included in the Project are the generator leads, the nine step-up transformers at the plant and the three parallel, 1,800-foot-long, 345-kV transmission lines, extending from the powerhouse to the Ludington switchyard. The switchyard and the 345 kV transmission lines exiting from the switchyard are not included in the Project license. (Commission Order dated February 2, 2001, 94 FERC ¶62,122, approved limiting the transmission system interconnection to the lines leading to the Ludington switchyard). (Figure 4-3)

The annual output during the years 1998 to 2012, inclusive, averaged 2,524,664 MWh. During the same period, annual output of the Project ranged from a minimum of 1,974,219 MWh in 2012 to a maximum of 2,884,159 MWh in 2001.

The average monthly generation is shown below:

Table 4-3: Average Monthly Generation (1998 to 2012)

Month	MWh
January	190,320
February	175,343
March	192,834
April	192,577
May	216,622
June	236,374
July	281,870
August	291,463
September	191,406
October	172,999
November	182,608
December	200,248

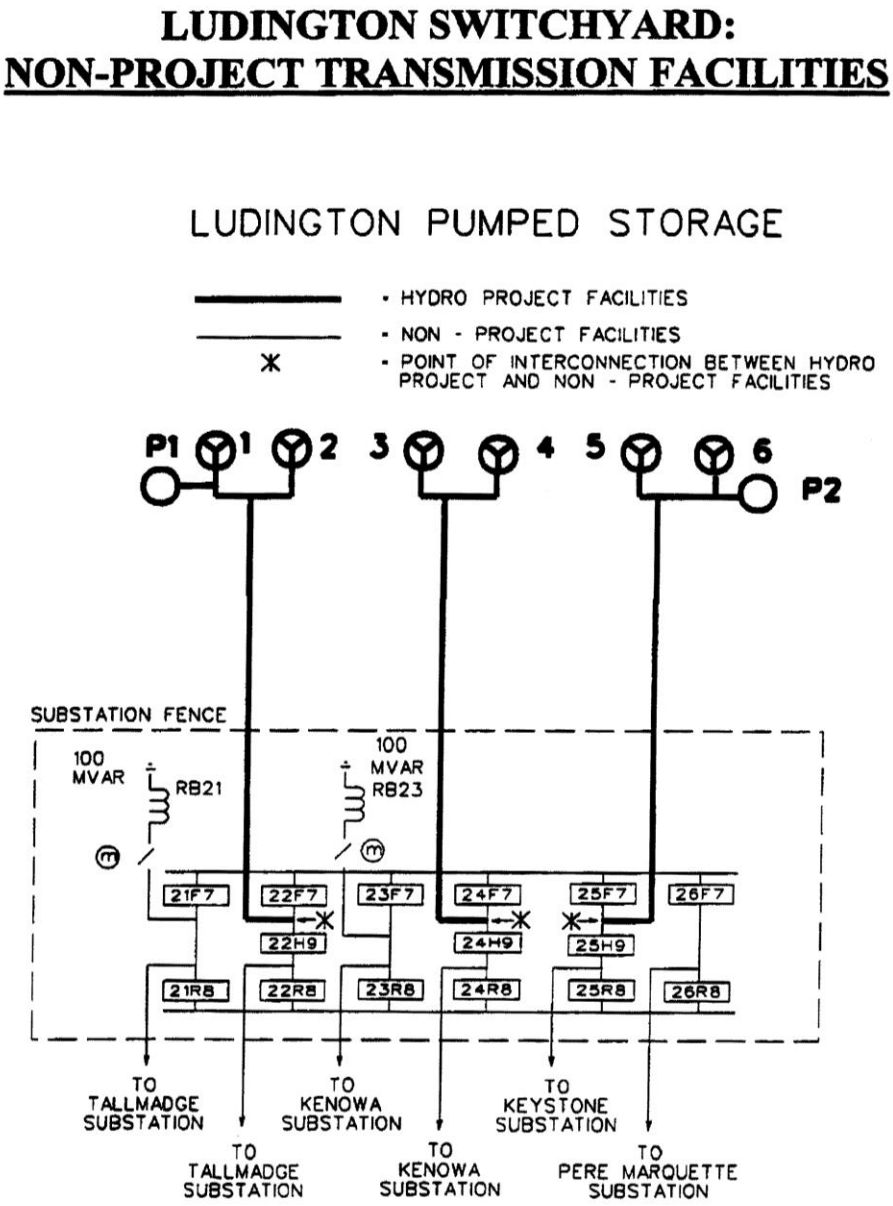
The projected generation assumes a 5% increase from current conditions following the turbine upgrades.

Table 4-3A: Projected Monthly Generation (Post - Upgrades)

Month	MWh
January	199,836
February	184,110
March	202,475
April	202,205
May	227,453
June	248,193
July	295,964
August	306,036
September	221,144
October	181,649
November	191,738
December	210,260

The dependable capacity of the Project is based on the capability which the Project can be expected to deliver at system peak loads under the present load shape.

Figure 4-3: One Line Print



4.3 Project Boundary

The upper reservoir, powerhouse and the majority of associated Project lands are located entirely within Pere Marquette and Summit Townships in Mason County. Also, a satellite Project recreation site is located in Port Sheldon in Ottawa County, approximately 70 miles south of the upper reservoir.

The Project boundary at the upper reservoir contains approximately 965 acres, which includes the 842-acre upper reservoir. The Project boundary is a series of traverse lines that encompass the upper reservoir, powerhouse, recreation and other Project facilities, and the tailrace area in Lake Michigan (See Figure 4-1). A switchyard and transmission lines south of the powerhouse are not included in the Project.

The Licensees submitted an application dated May 29, 2013 to FERC to remove approximately 35.2 acres of land from the Project boundary, as the land is not needed for Project purposes. This application was approved by FERC on October 28, 2013. The Licensees submitted a second application dated November 12, 2013 to FERC to remove 95 acres of land located near the southeast corner of the upper reservoir from the Project boundary. The land has not been used since construction for Project operational purposes. The Licensees requested that FERC respond to this application by December 31, 2013. FERC has not yet responded.

The Pigeon Lake North Pier recreation site's boundary contains approximately 1.8 acres that includes a 30-vehicle parking lot and a 4,600-foot boardwalk/pathway along the Pigeon River and is denoted by traverse lines around the parking area and offsets from an established centerline along the boardwalk/pathway (See Figure 4-2).

4.4 Current and Proposed Project Operations

As a hydroelectric pumped storage facility, the Project's operations differ both in purpose and nature from that of a conventional riverine hydroelectric facility. Most pumped storage projects assist with grid reliability. Such facilities use two reservoirs of differing elevation, pumping water from the lower reservoir to the upper reservoir, generally during off-peak times when energy loads are relatively low. The water is then stored in the upper reservoir until load demands are relatively high, at which time water is released from the upper reservoir down to hydroelectric turbines, where the water is used to generate electricity before being discharged back into the lower reservoir. Pumped storage provides an effective, large-scale way to store energy until needed to respond to high load demands.

The upper reservoir has no contributory drainage area (i.e. there is no geographical area which provides run-off other than the reservoir itself). Consequently, the Project is unaffected by the low, normal or flood flows of any stream. Similarly, the Project does not affect the flows of any

stream. The release of water from the upper reservoir to the lower reservoir has no influence upon the water level of the lower reservoir because of the relative size of the reservoirs. That is, Lake Michigan contains so much more water than the Project's upper reservoir that even if the upper reservoir was fully drained into Lake Michigan, the Lake's water level would not measurably change.

The Project is operated to generate during peak demand periods. The Project begins each week (Monday morning) with the upper reservoir at full pool. Generation usually occurs during the day with the upper reservoir partially replenished at night during pumping. The upper reservoir elevation is brought to full pool over the weekend to make up any differences between generation and pumping during the week. The Project can generate at maximum capacity for about 8 hours, starting with a full upper reservoir. Refilling the upper reservoir requires about 10 hours of pumping at maximum capacity. Licensees have no plans to change the current peaking operation of the Project.

The Licensees are not proposing any changes to current Project operations as part of the relicensing process.

4.5 Other Project Information

4.5.1 Current License Requirements

The Project is co-owned by Consumers Energy and DTEE. Consumers Energy, with 51% ownership, also operates and maintains the Project. FERC issued the Project's current license on July 30, 1969 for a period of 50 years, with an effective date of July 1, 1969. The current license expires on June 30, 2019. Articles 1 through 30 of the license are "standard articles" contained in FERC's Form L-4, and are part of the Order Issuing License. Articles 31 through 40 were also included in the Order Issuing License (FERC, 1969).

The original license articles are summarized below. Comments and subsequent amendments made during Project construction are included.

Article 1 Entire Project is subject to the provisions, terms and conditions of the license.

Article 2 No substantial changes can be made without approval. See Article 32.

Article 3 Project works shall be constructed in substantial conformity with the approved exhibits referred to in Article 2.

Article 4 Construction, operation, and maintenance of the Project is subject to inspection and supervision of the Regional Engineer, FPC.

Full cooperation was extended to FPC Inspector with all the FPC requests being honored. Letters to FPC Chicago, regarding the inspection program dated November 12, 1969, October 20, 1970, October 27, 1970 and November 9, 1971 are referenced.

Article 5 Requires land acquisitions completion within two years of the date of the license. (Would expire July 30, 1971).

A revised Exhibit F for acquisition of transmission line right-of-way and revised Exhibit K transmission line drawings were submitted January 27, 1971.

By July 1971 all land purchase for the Project had been completed except for a few parcels for the transmission line. A request for a six month extension was granted by the FPC in August 1971. On January 21, 1972 the final submittal was made to the FPC completing the requirements for this article.

Article 6 If Project is transferred to a new licensee, the Licensees shall assume responsibility for payment and discharge of all liens or encumbrances on the Project created after issuance of the license.

Article 7 Actual legitimate original cost of the Project and any betterments will be determined by the Commission in accordance with the FPA and Commission rules and regulations.

Article 8 Established an allowable rate of return. Consumers' letter to Commission dated August 22, 1969 calls attention to the unfairness of the allowable 6% rate of return and provides suggested alternatives.

Article 9 Licensee shall install and maintain gages as the Commission deems necessary, and install and maintain meters to determine the amount of electricity generated by the Project.

Article 10 After notice and hearing, the licensee shall install additional capacity or make other changes in the Project as directed by the Commission to the extent that it is economically sound and in the public interest.

Article 11 After notice and hearing, the licensee shall coordinate the operation of the Project with other projects or power systems.

Article 12 If licensee is directly benefited by another licensee's work on a storage project or headwater improvement, licensee shall reimburse headwater improvement owner a proportionate share of annual charges.

Article 13 United States retains and safeguards the right to use water as may be necessary for navigation purposes on the navigable waterway affected by the Project.

Article 14 Licensee shall permit reasonable use of its reservoir or other Project properties as may be ordered by the Commission in the interest of water resource utilization and conservation.

Article 15 During construction and maintenance of Project works, licensee shall maintain suitable structures to reduce the liability of contact with utility lines.

Article 16 Licensee shall construct, maintain, and operate reasonable facilities as may be ordered by the Commission for the conservation and development of fish and wildlife resources.

Fish and wildlife issues covered under Articles 37 and 38. Article 16 and Article 37 pertain to the effects of the Project on fishery resources, including evaluating the need to provide public fishing access and were revised per FERC Orders and Notices issued: August 11, 1987; September 30, 1988; February 9, 1990; January 23, 1996; February 16, 2001; and May 1, 2008.

Article 17 Licensee shall permit the United States use, free of cost, of Project lands and waters to construct and improve fish and wildlife facilities.

Article 18 Licensee shall construct, maintain, and operate reasonable recreation facilities as may be prescribed by the Commission. No submittals required except as required by Articles 37 and 38.

Article 19 Licensee shall allow the public access, to reasonable extent, to Project waters and lands for outdoor recreational purposes; provided the licensee may reserve portions of Project lands and waters from public access for the protection of life, health, and property.

Article 20 Licensee shall take reasonable measures to prevent soil erosion, sedimentation and water and air pollution in the operation of the Project.

Article 21 Licensee shall clear and keep clear to an adequate width lands along open conduits, clear lands within the bottom and margin of reservoirs.

Article 22 Material may be dredged or excavated in the prosecution of work authorized under the license and will be removed and deposited so it will not interfere with navigation.

Article 23 Licensee shall convey to the United States, free of cost, such lands and rights as required to construct, improve, and maintain navigation facilities.

Article 24 Licensee shall furnish power free of cost to the United States for the operation and maintenance of navigation facilities in the vicinity of the Project.

Article 25 Operation of navigation facilities constructed as part of any dam or diversion structure shall be control by the rules and regulation of the Secretary of the Army.

Article 26 Licensee shall construct, maintain, and operate at its expense lights and other signals for the protection of navigation as directed by the Coast Guard.

Article 27 The Commission will deem it to be a surrender of the license if essential Project property is removed or destroyed, if the Licensee abandons operation of the Project for a three year period, or refuses to comply with the terms of the license.

Article 28 Upon abandonment of the Project, licensee shall remove all structures and equipment.

Article 29 The right of the licensee to use and occupy waters, over which the United States has jurisdiction, under the license shall cease at the end of the license period.

Article 30 The terms and conditions set forth in the license shall not be construed as impairing any terms and conditions of the FPA which are not expressly set forth in the license.

Article 31 The licensee shall pay the United States an annual charge.

Article 32 Submittal of revised Exhibit L and Exhibit M showing final design prior to construction. Article 32 was revised per FERC Orders and Notices issued: April 16, 1970; 1981; August 4, 1998; August 21, 1998; February 9, 2001; and January 31, 2002.

The Project was constructed essentially per the original design drawings submitted with two exceptions:

1. Emergency overflow – covered in Article 41.
2. Asphalt lining – covered in Article 42.

Revised asphalt drainage scheme and location of the emergency overflow were submitted February 23, 1970 and approved April 16, 1970.

Article 33 Requires the formation of an Owners' Board of Consultants; reports on design changes and a final report prior to filling the reservoir: October 15, 1968 letter to the FPC provides the names of the consultants (Casagrande, Bertram and Wilson). General Vogel added in April of 1970.

Major design change panel reports:

1. Asphalt drainage system – January 5, 1970
2. Asphalt lining – April 22, 1971
3. Emergency overflow – April 26, 1972
4. Final report prior to filling reservoir – June 17, 1972
5. Panel Final Construction Report – August 17, 1974 (not required to be submitted to the FPC).

The Final Report prior to filling the reservoir was submitted to the FPC on June 6, 1972 with a supplement filed on August 2, 1972. FPC approval was received September 15, 1972.

Article 34 Requires redundant stop pump controls and design of emergency overflow. See Article 41.

Article 35 Requires submittal of lakefront, upper intake, pump-turbine model studies and transient pressure studies.

1. Lake Front Model Report	submitted July 17, 1970
2. Upper Intake Model Report	submitted July 17, 1970
3. Transient Pressure Study	submitted June 24, 1970
4. Pump-Turbine Model Study	submitted with As-built drawings

Article 36 Licensee to commence Project construction within two years of date of license and complete construction within six years of date of license.

Article 37 Conduct biological and limnological studies before and after construction to determine effects of the Project and its operation.

A series of study reports were provided prior to operation and for a short period of time following operation.

Article 38 Requires fish barrier net studies; study effect of positive and negative pressure within water courses on local fish; operate and maintain fish barriers or provide deeper submergence. Article 16 and Article 37 pertains to the effects of the Project on fishery resources, including evaluating the need to provide public fishing access and were revised per FERC Orders and Notices issued: August 11, 1987; September 30, 1988; February 9, 1990; January 23, 1996; February 16, 2001; and May 1, 2008.

In July 1971, the March 1971 report entitled "A Study of the Effects of Installing and Operating a Large Pumped Storage Project on the Shores of Lake Michigan Near Ludington, Michigan" was submitted. FPC approval was received on August 27, 1971 (FPC requested quarterly reports on continuing studies).

Fish Barriers

Several types of barriers were studied including electrical shock, sound, lights, laser beams, mechanical and impermeable rock barriers. Quarterly reports by Consumers Environmental Department covered the details.

Positive and Negative Pressures

Transient Pressure Studies and other studies determined that there were no negative pressures in the equipment or watercourses.

Fish Barriers and Design Changes (Deeper Submergence)

Submergence of the pump-turbine was increased from 15 to 25 feet. No feasible or practical fish barriers were discovered that would meet the requirements for the Project.

Article 39 Licensee shall minimize construction and maintenance disturbance of the Project works on the scenic values of the area, and shall within six months of license issuance, submit to the Commission, a plan showing the treatment needed to soften the profile of the upper reservoir dike.

Submittal of the Environmental Treatment Plan was made on July 30, 1970.

Article 40 Requires submittal of Exhibit J and K within one year of license issuance.

Revised Exhibits J and F made on January 28, 1971. (Plan for preservation and enhancement of environment as it may be affected by powerhouse, transmission line design and siting.) Article 40 was subsequently amended per FERC Orders and Notices issued: January 5, 1973; January 1, 2002; and April 25, 2002.

Article 41 Requires submittal of revised Exhibit L drawing showing the details of the emergency overflow. Submitted on June 19, 1972 and approved on July 12, 1972.

Article 42 Requires submittal of a report showing the results of testing and development of the asphaltic lining system. The report was submitted on May 28, 1971 and approved on June 9, 1971.

4.5.2 Compliance History of the Project

The Licensee has a sound compliance history for the Project and completes all necessary corrective actions to address comments and recommendations arising from FERC recommendations in a timely manner.

4.5.3 Safety Procedures

The Project complies with the FERC's Emergency Action Plan (EAP) requirements. The current EAP is dated December 15, 2009. The EAP is reviewed and updated as necessary annually, and contains a five-year periodic update requirement. The most recent functional exercise was performed in March 2013. The Licensees have a Dam Safety Surveillance and Monitoring Plan per FERC regulations, containing various monitoring/inspection requirements. A Surveillance

Monitoring Committee meets every other month to review the monitoring/inspection results. FERC conducts annual on-site inspections of the Project and Licensees also hire an independent consultant (approved by FERC) to perform the Part 12D Safety Inspection once every five years.

4.5.4 Summary of Project Generation Records

The table below provides the annual power generated and power used for pumping in megawatt-hours (MWh) (data from the annual statement of generation filed with the Commission in October of each year). The Project is not located on a river, and the Licensees do not monitor water flow using methods similar to riverine projects. Water flow records are not available for the Project.

Table 4-4: Annual Generation and Pumping

Report Period	Generation MWh	Pumping MWh
10/01/99 to 9/30/00	2,651,280	3,619,670
10/01/00 to 9/30/01	3,059,100	4,207,920
10/01/01 to 9/30/02	2,557,950	3,511,940
10/01/02 to 9/30/03	2,554,210	3,515,880
10/01/03 to 9/30/04	2,760,150	3,812,100
10/01/05 to 9/30/05	2,791,982	3,853,860
10/01/05 to 9/30/06	2,692,340	3,734,550
10/01/06 to 9/30/07	2,721,810	3,756,761
10/01/07 to 9/30/08	2,592,090	3,556,899
10/01/08 to 9/30/09	2,097,010	2,903,254
10/01/09 to 9/30/10	2,388,160	3,329,523
10/01/10 to 9/30/11	2,531,390	3,498,846
10/01/11 to 9/30/12	1,876,290	2,618,310
10/1/12 to 9/30/13	2,066,880	2,883,841
Average MWh	2,524,332	3,485,954

4.5.5 Net Investment

The net investment for the Ludington Project, represented by the book value as of December 31, 2012, is $59,556,681.

4.5.6 Benefits to Local Economy

The Project has the capability to generate enough energy to support a city of 1.4 million. The Project has approximately 41 employees and contributes approximately $11 million in property

taxes, which are converted into community and school improvements among other projects. The local economy also benefits from the payroll and expenditures associated with the plant's operation, maintenance, and overhauls. Annual operation and maintenance spending is about $16 million. In addition, the Licensees estimate that construction activities associated with the unit overhauls/upgrades will create an additional 100 construction building trades jobs between 2013 and 2019. (Consumers Energy, 2013).

4.6 References

Consumers Energy. 2013 [Online] URL: http://www.consumersenergy.com/content.aspx?id=1830. Accessed: August 27, 2013.

Federal Energy Regulatory Commission (FERC). 1969. Order Issuing License (FERC No. 2680). 42 FPC ¶274. Issued July 30, 1969

Federal Energy Regulatory Commission (FERC). 1970. Order Approving Revised Exhibit L Drawings for Project and Modifying License. 43 FPC ¶544. Issued April 16, 1970.

5.0 DESCRIPTION OF EXISTING ENVIRONMENT

Section 5 provides background and a summary of existing information about non-developmental features associated with the Project. This includes resources associated with geology and soils, water, aquatic resources, wildlife, botanical resources, recreation, aesthetics, history and archaeology (culture), socioeconomics and tribes. This information is used to make determinations about potential future project effects related to project operations and the need for additional studies to assess impacts of continued project operation on these resources.

5.1 Geology and Soils

5.1.1 Overview

The Project area is located in the Michigan Basin, which is an elliptical, intracratonic basin situated against the southern margin of the Canadian Shield. The Michigan Basin covers all of Michigan's Lower Peninsula and the eastern half of the Upper Peninsula. Strata from the Middle Cambrian through Upper Pennsylvanian Periods are well represented throughout the subsurface throughout the Basin (Gillespie et al, 2008).

5.1.2 Existing Geological Features

There are limited outcrops throughout the Basin, especially at the margins near the Great Lakes. Most of the rocks of the Michigan Basin are buried beneath thick deposits of Pleistocene glacial drift (Gillespie et al, 2008) (and include some description of the area in Michigan along Lake Michigan that describes the general geology of the area). Final shaping of the general area occurred during the latter stages of the Wisconsin glaciation. The high ground on which the Project's upper reservoir is located is a terminal moraine. Terminal moraines are linear masses of glacial drift that accumulate at the glacier front when it is in equilibrium for a relatively long period of time.

Moraines are composed largely of till and beds of outwash. Till is described as a subglacial deposit which is heterogeneous in composition and includes clay, silt, sand, gravel and boulders. Till deposits are characterized by irregularities and discontinuities in extent and thickness. Outwash includes all types of waterlaid sediments deposited by meltwater streams at the glacial front. Outwash generally is interbedded with the till and may occur in sizable beds.

Other Pleistocene deposits of till underlie the site to a depth of approximately 800 feet where bedrock composed of Mississippian Coldwater formation shale has been encountered. Underlying the Coldwater Formation are Mississippian and Devonian age shales. Devonian limestones of the Traverse City Group, occurring at a depth of about 950 feet, initiate a thick sequence of limestones and dolomite with minor amounts of anhydrite and salt to about a depth of 2,100 feet. Devonian Filer sandstone occurs at or near the base of the Detroit River Group, a

thick sequence of impervious dolomite, anhydrite and salt. The filer Sandstone, at a depth of about 2,850 to 3,100 feet, is approximately 100 feet thick beneath the Project's upper reservoir area and reaches a maximum thickness of about 140 feet just off-shore of the city of Ludington. Table 5-1 provides a generalized stratigraphic column of the Project area and summarizes the elevations at which the more conspicuous maker beds were encountered when drilling brine wells in the area.

Table 5-1: Brine Field Stratigraphy

Geologic Time Unit	Name of Rock Unit	Lithologic Description	Elevation in Feet (Top of Formation)						
			Well No. 5	Well No. 17	Well No. 18	Well No. 20	Well No. 30	Well No. 33	Well No. 34
Pleistocene		Glacial Till	+785	+805	+901	+760	+714	+682	+703
Mississippian	Coldwater Formation	Shale – Some Dolomite	+85	+90	+71	+64	+99	---	+103
Mississippian-Devonian	Antrium Formation	Shale	-675	---	-660	---	-715	---	-675
Devonian	Traverse Group	Dolomite, Limestone and Anhydrite	-925	-900	-870	-1005	-951	---	-960
Devonian	Dundee Formation	Limestone	-1500	-1505	-1500	-1485	-1501	---	-1565
Devonian	Detroit River Group	Dolomite, Anhdrite and Salt	-1520	-1618	-1565	-1654	-1551	---	-1565
Devonian	Filer Sandstone	Sandstone	-2088	-2104	-2101	-2075	-2078	-2129	-2142
Silurian	Bass Island Formation	Dolomite, Shale and Anhydrite	-2188	-2209	-2206	-2205	-2211	-2225	-2211

Table copied from 1968 General Analytics Report

5.1.3 Soils

Deposits observed at the Project site include four main till units with interbedded and overlaying outwash deposits.

The oldest till (Till A) is a gray to grayish brown clayey till with occasional cobbles and boulders. This till lies below the level of Lake Michigan at about elevation 580 in the penstock area, with a maximum known thickness of 170 feet. This till is overlain by discontinuous layers of clean, fine- to medium-grain outwash sands with lenses of silty sands.

Overlying Till A and the discontinuous layers of outwash sands is a gray to grayish brown clayey to silty clay till (Till B). The upper surface of this till layer is generally located at about elevation 650 to 700; however, it has been observed as high as elevation 750. The thickness of this till varies up to 50 feet. This till contains very little coarse-grained material and is less pervious than the overlying material which is an outwash deposit of fine to medium sand. Most of the springs and seeps along the Lake Michigan shoreline occur at the top of this till stratum where it exists as an outcrop.

Overlying Till B and the outwash sands is Till C, which is a red to grayish-brown silty clay till. The upper surface of this till is generally located between elevation 670 and 750. It is highly irregular in pattern and not continuous. This till varies in thickness to 75 feet but is commonly found in multiple lenses 5 to 10 feet thick. Till C is overlain by a rather thick irregular outwash deposit of sand and gravelly sand.

Till D overlying Till C and the thick outwash deposit, is a red clayey till which grades to a sandy gravelly till at its contact with the underlying outwash sand. Overlying this till and exposed at the site surface is a one- to two-foot thick deposit of outwash and gravels.

5.1.4 Erosion and Seepage

The Project consists of upper and lower reservoirs and is not located along a river so there are no stream banks. Lake Michigan serves as the Project's lower reservoir.

The upper reservoir is a man-made structure, with dikes that form the reservoir shoreline. The dikes are constructed entirely for the purpose of retaining and storing water for the Project. The bottom of the upper reservoir has a compacted impervious clay lining, with the inner face and top of the embankment surfaced with asphaltic concrete. The reservoir shoreline area is maintained clear of vegetation. The downstream slope of the dike is composed of compacted random fill planted with local grasses.

Consistent with License Article 20, during construction all reasonable measures were taken to prevent soil erosion and avoid siltation into Lake Michigan. Holding ponds were maintained for

construction water and runoff. Construction of the jetties and placement of riprap along the shoreline protected Project property and neighboring property from additional bluff erosion. An extensive re-vegetation and reforestation was designed and implemented. During construction Lake Michigan rose to near historically high levels. Wave action on the base of the shoreline bluffs was responsible for heavy siltation of the lake. Extensive lake turbidity studies showed that the Project was not responsible for the turbidity conditions. This was further borne out as the condition persisted following completion of the Project construction.

Early in the Project life, the Licensees received inquiries from local property owners and FERC regarding the effect plant operation was having on the stability of the high bluffs along the Lake Michigan shoreline to the north and south of the Project. The basis for the various property owner inquiries fit into three general categories: (a) impact of pumping and/or generating on shoreline currents, (b) interruption of littoral drift due to the plant jetties, and (c) seepage from the Project's upper storage reservoir.

Impact of Pumping or Generating on Shoreline Currents

The Licensees performed studies that disproved the claim that operation of the Project was causing increased shoreline currents leading to increased shoreline wave action. The property owners were experiencing the effects of near historic high water levels in Lake Michigan. Data from the Army Corps of Engineers on Lake Huron/Lake Michigan water levels show that levels had nearly reached a 100 year high shortly after the Project went into operation. As a result, though the wind itself is a regular direct cause of erosion from high bluff properties, its effect was exacerbated by the high Lake Michigan water levels as episodic collapses of upper bluff material resulted from waves eating away at the base of the bluff during this period. Adjacent property owner complaints were most prevalent in the mid-1970s and again in the mid-1980s when lake levels were high.

Littoral Drift

Littoral drift is generally defined as the material carried on-shore and off-shore as a result of the breaking action of waves coming on shore. Wave action and ice are the primary natural forces involved. In addition to wave action, there is a natural long shore current that contributes to littoral drift. Piers extending into the lake can have a significant local influence on littoral drift. The extent of a pier's influence is directly related to how far it extends into the lake. The LPS jetties are relatively short at about 1,600 feet, especially when compared to the southern breakwater/pier in the City of Ludington, 5-miles to the north, which is approximately 3,600 feet in overall length. The bulk of the effect occurred in the early years of the jetties' existence. The land builds up along the jetties relatively fast in the early years and as it extends farther out toward the end of the jetties, the drift begins to work its way out beyond the end of the jetties and

continues to move up and down the shoreline. The drift has not substantially changed in decades.

Seepage

The 842-acre Project storage reservoir holds approximately 27 billion gallons of water. The weight and resulting hydro static pressure of the water results in some seepage through the bottom of the reservoir, even with the clay and asphaltic concrete that lines the bottom and insides of the reservoir, respectively.

Seepage rates from 1972 to 1974 were higher than design rates. Seepage leveled off from 1974 until 1989 as a system of relief wells were put in place and used to discharge the seepage back into the reservoir and to Lake Michigan. In 1989 a program was initiated to inject grout into reservoir "trench features" where most of the seepage was believed to be occurring. Grout injections resulted in reducing seepage between 1989 until 1992. Since 1992 the use of a silica-based material in the trench features has further reduce seepage such that seepage has been reduced to at or below design rates. Seepage has continued to incrementally decline under the ongoing program.

2009 FERC Dam Safety Inspection

Even though bluff erosion has been documented along the shoreline, the Licensees believe it has been adequately demonstrated that this erosion is not the result of Project operations or facilities. The following Lake Michigan shoreline description is from the 2009 Dam Safety Inspection Report prepared by staff from the FERC Chicago Regional Office:

> The terraced bluffs along the Lake Michigan shoreline which extend north and south of the powerhouse are nearly 200 feet high and are within the Project's boundary. Perched water tables within the clays periodically cause some seepage to emerge from the bluff slopes. The bluffs are regularly monitored visually and photographically for erosion; however, only a short length of Lake Michigan shoreline immediately north and south of the Project are within the Project's boundary. Bluff weir readings are also taken three times per year.
>
> The full length of the South and North Bluffs were walked on 21 and 22 May 2009, respectively. During the inspection of the bluffs, the Licensee made the first of three regular bluff weir measurements for 2009. Much of the beach along the South Bluffs was eroded as compared to the condition observed during the 2008 inspection and, per the Licensee, compared to their last bluff weir inspection. An aerial survey was conducted in April 2009 and based on the photographs some erosion along the beach has occurred

since then. Much of this is attributed to high wave action encountered especially on 21 May 2009 during the inspection.

In summary, the reservoir seepage problem is the only significant direct Project factor that historically affected the shoreline properties. The generating and pumping flows were disproved as erosion factors early in Project life. The effect of the jetties on littoral drift is a documented phenomenon of all solid surface jetties or piers, but the major impact occurred in the early years of their existence and no significant variations in erosion rates could be directly traced to them now. With the reservoir remediation and leak monitoring programs, the seepage is under control and both the Licensees and FERC regulators have every expectation that it will remain under control.

5.1.5 References

Consumers Power Company and The Detroit Edison Company. Application for Original License. 1968.

Harding-Lawson Associates. 1980. Geophysical Investigation Ludington Pumped Storage Reservoir Ludington, Michigan.

General Analytics, Inc. 1968. Evaluation of Subsidence Caused By Brine Extraction Consumers Power Company Ludington Pumped Storage Project. April 1968.

Federal Energy Regulatory Commission, Chicago Regional Office. 2009 Dam Safety Inspection Report. Page 14.

Robb Gillespie, William B. Harrison III, and G. Michael Grammer; Geology of Michigan and the Great Lakes Michigan Geological Repository for Research and Education Western Michigan University, 2008.

5.2 Water Resources

5.2.1 Overview

The LPSP utilizes water pumped from Lake Michigan via penstocks into an upper reservoir from which it is released through the same penstocks back down to Lake Michigan to generate power during peak electricity demand periods. The Project is not located on a stream or river.

The upper reservoir is a man-made body of water with a surface area of 842 acres and a mean depth of 98 feet (the depth ranges from about 97 feet in the south end to about 112 feet in the north end). The embankment forming the perimeter of the upper reservoir does not allow for inflow or outflow from the reservoir other than through Project facilities.

The lower reservoir is Lake Michigan, which has a direct watershed area of approximately 45,600 square miles (http://www.epa.gov/glnpo/factsheet.html).

Because the Project is not located on a river, or stream, and does not create an impoundment with a watershed other than the surface of the upper reservoir itself, there are no gauging stations associated with the Project, and therefore flow duration curves are not applicable.

5.2.2 Existing and Proposed Uses of Water

Project use of water is for generation only. Licensees' use of water is not for consumption, irrigation, municipal water supply, industrial purposes or to supply domestic water. The Licensees do not plan to change the Project's water use for generation.

The Project currently holds a National Pollution Discharge Elimination (NPDES) permit that covers eight monitored outfalls. These reflect non-contact cooling water discharges for each unit (outfalls 1-6), the oil/water separator discharge (outfall 7), and the unwatering sump pump discharge (outfall 8). Outfall 1-6 and 8 (the unwatering sump pump discharge is used to drain draft tubes for periodic outage work) are free of pollutant loads with monitoring consisting of daily visual observations and reporting of daily flow. Similar monitoring is required for outfall 7 with the addition of a monthly grab sample collected for oil and grease analysis. Two large outfalls on each side of the tailrace are connected to the site storm water drainage system which also includes seepage water (ground water). The southern most of these outfalls is designated outfall #9 as it formerly drained the Upper Penstock Encasement Joint (UPEJ) of storm water. Drains to the UPEJ have been closed due to the discovery of PCBs in the grout of that area in 1999. The UPEJ was remediated and storm water continues to be collected, tested for PCBs, and properly disposed of in accordance with Part I Section (A)(5) of the NPDES permit. The Project has remained in compliance with the conditions of the NPDES permit.

5.2.3 Reservoir Bathymetry

The upper reservoir is a man-made body of water, approximately 5.7 miles in circumference. The water level elevation with a full upper reservoir is 942 feet NGVD. At this elevation the reservoir contains about 82,300 acre-feet of water, with a surface area of 842 acres. The reservoir has a mean depth of 98 feet (the depth ranges from about 97 feet in the south end to about 112 feet in the north end).

The upper reservoir was created by constructing an earthen dike primarily from local materials. There are three main sections of the dike: the downstream slope (exterior), the upstream slope (interior) and a central "chimney drain" section. The downstream slope of the dike is composed of random fill. The "chimney drain" is composed of course sand. The upstream slope is largely composed of fine sand and is topped with calcareous silt sand. The interior surface (i.e. water side) of the dike is lined with two layers of asphalt paving sandwiching a rock drainage course. The reservoir bottom is lined with clay, center thickness ranges from 3 to 5 feet with a thickness of 8 to 10 feet adjacent to the dike where it overlaps the bottom of the asphalt lining. Adjacent to the intake structure, the reservoir bottom is lined with riprap to protect the clay liner from scour due to the strong currents during pumping.

The lower reservoir is Lake Michigan, which has a surface area of 22,400 square miles. The Project boundary includes approximately 3,050 feet of Lake Michigan shoreline (Figure 5-1). The long-term (1918-2012) average Lake Michigan water surface elevation as measured at Harbor Beach, MI is 578.8 feet (IGLD 85). However, water levels have been consistently below average since 1999 with a record low level of 576.1 feet (IGLD 85) being established in January, 2013. During the period from commencement of Project operations (1973) until 1999, lake elevations were consistently above the long-term average (Gronewold et al, 2013).

Legend

- Project Boundary
- Non-Project Land
- Township Boundary

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY
DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT RESERVOIR

FIGURE 5-1

Created: 1/7/2014

TRC
14 Gabriel Drive
Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers_Energy_Company\Ludington_Pump_Storage_PAD\Figure_5_1_Project_Boundary_Map_8x11.mxd

5.2.4 Water Quality Standards

The Clean Water Act (CWA) was implemented after the current license for the Project was issued. Therefore, no CWA Section 401 Water Quality Certificate has been issued for the Project.

That said, current Federal and State standards are in place that could apply to the Project discharge into Lake Michigan. Section 401 of the Clean Water Act provides the federal water quality standards applicable to the Project. Further, Water Quality Guidance for the Great Lakes System (Guidance) is provided in 40 CFR Part 130 as required by section 118(c)(2) of the Clean Water Act, 33 USC § 1268(c)(2). The Guidance identifies minimum water quality standards, anti-degradation policies, and implementation procedures for the Great Lakes System to protect human health, aquatic life, and wildlife.

The Michigan Department of Environmental Quality (Michigan DEQ) implements the requirements of the Clean Water Act on behalf of the federal government. A 401 Water Quality Certificate issued by the Michigan DEQ would provide the conditions applicable to the Project for compliance with the Michigan Water Quality Standards (Michigan WQS).

Additionally, Lake Michigan water quality standards for applicable parameters as provided in Michigan Act 451 Part 4 are:

- Dissolved Oxygen (DO):
    - Rule 64 - DO in Great Lakes equal or greater than 7 mg/L
- Water Temperature:
    - The Great Lakes and connecting waters shall not receive a heat load which would warm the receiving water at the edge of the mixing zone more than 3 Fahrenheit degrees above the existing natural water temperature.
    - The Great Lakes and connecting waters shall not receive a heat load which would warm the receiving water at the edge of the mixing zone to temperatures in degrees Fahrenheit higher than the following monthly maximum temperature:

Table 5-2: Monthly Maximum Allowable Lake Michigan Water Temperatures
Applicable North of a Line due West from the City of Pentwater, MI.

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
40 °F (4.4 °C)	40 °F (4.4 °C)	40 °F (4.4 °C)	50 °F (10 °C)	55 °F (12.8 °C)	70 °F (21.1 °C)	75 °F (23.9 °C)	75 °F (23.9 °C)	75 °F (23.9 °C)	65 °F (18.3 °C)	60 °F (15.6 °C)	45 °F (7.2 °C)

Note: Temperature requirements use Fahrenheit but Celsius equivalents are provided.

5.2.5 Existing Water Quality Data 1972-1974

Physical and chemical water quality studies were conducted at the Project during 1972 (prior to filling the upper reservoir) through 1974 (after filling the upper reservoir and the start of Project operation). The studies were conducted by the Department of Fisheries and Wildlife, Michigan State University and reported to Consumers Energy in a report entitled "A Study of the Effects of Installing and Operating a Large Pumped Storage Project on the Shores of Lake Michigan Near Ludington, Michigan – 1974 Annual Report, Volume II and Twelfth Quarterly Report Physical-Chemical Aspects, 1972-1974." Below is a summary of the 1974 report.

Field work was conducted at six fixed sampling locations in Lake Michigan and within three general locations within the upper reservoir (See Figures 5-2 and 5-3). Table 5-3 provides the locations for the permanent Lake Michigan sampling locations. Data was collected from the beginning of April until November for the three years, 1972 to 1974.

Physical data collected consisted of surface and bottom water temperatures, turbidity (Formazin Turbidity Units (ppm)) and water transparency (Secchi disc (m)).

Chemical parameters measured were dissolved oxygen (ppm), pH, total alkalinity (ppm), and dissolved solids. These measurements were also made at the surface and at the reservoir bottom.

Table 5-3: Locations for the Permanent Lake Michigan Sampling Locations (Liston et al, 1976)

Station	Location	Depth
1 (Control Area)	3 miles S of breakwater	12 m (39.4 feet)
2	1 mile SSE of south jetty	6 m (19.7 feet)
3	0.5 miles S of breakwater	14 m (45.9 feet)
4	1.5 miles W of breakwater	24 m (78.7)
5	0.5 miles NNW of breakwater	12 m (39.4)
6	1 mile N of north jetty	6 m (19.7 feet)

5.2.6 Initial Reservoir filling and Project Operation

Initial filling of the upper reservoir began on October 23, 1972. The water level was raised approximately 22 feet over four days (elevation of 853 feet NGVD). Following a brief test period of about 13 days, the water level was raised to elevation 883.5 feet NGVD in about 4-1/2 days using one pump-turbine. In late November 1972, the upper reservoir was filled to its maximum level of 942 feet NGVD.

Figure 5-2: Depiction of Lake Michigan Sampling Locations Utilized During Monitoring from 1972-1974 and 2013. (GLEC, 2014)

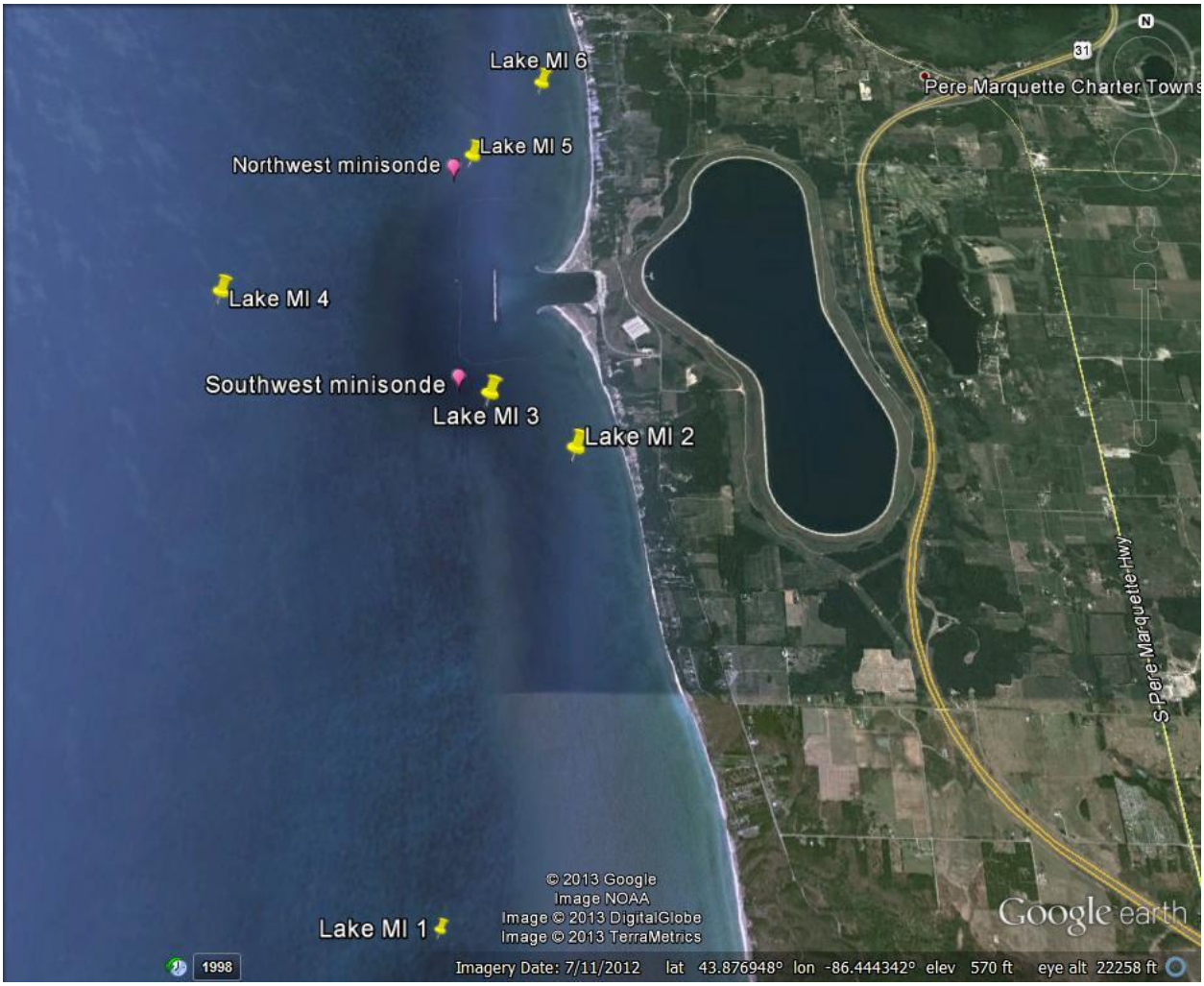
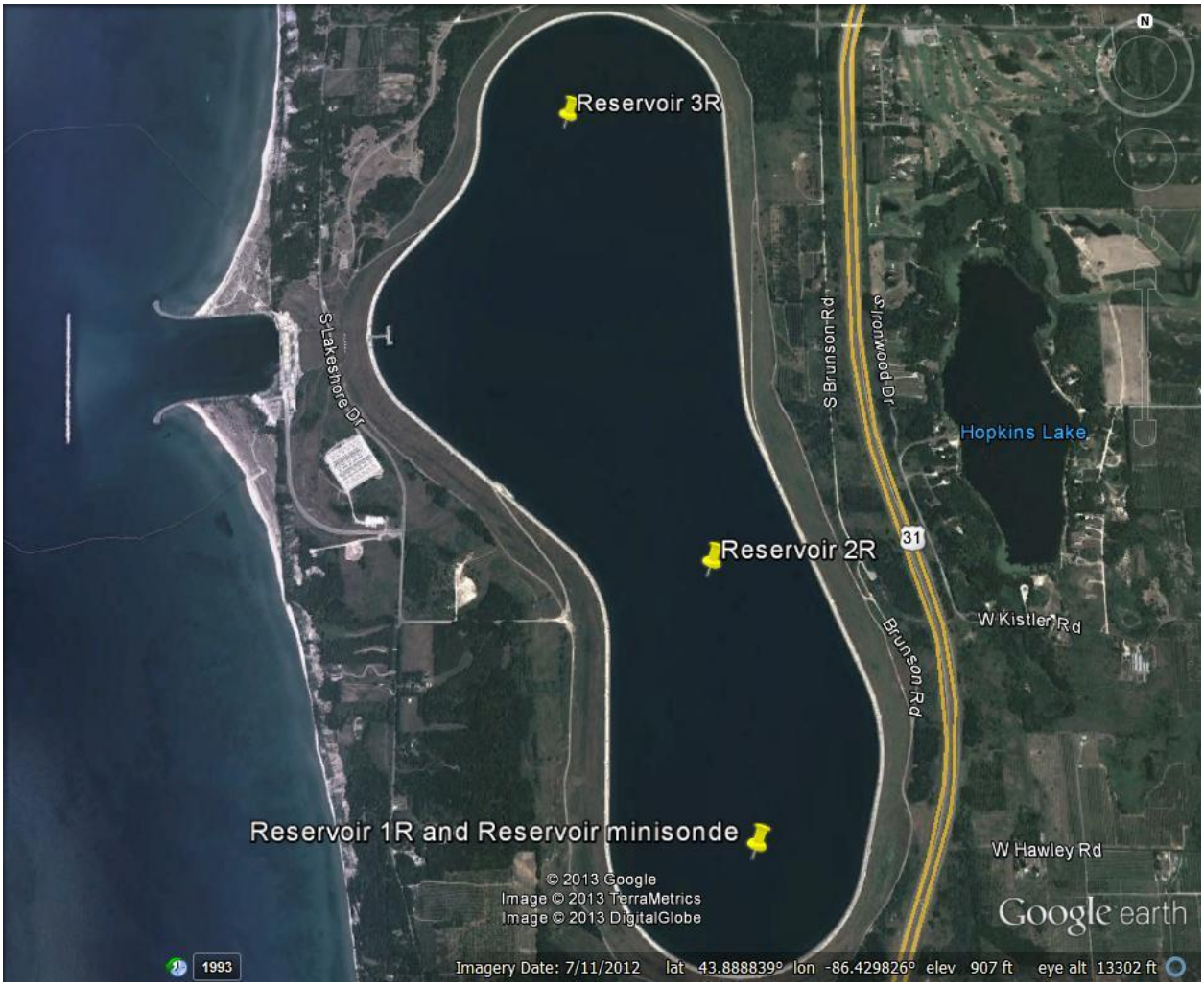


Figure 5-3: Upper Reservoir Sampling Locations Utilized During 1972-1974 and 2013. (GLEC, 2014)



Pumping rates were less than 50,000 acre-feet per week with only one pump-turbine in operation. Maximum pumping rates of greater than 200,000 acre- feet per week were attained after completion of the fifth pump-turbine installation in August 1973. Pumping occurred mainly in the evening and early morning hours during all weeks in 1973 and 1974. Volumes pumped during daylight typically were less than 15% of the total weekly volumes and most daylight pumping occurred on the weekends. The total volume of the upper reservoir at full pond is approximately 82,300 acre-feet. Thus, if 200,000 acre-feet was the approximate average weekly volume of water pumped, the weekly turnover rate was about 2.4 (200,000/82,300).

The first pump-turbine began commercial operation in January 1973. Therefore, one year of pre-operational data and two years of operating data are available for comparison. The 1974 report

includes comparisons of the data collected from the stations in Lake Michigan during 1972-1974 to determine if there were any plant-induced effects. Comparisons were also made between the Lake Michigan data and the data collected in the upper reservoir.

5.2.7 Upper Reservoir Data

Water Temperature: Surface and bottom water temperatures were measured on 78 dates in 1973 and 80 dates in 1974 and are summarized in Table 5-4. Temperature increased from about 39.2 °F (4 °C) on March 29, 1973 (initial visit) to 68 °F (20 °C) by July 7th. The maximum temperature recorded during 1973 was 74.8 °F (23.8 °C) on September 5th and declined to about 44.6 °F (7 °C) by November 7th. The lowest recorded temperature during 1973 was 38.3 °F (3.5 °C) on April 11th. In 1974, April temperatures were typically several degrees cooler than 1973. The initial temperature and the lowest recorded was 34.7 °F (1.5 °C) on April 1st. Temperatures of 68 °F (20 °C) were not encountered until July 15th. The maximum temperature recorded during 1974 was 70.7 °F (21.5 °C) on August 22nd. Autumn cooling was slightly later in 1974 as indicated by the 46.4 °F (8 °C) temperature recorded on November 20th.

Table 5-4: Upper Reservoir Temperature Summary

	1973		1974	
	°F (°C)	Date	°F (°C)	Date
Initial	39.2 (4.0)	3/29/1973	34.7 (1.5)	4/1/1974
Maximum	74.8 (23.8)	9/5/1973	70.7 (21.5)	8/22/1974
Minimum	38.3 (3.5)	4/11/1973	34.7 (1.5)	4/1/1974

Water temperatures between reservoir stations showed little variation in both years and only rarely were horizontal temperature differences as much as 1.8 °F (1 °C) (5-times in 1973 and 4 times in 1974). In addition, relatively few surface to bottom temperature differences more than 1.8 °F (1 °C) were recorded (19 times in 1973 and 10 times in 1974).

The greatest difference from top-to-bottom in 1973 of 5.2 °F (4 °C) was recorded on August 27th. In 1974, the greatest top-to-bottom difference of 4.3 °F (2.4 °C) was recorded on June 24th.

Turbidity: Turbidity readings taken in the reservoir during 1973 and 1974 show slightly higher average turbidity in 1974 compared to 1973, probably resulting from the increased amount of water moved in and out of the reservoir in 1974. The highest turbidity measured was 36 ppm and occurred on August 31, 1974. The report noted that much of the clay bottom was exposed at this time allowing for a greater disturbance of the substrate.

Secchi Disc: Secchi disc measurements (water transparency) ranged from 0.7 to 18.8 feet (0.2 to 4.5 m) during 1973 and 1974. Average readings in 1973 were 6.6 to 7.2 feet (2.0 to 2.2 m) and in 1974 average readings were 5.2 to 5.6 feet (1.6 to 1.7 m). The lower transparency in 1974 corresponded with the slightly increased turbidity as noted above. Secchi disc readings generally averaged less in April than other months for both years.

Chemical Analysis: Water chemistry measurements, such as DO, pH, alkalinity, and total dissolved solids (as discussed in Section 5.2.5) indicate minimal variation between surface and bottom depths and only minor differences between 1973 and 1974. Dissolved oxygen ranged from 9.0 to 12.6 ppm considering both years and all the reservoir sampling locations. Likewise pH ranged from 8.0 to 8.5, alkalinity ranged from 102 to 123 ppm, and dissolved solids ranged from 159 to 190 ppm.

5.2.8 Lake Michigan Data

Six sampling stations were established in Lake Michigan in April 1972 (See Figure 5-2). Surface and bottom water temperature measurements were made at these six stations during 1972 to 1974. Station 1, considered the control station, was located three miles south of the breakwater and outside the influence of the Project. Stations 2 thru 6 were used as impact stations. Surface and bottom water temperature measurements were made at all stations. The report indicates that due to the similarity in the results from 1972 and 1973 these parameters were monitored sporadically in 1974.

Minimum temperatures of 35.6-39.2 °F (2-4 °C) were encountered during early April while maximum temperatures were reached in August. Maximum observed temperatures were substantially different between years: 1972-67.6 °F (19.8 °C); 1973-73.4 °F (23.0 °C); and 1974-71.4 °F (21.9 °C). Yearly comparisons indicate that 1972 was a cool year compared to 1973 and 1974. Comparison of surface and bottom temperatures from the station 1 to stations 3 and 5 demonstrated that the observed variations resulted from internal lake conditions and were not induced by plant activity. The patterns of temperature variation were nearly identical among the three stations. In two previously conducted Lake Michigan studies (independent and distant from Ludington) conducted during the mid-1960's and early 1970's, one showed the thermal pattern of spring warm-up followed by rapidly fluctuating temperatures during the summer months and autumn cooling are typical of near shore water in Lake Michigan. The second observed frequent daily fluctuations of about 12 °F (7 °C) during June-September in a near-shore zone that were believed caused by wind induced upwelling.

Turbidity was also determined on six occasions during 1972, thus comparisons were mainly limited to the 1973 and 1974 data. Comparison of station 1 to stations 3 and 5 revealed no significant alteration of turbidity for either year. Turbidities were slightly greater in 1974 at both station 1 and at stations 3 and 5. Intra-station turbidities for stations 2, 4, and 6 during 1972-

1974 show an overall increasing trend at all stations but no significant alterations occurred. The mean turbidities at the station 4 (the outside station) were lower than at any other site for all years. The 1974 study indicated that the average and maximum turbidities encountered were slightly greater than previous data reported for central Lake Michigan.

Secchi disc values collected from 1972 to 1974 were generally lowest in the shallow areas and increased with depth. Mean transparency values from station 1 compared to stations 3 and 5 were slightly less near the power plant but the differences reported were not significant. Data variation increased from 1972 to 1974 at all three stations although variation was similar among stations each year. For stations 2, 4, and 6 mean values during plant operational years were not significantly different from the pre-operational means. Data variation were similar in 1972 and 1973 for all three stations. However, variation was considerably higher in 1974 compared to 1972 and 1973 indicating greater instability of water transparency as plant activity increased. Lower minimum and higher maximum readings were also recorded in 1974.

Chemical conditions were very similar between station 1 and stations 3 and 5. Dissolved oxygen ranged from 8.7 to 15.0 ppm across all years. During the first year of plant activity mean dissolved oxygen values were about 1.5 ppm less at all stations (comparison of 1973 data to 1972 and 1974). The pH ranged from 7.7 to 8.8 with values less than 8.0 recorded only during 1972. Lower pH values in 1972 were thought to have resulted from the unusually cool condition of Lake Michigan during that year compared to subsequent years. Alkalinities ranged from 98 to 136 ppm and values were slightly less in 1973 and 1974 compared to 1972. Differences between the stations were not apparent for any year. Dissolved solid concentrations were similar among stations during each year with values ranging from 151 to 198 ppm considering all sampling dates and locations. The 1974 report also stated that the ranges for dissolved oxygen, pH, and alkalinity reported were similar to other values reported from central Lake Michigan.

5.2.9 Upper Reservoir and Lake Michigan Comparisons

The ranges and means of the physical and chemical parameters determined from the reservoir were compared with similar determinations made at station 1 (the Lake Michigan control station). Station 1 was selected to be representative of natural Lake Michigan in a near-shore area. The data indicated that the only parameters undergoing some modification were turbidity and water transparency. Minimum and maximum turbidity were higher in the reservoir for both years. In 1973 turbidity averaged 1.1 ppm higher than station 1 and in 1974 turbidity averaged 2.0 ppm higher. Minimum and maximum Secchi disc readings were less in the upper reservoir in both years. In 1973 the average Secchi disc readings were 1.2 m less in 1973 and were 1.4 m less in 1974. Water temperature, dissolved oxygen, pH, alkalinity, and dissolved solids were essentially the same in the reservoir and the Lake Michigan control station during both years.

5.2.10 Water Quality Data 2013

The Licensees acknowledge that water quality data relative to the Project was limited and somewhat dated. Therefore, in order to supplement existing information with recent data, a water quality study was conducted during the summer and early fall of 2013. To the extent practical, the study duplicated the efforts of Liston et al, 1976. As provided below, 2013 study results were comparable to the historic data (GLEC, 2014). Specifically, water quality parameters measured met water quality standards and plant impacts on water quality were not observed.

Profile Data

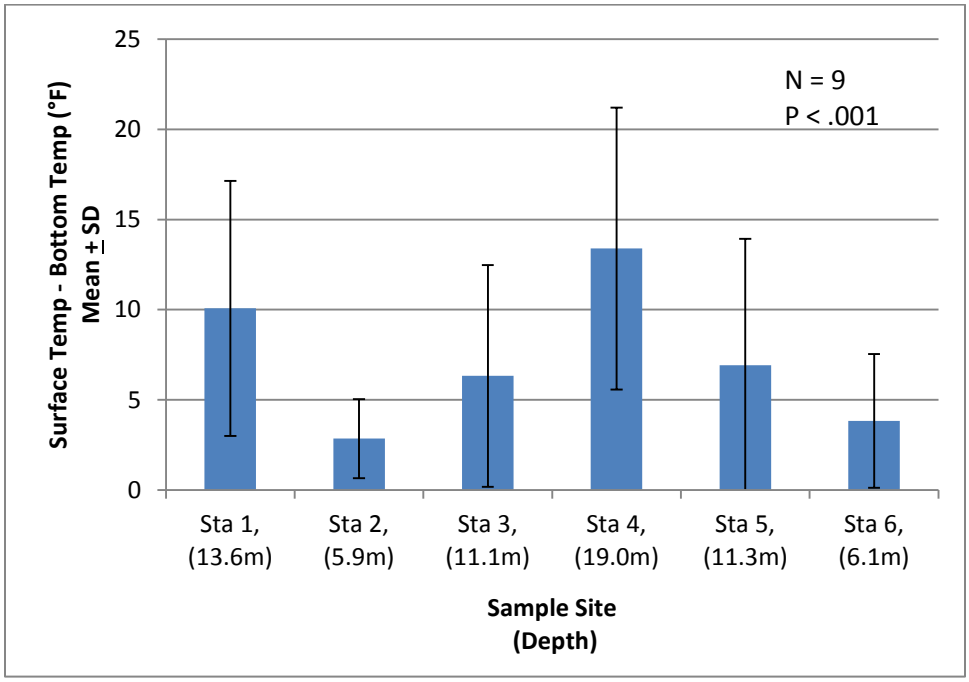
Water temperature and DO profiles were collected twice per month from June 20th to October 11th. Six Lake Michigan locations and three upper reservoir locations are consistent with those monitored by Liston et al (Figures 5-2 and 5-3) with the exception that some depths had measured differently. Station 1 measured deeper (approx. 13.6 m) while stations 3 and 5 measured shallower (approx. 11 m) and station 4 measured shallower (approx. 19 m). Profile data were collected at 3.3 feet (1 m) increments from the surface to the bottom at each site.

The data were evaluated to determine if temperature stratification occurred. Stratification was defined as a 1.8 °F (1°C) or greater temperature change within a 3.3 feet (1 m) interval. Data shows that the upper reservoir rarely thermally stratifies. Site 1R in the upper reservoir showed stratification once over the study period (on July 15, 2013) while sites 2R and 3R did not stratify. More instances of thermal stratification were observed in the Lake Michigan sites:

- Lake Michigan sites 1 and 4 showed stratification in seven out of nine visits
- Lake Michigan site 5 showed stratification in five out of nine visits
- Lake Michigan sites 2 and 3 showed stratification in four out of nine visits
- Lake Michigan site 6 showed stratification in three out of nine visits

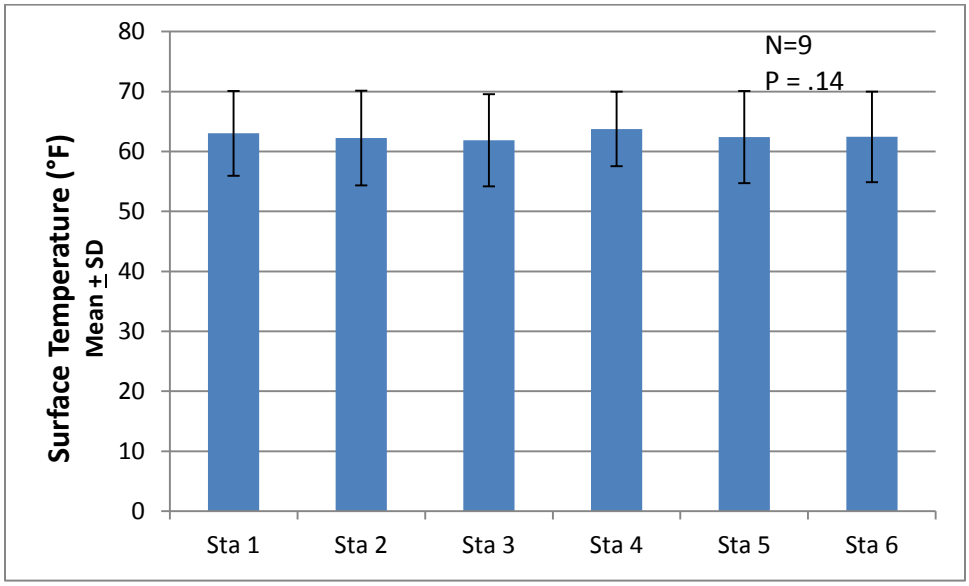
In addition, an analysis of variance (ANOVA) of the differences between top and bottom temperatures revealed that the means were significantly different among the sites (Figure 5-4), consistent with the stratification frequencies.

Figure 5-4: 2013 Water Quality Study – Mean Difference Between Surface and Bottom Temperatures at Each Lake Michigan Sampling Station



Sites 2 and 6 are the two most shallow of the Lake Michigan sites so wave action is likely responsible for more mixing of the water and consequently a more homogeneous water temperature was observed at these locations. Lake Michigan sites 1 and 4 showed stratification most often over the course of the study period probably because these are the two deepest sites and are less impacted by wave action near the shore. Additionally, these two sites are the furthest away from the plant outlet and consequently less likely to be influence by water released from the upper reservoir (Figure 5-2). Sites 5 and 3 are approximately the same depth and are the two closest sites to the plant outlet (Figure 5-2). While stratification at these sites is more likely to be influenced by water released from the upper reservoir than it is at sites 1, 2, 4 and 6, the pattern of differences among sites appears to be associated with depth. An ANOVA of the surface temperatures showed no significant differences among the sites (Figure 5-5). Mean surface to bottom DO differences exhibited the same pattern as temperature (associated with depth) but were not significantly different (P=.10), Mean differences did not exceed 1mg/L with a maximum observed difference of 3.03mg/l at the Control Site 1 on July 15th. Mean surface DO measurements were also not significantly different (P=0.71).

Figure 5-5: 2013 Water Quality Study – Mean Surface Temperatures at Each Lake Michigan Sampling Station



Average DO and average water temperature were calculated for each site by date on days during which a profile was taken by averaging all the profile data points to obtain a single temperature and DO value for that date (see Table 5-5). For all nine study sites, average water temperature increased from June 20 to August 29 and then began to decline from August 29 to October 11. Average DO showed a general decline over the study period for all sites June values generally being in the 11-12 ppm range and October values being in the 8-9 ppm range.

Over the study period, DO ranged from 8.2 to 11.7 ppm in the upper reservoir and from 8.2 to 12.8 ppm in Lake Michigan. Mean DO values over the study period were slightly lower in the upper reservoir (9.5 ppm) than in Lake Michigan (9.8 ppm). Water temperature ranged from 51.8 to 70.9 °F (11.01 to 21.62 °C) in the upper reservoir and from 41.4 to 73.0 °F (5.20 to 22.80 °C) in Lake Michigan.

Table 5-5: Summary of Average Dissolved Oxygen (ppm), Water Temperature (°F), and Turbidity (NTU) for each site using data obtained during profile measurements

	Station 1R Avg DO	Avg Temp	Avg Turbidity		Station 2R Avg DO	Avg Temp	Avg Turbidity		Station 3R Avg DO	Avg Temp	Avg Turbidity
6/21/2013	11.3	52.5	0.3	**6/21/2013**	11.3	52.6	0.2	**6/21/2013**	11.3	52.8	0.2
7/1/2013	10.0	57.5	0.5	**7/1/2013**	10.0	57.4	0.4	**7/1/2013**	10.0	56.6	0.2
7/15/2013	10.2	63.9	0.1	**7/15/2013**	10.3	63.9	0.4	**7/15/2013**	10.3	63.3	0.3
7/30/2013	8.7	59.3	0.3	**7/30/2013**	8.6	59.6	0.4	**7/30/2013**	8.9	59.2	0.4
8/13/2013	9.0	63.8	0.3	**8/13/2013**	9.0	63.5	0.3	**8/13/2013**	9.0	62.9	0.2
8/29/2013	8.5	70.0	0.6	**8/29/2013**	8.7	70.0	0.3	**8/29/2013**	8.6	70.0	0.2
9/11/2013	9.2	61.6	0.3	**9/11/2013**	9.1	62.2	0.2	**9/11/2013**	9.0	62.3	0.3
9/25/2013	9.2	58.6	0.2	**9/25/2013**	9.2	58.6	0.2	**9/25/2013**	9.1	58.6	0.2
10/11/2013	8.7	61.6	0.6	**10/11/2013**	8.6	61.6	0.2	**10/11/2013**	8.6	61.6	0.2

	Lake Michigan Station 1 Avg DO	Avg Temp	Avg Turbidity		Lake Michigan Station 2 Avg DO	Avg Temp	Avg Turbidity		Lake Michigan Station 3 Avg DO	Avg Temp	Avg Turbidity
6/20/2013	12.0	49.7	0.2	**6/20/2013**	12.0	53.7	0.2	**6/20/2013**	11.9	52.2	0.4
7/1/2013	11.4	45.5	0.2	**7/1/2013**	11.2	44.5	0.2	**7/1/2013**	11.6	45.3	0.2
7/15/2013	11.0	60.8	0.3	**7/15/2013**	9.9	68.0	0.2	**7/15/2013**	10.7	62.4	0.4
7/30/2013	9.4	57.5	0.3	**7/30/2013**	9.3	58.5	0.7	**7/30/2013**	9.4	57.4	0.4
8/12/2013	9.0	62.1	0.2	**8/12/2013**	8.5	66.3	0.2	**8/12/2013**	8.8	62.9	0.3
8/29/2013	9.1	68.3	0.3	**8/29/2013**	8.8	70.9	0.2	**8/29/2013**	8.8	70.1	0.3
9/11/2013	9.0	64.5	0.2	**9/11/2013**	8.8	64.7	0.3	**9/11/2013**	8.9	64.8	0.2
9/25/2013	9.3	58.8	0.3	**9/25/2013**	9.6	57.5	0.3	**9/25/2013**	9.5	58.1	0.2
10/11/2013	9.0	61.9	0.2	**10/11/2013**	9.0	61.4	0.3	**10/11/2013**	9.0	61.5	0.3

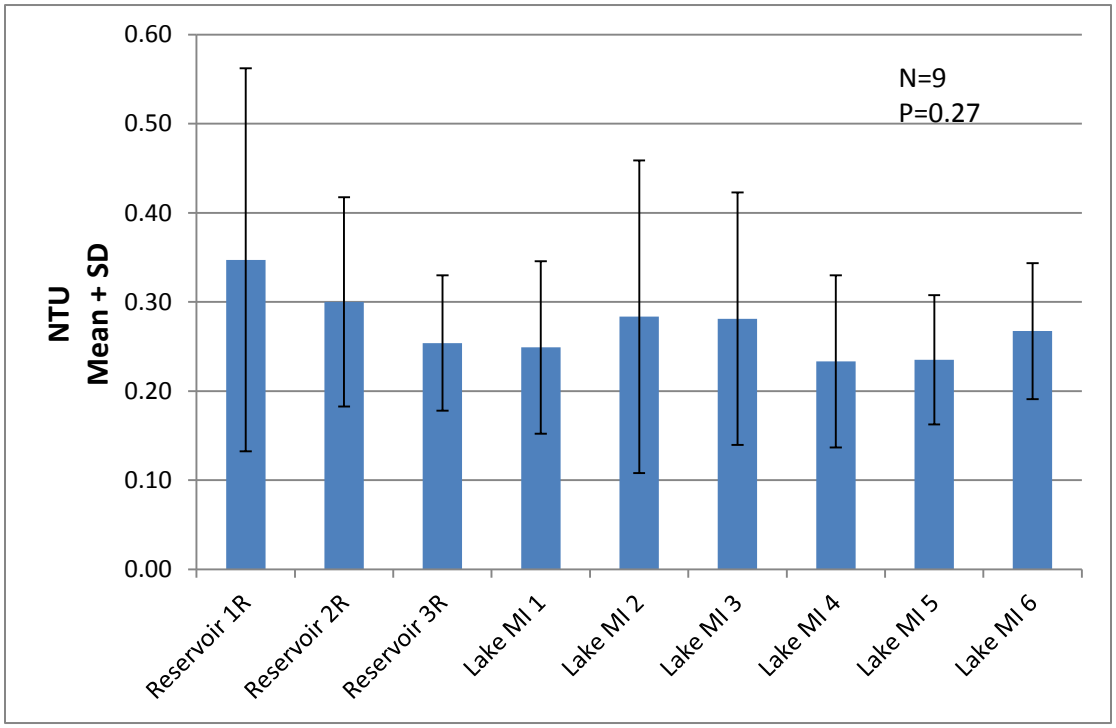
	Lake Michigan Station 4				Lake Michigan Station 5				Lake Michigan Station 6			
	Avg DO	Avg Temp	Avg Turbidity		Avg DO	Avg Temp	Avg Turbidity		Avg DO	Avg Temp	Avg Turbidity	
6/20/2013	12.2	48.2	0.1	**6/20/2013**	11.9	50.5	0.2	**6/20/2013**	11.4	52.9	0.2	
7/1/2013	11.3	48.7	0.3	**7/1/2013**	11.3	47.8	0.3	**7/1/2013**	11.9	45.4	0.2	
7/15/2013	11.2	57.1	0.4	**7/15/2013**	10.9	60.1	0.3	**7/15/2013**	10.2	66.4	0.4	
7/30/2013	10.0	51.6	0.3	**7/30/2013**	10.3	51.1	0.3	**7/30/2013**	9.8	55.2	0.3	
8/12/2013	8.9	61.4	0.2	**8/12/2013**	8.6	65.8	0.2	**8/12/2013**	8.4	67.0	0.2	
8/29/2013	9.5	66.0	0.4	**8/29/2013**	8.7	70.0	0.3	**8/29/2013**	8.8	70.6	0.4	
9/11/2013	9.0	64.4	0.2	**9/11/2013**	8.9	64.6	0.2	**9/11/2013**	8.9	64.6	0.3	
9/25/2013	9.4	58.6	0.1	**9/25/2013**	9.2	59.7	0.2	**9/25/2013**	9.7	59.5	0.2	
10/11/2013	9.0	62.0	0.2	**10/11/2013**	8.9	61.4	0.3	**10/11/2013**	9.0	61.5	0.3	

Turbidity

In addition to water temperature and DO profiles, turbidity measurements were also made at each of the six Lake Michigan locations and three upper reservoir locations. At each site, samples were collected at two depths; one meter from the water surface and one meter from the bottom. Turbidity values for all six sites in Lake Michigan and all three sites in the upper reservoir were less than 1.0 NTU over the course of the study period which are below the limits typically set for recreational uses. An acceptable range for turbidity for recreational use is typically less than 5 NTU (GLEC 2014).

Average turbidity was calculated for each site by date by averaging both turbidity results from that site (a measurement taken 1 meter below surface and a measurement taken 1 meter above the bottom) to determine a single number for turbidity for that date (Table 5-5) Mean turbidity was less than 0.4 NTU at all sites (Figure 5-6) and values were not significantly different (two-way ANOVA P=0.27). Reservoir sites 1 and 2 had slightly higher mean values, perhaps due to proximity to the intake/discharge structure. Lake control site 4 had the lowest value (GLEC 2014).

Figure 5-6: 2013 Water Quality Study – Mean Turbidity at Each Sampling Station



Continuous Recording of Water Temperature and Dissolved Oxygen

While it was not a component of the 1970's study efforts, three continuous monitors were also utilized. One each was deployed near the northwest and southwest corners of the seasonal fish barrier net in Lake Michigan (Figure 5-2) and the upper reservoir in section 1R (Figure 5-3). These monitors collected water temperature and DO data on an hourly basis.

Plotting the daily average surface water measurements from the lake MiniSondes with the reservoir MiniSonde (Figure 5-6) showed agreement where reservoir temperatures temporally followed those in the lake except when not pumping or generating. Reservoir temperatures were also less varying than those in the lake indicating lake/weather conditions were driving the lake changes and not water released from the reservoir. As an inverse function of temperature, the average daily DO values exhibited a similar pattern of agreement with temporal offset between lake and reservoir changes and smaller excursions in the reservoir (Figure 5-7).

Figure 5-7: 2013 Water Quality Study – Continuous MiniSonde Water Temperature Data

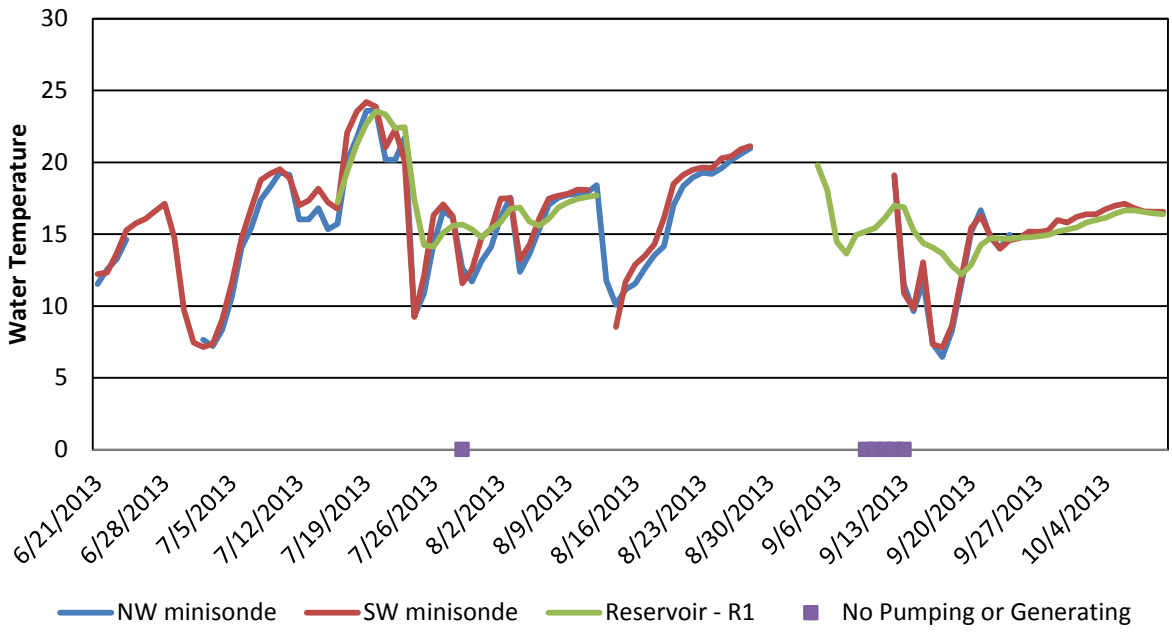
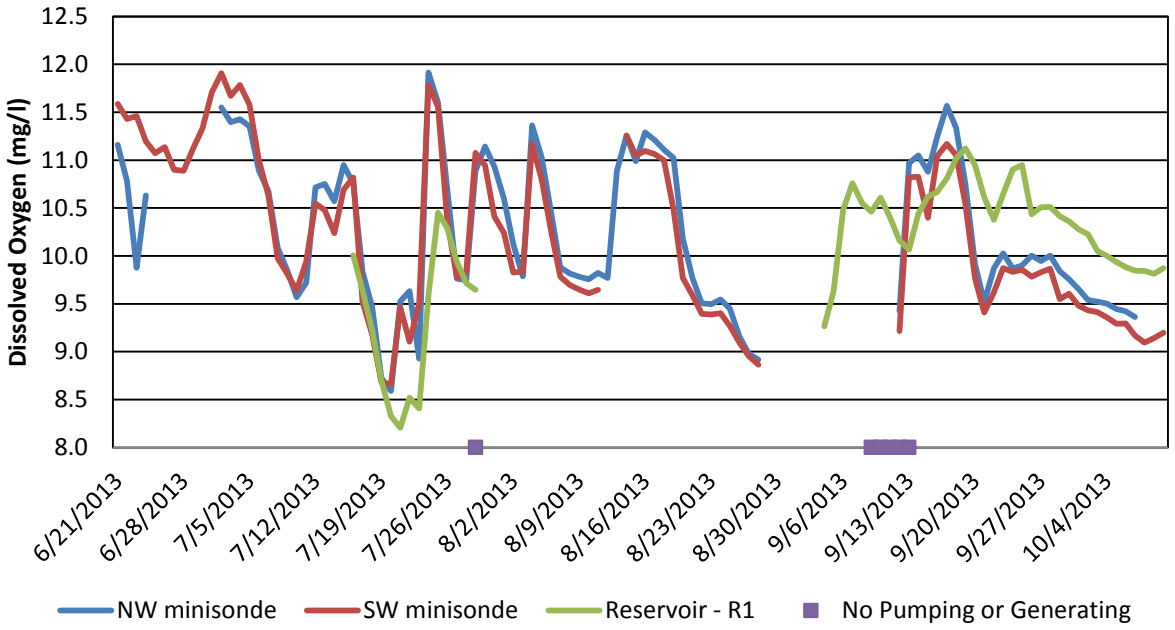


Figure 5-8: 2013 Water Quality Study – Continuous MiniSonde Dissolved Oxygen Data



Similar to the original pre/post operational studies, the 2013 water quality data indicate that, in general, water quality conditions in the reservoir mimic those in the lake but without thermal stratification. Turbidity measurements showed no apparent pattern but mean values were largest for the reservoir sites nearest the intakes, possibly due to greater mixing. However, these means were not statistically significant from other sites and not consistently highest. Changes in temperature/dissolved oxygen in the inshore areas appear to be primarily driven by natural lake/ weather conditions.

5.2.11 References

Andrew D. Gronewold, Anne H. Clites, Joseph P. Smith, Timothy S. Hunter. A dynamic graphical interface for visualizing projected, measured, and reconstructed surface water elevations on the earth's largest lakes. Environmental Modeling & Software. Volume 49. November 2013. Pages 34-39. http://dx.doi.org/10.1016/j.envsoft.2013.07.003

Liston, C. R., Brazo, D.C. and Tack P.I. 1976. A Study of the Effects of Installing and Operating A Large Pumped Storage Project on the Shores of Lake Michigan Near Ludington, Michigan. Michigan State University, Department of Fisheries and Wildlife 1974 Ann. Rep. to Consumers Power Co., Vol. II and Twelfth Quarterly Report Physical-Chemical Aspects, 1972-1974 pp.

Great Lakes Environmental Center (GLEC). 2014. Ludington Pumped Storage Hydroelectric Project 2013 Water Quality Data Collection.

5.3 Aquatic Resources

5.3.1 Overview

The Environmental Assessment for the Settlement Agreement (FERC 1995) states that Lake Michigan supports a rich assemblage of freshwater fish that includes over 78 species in about 22 families. Among the families represented by numerous species are the minnows (shiners, daces, and chubs); coldwater salmonids (whitefishes, trout, and salmon); coolwater species (walleye, pike, and perch); and warmwater sunfishes, suckers, and catfish. The principal sport fish caught by anglers along the eastern shore of Lake Michigan are Chinook salmon, Coho salmon, lake trout, steelhead (landlocked populations of sea-run rainbow trout), brown trout, and to a lesser extent yellow perch and walleye.

Both sport and commercial fisheries, as well as the forage base of Lake Michigan, have been and continue to be dramatically influenced by non-native invasive species that have entered the Great Lakes via the St. Lawrence Seaway. Native lake trout, lake whitefish, and ciscoes formerly supported large commercial fisheries on Lake Michigan but were drastically depleted by the parasitic sea lamprey in the 1950s. The most prolific forage species in Lake Michigan is the alewife, which, like the sea lamprey, gained access to the upper Great Lakes through the Welland Canal. Growing alewife populations eventually replaced the native lake herring or cisco as the principal forage species (FERC 1995). Intense management of salmonid stocks, in particular, introductions of Pacific salmon (including Chinook and Coho salmon) in the late 1960s, helped control the invasive alewife and created a widely successful and valuable sport fishery. Rainbow smelt, introduced to the Great Lakes in the early 1900s, has also played an important role in the food base for sport fish as well as being an economically viable target of commercial and sport fishing. Smelt have become increasingly scarce since the early 1990s (Bunnell et al. 2009), with their decline coinciding with the steady decline of the formerly successful yellow perch fishery (Makauskas and Clapp 2010). Even alewife populations have experienced a steady decline to record low levels over the past several years (Bunnell et al. 2009). While a forage base collapse is thought to be the demise of the Lake Huron salmon fishery, the Lake Michigan fishery still remains vibrant. Stocking management has been a key to salmon obtaining balance with the forage resource as currently over 50% of Lake Michigan Chinook salmon are estimated as natural recruits (Claramunt et al. 2010).

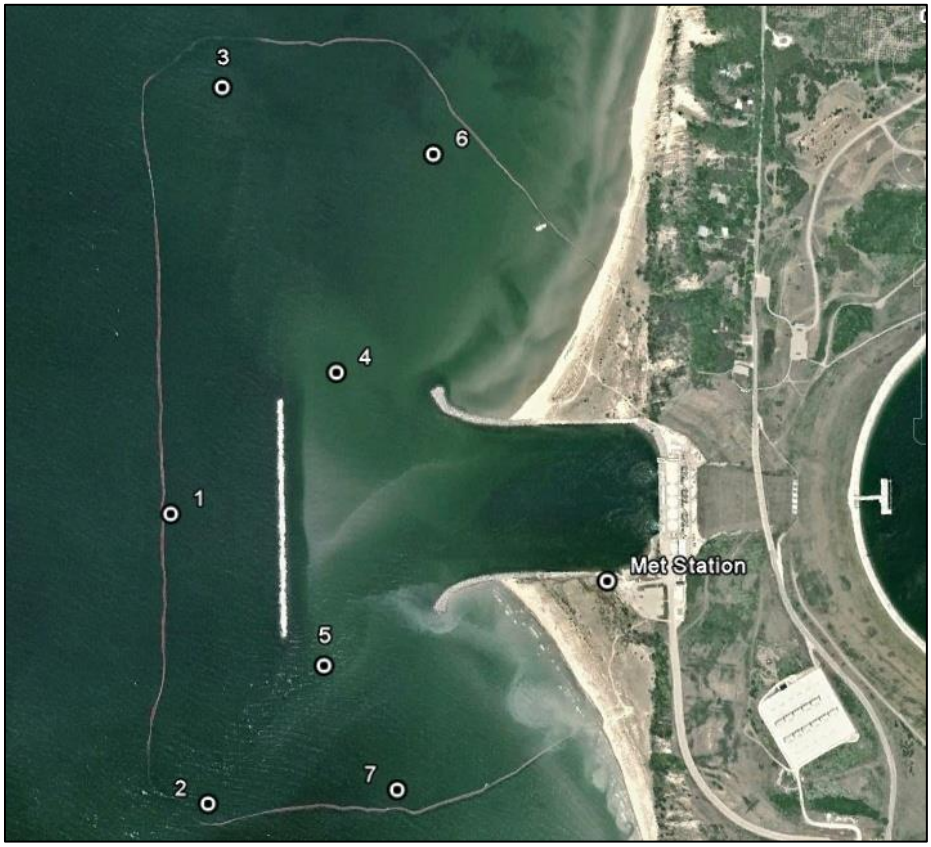
Dreissenid mussels (zebra and quagga) appear to be the causative agents in the reduction of plankton biomass at certain times of the year and subsequent food web disruption. The filtering of algae and phytoplankton from the lake has created a nutrient sink and broken the food chain, which has dramatically reduced populations of important aquatic invertebrate forage such as the small shrimp-like crustaceans Diporeia and Mysis. The successful establishment of another invasive fish species, the round goby, has also impacted the food web by providing a significant portion of benthic predator diets (Bunnell et al. 2009).

5.3.2 Aquatic Habitat in the Ludington Project Vicinity

The inshore waters of Lake Michigan at the Ludington Project contain a variety of aquatic habitats that are influenced daily by the strong multi-directional currents created by Project operation. The shoreline is characterized by high clay bluffs and coarse-gravel beaches. The lake bottom slopes gradually and consists mainly of fine gravel and sand, with clay and large rocks occurring at depths exceeding 40 feet. The jetties and breakwater provide rocky habitat for fish and other aquatic organisms. Sand deposits occur outside the jetties, where current velocities are low (FERC 1995). Between the jetties, bottom substrates consist mostly of clay, with depths between the jetties averaging around 24 feet according to a bathymetric survey conducted for the Licensees in April 2010.

Current velocities reach an upper limit of approximately 9 feet per second (fps) immediately in front of the powerhouse when all six units are generating (Alden 2011). Maximum current velocities diminish to about 3 to 4 fps between the ends of the jetties and the outer breakwater during generation. Flow patterns within the vicinity of the barrier net vary significantly depending on whether the plant is pumping or generating, how many units are in each operating mode, location with respect to underlying bathymetry, and proximity and position relative to the jetties and breakwater. When the plant is in pumping mode, flow patterns at the net are more uniform and lower in velocity than during generation. During generation, the flow is discharged from the tailrace at a higher velocity and in a concentrated jet (Alden 2011). Current velocities during operation at five locations along the barrier net inside perimeter and two locations just outside of the tailrace openings were measured by Alden (2011) using in-situ Acoustic Doppler Current Profilers (ADCPs) during April 15 through June 15, 2011 (Figure 5-9).

Figure 5-9: Acoustic Doppler Current Profiler Locations for In Situ Measurements



Source: Alden (2011)
Note: Gray line encompassing the ADCP locations depicts the barrier net.

Among the locations along the barrier net perimeter (Figure 5-9, Stations 1, 2, 3, 6, and 7), maximum current velocities measured during this period ranged from 0.4 to 0.8 fps during six-unit pumping. The average values during six-unit pumping ranged from a low of 0.2 fps at Stations 1, 3, and 6 to 0.4 fps at Station 7. During six-unit generation, the maximum measured flow among these locations was 2.8 fps at Stations 2 and 3, with average values ranging from a low of 0.2 fps (Stations 1 and 7) to 1.5 fps at Station 2. For the locations just outside the tailrace structures (Stations 4 and 5), maximum flow during six-unit generation was 3.7 fps, with a highest average flow of 3.0 fps measured at Station 4. During six-unit pumping, the maximum flow measured was 1.7 fps at Station 5, with the highest average flow being 1.4 fps at Station 4 (Alden 2011).

5.3.3 Fish Resources, Barrier Net, and the Barrier Net Monitoring Program

In accord with an Order issued on September 30, 1988 by the FERC Director, Division of Project Compliance and Administration; subsequent directives from FERC; and the January 23, 1996 Order Approving the Offer of Settlement, since 1989 the Licensees have annually installed a

seasonal (April – October) barrier net around the Project jetties and breakwater to minimize fish losses at the Project due to entrainment mortality. Additional details about the technical design and specifications of the barrier net can be found in the "2012 Annual Report of Barrier Net Operation" (Consumers Energy and Detroit Edison 2012), filed with FERC on December 18, 2012 [Accession Number 20121218-5029], and in the report "Ludington Pump Storage Plant Fish Protection Impact Evaluation, Potential Impacts to Barrier Net and Fisheries" (Alden 2011), which is included in the turbine upgrade amendment application filed on December 16, 2011 [Accession 20111216-5047]. It should be noted that the majority of the barrier net is deployed outside of the project boundary. The anchoring components are allowed through MDEQ bottomlands Permit (12-53-0018-P).

The Licensees have monitored performance of the barrier net against established performance standards since 1989, in consultation with the Scientific Advisory Team (SAT). As such, an abundance of fisheries data has been collected and is summarized in the 2011 "Evaluation of Recently Evolved Fish Abatement Technologies for Application at the Ludington Pumped Storage Project" (Environmental Solution Professionals LLC, 2011). The annual barrier net monitoring program undertaken by the Licensees consists of weekly gill net sets at eight locations roughly aligned with the north and south jetties, four inside the barrier net and four proximally outside. Stations are paired at the same depths with the assumption that the catches should be the same in the absence of the barrier net. Barrier net effectiveness (expressed as percent)[5] is calculated by comparing the relative fish abundance from gill net sample collections inside and outside the barrier net. For a detailed description of the study methodology and associated activities, see the "2012 Annual Report of Barrier Net Operation" (Consumers Energy and Detroit Edison 2012).

A list of species collected through the barrier net monitoring program from 2000 to 2012 is included in Table 5-6. This list was compiled from the Annual Reports of Barrier Net Operation for this period. Nine fish species of various size groups are identified as the target species to be used in the calculation of barrier net effectiveness. These species, noted in Table 5-6, comprise about 87 percent of all fish collected outside the barrier net since 1991 (the last year of major design improvements to the barrier net). Two species, collected infrequently, are listed by the State of Michigan as threatened; lake herring (also known as ciscoes) and lake sturgeon.

Although the barrier net monitoring program has remained essentially unchanged since the first year of monitoring in 1989, the historical results have documented a vast change in both the abundance and composition of the near-shore fish community at Ludington. The annual monitoring program catch averaged less than 10,000 fish per year from 2002 to 2012, several

[5] Barrier Net Effectiveness is calculated as 100 * (outside catch - inside catch) / outside catch

times lower than the monitoring catch at the beginning the monitoring program. These smaller collections are primarily the result of greatly reduced catches of alewife and yellow perch that are consistent with historical lake-wide trends (Bunnell et al. 2009, Makauskas and Clapp 2010).

Table 5-6: Species Collected through Barrier Net Monitoring: 2000 to 2012
(*Denotes target species that are used in the calculation of barrier net effectiveness)

Common Name	Scientific Name
Alewife*	*Alosa pseudoharengus*
Black bullhead	*Ictalurus melas*
Black crappie	*Pomoxis nigromaculatus*
Bowfin	*Amia calva*
Brook trout	*Salvelinus fontinalis*
Brown trout*	*Salmo trutta*
Burbot	*Lota lota*
Channel catfish	*Ictalurus punctatus*
Chinook salmon*	*Oncorhynchusts hawytscha*
Chub (bloater)*	*Coregonus spp. (hoyi)*
Coho salmon*	*Oncorhynchus kisutch*
Common carp	*Cyprinus carpio*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Lake herring	*Coregonus artedi*
Lake sturgeon	*Acipenser fulvescens*
Lake trout*	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Longnose gar	*Lepisosteus osseus*
Longnose sucker	*Catostomus catostomus*
Mottled sculpin	*Cottus bairdi*
Northern pike	*Esox lucius*
Rainbow smelt*	*Osmerus mordax*
Rainbow trout (steelhead)*	*Oncorhynchus mykiss*
Redhorse spp.	*Moxostoma spp.*
Rock bass	*Ambloplites rupestris*
Round goby	*Neogobius melanostomus*
Round whitefish	*Prosopium cylindraceum*
Sea lamprey	*Petromyzon marinus*
Slimy sculpin	*Cottus cognatus*
Smallmouth bass	*Micropterus dolomieu*
Spottail shiner	*Notropis hudsonius*
Threespine stickleback	*Gasterosteus aculeatus*
Trout perch	*Percopsis omiscomaycus*
Walleye	*Sander vitreus*
White perch	*Morone americana*
White sucker	*Catostomus commersoni*
Yellow perch*	*Perca flavescens*

To illustrate, during the first 5 years of the monitoring program (1989-1993), yellow perch comprised from 84 to 93 percent of the annual catch of large (>5 inches) game fish, while during the last 5 years of the monitoring program (2008-2012) this value has ranged from 5 to 53 percent (Figure 5-10). Also notable, are the historic low catches of large alewife (>5") from 2010-2012 (Figure 5-11) and the historic low 2012 catch for Chinook salmon, the top predator of alewife and among the sport fishing industry's most valuable species.

The abundance of not only alewife and yellow perch, but also rainbow smelt and walleye has changed substantially near the Ludington Project. Rainbow smelt, once common, are virtually absent in recent collections. Walleye, absent from effectiveness monitoring collections through the early 1990s, now comprise a significant portion of the sportfish catch. The exotic invasive round goby, first found in the 2003 collection, has become firmly established as among the most numerous non-target fish. As a whole, however, non-target fish species collections have also dropped off dramatically since 2000, to levels an order of magnitude smaller (Consumers Energy and Detroit Edison 2012).

5.3.4 Barrier Net Effectiveness

Regardless of the change in species composition and abundance due to factors external of the Project and its operation (see Section 5.3.1), the monitoring data collected from 1991 through 2012 demonstrate that the barrier net effectively excludes the majority of target species. From 1991 through 2012, target species effectiveness has averaged 92 percent. Effectiveness for the large game fish (>5 inches) component has averaged 83 percent with annual values historically ranging between 70 and 90 percent for salmonids and 80 to 100 percent for yellow perch. Effectiveness for large forage (alewife and smelt >5 inches) has averaged about 94 percent (Environmental Solution Professionals LLC, 2011).

During the past 24 years of monitoring, 66 lake sturgeon, a species listed as threatened by the State of Michigan, have been collected. Only four of those were found inside the barrier net and all were released in good condition, outside the barrier net. The maximum number caught during any single year was seven in 2009 and again in 2011. All lake sturgeon captured are processed according to USFWS protocol, including tagging. At the request of the SAT, in 2010 the Licensees began Passive Integrated Transponder (PIT) tagging for lake sturgeon catches.

Another species listed by the State of Michigan as threatened, lake herring (ciscoes), have been collected in eight of the twenty-four years of monitoring. A total 82 fish have been found. Most were collected in 2003 and 2004 but 26 were found over the past two years (2011, 2012), and the majority have been small. Overall barrier net effectiveness has been 59% for lake herring.

**Figure 5-10: Gil Net Effectiveness Monitoring
Salmonids/Perch**

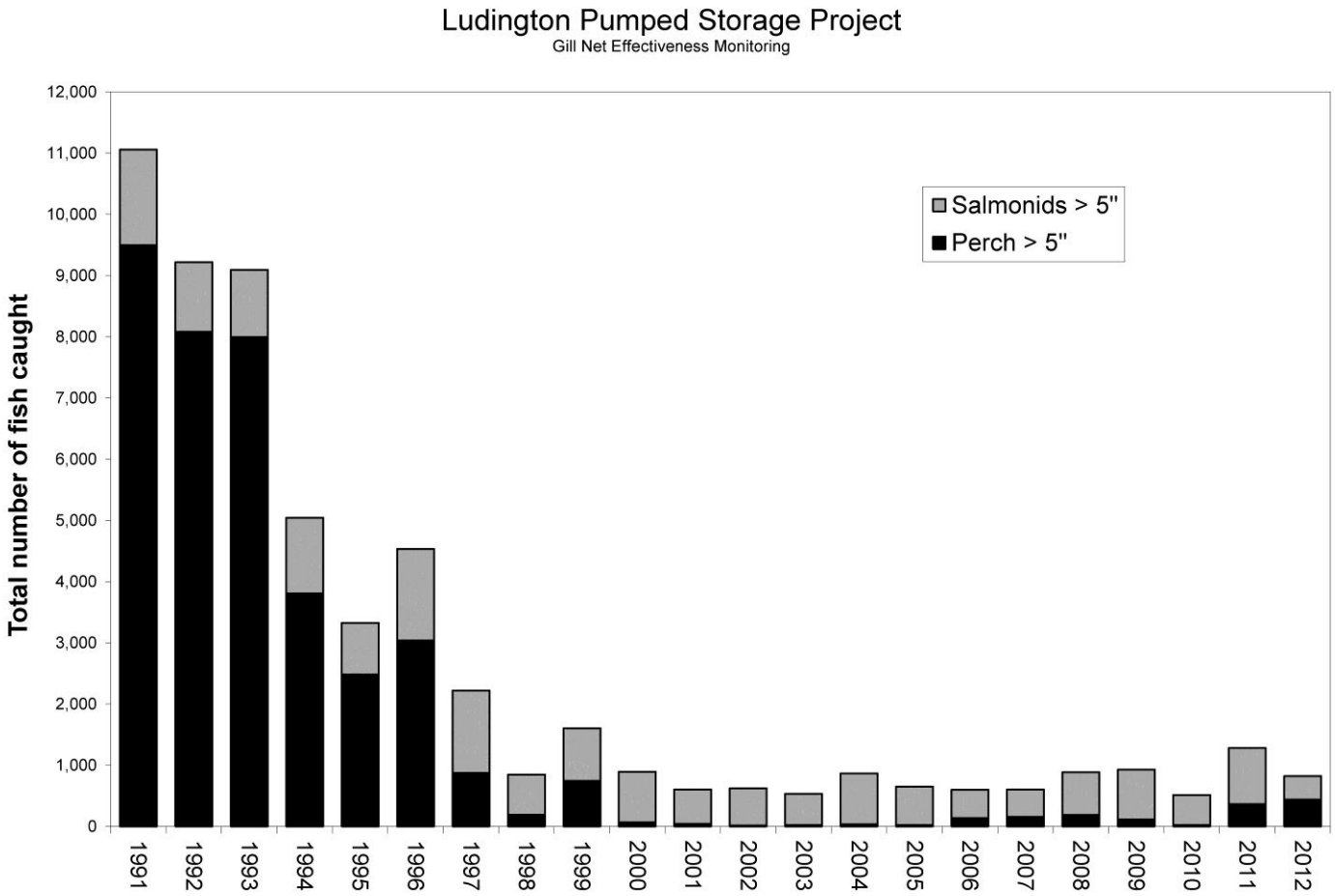
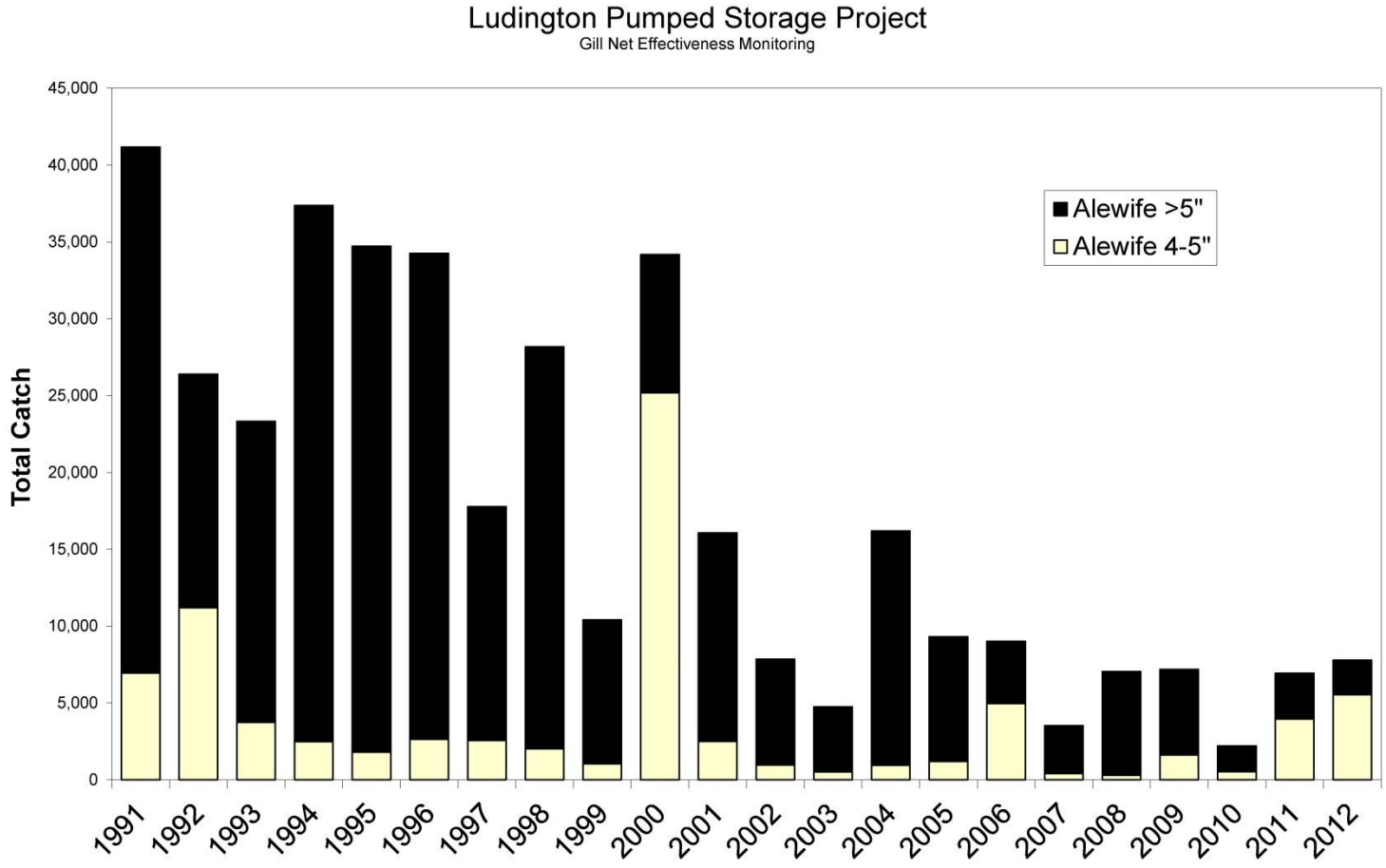


Figure 5-11: Gil Net Effectiveness Monitoring
Alewives



5.3.5 Benthic Macroinvertebrate Resources

Pre-operational studies conducted from 1969 to 1971 (Beak Environmental – 1972) characterized benthic habitat of Lake Michigan near the Project as coarse substrates that are flushed by natural currents and wave action, and though light penetration is generally adequate for good growth, the shifting sand bottom and low organic matter combine to limit benthic productivity (aquatic invertebrate, diatoms, algae, macrophytes, and protozoa). Sampling found low densities of the following benthic invertebrates, with seasonal fluctuations in abundance. Deeper stations (>30-ft) were more productive.

- midges (Chironomidae),
- clams (Bivalves),
- snails (Gastropoda),
- small crustaceans/amphipods (Amphopoda–*Pontoporeia* spp. now known as *Diporeia* spp.),
- water mites (Acari), and
- aquatic worms (Oligochaeta –*Naididae*).

Post-construction and pre-/post-operational data showed great variation between seasons and stations for each major benthic group, particularly at the shallow water stations (Olson 1974). The protective jetties and breakwater area in Lake Michigan provided microhabitats that attracted species not found at the coastal sampling stations (amphipod *(Gammarus* spp.) and caddisfly (trichopteran) larvae). Aquatic worms and midges were the first dominant taxa to colonize the upper reservoir but all Lake Michigan major taxa were found after initial operations in 1973. Olson (1974) concluded the "plant has not had major detrimental effects on the adjacent Lake Michigan benthic macroinvertebrate communities. Subsequent Lake Michigan data collections through 1976 (Duffy & Liston 1978a) found the following to be true:

- shallow stations (6m) were dominated by midges,
- intermediate depth stations (12m) were more diverse but primarily composed of midges and aquatic worms, and
- the deep station (24m) was dominated by amphipods.

The abundance of total benthic macroinvertebrates increased with depth but within the intermediate depth, the station outside the plant impact area (control station) exhibited both greater diversity and total abundance.

Five major groups contributed similarly to the benthos at the control site: aquatic worms, midges, clams, snails, and amphipods. At the impact stations, the benthos was more restricted to aquatic worms and midges, indicating a localized disturbance of the substrate. At 24 meters depth, benthos was dominated by amphipods (*Diporeia* spp.) before and after plant operation. This is consistent with southern Lake Michigan data from the early 1980s (Nalepa 1989). Aquatic worm densities decreased significantly at all depth zones after 1973. Higher densities during 1972 and 1973 were thought to be related to disturbances created by dredging during the plant construction phase. It was concluded that new benthos production on the offshore rock jetties and breakwater may counter any localized loss of benthic macroinvertebrate production occurring within major groups in the sampling area.

Reservoir studies (Lawson 1977) conducted after initial filling (1973-75) showed increasing abundance of aquatic worms and midges and to a lesser extent amphipods, isopods (Isopoda) and snails compared to the adjacent Lake Michigan benthic populations. While physical and chemical parameters of reservoir water indicated the reservoir benthic organisms were exposed to approximately the same water conditions as those in the adjacent Lake Michigan, the reservoir provided a more favorable current and substrate. There was a shift in species from those preferring oligotrophic to more eutrophic conditions (successional dominance within aquatic worms and midge species) with continued allochthonous inputs and organic enrichment of the reservoir since filling in 1973. Subsequent research over the first five years of plant operation (Duffy & Liston 1978b) concluded that the high cycling rate of Lake Michigan water into and out of the reservoir resulted in habitat characterized as having high water quality with mesotrophic to eutrophic bottom conditions very favorable to benthic invertebrates. Aquatic worms and midges along with populations of amphipods, snails, isopods, and clams significantly increased in abundance over the first five years, exhibiting different spatial preferences within the reservoir. Additionally, measured abundance and biomass of benthic invertebrates were found to be greater in the reservoir than in Lake Michigan.

In a 1979 study comparing pelagic macroinvertebrate samples from Lake Michigan to Project entrainment samples (Ligman 1981), *Mysis relicta* (a small crustacean) and midges were the most abundant organism collected in Lake Michigan, followed by amphipods (*Pontoporeia* and *Gammarus*) and naidid aquatic worms. *Mysis* and *Pontoporeia* (i.e. *Diporeia*) exhibited a definite lakeward increase and lower numbers of *Mysis* were found at the control sites. *Gammarus* were concentrated in the shallows. Macroinvertebrate species composition of entrainment and reservoir samples reflected the Lake Michigan results.

Since initial operation of the Project, changes to the benthic macroinvertebrate community of Lake Michigan and the Great Lakes in general, have been among the most profound, due in part to the introduction and establishment of dreissenid mussels during the 1980s. Recent studies have shown that the Lake Michigan benthic community, particularly offshore, has undergone

substantial changes as a result of the invasive mussel expansion (Nalepa et al. 2008). The appearance of the zebra mussel (*Dreissena polymorpha*) and the quagga mussel (*Dreissena rostriformis bugensis*) have had dramatic and far-reaching physical, chemical, and biological impacts. Reduced food and available spawning habitat, increased water clarity and subsequent ecosystem change, contaminant accumulation, and clogging water intake structures are among the many consequences of the mussel invasion.

Coincident with the expansion of the zebra mussel in near-shore waters and the expansion of the quagga mussel in offshore waters has been the dramatic decline in populations of *Diporeia* spp., formerly the most dominant benthic organism in Lake Michigan. Prior to invasive mussel establishment (1980-81), aquatic worms (46%) and *Diporeia* spp (44%) accounted for most of the southern Lake Michigan biomass at depths shallower than 30 m with *Diporeia* being the dominant form (65%) at depths greater than 30 m (Nalepa 1989). Subsequent research documented dramatic declines in those species as well as fingernail clams (Sphaeriidae) in the shallower zones. Aquatic worms and fingernail clam declines were attributed to phosphorus reductions and a general decrease in near-shore productivity. *Diporeia*, however, were negatively impacted due to the zebra mussel limiting food availability (Nalepa et al. 1998).

The relatively high assimilation efficiency and low respiration rate of quagga mussels are favored attributes in the harsh competitive conditions of offshore benthic Great Lakes environments. *Diporeia* are an important diet item for many fish, so energy once efficiently cycled through to upper trophic levels now resides in invasive mussel biomass. Due to the fact that zebra and quagga mussels do not represent a significant forage base, this energy is lost to the system. Because of the lower degree of predation, the Lake Michigan benthic energy pool is estimated to be an order of magnitude greater than the mid-1990s. While the quagga mussel is being fed upon by some higher trophic levels, energy is lost to the food web when the shell is produced and also lost when ingested by fish (handling and digestion). Energy density of forage fish has dropped off significantly with the decline of *Diporeia* (Hondorp et al, 2005, Pothoven et al., 2001; Madenjian et al., 2006).

In order to supplement historic data, benthic macroinvertebrate samples were collected during 2013 in conjunction with water quality monitoring efforts (GLEC). Samples (standard ponar grabs) and replicates were collected from the six Lake Michigan water quality monitoring sites on August 12, 2013 and from the three upper reservoir water quality monitoring sites on September 11, 2013. Sampling sites are displayed in Figures 5-2 and 5-3. The total number of organisms recovered per site, and the percent total for each taxa per site can be found in Table 5-7 (GLEC 2014).

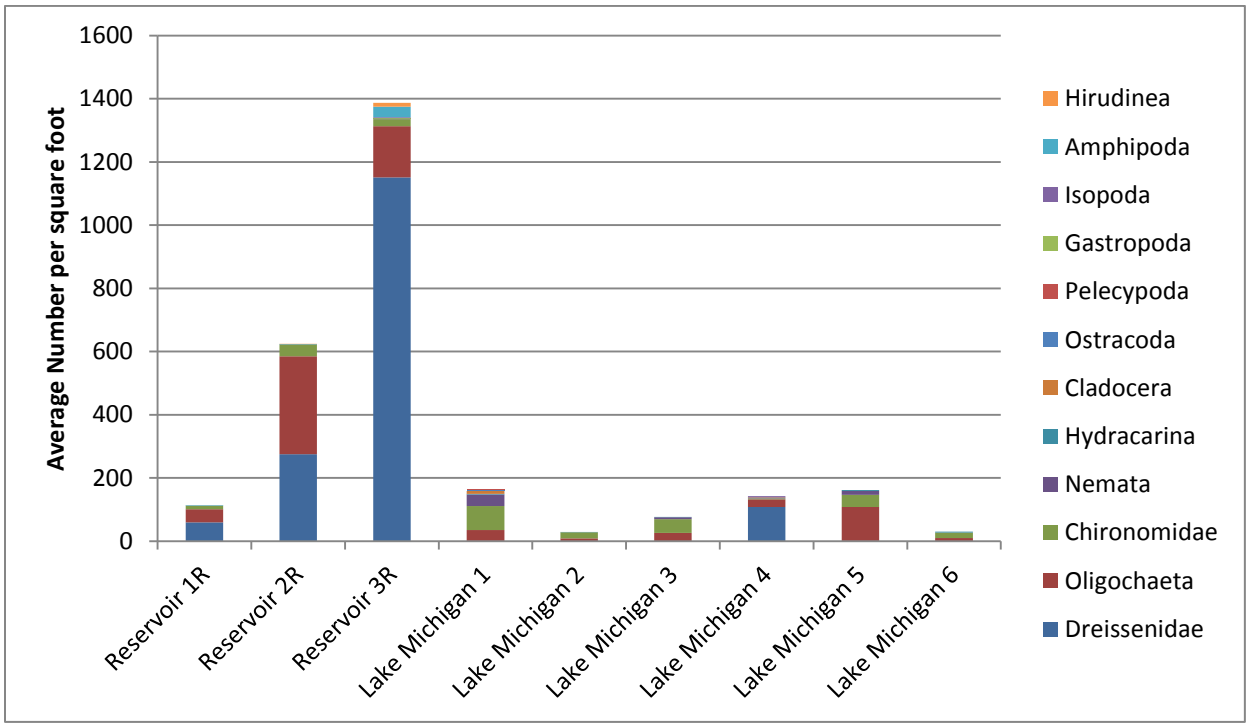
Table 5-7: Ponar Sample Results 2013

Site	Taxa												Total Number
	Dreissenidae	Oligochaeta	Chironomidae	Nemata	Hydracarina	Cladocera	Ostracoda	Pelecypoda	Gastropoda	Isopoda	Amphipoda	Hirudinea	
Lake Michigan 1	1 (0.9%)	20 (17.9%)	46 (41.1%)	36 (32.1%)	1 (0.9%)	3 (2.7%)	2 (1.8%)	3 (2.7%)	----	----	----	----	**112**
Lake Michigan 1 Rep	----	50 (23.3%)	105 (48.8%)	38 (17.7%)	3 (1.4%)	14 (6.5%)	2 (0.9%)	3 (1.4%)	----	----	----	----	**215**
Lake Michigan 2	----	10 (32.3%)	21 (67.7%)	----	----	----	----	----	----	----	----	----	**31**
Lake Michigan 2 Rep	----	8 (30.8%)	17 (65.4%)	----	1 (3.8%)	----	----	----	----	----	----	----	**26**
Lake Michigan 3	----	35 (46.1%)	38 (50.0%)	3 (3.9%)	----	----	----	----	----	----	----	----	**76**
Lake Michigan 3 Rep	----	17 (22.4%)	49 (64.5%)	9 (11.8%)	1 (1.3%)	----	----	----	----	----	----	----	**76**
Lake Michigan 4	67 (59.3%)	33 (29.2%)	5 (4.4%)	5 (4.4%)	----	----	----	----	----	3 (2.7%)	----	----	**113**
Lake Michigan 4 Rep	150 (87.7%)	14 (8.2%)	2 (1.2%)	1 (0.6%)	----	1 (0.6%)	----	----	----	3 (1.8%)	----	----	**171**
Lake Michigan 5	1 (0.6%)	107 (69.0%)	30 (19.4%)	15 (9.7%)	2 (1.3%)	----	----	----	----	----	----	----	**155**
Lake Michigan 5 Rep	----	109 (64.9%)	45 (26.8%)	10 (6.0%)	4 (2.4%)	----	----	----	----	----	----	----	**168**
Lake Michigan 6	----	17 (37.0%)	27 (58.7%)	----	2 (4.3%)	----	----	----	----	----	----	----	**46**
Lake Michigan 6 Rep	----	2 (13.3%)	9 (60.0%)	----	4 (26.7%)	----	----	----	----	----	----	----	**15**
Reservoir 1R	83 (71.6%)	28 (24.1%)	3 (2.6%)	----	2 (1.7%)	----	----	----	----	----	----	----	**116**
Reservoir 1R Rep	35 (31.5%)	55 (49.5%)	20 (18.0%)	----	----	----	----	----	----	----	1 (0.9%)	----	**111**
Reservoir 2R	241 (47.3%)	237 (46.6%)	29 (5.7%)	----	----	----	----	----	----	----	----	2 (0.4%)	**509**
Reservoir 2R Rep	309 (41.8%)	382 (51.7%)	46 (6.2%)	----	1 (0.1%)	----	----	----	----	----	1 (0.1%)	----	**739**
Reservoir 3R	1286 (80.8%)	199 (12.5%)	22 (1.4%)	1 (0.1%)	----	----	----	----	1 (0.1%)	5 (0.3%)	65 (4.1%)	12 (0.8%)	**1591**
Reservoir 3R Rep	1015 (84.4%)	125 (10.4%)	24 (2.0%)	----	----	----	----	----	3 (0.2%)	2 (0.2%)	23 (1.9%)	11 (0.9%)	**1203**

As shown in Figure 5-12, , Chironomidae was the dominant taxa at Lake Michigan sites 1, 2, 3, and 6 while the deep water site 4 was dominated by Dreissenidae. Oligochaeta was the dominant taxa at Lake Michigan site 5. The Lake control site 1 exhibited the greatest diversity with eight individual taxa identified. Similar to the Lake Michigan deep-water site, all upper reservoir sites were dominated by Dreissenidae and Oligochaeta. However, the numbers of organisms recovered from site 3R was more than twice the number found at 2R and an order of magnitude greater than site 1R and any of the lake sites. In addition, collections from site 3R exhibited a level of diversity comparable to the lake control site 1 (eight taxa) though the half of the taxa were different, including a notable number of amphipods.

With the exception of the presence of the exotic invasive dreissenids, the results of this limited sampling are consistent with the historic pre/post operational studies. The greater benthic abundance in the reservoir is likely attributable to more favorable current and substrate, depth and organic enrichment.

Figure 5-12: Results of 2013 Benthic Macroinvertabrate Sampling



5.3.6 Zooplankton Resources

Pre/post operational studies (Duffy 1975, Duffy & Liston 1976) described the zooplankton communities in Lake Michigan adjacent to the Project and within the Reservoir. Results of these studies are displayed in Table 5-8.

Table 5-8: LPSP Pre/Post Operational Studies

Lake Michigan	LPSP Reservoir
• Spring prevalence of copepods and nauplii (immature copepods) followed by summer dominance of cladocerans (water fleas) (Barbiero et al. 2005)	• Densities of each major taxon were significantly correlated with Lake Michigan densities
• Peak rotifer abundance was recorded during the seasonal transition period	• Populations of calanoid and cyclopoid copepods and nauplii were each depressed relative to lake densities
• Copepod abundance was directly correlated to depth (Evans and Hawkins 1977, Roth and Stewart 1973)	• Cladocerans (primarily *Bosmina longirostris*) were significantly elevated relative to lake densities

Differences in copepod (a group of small crustacean) densities were thought to be due to the depth preference as the lake control station is located at a depth of 12m (4.8 km south of the plant). While the paired collections (lake and reservoir) were relatively simultaneous and taken at the same depth, the reservoir source water is at shoreline intakes. The larger densities of water fleas within the reservoir could not be explained; however, subsequent research has documented strong diel vertical migrations in this species with much larger densities found in the epilimnion, the upper layer of water in a thermally stratified lake, during the night (Barbiero et al. 2005). This is thought to be a result of physical (temperature/light) or biological (predation pressure) factors. The paired sampling in the post operational studies occurred between 7AM and 12PM (daylight hours) but pumping up the reservoir almost exclusively occurs at night. The pre/post operational studies concluded that the confounding effects of natural lake currents and lack of knowledge of the complex relationships between zooplankton and lower or higher trophic levels made it difficult to identify any adverse effects of plant operation.

More contemporary research has shown that cascading synergistic interactions have changed the Lake Michigan zooplankton community over the past 35 years (Barbiero et al. 2005, Vanderploeg et al. 2012). Among the drivers are a slow decline in phosphorous concentrations, zebra and quagga mussel ecosystem impacts, large fluctuations in planktivorous fish abundance, and invasion of the predatory water flea *Bythotrephes longimanus*.

Implementation of phosphorous control strategies beginning in the 1970s along with the dramatic expansion of the filtering zebra and quagga mussels has decreased primary production. During the 1990s, poor recruitment of vertebrate planktivores seems to have resulted in larger water flea

populations, while shifts towards smaller bodied water fleas coincided with large year classes of alewife (Barbiero et al. 2005). The planktivorous alewife has been subject to predator manipulation as they are the major diet of stocked Pacific salmon which have established substantial natural recruitment as well. A massive expansion of quagga mussels into deep waters starting in 2004 was followed by losses of spring phytoplankton bloom (Fahnenstiel et al., 2010) and dramatic declines in macroinvertebrates favored by planktivorous fish; *Diporeia* spp. and *Mysis* spp. have both decreased with the former species nearly disappearing (Nalepa et al., 2009; Pothoven et al., 2010). This has been followed by record low levels of planktivorous fish biomass (Bunnell et al., 2009, Madenjian et al., 2010) and a decrease in predation pressure on the larger bodied zooplankton they prefer. Mussel induced water clarity has been implicated in changing zooplankton behavior and composition by increasing foraging efficiency of large predatory zooplankton such as the invasive *B. longimanus*, as well as their competitive dynamics with native predators (Vanderploeg et al. 2012). Subsequently there has been a substantial composition shift in Lake Michigan zooplankton where lower primary production and an increased presence of the invasive predatory *B. longimanus* in the epilimnion and metalimnion has led to smaller populations of herbivorous water fleas. Additionally, decreased vertebrate planktivory has increased populations of large omnivorous and predacious calanoid copepods, mostly in hypolimnion, the bottom layer of water in a thermally stratified lake (Vanderploeg et al. 2012).

5.3.7 References

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5.4 Wildlife Resources

5.4.1 Overview

The Project is located on the eastern shore of Lake Michigan and uses the lake as the lower reservoir. The area surrounding the Project is a mix of forest, agricultural, residential, and industrial lands. Project lands in Mason County are relatively well distributed around the perimeter of the reservoir and discrete habitat types within these lands are relatively small in area and disjointed. Land associated with the satellite recreation site located in Ottawa County is part of Consumers Energy's J. H. Campbell Generating Complex, containing a mix of industrial (fossil power generation) and forest, while the area along Lake Michigan is primarily residential. Wildlife habitats and associated wildlife resources in the vicinity of the Project are therefore determined primarily by the influences of the surrounding non-project lands and associated uses.

Based on the available information on habitats within the proximity of the Project, a number of wildlife species occupy, or have the potential to occupy, the immediate vicinity of the Project. The surrounding area provides a diversity of habitats such as mixed hardwood and pine forests, wetlands, agricultural land, and sand bluffs along the Lake Michigan shoreline. The Project boundary itself encompasses only a small amount of habitat outside of the wetted portions of the Project impoundment. Most of the upland habitats and the associated wildlife resources surrounding the impoundment occur outside of the Project boundary on private lands. A generalized list of wildlife occurring or potentially occurring within the vicinity of the Project is included in Table 5-9. Aquatic wildlife species are discussed in Section 5.3.

5.4.2 Wildlife Resources and Habitats in the Project Vicinity

Habitats

In general, the forested upland areas surrounding the Project in Mason and Ottawa Counties are comprised of patches of mature mixed softwood and hardwood habitat. These mixed habitats are usually characterized by a dense canopy and often have well-established shrub and sapling layers. They are distributed in a patchwork around the Project area, interspersed with open habitats which include agricultural areas and features associated with the Project such as the impoundment dike slopes and transmission line corridors. The western counties of central Michigan are perhaps the most heavily farmed region in the state.

A portion of the lands surrounding the Project in Mason and Ottawa Counties contains open dunes. No known significant wildlife habitats are associated with the Project.

Wildlife

The wildlife species assemblage known or considered likely to occur in the vicinity of the Project is typical of those found in developed areas of the Northern Lower Peninsula and

Southern Lower Peninsula of Michigan. Table 5-9 presents a representative listing of vertebrate wildlife species known or considered likely to occur in the vicinity of the Project based upon habitat and life history information.

Table 5-9: Common Wildlife Species Known or Considered Likely to Occur in the Project Vicinity

COMMON NAME	SCIENTIFIC NAME
Mammals	
Cottontail rabbit	*Sylvilagus floridandus*
Deer mouse	*Peromyscus msniculatus*
Eastern chipmunk	*Tamias striatus*
Eastern coyote	*Canis Latrans*
Fox squirrel	*Sciurus niger*
Gray squirrel	*Sciurus carolinensis*
Little brown bat	*Myotis lucifugus*
Meadow vole	*Microtus pennsylvanicus*
Opossum	*Didelphis marsupialis*
Raccoon	*Procyon lotor*
Red fox	*Vulpes vulpes*
Shortailed shrew	*Blarina brevicauda*
Silver-haired bat	*Lasionycteris noctivagans*
Southern flying squirrel	*Glaucomys volans*
Striped skunk	*Mephitis mephitis*
White-footed mouse	*Peromyscus leucopus*
White-tailed deer	*Odocoileus virginianus*
Woodchuck	*Marmota monax*
Birds	
American crow	*Corvus brachyrhynchos*
American goldfinch	*Carduelis tristis*
American kestrel	*Falco sparverius*
American redstart	*Setophaga ruticilla*
American robin	*Turdus migratorius*
Bald eagle	*Haliaeetus leucocephalus*
Bank swallow	*Riparia riparia*
Barred owl	*Strix varia*
Black-capped chickadee	*Poecile atricapillus*
Blue jay	*Cyanocitta cristata*
Bonaparte's gull	*Larus Philadelphia*
Broad winged hawk	*Buteo platypterus*

COMMON NAME	SCIENTIFIC NAME
Brown thrasher	*Toxostoma rufum*
Brown-headed cowbird	*Molothrus ater*
Bunting	*Passerina cyanea*
Canada goose	*Branta Canadensis*
Chipping sparrow	*Spizella passerine*
Common grackle	*Quiscalus quiscula*
Common merganser	*Mergus merganser*
Common tern	*Sterna hirundo*
Common yellowthroat	*Geothlypis trichas*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker	*Dendrocopus pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird	*Tyrannus tyrannus*
Eastern phoebe	*Sayornis phoebe*
Eastern towhee	*Pipilo erythrophtalmus*
European starling	*Strunus vulgaris*
Field sparrow	*Spizella pusilla*
Great blue heron	*Ardea Herodias*
Great Crested flycatcher	*Myiachus crinitus*
Grey catbird	*Dumetella carolinenius*
Herring gull	*Larus argentatus*
Horned lark	*Eremophilia alpestris*
House sparrow	*Passer domesticus*
House wren	*Troglodytes aedon*
Least sandpiper	*Calidris minutilla*
Mallard	*Anas platyrhynchos*
Meadowlark	*Sturnella magna*
Mourning dove	*Zenaida macroura*
Northern cardinal	*Cardinalis cardinalis*
Northern flicker	*Colaptes auratus*
Osprey	*Pandion haliaetus*
Purple martin	*Progne subis*
Red-eyed vireo	*Vireo olivaceus*
Red-tailed hawk	*Bueto jamaicensis*
Red-wing blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Rock dove	*Columba livia*

COMMON NAME	SCIENTIFIC NAME
Rose-breasted grosbeak	*Pheicticus ludovicianus*
Ruby-throated hummingbird	*Archilochus colubris*
Savannah sparrow	*Passerculus sandwichensis*
Song sparrow	*Melospiza melodia*
Spotted sandpiper	*Actitis macularia*
Tree swallow	*Tachycineta bicolor*
Vesper sparrow	*Pooecetes gramineus*
White-breasted nuthatch	*Sitta carolinensis*
Yellow warbler	*Dendroica petechia*

Source: Michigan State University, 2013

5.4.3 Temporal and Spatial Distribution of Wildlife Resources

Many of the avian species occurring in the vicinity of the Project are seasonal migrants that travel substantial distances between breeding and wintering areas. Some of the avian species are found in the area year round. Other species may have life history and habitat requirements that result in seasonal shifts of habitat usage within the Project vicinity, such as deer movement to preferred wintering habitats. At the most limited end of the species movement spectrum, certain other species will simply remain in the immediate area of the Project year round, or make only very limited movements between closely associated habitats, as dictated by their life history, overall mobility, and occurrence of acceptable habitat conditions within a relatively small area.

5.4.4 References

Michigan State University Extension. 2013. Michigan Natural Features Inventory. http://mnfi.anr.msu.edu/

5.5 Botanical Resources

5.5.1 Overview

The Project's location in Mason and Ottawa counties includes areas that lie within the Michigan Lake Plain Ecoregion. The Project satellite recreation area in Ottawa County is limited to the parking area, walking path and boardwalk which are also part of the Consumers Energy's J.H. Campbell Generating Complex. Botanical resources associated with this site are located outside of the Project boundary and are similar in nature to the resources in Mason County. This section addresses botanical resources in Mason County associated with the Project generating facilities and recreation areas. This sandy coastal strip region has beaches, high dunes, beach ridges, mucky interior-dune depressions, and swales. The climate moderation by Lake Michigan, as well as the beach and dune plant communities, differentiates it from inland areas of Michigan. Plant communities include oak and pine forest found on stabilized dunes and beech-sugar maple forest on dunes and moraines. The relatively moderate climate has also made this area a center for fruit and vegetable farming in Michigan (USEPA 2012), and it is the most heavily farmed region in the state.

5.5.2 Upland Habitat Communities and Species

Much of the land in this area has been altered significantly by agricultural practices. Lands abutting the Project boundary are largely agricultural with some year-round residential areas. Agricultural uses include fruit orchards and row crops.

Upland plant communities within the Project area are dominated by second growth of hardwood mixed with eastern white pine (Table 5-10). Other upland plant communities within the Project area include early successional communities, open field and maintained lawn, and electric transmission corridor shrubland-meadow. Natural communities found in this region include the following:

Dry-mesic Northern Forest – A dry-mesic northern forest is a pine or pine-hardwood forest of generally dry-mesic sites. White pine (*Pinus strobus*) is typically the dominant canopy species often forming a supercanopy. Red pine (*Pinus resinosa*) and hemlock (*Tsuga canadensis*) are also frequently present and occasionally are codominant. Hardwood species include oaks (*Quercus alba, Q. velutina, and Q. rubra*) and red maple (*Acer rubrum*).

Great Lakes Barrens – The Great Lakes barrens is a coniferous savanna community of scattered and clumped trees, and an often dense, low or creeping shrub layer. It is often associated with interdunal wetland and open dune communities.

Open Dunes – This community is a grass- and shrub-dominated multi-seral community located on wind-deposited sand formations near the shorelines of the Great Lakes. Dune formation and the patterning of vegetation are strongly affected by lake-driven winds.

Table 5-10: Common Upland Vegetation within the Project Vicinity

Common Name	Scientific Name	Woody	Herbaceous
Black chokeberry	*Photinia melanocarpa*	X	
Black huckleberry	*Gaylussacia baccata*	X	
Black oak	*Quercus velutina*	X	
Bracken fern	*Pteridium aquilinum*		X
Buttercup species	*Ranunculus* species		X
Canada mayflower	*Maianthemum canadense*		X
Cherry species	*Prunus* species	X	
Clover species	*Trifolium* species		X
Common juniper	*Juniperus communis*	X	
Common lowbush blueberry	*Vaccinium angustifolium*	X	
Common yarrow	*Achillea millefolium*		X
Eastern serviceberry	*Amelanchier canadensis*	X	
Eastern white pine	*Pinus strobes*	X	
Maleberry	*Lyonia ligustrina*	X	
Meadowsweet	*Spiraea alba var. latifolia*	X	
Northern red oak	*Quercus rubra*	X	
Panic grasses	*Panicum* species		X
Paper birch	*Betula papyrifera*	X	
Quaking aspen	*Populus tremuloides*	X	
Red oak	*Quercus rubra*	X	
Sheep laurel	*Kalmia angustifolia*		X
Speckled alder	*Alnus incana rugosa*	X	
Sugar maple	*Acer saccharum*	X	
Sweet fern	*Comptonia peregrine*	X	
Vetch species	*Vicia* species		X
White oak	*Quercus alba*	X	
Wintergreen	*Gaultheria procumbens*	X	

Source: Michigan DNR, 2007.

5.5.3 Unique Plant Communities and Botanical Resources

No known unique plant communities or botanical resources are in the vicinity of the Project.

5.5.4 Invasive Plants and Noxious Weeds

The Michigan Division of Natural Resources (Michigan DNR) has published a plan that describes and documents the status and distribution of invasive plants within the State of Michigan (Michigan DNR 2009). Table 5-11 lists common problematic species considered invasive within the region. Due to the land use history in Mason (and Ottawa) Counties, many of these invasive species are likely present in the Project area. However, their presence or absence within the Project vicinity is not expected to be affected by the continued operation of the Project.

Table 5-11: Potential Invasive Species within the Project Vicinity

Common Name	Scientific Name	Ecoregion*
Terrestrial Plants		
Amur cork-tree	*Phellodendron amurense*	*Southern Lower Peninsula*
Amur honeysuckle	*Lonicera maackii*	*Both***
Autumn olive	*Elaeagnus umbellate*	*Both*
Baby's breath	*Gypsophila paniculatus*	*Both*
Bell's honeysuckle	*Lonicera X bella*	*Both*
Black alder	*Alnus glutinosa*	*Southern Lower Peninsula*
Black jetbead	*Rhodotypos scandens*	*Both*
Black locust	*Robinia pseudoacacia*	*Both*
Canada thistle	*Cirsium arvense*	*Both*
Common buckthorn	*Rhamnus cathartica*	*Both*
Common reed	*Phragmites australis*	*Both*
Common St. John's-wort	*Hypericum perforatum*	*Northern Lower Peninsula*
European fly honeysuckle	*Lonicera xylosteum*	*Southern Lower Peninsula*
European highbush cranberry	*Viburnum opulus*	*Both*
Flowering rush	*Butomus umbellatus*	*Both*
Garlic mustard	*Alliaria petiolata*	*Both*
Giant hogweed	*Heracleum mantegazzianum*	*Both*
Giant knotweed	*Polygonum sachalinensis*	*Both*
Glossy buckthorn	*Frangula alnus*	*Both*
Japanese barberry	*Berberis thunbergii*	*Northern Lower Peninsula*
Japanese hedge-parsley	*Torilis japonica*	*Northern Lower Peninsula*
Japanese honeysuckle	*Lonicera japonica*	*Southern Lower Peninsula*
Japanese knotweed	*Fallopia japonica*	*Both*
Japanese stilt grass	*Microstegium vimineum*	*Both*
Kudzu	*Pueraria lobata*	*Southern Lower Peninsula*
Leafy spurge	*Euphorbia esula*	*Both*

Common Name	Scientific Name	Ecoregion*
Money-wort	*Lysimachia nummularia*	*Northern Lower Peninsula*
Morrow's honeysuckle	*Lonicera morrowii*	*Both*
Multiflora rose	*Rosa multiflora*	*Both*
Norway maple	*Acer platanoides*	*Both*
Oriental bittersweet	*Celastrus orbiculatus*	*Both*
Privet	*Ligustrum obtrusifolium*	*Northern Lower Peninsula*
Purple loosestrife	*Lythrum salicaria*	*Both*
Reed canary grass	*Phalaris arundinacea*	*Both*
Reed mannagrass	*Glyceria maxima*	*Both*
Russian olive	*Elaeagnus angustifolia*	*Both*
Scotch pine	*Pinus sylvestris*	*Both*
Spotted knapweed	*Centaurea maculosa*	*Both*
Swallowwort	*Vincetoxicum* species	*Both*
Swamp thistle	*Cirsium palustre*	*Northern Lower Peninsula*
Tartarian honeysuckle	*Lonicera tatarica*	*Both*
Tree-of-heaven	*Ailanthus altissima*	*Both*
Wild parsnip	*Pastinaca sativa*	*Northern Lower Peninsula*
Aquatic Plants		
Curly-leaf pondweed	*Potamogeton crispus*	*Both*
Eurasian water-milfoil	*Myriophyllum spicatum*	*Both*
European frog-bit	*Hydrocharis morsus-ranae*	*Northern Lower Peninsula*
European water-clover	*Marsilea quadrifolia*	*Northern Lower Peninsula*
Hydrilla	*Hydrilla verticillata*	*Southern Lower Peninsula*
Lesser naiad	*Najas minor*	*Southern Lower Peninsula*
Variable water-milfoil	*Myriophyllum heterophyllum*	*Both*
Water-hyacinth	*Eichhornia crassipes*	*Southern Lower Peninsula*

Source: Michigan DNR 2009.
* Ecoregions are defined in Level III Ecoregions of Michigan (USEPA, 2012)
** "Both" includes the Northern Lower Peninsula and Southern Lower Peninsula, as defined in USEPA, 2012.

5.5.5 References

USEPA. 2012. Level III Ecoregions of Michigan. U.S. EPA Office of Research and Development (ORD) - National Health and Environmental Effects Research Laboratory (NHEERL). Corvallis, OR. [Online] URL: ftp://ftp.epa.gov/wed/ecoregions/mi/mi_eco_l3.zip.

USEPA. 2012. Level IV Ecoregions of Michigan. U.S. EPA Office of Research and Development (ORD) - National Health and Environmental Effects Research Laboratory (NHEERL). Corvallis, OR. [Online] URL:ftp://ftp.epa.gov/wed/ecoregions/mi/mi_eco_l4.zip.

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Michigan State University Extension. 2013. Michigan Natural Features Inventory. http://mnfi.anr.msu.edu/.

5.6 Riparian, Wetland and Littoral Habitat

5.6.1 Overview

Wetland, riparian, and littoral habitats within the Project boundary are primarily associated with the margins and near shore areas of Lake Michigan. Very little of these habitats are contained within the Project boundary and what is included is not significantly affected by Project operations. US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data and digital orthophotography of the Project vicinity show that vegetated wetlands within and adjacent to the Project boundary include palustrine and lacustrine wetlands with unconsolidated bottoms (Figure 5-13). Riparian habitat and each of the wetland types mapped by the NWI adjacent to, and within, the Project boundary are discussed in more detail below.

5.6.2 Riparian, Wetland and Littoral Habitat Types

5.6.2.1 Riparian Habitat

Riparian habitat is located along streams, rivers, and lakes, and provides important ecosystem functions related to hydrology and flooding, nutrient cycling, and plant and wildlife habitat (Mitsch and Gosselink, 2000). Riparian habitat in the Project vicinity along Lake Michigan is largely dune area on the immediate shoreline around the impoundment discharge area. Areas inland from the dunes are residential in nature north of the discharge, and industrial and related to Project operations to the south of the discharge area.

5.6.2.2 Wetlands

Wetlands have the potential to provide a variety of ecological functions including groundwater discharge/recharge, floodflow alteration, fish and shellfish habitat, sediment/toxicant/pathogen retention, nutrient removal/retention/transformation, production export, sediment/shoreline stabilization, and wildlife habitat. Wetlands also support human-defined values such as recreation, educational/scientific use, uniqueness/heritage, visual quality/aesthetics, and threatened/endangered species habitat (USACE, 1999). Understanding the distribution and characteristics of wetlands on the landscape is therefore useful for land use planning and management.

The NWI classifies Lake Michigan and the upper reservoir as lacustrine, limnetic deepwater habitats (L1BH) and Pigeon Lake as a river with an unconsolidated bottom and a permanently flooded waterway (RUBH) (Figure 5-13). It should be noted, however, that while the reservoir holds water, it is a man-made structure with asphaltic-concrete lined earthen embankments, and does not function as a natural wetland. The NWI data indicate that there are small wetlands classified as palustrine unconsolidated bottom (PUB) and palustrine forested (PFO) wetlands within the Project vicinity, located outside of the Project boundary (Table 5-12, Figure 5-13).

Table 5-12 lists the type and acreage of wetlands located outside the Project boundary, but in the Project vicinity west of highway 31 and south of Chauvez Road, excluding Lake Michigan and the reservoir. Table 5-13 lists vegetation common to the wetlands and shorelines of the region, as indicated by NWI data.

Table 5-12: NWI Wetlands within the Project Vicinity

Wetland Type	Acreage
Palustrine Unconsolidated Bottom	0.64
Palustrine Forested	1.60
Total	**2.24**

Palustrine Unconsolidated Bottom – Palustrine unconsolidated bottom wetland includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones, and a vegetative cover less than 30%. These wetlands are characterized by the lack of large stable surfaces for plant attachment (Cowardin, 1979).

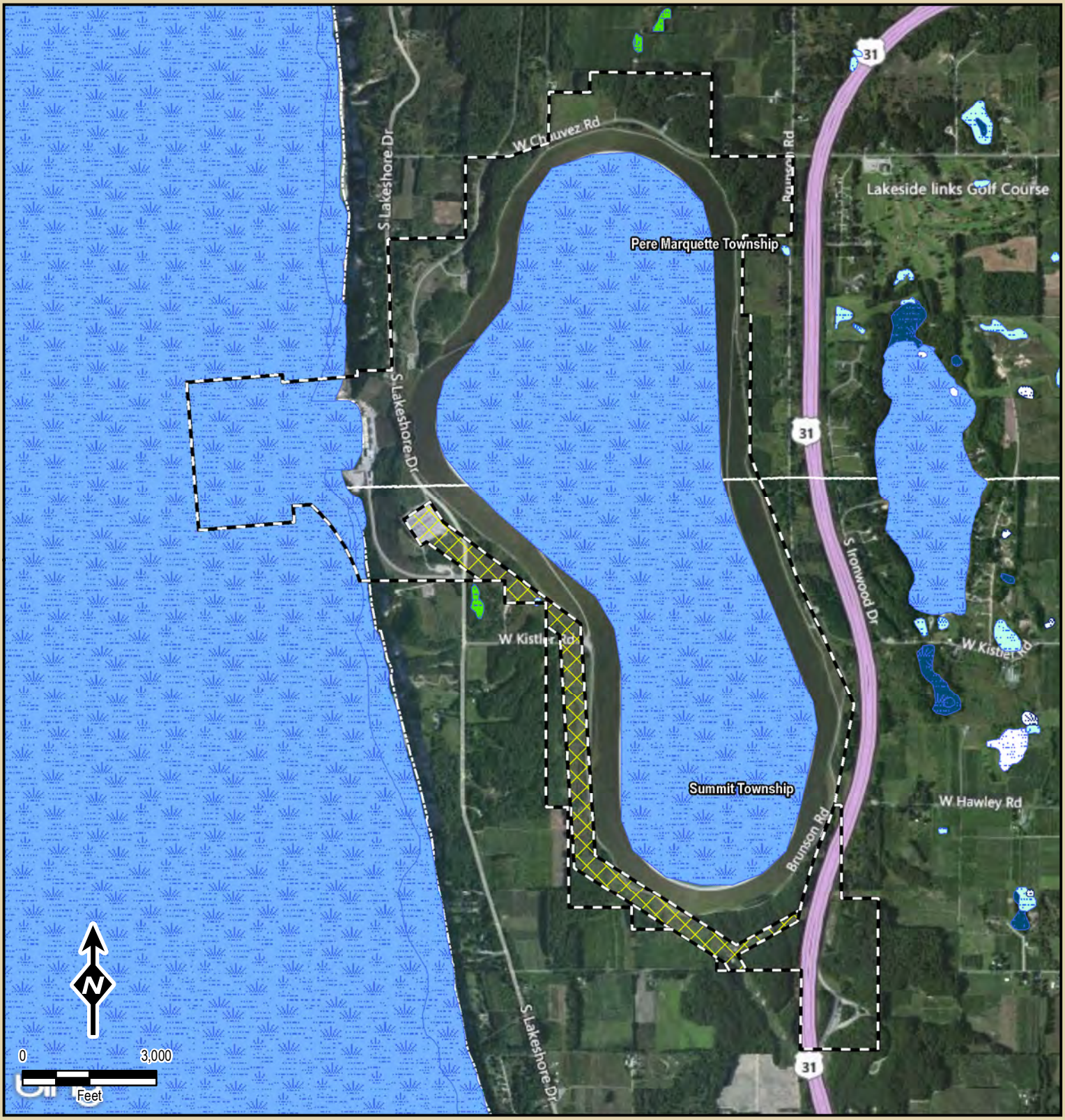
Palustrine Forested – Palustrine forested wetlands include wetland characterized by wood vegetation 6 meters in height or taller. Wetlands typically contain an overstory of trees, understory of young trees and shrubs, and an herbaceous layer (Cowardin, 1979).

Table 5-13: Common Wetland and Shoreline Vegetation within the Project Vicinity

Common Name	Scientific Name	Woody	Herbaceous
Arrowhead species	*Sagittaria*		X
Arrowwood	*Viburnum dentatum lucidum*	X	
Balsam fir	*Abies balsamea*	X	
Beggar-ticks species	*Bidens*		X
Black chokeberry	*Photinia melanocarpa*	X	
Black spruce	*Picea mariana*	X	
Bladderwort species	*Utricularia*		X
Bog laurel	*Kalmia polifolia*	X	
Bog rosemary	*Andromeda polifolia glaucopylla*	X	
Boneset	*Eupatorium perfoliatum*		X
Bunchberry	*Cornus canadensis*		X
Buttonbush	*Cephalanthus occidentalus*	X	
Canada mayflower	*Maianthemum canadense*		X
Carex species	*Sedge*		X
Cinnamon fern	*Osmunda cinnamomea*		X

Common Name	Scientific Name	Woody	Herbaceous
Common cat-tail	*Typha latifolia*		X
Common horsetail	*Equisetum arvense*		X
Coontail	*Ceratophyllum demersum*		X
Cotton-grass species	*Eriophorum*		X
Cranberry species	*Vaccinium*	X	
Deer tongue grass	*Panicum clandestinum*		X
Eastern hemlock	*Tsuga canadensis*	X	
Eastern white pine	*Pinus strobus*	X	
Gray birch	*Betula populifolia*	X	
Green ash	*Fraxinus pennsylvanica*	X	
Highbush blueberry	*Vaccinium corymbosum*	X	
Labrador-tea	*Rhododendron groenlandicum*	X	
Leatherleaf	*Chamaedaphne calyculata*	X	
Maleberry	*Lyonia ligustrina*	X	
Marsh fern	*Thelypertis palustris pubescens*		X
Meadowsweet	*Spiraea alba latifolia*	X	
Mountain holly	*Nemopanthus mucronatus*	X	
Northern panic grass	*Panicum boreale*		X
Northern white-cedar	*Thuja occidentalis*	X	
Pickerelweed	*Pontedaria cordata*		X
Poverty oatgrass	*Danthonia spicata*		X
Red maple	*Acer rubrum*	X	
Red osier dogwood	*Cornus sericea*	X	
Royal fern	*Osmunda regalis spectabilis*		X
Sedge species	*Carex*		X
Sensitive fern	*Onoclea sensibilis*		X
Silky dogwood	*Cornus amomum*	X	
Softstem bulrush	*Schoenoplectus tabernaemontanii*		X
Speckled alder	*Alnus incana Rugosa*	X	
Spike-rush species	*Eleocharis*		X
Swamp candles	*Lysimachia terrestris*		X
Sweet gale	*Myrica gale*	X	
Switchgrass	*Panicum virgatum var. spissum*		X
Tamarack	*Larix laricina*	X	
Tuberous white water-lily	*Nuphar odorata*		X
Water-parsnip	*Sium suave*		X
Wild-raisin	*Viburnum nudum cassinoides*	X	

Common Name	Scientific Name	Woody	Herbaceous
Willow species	*Salix*	X	
Winterberry	*Ilex verticillata*	X	
Yellow birch	*Betula alleghaniensis*	X	



Project Boundary

Township Boundary

NWI Wetland Type

- Lacustrine
- Palustrine (Unconsolidated Bottom)
- Palustrine (Aquatic Bed)
- Palustrine (Emergent)
- Palustrine (Forested)
- Palustrine (Scrub/Shrub)
- Non-Project Land

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

The constructed, asphalt-lined reservoir does not function as a natural wetland

Sources: BING, ESRI, MiGDL, Consumers Energy Company, Ducks Unlimited GLARO

CONSUMERS ENERGY COMPANY
DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT RESERVOIR

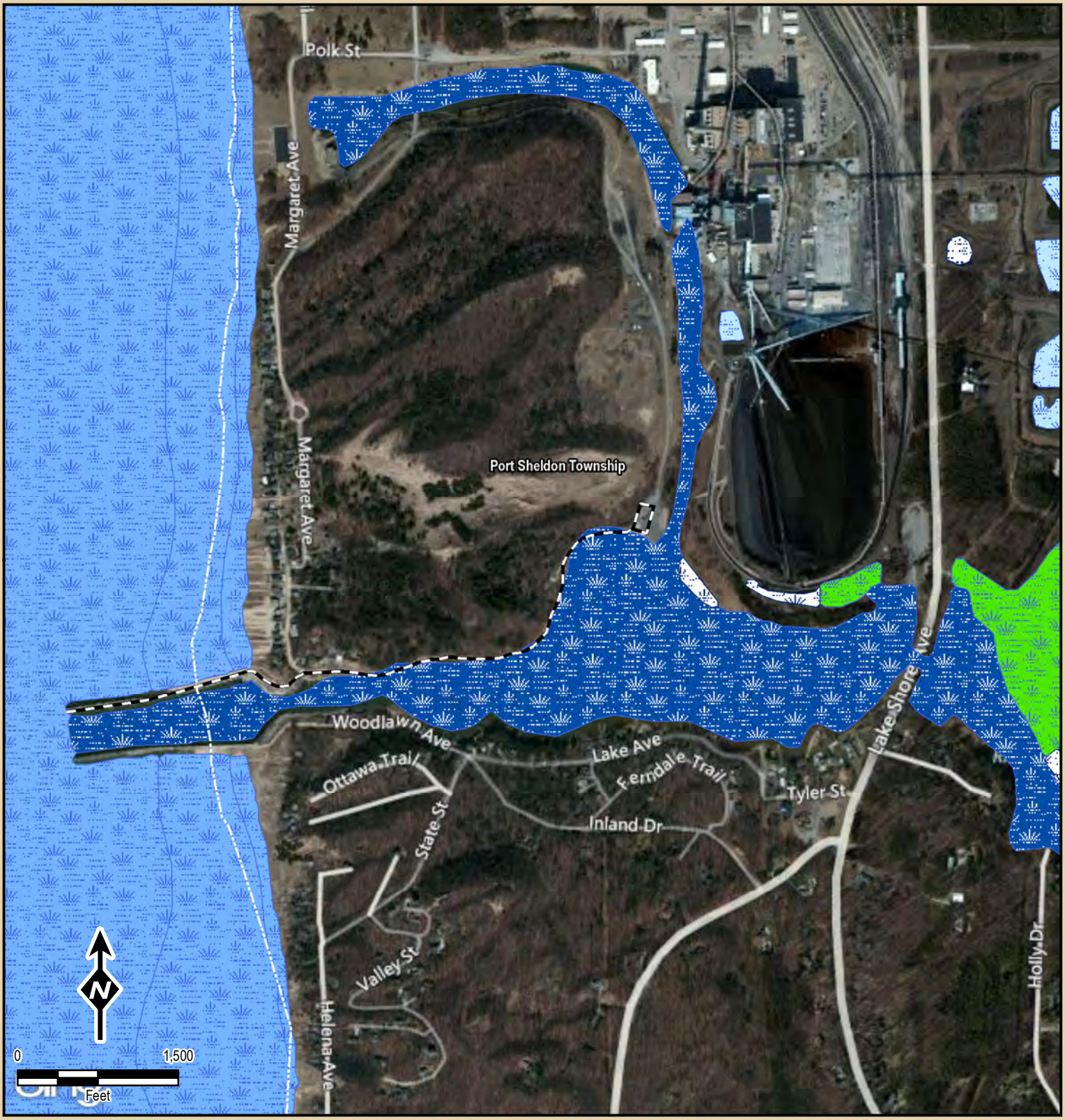
Wetlands In The Project Vicinity

FIGURE 5-13

Created: 1/7/2014

TRC 14 Gabriel Drive Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers Energy Company\Ludington Pump Storage PAD\Figure 5_7 Project Wetlands 8x11.mxd



Project Boundary

Township Boundary

NWI Wetland Type

- Palustrine (Unconsolidated Bottom)
- Riverine (Unconsolidated Bottom)
- Lacustrine
- Palustrine (Aquatic Bed)
- Palustrine (Emergent)
- Palustrine (Forested)

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

Sources: BING, ESRI, MiGDL, Consumers Energy Company, Ducks Unlimited GLARO

CONSUMERS ENERGY COMPANY
DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT PORT SHELDON

Pigeon Lake Area Wetlands

FIGURE 5-14

Created: 11/25/2013

TRC 14 Gabriel Drive Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers Energy Company\Ludington Pump Storage PAD\Figure 5-8 Pigeon Lake Wetlands 8x11.mxd

5.6.2.3 Littoral Habitat

The littoral zone acts as an interface between the open water aquatic environment and that of the terrestrial environment. The size and extent of the littoral zone within a waterbody varies depending upon geomorphology and sedimentation within the aquatic system (Wetzel, 2001). Lake Michigan shoreline within the Project Boundary is limited and largely consists of the Project structures and discharge. However, the two 1,600-foot long armor stone and sheet pile jetties that extend from the shoreline into Lake Michigan along with the 1,850-foot-long armor stone and rubble breakwater provide some functions of more traditional littoral habitat. These structures provide rocky substrate within the photic zone, which does not support submerged or emergent vegetation but likely supports algae and macroinvertebrate communities. As such, it also provides fish habitat in a form that is uncommon relative to nearby Lake Michigan littoral habitat consisting of finer substrates. Sand and gravel is the most common substrate along the shore of the lake within the Project boundary.

Few to no aquatic plant species vegetate the littoral zones and no mapped NWI submerged aquatic bed wetlands in Lake Michigan are in the Project Boundary.

5.6.3 Invasive Plants and Noxious Weeds

Invasive plants and noxious weeds that potentially exist within the Project Boundary are discussed in detail in Section 5.5.4, Invasive Plants and Noxious Weeds.

5.6.4 References

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Wetzel, R.G. 2001. Limnology: Lake and River Ecosystems. Academic Press.

5.7 Rare, Threatened, Endangered and Special Concern Species

5.7.1 Overview

The Project area may be utilized by Federal and/or State-listed rare, threatened, or endangered (RTE) species. The State of Michigan also identifies State Species of Special Concern. These Special Concern species do not meet the criteria established for being listed, but are particularly vulnerable and could become threatened or endangered due to restricted distribution, low or declining numbers, specialized habitat needs, or other factors. Lists of Federal and State RTE and special concern species with documented occurrences in Mason County and Ottawa County and the potential to occur in the Project vicinity are provided in Tables 5-14 to 5-16.

5.7.2 Rare, Threatened and Endangered Aquatic Species

A few aquatic species, including the river redhorse (*Moxostoma carinatum*) and the cisco or lake herring (*Coregonus artedi*), are listed by the State of Michigan.[6] Table 5-14 lists species documented by county in the Michigan Natural Features Inventory that may be found in the vicinity of the Project.

Table 5-14: Rare, Threatened, and Endangered (RTE) Aquatic Fauna Species that May Occur in the Project Vicinity

COMMON NAME	SCIENTIFIC NAME	STATUS[a]	COUNTY
Bigmouth shiner	*Notropis dorsalis*	SC	Ottawa
Cisco (lake herring)	*Coregonus artedi*	T	Ottawa
River redhorse	*Moxostoma carinatum*	T	Ottawa

[a] E (State Endangered), T (State Threatened), SC (State Special Concern), FE (Federal Endangered), FT (Federal Threatened), FC (Federal Candidate), PFE (Proposed Federal Endangered)
Source: Michigan Natural Features Inventory. 2007. County Element Data (Web Application). Available online at http://mnfi.anr.msu.edu/data/county.cfm [Accessed Sep 4, 2013]

5.7.3 Essential Fish Habitat

Pursuant to the amended Magnuson-Stevens Fishery Conservation and Management Act (Act), Congress mandated that habitats essential to federally managed commercial fish species be identified, and that measures be taken to conserve and enhance habitat. In the amended Act, Congress defined essential fish habitat (EFH) for federally managed fish species as "those waters

[6] Rare, threatened and endangered fish species are also addressed in the Fisheries section, Section 5.3.3 of this document. A discussion of the protective fish net is also located in Section 5.3.4. The Licensees entered into an ongoing settlement that was intended to reduce the effects of project operation on RTE fish species. A discussion of this Settlement found in Section 5.3.

and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NMFS, 2011). There is no EFH mapped in the Project vicinity.

5.7.4 Rare, Threatened and Endangered Wildlife Resources

While there are no rare, threatened, or endangered wildlife species documented to occur within the Project boundary, there are a few species documented within the vicinity of the Project in Mason County and the Port Sheldon recreation facility in Ottawa County. Table 5-15 lists the species that are found in the Project vicinity.

Table 5-15: Rare, Threatened, and Endangered (RTE) Terrestrial Fauna Species that Occur in the Project Vicinity

COMMON NAME	SCIENTIFIC NAME	STATUS[a]	COUNTY
Birds			
Bald eagle	*Haliaeetus leucocephalus*	SC	Mason
Marsh wren	*Cistothorus palustris*	SC	Mason
Piping plover	*Charadrius melodus*	FE	Mason
Insects			
Karner blue butterfly	*Lycaeides Melissa samuelis*	FE	Mason
Mammals			
Indiana bat	*Myotis sodalis*	FE	Mason, Ottawa
Northern long-eared bat	*Myotis septentrionalis*	PFE	Mason, Ottawa
Reptiles and Amphibians			
Eastern box turtle	*Terrapene carolina carolina*	SC	Mason
Eastern massasauga	*Sistrutus catenatus*	FC	Mason

[a] E (State Endangered), T (State Threatened), SC (State Special Concern), FE (Federal Endangered), FT (Federal Threatened), FC (Federal Candidate), PFE (Proposed Federal Endangered)
Source: Michigan Natural Features Inventory. 2013. Michigan Natural Features Inventory Database (GIS Application). [Accessed Oct 9, 2013]
Source: U.S. Fish and Wildlife Service. 2013. Michigan County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. http://www.fws.gov/midwest/endangered/lists/michigan-cty.html [Accessed Nov 21, 2013]

5.7.5 Rare, Threatened and Endangered Botanical Resources

The Project area and immediate vicinity includes upland and shoreline habitat associated with Lake Michigan and Pigeon Lake. No records for rare or exemplary natural communities within the Project area were found. A review of the Michigan Natural Features Inventory indicated that the species listed in Table 5-16 have been found in the Project vicinity; however, these species have not been documented within the Project boundary.

Table 5-16: Rare, Threatened, and Endangered (RTE) Floral Species that Occur in the Project Vicinity

COMMON NAME	SCIENTIFIC NAME	STATUS[a]	COUNTY
Plants			
Ginseng	*Panax quinquefolius*	T	Mason, Ottawa
Pitcher's thistle	*Cirsium pitcher*	T, FT	Mason, Ottawa

[a] E (State Endangered), T (State Threatened), SC (State Special Concern), FE (Federal Endangered), FT (Federal Threatened), FC (Federal Candidate), PFE (Proposed Federal Endangered)
Source: Michigan Natural Features Inventory. 2013. Michigan Natural Features Inventory Database (GIS Application). [Accessed Oct 9, 2013]
Source: U.S. Fish and Wildlife Service. 2013. Michigan County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. http://www.fws.gov/midwest/endangered/lists/michigan-cty.html [Accessed Nov 21, 2013]

5.7.6 References

Michigan Natural Features Inventory. 2013. Michigan Natural Features Inventory Database (GIS Application). [Data accessed October 9, 2013]

Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at http://mnfi.anr.msu.edu/explorer [Accessed Sep 4, 2013]

Michigan Natural Features Inventory. 2007. County Element Data (Web Application). Available online at http://mnfi.anr.msu.edu/data/county.cfm [Accessed Sep 4, 2013]

Tekiela, Stan. Reptiles & Amphibians of Michigan Field Guide. Adventure Publications, Inc. Cambridge, MN. 2004.

U.S. Fish and Wildlife Service. 2013. Michigan County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. http://www.fws.gov/midwest/endangered/lists/michigan-cty.html [Accessed Nov 21, 2013]

U.S. Fish and Wildlife Service. 2011. Threatened and Endangered Species Concurrence. Letter dated July 1, 2011.

5.8 Recreation and Land Use

5.8.1 Overview

Lands within the Project boundary are largely lands associated with Project facilities (upper reservoir, penstock area, powerhouse, and recreation facilities). There are no federal lands within the Project boundary.

There are no Projects lands currently under study for inclusion in the National Trails System or designated as, or under study for inclusion, as a Wilderness Area. There are designated National Trails and a Wilderness Area near the Project. The Nordhouse Dunes Wilderness Area (National Wilderness Area), part of the Manistee National Forest, is located approximately 12.5 miles north of the Project. The North Country Trail (National Scenic Trail) is approximately 21 miles east of the Project. The Lake Michigan Water Trail extends along the lake shoreline, just west of the Project. A 75-mile section of the trail in Illinois, Indiana and western Michigan has been designated as a National Recreation Trail (http://www.lmwt.org/maps.html and http://www.americantrails.org/nationalrecreationtrails/stateNRT/MInrt.html).

5.8.2 Project Vicinity Recreation Opportunities

There are two regionally important recreation areas near the Project: 1) Ludington State Park and 2) the Pere Marquette National Scenic River. Both sites have well-developed recreation facilities and are well maintained. Neither of these recreation areas border the Project boundary or is associated with the Project.

The Ludington State Park, located north of the City of Ludington, is located 6.5 miles north of the Project and is comprised of nearly 5,300 acres of scenic sand dunes, shoreline vistas, ponds, marshlands and forests. It is situated between Hamlin Lake and Lake Michigan with several miles of shoreline and beaches on both bodies of water. There are three modern campgrounds included within the Park with a combined total of 355 campsites including three mini-cabins (http://www.michigandnr.com/publications/pdfs/wildlife/viewingguide/nlp/37Ludington/).

The Pere Marquette River was designated a Scenic River under the National Wild and Scenic River program in 1978 and was the first river so designated in Michigan. The river is also designated a State Natural River under the State's Natural Rivers Program. The river wanders across central Michigan and is the longest river system in Michigan's Lower Peninsula without a dam or impoundment. The river flows in a westerly direction for approximately 67 miles from the junction of the Middle and Little South Branches east of the City of Baldwin to its mouth at Pere Marquette Lake, just south of the City of Ludington. Even though this river is not associated with the Ludington Project, it provides water-based recreation in the area,

approximately 2 miles north of the Project. (http://www.fs.usda.gov/recarea/hmnf/recarea/?recid=18608).

There are several additional recreational opportunities in the vicinity of the Project including Federal, State, municipal and private lands. This includes:

City of Ludington: The City of Ludington provides several municipal facilities (Stearns Park, Waterfront Park, Cartier Park, Copeyon Park, Loomis Street Boat Launch) that provide a beach area on Lake Michigan, playgrounds, trails, a campground, a natural area, boat launches, mini-golf and a skate park.

State of Michigan: The Department of Natural Resources manages several areas in addition to Ludington State Park (e.g., Pere Marquette State Game Area, Charles Mears State Park) in the project vicinity that provide hunting, fishing, rustic and modern campgrounds, trails, swim beaches, picnic areas, and boat launches.

US Forest Service: The USFS manages the Manistee National Forest that provides overnight and day use activities,

Private facilities: Privately owned/managed facilities in the Project vicinity include golf courses, campgrounds, and marinas. (DeLorme, 2003).

5.8.3 Existing Project Area Recreation Facilities and Opportunities

Recreation within the Project boundary includes camping, picnicking, walking, disc golf, and fishing. In general, areas associated with the Project are open to the public for recreation use unless restricted due to operational, security or public safety concerns, in which case these areas are fenced and gated. There is no public access to the upper reservoir or to other fenced Project facilities for these reasons. However, both areas can be viewed from public observation areas/platforms accessed from public trails.

There are five formal Project recreation facilities associated with the Project (Figure 5-15 and Figure 5-16). These facilities provide a variety of amenities, including a campground, picnic area, fishing access, scenic overlooks with interpretive signage, and a disc golf course. Following is a brief description of each of the Project recreation facilities.

1 Mason County Campground – An overnight recreational campground with 56 sites. Campground features include: 30 or 50 amp electric hookups to each site (there is a limited number of full hook up sites) in addition to a fire ring and picnic table, drinking water faucets are located throughout the park, a heated and lighted ADA accessible rest room and shower facility, a dumping station, paved roads and a children's play area. In addition to the campsites several camper cabins have recently been constructed in the

campground. A hiking trail connects the camp area to the picnic area (described below). A field for radio controlled model airplanes is adjacent to the campground. The campground is open from Memorial Day and typically closes after the fishing and deer-hunting season.

2 Mason County Picnic Area – The picnic area with 40 picnic units is located north of the penstocks along the western edge of the reservoir. The facility contains a heated and lighted rest room, concession area, a children's play area, a 350-person capacity pavilion, and three 24-goal disc golf courses. Each picnic site includes a table, grill and waste container. A paved roadway and parking area are also provided. An access trail extends from this site to the upper reservoir observation area. The picnic facility is open daily to vehicle traffic from 8:00 AM to 9:00 PM from Memorial Day through Labor Day, and is accessible to walk-in traffic for the remainder of the year.

The Licensees and Mason County have entered into a lease agreement whereby Mason County operates and maintains the campground and picnic facilities. The Licensees provide annual funding to Mason County.

3 Upper Reservoir Observation Platform – A foot trail with periodic resting facilities provides access to a scenic overlook of the reservoir along the dike crest. This platform also gives excellent scenic views of Lake Michigan and the surrounding countryside. The platform is open Memorial Day weekend to Labor Day.

4 Lake Michigan Overlook – A Vista Point is at the top of the north bluff overlooking the powerhouse and Lake Michigan. An overhead pedestrian bridge crossing of Lake Shore Drive provides access to the Vista Point from the designated parking area. The overlook is accessible to the public year round.

5 Pigeon Lake North Pier – This site is located in Port Sheldon, approximately 70 miles south of the Project. The facility consists of a paved 30 vehicle (one ADA space) parking area with a pit privy, a series of elevated boardwalks and turnpike trail extending from the parking lot westerly along the shoreline for approximately 3,400 feet to a U.S. Army Corps of Engineers (USACE) pier, which extends an approximately 1,280 feet out into Lake Michigan. Two fishing decks, approximately 1,100 and 1,400 feet from the parking lot, extend from a boardwalk section and into Pigeon Lake. The parking lot, boardwalks, fishing decks and other sections of trail are owned and managed by the Licensees, who also maintains the public access improvements on the USACE pier. The facility is open from mid-April to mid-October and provides day use activities including walking, fishing, and sightseeing.

Legend

- Project Boundary
- Non-Project Land
- Recreation Facility
- Township Boundary

Note: Project Boundary will be updated upon receipt of electronic files to reflect lands removed/to be removed from boundary.

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY
DTE Electric Company

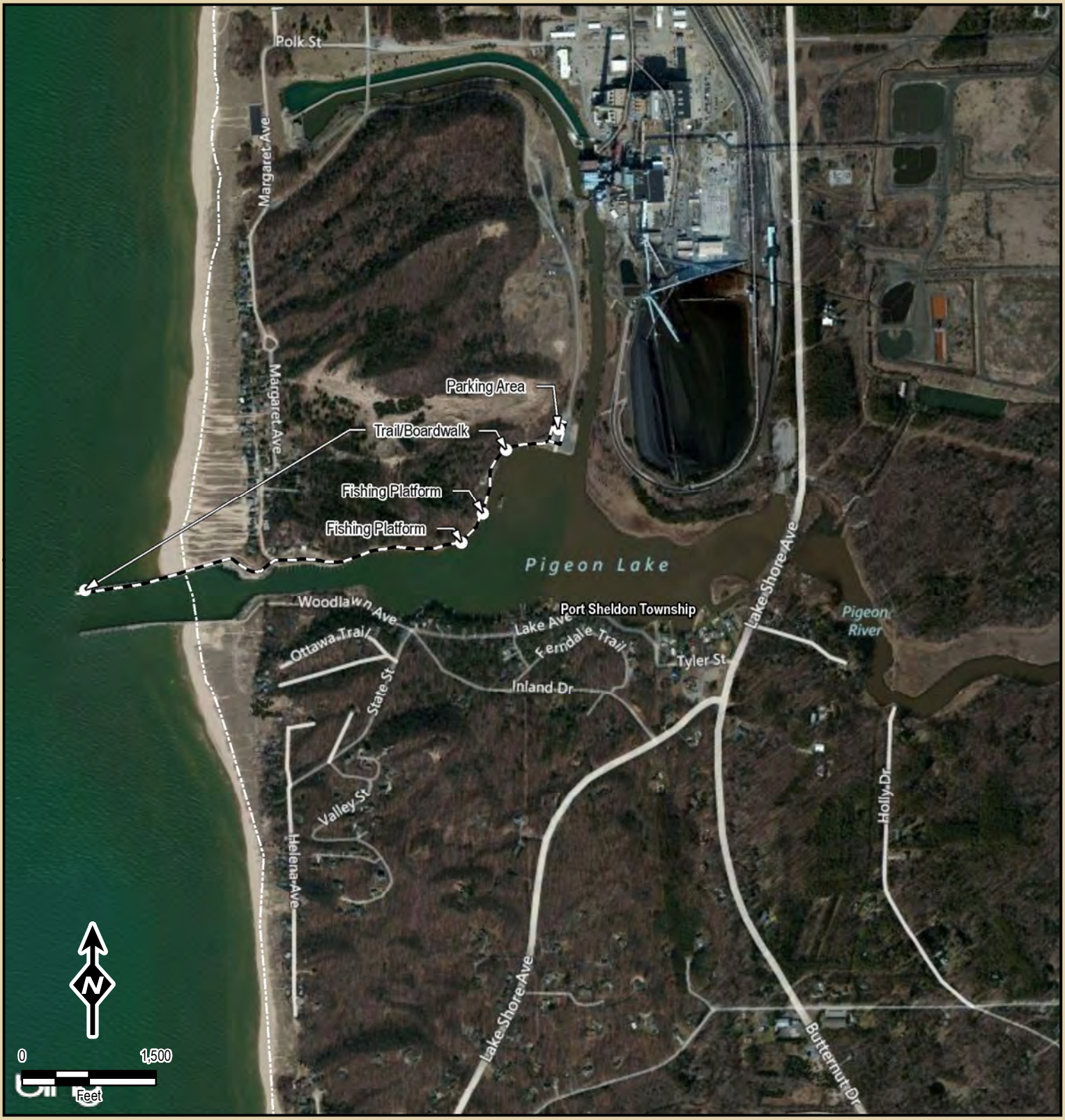
LUDINGTON PUMPED STORAGE PROJECT RESERVOIR

FIGURE 5-15

Created: 1/7/2014

TRC
14 Gabriel Drive
Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers Energy Company\Ludington Pump Storage PAD\Figure 5_9 Reservoir Recreation Facility Map 8x11.mxd



Legend

- Recreation Facility
- Project Boundary
- Township Boundary

Sources: BING, ESRI, MiGDL, Consumers Energy Company

CONSUMERS ENERGY COMPANY
DTE Electric Company

LUDINGTON PUMPED STORAGE PROJECT
PORT SHELDON

FIGURE 5-16

Created: 11/25/2013

TRC 14 Gabriel Drive Augusta, ME 04330

V:\PROJECTS\AUGUSTA\Consumers Energy Company\Ludington Pump Storage PAD\Figure 5-10 Port Sheldon Recreation Facility Map 8x11.mxd

5.8.4 Project Recreation Use

Recreational use data for the Project was most recently collected during 2008 for the FERC required "Licensed Hydropower Development Recreation Report" (Form 80) and submitted to FERC on April 27, 2009. The Form 80 provides an estimate of recreation use as "recreation days" that occurs within the Project area. A recreation day is defined by FERC as each visit by a person to a Project development for recreational purposes during any portion of a 24-hour period. The Form 80 also estimates the percent capacity at which Project recreation facilities are used.

The 2009 Form 80 for the Project reports that the total annual daytime use was 13,411 recreation days, and total annual nighttime use was 8,245 recreation days. The peak weekend daytime average use was 485 recreation days and the peak weekend nighttime average use was 27 recreation days. Project facility use capacities are low and range from 25% (playground areas and trails) to 60% (camping areas and tent/trailer/RV sites).

Data for the next Form 80 will be collected in 2014 and will provide updated Project recreational use and capacities, and the Form 80 report will be filed with the Commission by April 1, 2015.

5.8.5 Recreation Needs Identified in Management Plans

Various management plans have been developed to assess and address recreational use and future needs on a statewide and local basis. Plans pertinent to the Project vicinity are summarized below.

5.8.5.1 Michigan Statewide Comprehensive Outdoor Recreation Plan

Every state must prepare and regularly update a statewide recreation plan that addresses the demand for and supply of local, state and federal recreation resources within a state, identify needs and new opportunities for recreation improvements and set forth an implementation program to meet the goals identified by its citizens and elected leaders.

The Michigan Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2013-2017 notes that biking, camping, fishing and walking are the top rated outdoor recreation activities based on a telephone survey conducted as part of the SCORP development. The SCORP notes that the greatest statewide needs are for trail-based activities and connections (both non-motorized and motorized) and access to water-based recreation is a priority over the next five years. (Michigan DNR, 2012).

5.8.5.2 2009-2019 Strategic Plan, Michigan DNR, Parks and Recreation Division

"Sustaining 90 years of Excellence," the Michigan DNR 2009-2019 Strategic Plan, addresses the overall management and planning of state parks, recreation areas, linear parks, scenic sites, harbors, recreational locks, and boating access sites and provides guidance for future planning and program management consistent with the mission of the DNR. The goals and objective of the plan include: balance and expand recreation use with protection of the resources; establish and maintain long-term funding; develop partnerships; incorporate "universal access" to state parks and boating facilities and programs; and provide facilities that support emerging public recreation activities. (Michigan DNR, 2009).

5.8.5.3 The Mason County Recreation Plan: 2013-2017

The Mason County Recreation Plan: 2013-2017 (Draft 10-10-12) provides a basis to guide policy for implementation or improvements and new initiatives to meet recreational goals and interests of the county. In an on-line survey conducted to develop this plan, residents indicated the recreational facilities and amenities most needed (in order of priority) at county parks and recreational areas are walking/biking paths, restrooms, Nordic skiing/snowshoe trails, and fish cleaning stations. (Mason County Parks and Recreation Commission, 2012).

5.8.6 Land Use and Management of Project Lands

The area surrounding the Project is a mixture of residential, agricultural and undeveloped lands in Mason County, and a mixture of residential, undeveloped and industrial lands in Ottawa County.

Land use in the Project vicinity is regulated by local, county and state zoning regulations and ordinances. Landowners must comply with these regulations and ordinances for use and development of their lands. The majority of the lands abutting the Project in Pere Marquette are zoned as agricultural residential, and lands in Summit are zoned industrial, agricultural, and recreational residential.

The Licensees conveyed a 33-foot wide easement for underground brine lines and underground and overhead electric lines on Project lands to Dow Chemical Company in 1977 (FERC Order dated 9-15-1977). Most of the lands within the Project boundary are predominantly developed and/or used for Project-related purposes, including public recreation facilities and access. The upper reservoir and Lake Michigan shoreline within the Project Boundary are restricted from public use for safety concerns, project security and project operations.

Licensees will consider requests for non-Project use of Project lands and may approve such requests provided the use complies with the current license's land use article. There are no plans to allow non-Project shoreline development of any kind.

5.8.7 References

American Trails. http://www.americantrails.org/nationalrecreationtrails/stateNRT/MInrt.html.

DeLorme. 2003. Michigan Atlas & Gazetteer

Mason County. http://www.masoncounty.net/content.aspx?departmentid=14&page=home.

Mason County Parks and Recreation Commission. 2012. The Mason County Recreation Plan: 2013-2017 (Draft 10-10-12).

Michigan Department of Natural Resources. 2012. The Michigan Statewide Comprehensive Outdoor Recreation Plan (SCORP) 2013-2017.

Michigan Department of Natural Resources. http://www.michigandnr.com/publications/pdfs/wildlife/viewingguide/nlp/37Ludington.

Michigan Department of Natural Resources. http://www.michigandnr.com/parksandtrails/Details.aspx?id=468&type=SPRK.

Michigan Department of Natural Resources. http://www.michigandnr.com/parksandtrails/Details.aspx?id=470&type=SPRK.

Pere Marquette Township. http://www.pmtwp.org/Portals/6/PDF/Bld-Zon/Zoning%20Ord/Zoning.pdf.

U.S. Forest Service, http://www.fs.usda.gov/recarea/hmnf/recarea/?recid=18608.

5.9 Aesthetic Resources

5.9.1 Overview

The Project is located in Summit and Pere Marquette Townships in Mason County on the east shore of central Lake Michigan approximately 46 miles north of Muskegon, Michigan. Mason County is characterized by large areas of farmland and forest. There are extensive bluff and dune areas along the Lake Michigan shoreline and several pristine rivers and streams flow through the county and empty into Lake Michigan. Most of the privately owned shoreline along the lake is developed with cottages and seasonal and year-round houses (Mason County Comprehensive Plan, 2006). The area surrounding the Project is a mix of agriculture lands, forested areas, residential properties, and park/recreation areas, and scattered residential properties along the Lake Michigan shoreline.

5.9.2 Visual Character of Project Lands and Waters

The Project is located on approximately 965 acres, including an 842-acre man-made upper reservoir on a bluff approximately 360 feet above (950 NGVD), and overlooking, Lake Michigan. The upper reservoir is approximately 2.5 miles long and one mile wide and surrounded by an approximate six mile long dike asphaltic-concrete lined earth embankment. A concrete intake building is located near the west shoreline of the reservoir connecting the upper reservoir to the powerhouse via the penstocks. Photo 1 provides an aerial view of the Project.

Photo 1: Aerial View of Project

A public observation platform on the northwest side of the reservoir overlooks the reservoir and views of Stearns Beach and Ludington North Breakwater Light on Lake Michigan to the north.

Photo 2: View north from upper reservoir observation building

Photo 3: View looking east from upper reservoir observation building

A second observation area is provided on the west side of Lakeshore Drive and provides views of the powerhouse and Lake Michigan.

Photo 4: View looking southwest from powerhouse overlook area

The six steel penstocks are encased in concrete where they pass through the upper reservoir embankment and are supported on concrete saddles and buried in fill sand as they emerge from the top of the slope and extend to the powerhouse.

Photo 5: Concrete encased penstocks below upper reservoir

State highway 31 roughly parallels the east side of the upper reservoir and township roads that encircle the reservoir on the three sides.

The powerhouse facility is located on the shore of Lake Michigan and approximately 0.25 miles west of the upper reservoir. The concrete powerhouse consists of six bays that house the pump-turbine motor-generator units. Approximately 85% of the powerhouse structure is below the Lake Michigan water level. Three main transformer banks, station power transformers, a gantry crane, heating and ventilation units, and the motor-generator collector rings are located on the roof of the powerhouse. In general, the Project does not adversely affect the shoreline viewscape and the earthen embankment is the most visible portion of the Project.

Photo 6: Breakwater, powerhouse and upper reservoir dike from Lake Michigan

A 1,100-foot-wide, 2,175-foot-long tailrace area extends from the powerhouse into Lake Michigan. Two parallel 1,600-foot-long armor stone and sheet pile jetties extend along the tailrace shoreline and into Lake Michigan. A 1,850-foot-long armor stone and rubble breakwater is located parallel to and approximately 2,700 feet offshore from the powerhouse. A 12,850-foot fish barrier net, extending from the lake bottom to the surface is in place seasonally (April 15th to October 15th) outside of the jetties and breakwater.

Photo 7: South jetty and breakwater

5.9.3 Nearby Scenic Attractions

The following scenic attractions are within 5 miles of the Project Area:

Stearns Beach, Ludington – Located north of the Project in Ludington, this town facility offers 2,500 feet of sand beach, a skate park, accessible walkway, and a picnic area (www.visitludington.com).

Ludington State Park – This 5,300 acre State park with seven miles of Lake Michigan shoreline is located north of the Project. The park includes 18 miles of trails and a variety of recreational day use activities including boating, fishing, and picnicking (www.visitludington.com).

Ludington North Breakwater Light – This operating 57-foot tall lighthouse is located near Stearns Beach. This station was established in 1871 and is still operational. The station was transferred to the City of Ludington by the US Coast Guard under the terms of the National Historic Lighthouse Preservation Act and is currently operated and maintained by the City and the Sable Points Lighthouse Keepers Association (www.visitludington.com).

White Pine Village – Operated by the Mason County Historical Society, the village is a community of 29 building and sites dedicated to preserving and presenting Mason County's history. The buildings contain thousands of artifacts to help interpret their setting in the area history from the 1800's and beyond. The village is located north of the Project (www.historicwhitepinevillage.org).

Pere Marquette River – The river is located north and easterly of the Project. A 66-mile segment of the river is designated as a federal Scenic River and a state Natural River and provides fishing, boating and camping opportunities (www.visitpmriver.com).

5.9.4 Visual Characteristic of the Pigeon Lake North Pier recreation site

The satellite Project recreation site is located in Port Sheldon along Pigeon Lake in Ottawa County, approximately 70 miles south of the upper reservoir. The recreation site consists of the walkway along Pigeon Lake, extending from a parking lot to Lake Michigan.

Photo 8: Walkway along the shoreline

Photo 9: Walkway along Pigeon Lake

5.9.5 References

Historic White Pine Village. http://www.historicwhitepinevillage.org/.

Mason County. http://www.masoncounty.net/content.aspx?departmentid=14&page=home.

Visit Ludington. http://www.visitludington.com/.

Visit Pere Marquette River. http://www.visitpmriver.com/.

5.10 Cultural Resources

5.10.1 Archeology Review

West Michigan has been the focus of many archaeological investigations over the years (see Fitting 1975; Halsey 1999). The Michigan State Historic Preservation Office's (SHPO) archaeological site files at the Michigan Historical Center (MHC) show that no known sites are within the Project area. A recent study conducted for Consumers Energy discovered the presence of two new archaeological sites on Michigan Department of Transportation (MDOT) lands currently included within the Project boundary. Neither site was determined to be eligible for listing on the National Registry of Historic Places. On October 17, 2013, Consumers provided a report documenting the Phase I survey results to the SHPO for review. The SHPO provided their review in a letter to the Commission dated November 25, 2013, concurring with the conclusion that the sites are not eligible for listing on the National Registry. Consumers Energy has filed a request to remove this MDOT property from the Project boundary. Similarly, to the Licensees knowledge, no religious or cultural significance has been associated with any of the lands included within the Project boundary.

The SHPO files show 21 previously recorded archaeological sites within about 2.0 mi (3.6 km) of the general Project area. Archaeological sites in West Michigan include the entire cultural sequence for the region from the Paleoindian period to the twentieth century. The Pre- European Contact chronology is broadly subdivided into three periods: the Paleoindian period (12,000 Before Present (BP) to 9000 BP), the Archaic period (9000 BP to 4000 BP), and the Woodland period (4000 BP to AD 1600). [Note: BP refers to Before Present'] After European contact, time frames are typically described in terms of centuries – seventeenth, eighteenth, etc.

The presence of known prehistoric sites within the general Project area indicates a moderate to high potential for the discovery of archaeological sites in similar environmental settings. The prehistoric sites identified in the general area all appear to be directly associated with bodies of water (Lake Michigan as well as other lakes rivers and streams). Aside from the reservoir, which was constructed in the early 1970s, the closest bodies of water are about 0.5 mi (0.8 km) away suggesting the potential for prehistoric sites in the Project area is moderate, if not low.

The study of Lake Michigan coastal dunes recently completed by Lovis et al. (2012) identified buried soils dating from 1300 BP to 2600 BP beneath dune features in nearby Ludington State Park (Lovis et al.). These buried soils represent former ground surfaces that are now buried beneath the dunes. These were encountered from 10 feet to nearly 65.5 feet (3 m to 20 m) below the modern dune surface, thus raising the potential of buried archaeological sites that are too deeply buried to discover via standard Phase I reconnaissance methods (see Section 3.1).

While it can be assumed there are buried surfaces under the dunes in the Project area, their depth and whether they harbor undiscovered archaeological sites is not known. The Project area's distance to water would not have been radically different than it is today over the past 2,600 years, so it is unlikely the area would have been any more sensitive for prehistoric occupation than it is today.

5.10.2 Architectural Review

The Project was constructed between 1969 and 1973, and while properties less than 50 years old are not typically considered eligible for the National Register of Historic Places (NRHP), the Licensees are aware that properties less than 50 years old that are considered exceptionally important may be considered eligible for listing.

As discussed in Section 4 of this PAD, the Licensees have initiated an overhaul of the six pump-turbine/motor-generators. In December 2011, a license amendment request was filed with the Commission for the unit upgrades. The amendment request included the results of a historic property assessment performed for the Project. Below is a summary of the historic assessment discussion that was included in the December 2011 amendment request.[7]

The Project is unique in that it is Michigan's first and only pumped storage hydroelectric facility. At the time it was constructed, the Project had the largest generating capacity in the world for pumped storage facilities, and it remains the third largest pumped storage facility in the world and the second largest in the United States.

Due to its uniqueness, the Licensees voluntarily conducted a NRHP-eligibility study for the Project. Consumers contracted with Commonwealth Cultural Resources Group (CCRG), of Jackson, Michigan, to perform a baseline (i.e., prior to unit upgrades) historic assessment of the Project. This assessment found that the Project meets several of the eligibility criteria for NRHP listing. CCRG also reviewed the actions associated with the overhaul/upgrade and in their professional judgment found that proposed work would not adversely impact the Plant's eligibility for listing on the NRHP.

The Licensees informally consulted with, and requested concurrence from, SHPO that the proposed Project upgrades and associated upgrade or routine maintenance activities would not adversely affect the integrity of location, design, setting, materials, workmanship, feeling, and associations that make the Project potentially eligible for inclusion in the NRHP. In a February 21, 2012 letter to the Commission, the SHPO provided their opinion that, based on its review of

[7] The license amendment was approved in FERC Order 139 FERC ¶ 62,101 dated May 7, 2012.

the draft application for amendment and the historic assessment, the Project upgrades would have no adverse effect on the Project's eligibility for listing on the NRHP.

5.10.3 References

Report – R-1113 Dated September 2013 – 95 Acre MDOT Phase I Property Survey

Report – R-1085 Dated July 2013 – 35 Acre Data Center Property Survey

Report – R-0876 Dated June 2011 – Historic Assessment of LPSP

5.11 Socioeconomic Resources

5.11.1 Overview

The Project boundary, encompassing all associated facilities and lands, is contained within the townships of Pere Marquette and Summit in Mason County, and Port Sheldon Township in Ottawa County. In terms of total population, Mason County, the location of the Project, ranks 50th in the state out of 83 counties. In contrast, Ottawa County, where the Pigeon Lake North Pier is located, is the 8th most populous in Michigan and is part of the Grand Rapids-Wyoming Metropolitan Statistical Area (MSA), which boasts a population of just over one million.

The following sections provide a summary of selected socioeconomic characteristics for Mason County, Ottawa County, and for the townships of Pere Marquette, Summit, and Port Sheldon.

5.11.2 General Land Use Patterns

Much of Mason County is rural in nature. According to the 2010 US Census, two-thirds of the population lives in a rural area, with 33 percent inside an urban cluster (US Census, 2013a). An urban cluster is a densely settled territory with at least 2,500 people, but fewer than 50,000.

The area immediately surrounding the Project is primarily classified as grassland/herbaceous with some light deciduous forest. Private residences and undeveloped private property are located to the north and south of the Project along Lake Shore Drive. Land use to the east of the Project can be characterized as primarily agricultural. Recently, a 56-turbine wind farm has been built east of the Project area.

Ottawa County is more urban, with just 20 percent of the residents categorized as living in a rural area at the time of the 2010 US Census. Seventy-nine percent of the population can be found in urbanized areas, a densely settled area of at least 50,000 people. The remaining one percent is in urban clusters (US Census, 2013a).

The J. H. Campbell Generating Complex is a coal-fueled generating facility owned by Consumers Energy and located on about 2,000 acres just west of the Pigeon Lake North Pier. About half of the land, to the east and north, is undeveloped wildlife habitat and preserve, and contains a Biological Field Station. To the south is Pigeon Lake, which has a number of private residences on its shores.

5.11.3 Population Patterns

From 2000 through 2012, the total population of the United States grew by 11.5 percent. The State of Michigan, however, experienced a slight decline in population, as the economy struggled with rising unemployment and jobs loss (see Section 5.11.6). Most of the cities and townships in

the vicinity of the Project also saw a decrease in population. Only Mason County, as a whole, and Pere Marquette Township increased in population during the 12-year period.

The population of Mason County grew by two percent from 2000 to 2010 to 28,705, according to the U.S. Census Bureau. In 2012, it was estimated that Mason County had a population of 28,680 residents, down slightly from the 2010 population of 28,705 residents. After increasing slightly from 2000 to 2010, Pere Marquette Township's population remained static from 2010 to 2012 at 2,366. The smaller Summit Township saw its population drop by roughly one hundred people to 924 from 2000 to 2010, before ticking up by one person by 2012.

From 2000 to 2010, Port Sheldon Township saw a 6 percent decline in population to 4,240. Over the next two years, the township reversed the trend and grew to 4,311. In contrast to Michigan as a whole, Ottawa County experienced strong growth from 2000 to 2010, growing 11 percent to 263,801. The population growth has continued into this decade, with an additional 2 percent increase to 269,099. In 2013, the US Census Bureau changed the definition of the Grand Rapids-Wyoming MSA to include Ottawa County. The revised MSA has a population of just over one million residents.

The Table 5-17, below, provides a comparison of the 2000 and 2010 Census results and the 2012 Census estimates for the communities near the Project.

Table 5-17: Populations in the LPSP Study Area

Area	2000	2010	2012	Change 2000 to 2012	Distance from Project
State of Michigan	9,938,444	9,883,640	9,883,360	-0.6%	N/A
Mason County	28,274	28,705	28,680	1.4%	N/A
Pere Marquette Township	2,228	2,366	2,366	6.2%	N/A
Summit Township	1,021	924	925	-9.4%	N/A
City of Ludington	8,357	8,076	8,045	-3.7%	< 5 miles
City of Scottville	1,266	1,214	1,215	-4.0%	9 miles
Custer Township	1,307	1,254	1,255	-4.0%	15 miles
Pentwater Township	1,513	1,515	1,507	-0.4%	15 miles
City of Manistee	6,586	6,226	6,173	-6.3%	20 miles

Source: US Census Bureau, 2013b

While total population figures provide an opportunity to identify trends over time, population density allows for the comparison of the number of persons per square mile (or other measure of area) across geographic areas of varying sizes. The 2010 population density of Mason County was 58 people per square mile with a land area of 495.1 square miles, about a third the population density of the State of Michigan. The County ranks 43rd out of the State's 83 counties in terms of population density. The density of counties in Michigan varies widely, from a low of

four persons per square mile in Keweenaw County to a high of 2,974.4 persons per square mile in Wayne County (which includes Detroit). Pere Marquette Township, with 167.9 persons per square mile more closely approximates the population density of the State of Michigan. Summit Township has a density of 72.2 persons per square mile. (US Census Bureau, 2013c).

Roughly 25 percent of Summit Township's residents were aged 65 or older in 2010. The State of Michigan as a whole had a much lower proportion (13.8 percent) of persons in this age category. Mason County and Pere Marquette Township also had a higher percentage of older people than the State average, with 19.2 percent and 20.7 percent of the population, respectively. Unlike Mason County and Pere Marquette Township, which had proportions of children under eighteen similar to the Michigan's 23.7 percent, Summit Township had fewer children, at 17.6 percent.

The area around the Project had a higher percentage of Caucasian residents than Michigan as a whole (78.9 percent) in 2010. Less than 3 percent of residents identified themselves as non-Caucasian in Summit Township. In Mason County, 94.8 percent reported being Caucasian, as did 96.3 percent in Pere Marquette Township.

In 2010, the population density of Ottawa County was roughly 468 people per square mile, nearly three times the population density of Michigan as a whole. This places the Ottawa County eighth in the state in terms of population density. Port Sheldon Township is less densely populated, with 190 people per square mile.

In Port Sheldon Township, the proportion of residents aged 65 or older in 2010 was 13.9 percent, very similar to the proportion of the state. Ottawa County had a lower percentage of older people than the state, with 11.8 percent. Port Sheldon had relatively fewer children under 18 (22.9 percent of the residents) than Ottawa County (26.1 percent) and the State of Michigan (23.7 percent).

The area in the vicinity of the Pigeon Lake North Pier had a higher percentage of Caucasian residents than the State of Michigan (78.9 percent) in 2010. Roughly 94 percent of residents in Port Sheldon Township identified themselves as Caucasian. In Ottawa County, 90.1 percent reported being Caucasian.

Additional details for the Project area is shown in Table 5-18, below, with the State of Michigan shown for reference.

Table 5-18: Selected Demographic Characteristics of the Project Area, 2010

	Pere Marquette Township	Summit Township	Mason County	Port Sheldon Township	Ottawa County	State of Michigan
2010 Population (a)	2,366	924	28,705	4,240	263,801	9,883,640
Geography (2010)						
Land Area in Square Miles (b)	14.1	12.8	495.1	22.3	563.5	56,538.9
Population Density	167.9	72.2	58.0	190.1	468.1	174.8
Gender (2010) (a)						
Male	50.7%	49.1%	49.4%	51.10%	49.0%	49.10%
Female	49.3%	50.9%	50.6%	48.9%	51.0%	50.9%
Age (2010) (a)						
under 5 years old	6.2%	3.8%	5.7%	4.7%	6.7%	6.0%
under 18 years old	23.8%	17.6%	21.7%	22.9%	26.1%	23.7%
18 to 64 years old	55.5%	56.6%	59.1%	63.2%	62.1%	62.5%
65 years old & older	20.7%	25.8%	19.2%	13.9%	11.8%	13.8%
Race (2010) (a), (c)						
Caucasian	96.3%	97.4%	94.8%	93.8%	90.1%	78.9%
Black	0.3%	0.2%	0.6%	0.6%	1.5%	14.2%
American Indian & Alaska Native	0.6%	0.4%	1.0%	0.3%	0.4%	0.6%
Asian	0.7%	0.4%	0.5%	1.7%	2.6%	2.4%
Other	0.6%	1.0%	1.2%	2.8%	3.4%	1.5%
Two or more races	1.4%	0.5%	1.9%	0.8%	2.0%	2.3%
Ethnicity (2010) (a)						
Hispanic or Latino	2.5%	2.4%	4.0%	6.0%	8.6%	4.4%

(a) Source: US Census Bureau, 2013e
(b) Totals may not sum to 100 percent because of rounding.
(c) Source: US Census Bureau, 2013f

5.11.4 Households/Family Distribution and Income

In 2010, there were 11,940 households in Mason County, with approximately 2.4 persons per household, slightly less than the State of Michigan's household size of roughly 2.5 people. The average household size in Pere Marquette Township was 2.5 persons. Within the study area, Summit Township had the lowest number of persons per household at 2.3 (U.S. Census Bureau, 2013d).

Data available from the American Community Survey (based on a 3-year survey of 2009 to 2011 Census Bureau data) show a median household income of $40,530 for Mason County. Statewide

median household income was higher for that time period at $46,847. Households earning less than $15,000 comprised about 14.4 percent, while households earning greater than $100,000 comprised about 11.7 percent of the total[8]. Approximately 17.1 percent of the population and 12 percent of all families were living below the poverty level during the study period in Mason County. Statewide poverty rates were roughly comparable to the County, at 16.7 percent and 11.9 percent respectively (US Census Bureau, 2013e).

Ottawa County had 93,776 households in 2010, with approximately 2.7 persons per household. This exceeded Michigan's household size of roughly 2.5 people. The average household size in Port Sheldon Township was 2.6 persons. (U.S. Census Bureau, 2013e).

American Community Survey 1-year estimates for 2012[9] show a median household income of $54,323 for Ottawa County, higher than the state's $46,859. Approximately 4.6 percent of households in the county earned less than $15,000, while households earning greater than $100,000 comprised about 23.4 percent of the total. Approximately 11.3 percent of the total population and 7.2 percent of all families were living below the poverty level during 2012 in Ottawa County, lower than the statewide poverty rates of 17.4 percent and 12.6 percent, respectively (US Census Bureau, 2013h).

5.11.5 Housing

According to the American Community Survey, Mason County had an estimated 17,292 housing units during the survey period from 2009 through 2011. Of these units, approximately 29 percent were identified as vacant (US Census Bureau, 2013f). More than two-thirds of the vacant housing (69 percent), and one-fifth of total housing, was attributable to housing units that were being held for seasonal, recreational, or occasional use (US Census Bureau, 2013g). The large proportion of seasonal housing reflects the area's lakefront location and desirability as a vacation destination.

Ottawa County had an estimated 103,102 housing units in 2012, according to the American Community Survey. Of these units, approximately 7.8 percent were identified as vacant, far less than observed in Mason County (US Census Bureau, 2013k). Twenty-seven percent of the vacant housing was attributable to housing units that were being held for seasonal, recreational, or occasional use. This use represents roughly 2 percent of total housing (US Census Bureau, 2013l). The difference in seasonal housing vacancy reflects that Ottawa County is not as strongly considered as a vacation destination.

[8] Figures are presented in 2011 dollars.

[9] For Mason County, detailed demographic data from the American Community Survey is available for a 3-year study period from 2009 to 2011. For the larger Ottawa County, 1-year data are available for 2012.

5.11.6 Project Vicinity Employment Sources

Mason County's total labor force in July 2013 was 15,799, based on the Bureau of Labor Statistics (BLS) preliminary figures. The preliminary unemployment rate was 8.7 percent, lower than the State of Michigan's rate of 9.7 percent (BLS, 2013). Total employment fluctuates seasonally, with summer-time employment increasing roughly 5 to 7 percent over the annual employment, based on a review of the previous decade's monthly employment levels (BLS, 2013). The sector with the highest employment (24.5 percent) was within the Education, Healthcare and Social Assistance industry during the 2009 to 2011 period (US Census Bureau, 2013e). Memorial Medical Center of West Michigan, which employs just over 500 full and part-time employees, is currently the largest employer in Mason County (Ludington, 2013). The Manufacturing (19.9 percent) and Retail Trade (12.2 percent) industries were also major employers.

According to the Bureau of Labor Statistics' preliminary figures, Ottawa County's total labor force in July 2013 was 135,626. The unemployment rate was 7.7 percent, lower than the State of Michigan's rate of 9.7 percent (Bureau of Labor Statistics, 2013). In 2012, the sector with the highest employment (23.8 percent) was within the Manufacturing industry (US Census Bureau, 2013G). Herman Miller, a manufacturer of office furniture, is the largest employer in Ottawa County with 3,973 employees in 2012. Johnson Controls, Gentex Corporation, and Grand Valley State University also boasted over 3,000 employees (County of Ottawa, 2013). The Education (21 percent) and Retail Trade (10.3 percent) industries also employed significant proportions of the labor force.

5.11.7 Transportation and Access

The Project is located along South Lake Shore Drive, a two-lane road running along the Lake Michigan shoreline connecting the City of Pentwater, to the south of the Project, to the City of Ludington, to the north of the Project. The Project reservoir is situated to the east of the Lake Shore Drive with the powerhouse to the west. A four-lane highway, US-31, follows a path along the eastern boundary of the Project and for one very short section passes through the Project boundary[10]. US-31 transitions to a two lane where it connects with US-10, east of the City Ludington before continuing north to the City of Manistee.

Public transit is available in Mason County. The Ludington Mass Transit Authority (LMTA) serves residents in Ludington, Scottville and Pere Marquette. LMTA also provides contract service to clients of West Michigan Community Health, Senior Meals Program, and Ludington

[10] Licensees filed an "Application for Authority to Change Project Boundary" with FERC dated November 12, 2013 to remove approximately 95 acres of land adjacent to the US-31 corridor from the Project Boundary.

and Scottville Schools. Additional transportation access to the area is provided via air, rail, and water. The Mason County Airport, which has two runways, is located a few miles from the Ludington business district. Rail service in the County is provided by CSX. Lake Michigan provides additional transportation access to the Ludington area. The SS Badger provides car ferry service from Ludington to Manitowoc, Wisconsin from May through October. Barge traffic is also important to the region.

The Pigeon Lake North Pier recreation site in Port Sheldon Township is reached via an access road off of Margaret Avenue. US-31 serves as a primary north-south route through Ottawa County. Limited public transit in the county is provided by Harbor Transit and Macatawa Area Express. Amtrak offers passenger train service in Ottawa County. The service runs daily from Grand Rapids to Chicago, Illinois, with a stop in Holland, located in Ottawa County. Air service is available via the four airports located within the county. Additional air travel is available via the Gerald R. Ford International Airport in nearby Grand Rapids. The Lake Express offers car ferry service from Muskegon, which is about 30 miles north of Port Sheldon, to Milwaukee, Wisconsin from May through October.

5.11.8 References

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5.12 Tribal Resources

5.12.1 Overview

The Project includes no Tribal lands. In March 2013, the Licensee sent a letter to interested parties, including the Chiefs and/or the Tribal Historic Preservation Offices of 17 Tribes. This letter provided information about the upcoming relicensing and it invited them to attend an informational meeting in May 2013. Licensees intended this informational meeting to provide information about the Project and the ILP. On September 18, 2013, FERC issued a notification of consultation to the Tribes interested in participating in the Project's relicensing and requesting a response by October 18, 2013. As of the filing date of this PAD, Consumers has not received responses from the Tribe or Bureau of Indian Affairs (BIA) or any indication as to whether any of the Tribes contacted would like to be kept apprised of any upcoming activities associated with the relicensing process.

6.0 PROJECT EFFECTS, ISSUES, STUDIES, MEASURES, AND PLANS

6.1 Known or Potential Project Effects

This section identifies any known or potential effects of licensing the continued operation of the Project. For the purposes of this PAD, Project effects are any new changes to the natural and human environment attributable to licensing the continued operation of the Project. In this section, potential issues, proposed studies and mitigation enhancement are discussed for each resource area discussed and assessments made based on existing information found in Section 5.

6.1.1 Primary Project Effects

FERC issued a license for the Project in 1969. Subsequent to the issuance of the license, and to address License Articles 16, 18, 37, and 38, Licensee filed a Settlement Agreement in 1995. The Settlement Agreement consisted of a State of Michigan agreement and a FERC agreement and was prepared and agreed to by: Consumers, DTEE, Attorney General for the State of Michigan, The Michigan Department of Natural Resources, Grand Traverse Band of Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, Little Traverse Bay Band of Odawa Indians, Michigan United Conservation Clubs and the National Wildlife Federation; the FERC agreement was also agreed to by the Department of Interior (US Fish and Wildlife Service), and addresses fish entrainment, public fishing access, and Project retirement studies and possible establishment of a trust fund for future retirement.

License Article 16 and 37 were subsequently revised by FERC orders issued on August 11, 1987, September 30, 1988, February 9, 1990, January 23, 1996, February 16, 2001, and May 1, 2008.

On March 26, 2013, a letter was sent to all parties to the Settlement Agreements as well as local municipalities notifying them of the Licensees' intent to relicense the Project, and notifying interested parties of an upcoming meeting to solicit input into the relicensing process. Appendix B contains a list of the stakeholders invited to the meeting and a list of those in attendance.

6.2 Preliminary Issues, Studies, and Measures by Resource

6.2.1 Geology and Soils

6.2.1.1 Potential Issues

No issues have been identified relative to geology and soils.

6.2.1.2 Proposed Studies

No studies are being proposed specific to geologic or soil resources.

6.2.1.3 Mitigation Enhancement

The Project has been operated for over 40 years in a manner that has not impacted geological and soils resources. Given the Licensees' proposal to continue operation in the same manner, no change to geology and soils should result from hydroelectric generation. Therefore, no Protection, Mitigation and Enhancement (PM&E) measures regarding geology or soils are proposed.

6.2.2 Water Resources (Related to Lake Michigan)

6.2.2.1 Potential Issues

No issues have been identified relative to water resources.

6.2.2.2 Proposed Studies

No studies are being proposed specific to water resources.

6.2.2.3 Mitigation Enhancement

Based on data collected, historical Project operation has not had a measurable effect on water resources in Lake Michigan. Since the Licensees propose to continue operation in the same manner, no change to water resources should result from hydroelectric generation. Therefore, no PM&E measures regarding water resources are proposed.

6.2.3 Fish and Aquatic Resources (Including Related RTE and Riparian, Wetland and Littoral Habitat Resources Related to Lake Michigan)

6.2.3.1 Potential Issues

Potential effects of Project operations on the Lake Michigan fishery have been a consideration since the Project was constructed. Specifically, fish entrainment mortality due to Project operations was identified by several agencies and NGOs as a primary issue of concern. Over the past 30 years, this issue has been intensively studied with the results of these studies evaluated by the Licensees, resources agencies, tribes, NGOs and other stakeholders. One means to reduce entrainment and mortality was the seasonal installation of a barrier net. In 1991, after considerable testing of the barrier net, the Licensees submitted the "Plan for Permanently Mitigating Fish Mortality." The Plan consisted of continued operation and monitoring of a seasonal barrier net, mitigation for unavoidable fish losses, and funding for additional recreational facilities. The Licensees entered into a Settlement Agreement with agencies, tribes and stakeholders which was approved by the FERC in 1996. The FERC-approved Settlement Agreement provides for continued operation of a seasonally installed barrier net and net effectiveness monitoring with oversight by a Scientific Advisory Team (SAT) made up of

representatives from the parties to the Settlement. It also provides for the periodic review other fish protection measures every five years. The five-year review includes an evaluation of technologies, and "conclusions and recommendations pertaining to utilizing any new technologies at LPSP."

Three fish entrainment abatement technology reviews were conducted with reports summarizing the results submitted to FERC in 2001, 2006 and 2011. None of the three reviews identified any new or improved technologies that would perform as well as the seasonal barrier net that is currently in use at the Project in any of the categories included in the evaluations, i.e. biological effectiveness, engineering feasibility, and potential application at LPSP. The Licensees' intensive barrier net effectiveness monitoring program provides an abundance of information on barrier net effectiveness and the fishery in the vicinity of the Project. The SAT is provided monthly detailed monitoring reports, status reports/discussions at quarterly meetings, and an opportunity to review and comment on each final annual report of barrier net operations filed with FERC. Other than fish entrainment mortality, which has been successfully addressed, no other issues potentially affecting fish and aquatic resources have been identified.

In addition to being listed as a Threatened Species by the State of Michigan, lake sturgeon is also a species of cultural significance to the Little River Band of Ottawa Indians (LRBOI). As such, the LRBOI has expressed concerns regarding the potential effects of Project operations on lake sturgeon recovery effort. In particular, they questioned the vulnerability of this species during winter migrations. Relatively few sturgeon have been collected during the barrier net monitoring program but the number collected per year may be trending upward. All lake sturgeon collected are processed and PIT tagged. This information along with any recapture information that may be collected in the future is provided to the MDNR. Over time, these data on growth, relative abundance, and movement patterns could prove valuable in the recovery of this species. The Licensees will continue to collect such data and PIT tag all lake sturgeon as part of the barrier net monitoring program as well as coordinate efforts with entities conducting research to enhance this species.

6.2.3.2 Proposed Studies

The abundance of fisheries data collected at the Project and potential fish entrainment abatement methodologies is sufficient for decision making purposes regarding the issuance of a new license. Therefore, no studies are being proposed specific to fish and aquatic resources.

6.2.3.3 Mitigation Enhancement

Given the historical effectiveness of the barrier net, its continued operation and monitoring would remain the best fish entrainment abatement method for this location. Therefore, while

seasonal barrier net operation should continue, no additional or new PM&E measures regarding fish and aquatic resources are proposed.

6.2.4 Wildlife Resources (Including Related RTE and Riparian, Wetland and Littoral Habitat Resources Related to Lake Michigan)

6.2.4.1 Potential Issues

The Michigan Natural Features Inventory database does not identify any threatened or endangered wildlife species within the Project boundary (MNFI, 2013). Correspondence received from the USFWS, dated July 1, 2011, indicate that while federally listed threatened and endangered species occur within the Project vicinity in Mason County, no impacts from continued hydroelectric pumped storage operations were anticipated (USFWS, 2011). Lake Michigan, the upper reservoir, and Pigeon Lake are located within the Project boundary; however, no alterations to these waterways are planned or anticipated. Based on publically available information and anticipated ongoing Project activities, no issues have been identified relative to wildlife resources. Therefore, impacts to wildlife resources are not anticipated.

6.2.4.2 Proposed Studies

The Licensees propose a wildlife survey within the Project boundary to identify any terrestrial or potential RTE habitat. This survey will be conducted using an intuitive meander approach, focusing on areas of potential habitat; no species-specific surveys are planned at this time.

6.2.4.3 Mitigation Enhancement

Historical operation of the Project has had little to no effect on wildlife resources within the Project boundary. Since the Licensees propose to continue operation in the same manner, there should be no change to wildlife habitats or species impacts. Therefore, no PM&E measures regarding wildlife resources are proposed.

6.2.5 Botanical Resources (Including Related RTE and Riparian, Wetland and Littoral Habitat Resources as they pertain to Lake Michigan)

6.2.5.1 Potential Issues

The Michigan Natural Features Inventory database does not identify any threatened or endangered botanical species within the Project boundary (MNFI, 2013). Correspondence received from the USFWS, dated July 1, 2011, indicate that while federally listed threatened and endangered species are listed to occur within the Project vicinity in Mason County, no impacts from continued hydroelectric pumped storage operations were anticipated (USFWS, 2011). Lake Michigan, the upper reservoir, and Pigeon Lake are located within the Project boundary; however, no alterations to these waterways are planned or anticipated. Based on publically

available information and anticipated ongoing Project activities, no issues have been identified relative to botanical resources. Therefore, impacts to botanical resources are not anticipated.

6.2.5.2 Proposed Studies

The Licensees propose a botanical survey within the Project boundary to identify any RTE or potential RTE habitat. This survey will be conducted using an intuitive meander approach, focusing on area of potential habitat for ginseng and pitcher's thistle.

6.2.5.3 Mitigation Enhancement

The Project operation has been consistent for over 40 years with little to no effect on botanical resources within the Project boundary. No change in operation is being proposed by the Licensees. With continued operation in the same manner, there should be no impacts to botanical resources. Therefore, no PM&E measures regarding botanical resources are proposed.

6.2.6 Recreation and Land Use

6.2.6.1 Potential Issues

The Project provides a variety of public recreational facilities and opportunities near it and at a satellite facility in Port Sheldon, approximately 70 miles south of Ludington. Additionally, there are numerous other state and local recreational facilities in the area of the Project that offer a wide range of access and recreational experiences. The most recent FERC Form 80 (2009) indicates that Project recreational use is well below capacity, likely the result of the significant recreational opportunities readily available at other locations in close proximity to the Project.

Use of Project lands are subject to FERC jurisdiction and local and state rules, regulations and ordinances. Recent applications to FERC requesting removal of Project land from the license indicate that the Licensees' approach to use of Project Land is focused on maintaining only land needed to support Project operation and maintenance. Land removed from the Project recently is proposed for or being used for non-Project purposes. These modifications conform to the FERC land use article.

No additional issues have been identified relative to recreation and land use.

6.2.6.2 Proposed Studies

FERC Form 80 surveys will be completed in 2014, with a planned submittal in 2015. No additional recreational use studies are proposed at this time.

6.2.6.3 Mitigation Enhancement

Licensees will continue to provide, operate and maintain the existing Project recreation facilities and access.

6.2.7 Aesthetic Resources

6.2.7.1 Potential Issues

The Project, located along the shore of Lake Michigan, has been part of the landscape since the early 1970s. Additionally, existing public viewing areas within the Project offer convenient and scenic views of Lake Michigan and surrounding areas. No issues have been identified relative to aesthetic resources.

6.2.7.2 Proposed Studies

No studies are proposed at this time.

6.2.7.3 Mitigation Enhancement

The Licensees have proposed no changes to the Project or Project operation which would affect the viewshed, therefore, no PM&E measures regarding aesthetic resources are proposed at this time.

6.2.8 Cultural Resources

6.2.8.1 Potential Issues and Project Effects

The Licensees voluntarily had an NRHP-eligibility study conducted for the Project in 2011. This assessment found that the Project meets several of the eligibility criteria for NRHP listing. The Project was also constructed prior to requirements for archeological resources surveys. Much of the land associated with the Project was disturbed and soil was brought in as part of the Project construction. As a result, many of the areas where other cultural resource may have been evident have been disturbed and are not representative of undisturbed areas in the vicinity of the Project.

6.2.8.2 Proposed Studies

The Licensees propose to conduct a Phase I Cultural Resource survey of the property within the Project boundary to identify any cultural resource sites.

6.2.8.3 Mitigation Enhancement

The Licensees propose to consult with the SHPO and FERC on the development of a Historic Properties Management Plan (HPMP). The HPMP will be designed to guide the Licensees in the

identification, preservation, treatment, and management of historic resources under its jurisdiction and stewardship at the Ludington Pumped Storage Project. Consultation with the SHPO will address listing the Project on the National Registry of Historic Places.

6.2.9 Socioeconomic Resources

6.2.9.1 Potential Issues

No issues have been identified relative to socioeconomic resources.

6.2.9.2 Proposed Studies

Sufficient information about the Project's contribution to the local socioeconomic resources exists and no additional studies are proposed.

6.2.9.3 Mitigation Enhancement

Under a new license, the Project is proposed to be operated in the same manner with similar contributions to the local economy resulting from taxes, jobs, and operating and maintenance funding. Given the current contribution the Project makes to local socioeconomic resources there should be no change to socioeconomic resources. Therefore, no PM&E measures regarding socioeconomic resources are proposed.

6.2.10 Tribal Resources

6.2.10.1 Potential Issues

The Little River Band of Ottawa Indians (LRBOI) have developed and implemented a Nmé (lake sturgeon) Stewardship Plan, which guides their activities for lake sturgeon restoration and research for the next seven generations. This plan demonstrates and documents the importance of sturgeon to the LRBOI Tribe from a socio-ecological perspective. No other concerns have been identified relative to tribal resources.

6.2.10.2 Proposed Studies

Based on information collected to date, no tribal resource concerns have been identified. Therefore, no tribal resource studies are proposed at this time.

6.2.10.3 Mitigation Enhancement

The Licensees recognize the cultural importance of lake sturgeon to the LRBOI. There currently is no information to suggest that the Project has a specific operational effect on this species. Since the Licensees are not proposing to change the Project operation, there should be no change

to Tribal resources. Therefore, no PM&E measures regarding Tribal resources are proposed at this time.

Table 6-1: Potentially Relevant Qualifying Federal and State or Tribal Comprehensive Plans

Resource	Comprehensive Plan
Water Resources; Fisheries and Aquatic Resources	Michigan Department of Environmental Quality. 1996. Non-indigenous aquatic nuisance species, State management plan: A strategy to confront their spread in Michigan. Lansing, Michigan. 42 pp.
Water Resources; Fisheries and Aquatic Resources	Michigan Department of Natural Resources. 1994. Fisheries Division strategic plan. Lansing, Michigan. June 1994. 137 pp.
Recreation and Land Use	Michigan Department of Natural Resources. Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2008-2012. Lansing, Michigan
Water Resources; Fisheries and Aquatic Resources	Michigan Department of Environmental Quality. 1997. Lake Sturgeon rehabilitation strategy. Special Report 18. Lansing, Michigan. August 1997.
Wildlife Resources	U.S. Fish and Wildlife Services. 1988. Great Lakes and Northern Great Plains Piping Plover Recovery Plan. Department of the Interior, Twin Cities, Minnesota. May 12, 1988.
Wildlife Resources	U.S. Fish and Wildlife Services. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.
Wildlife Resources	U.S. Fish and Wildlife Services. 1988. The Lower Great Lakes/St. Lawrence Basin: A component of the North American waterfowl management plan. December 29, 1988.
Wildlife Resources	U.S. Fish and Wildlife Services. 1993. Upper Mississippi River & Great Lakes region joint venture implementation plan: A component of the North American waterfowl management plan. March 1993.

APPENDIX A

LUDINGTON PUMPED STORAGE PROJECT
DISTRIBUTION LIST

CERTIFICATE OF SERVICE
Ludington Pumped Storage Project (FERC No. 2680)
Pre-Application Document and Notice of Intent to File License Application

I, James D. W. Roush, Federal Regulatory Attorney for Consumers Energy Company, hereby certify that copies of the foregoing document have been transmitted to the following parties.

On January 20, 2014, one copy, eFile to:

Ms. Kimberly D. Bose
Federal Energy Regulatory Commission
888 First Street N.E.
Dockets Room
Washington, DC 20426

On January 20, 2014, one copy on compact disc,
US Mail or other delivery method that provides confirmation of delivery, to:

Federal Agencies

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APPENDIX B

SUMMARY OF CONTACTS AND CONSULTATION

Summary of Contacts and Consultation

Appendix B provides a summary of consultation with Federal and state resource agencies, local governments, and Indian tribes with respect to preparation of the PAD.

Relicensing Information – On March 26, 2013 Consumers Energy Company mailed letter invitations to various Agencies, Tribes, and NGO's regarding an informational meeting pertaining to the LPSP Relicensing and the FERC relicensing process. The meeting was held on May 9, 2013. The purpose of the meeting was to: (a) provide an introduction to the Project and the staff responsible for relicensing, (b) provide notice to these parties of the upcoming Project licensing proceeding, (c) outline the FERC licensing process, (d) provide a basic description of what information is typically included in the Pre-Application Document, and (e) generally describe the various roles and responsibilities of the stakeholders involved in the relicensing process.

Threatened and Endangered Species Information – On May 24, 2011 Consumers sent a letter to the USFWS requesting review of Threatened and Endangered Species in vicinity of LPSP. The request was made in part for input to the non-capacity amendment application and for the upcoming relicensing effort. USFWS responded on June 23, 2011 concurring with Consumers Energy's assessment that no Threatened and Endangered Species are affected by the upgrade project.

Cultural Resources – Consumers Energy consulted with the State Historic Preservation Office regarding a historical assessment of the LPSP and on the removal of two parcels of property included within the LPSP boundary. With the upcoming relicensing and the LPSP nearing 50 years old, an assessment would likely be required during the relicensing process. While not required for the non-capacity amendment application, Consumers Energy elected to perform the historical assessment to document the LPSP prior to initiation of the upgrades. On August 2, 2011 as part of the non-capacity amendment application for the turbine upgrades, Consumers Energy requested the SHPO review the historical evaluation of the LPSP. SHPO responded to FERC on February 21, 2012 regarding the amendment application and historical assessment indicating that the upgrade would have no adverse effect on the LPSP and that the LPSP appears to be eligibility for listing on the National Register of Historic Places.

In addition to the historical assessment, during preparation of the PAD, Consumers identified two parcels of property included in the LPSP boundary that were included during the original license application and no longer served any project purposes and could be removed from the LPSP boundary.

On August 5, 2013 Consumers Energy provided a Section 106 Review Request to the SHPO regarding removal of a of 35 acre parcel from the property boundary. On September 5, 2013 the SHPO responded to FERC with a finding of no historic properties affected.

On October 17, 2013 Consumers Energy provided a Section 106 Review Request to the SHPO regarding removal of a 95 acre MDOT property parcel from Project boundary. On November 25, 2013 the SHPO responded to FERC with a finding of no historic properties affected.

Tribal Outreach – Consumers Energy included tribal contacts in the invitation to attend the May 9, 2013 information meeting.

Water Quality Certification – In May 2013, in an informal conversation between Gary Dawson (Consumers Energy) and Diana Klemans (MDEQ Chief Surface Water Assessment Section of the Water Resources Division) Mr. Dawson discussed the Water Quality Certificate requirement for the LPSP. Ms. Klemans had believed the water quality certificate requirements would be met by the NPDES permit. Mr. Dawson explained that the Water Quality Certificate was to be executed as part of the FERC relicensing process and not with an NPDES permit. Ms. Klemans indicated that she would re-educate herself on the process. In a September 12, 2013 email from David McIntosh (Consumers Energy) to Ms. Klemans, Consumers informed the MDEQ of the water quality data collection that Consumers was performing at LPSP and indicated that the data would be included in the PAD. Consumers also requested that the MDEQ contact information be provided for the staff member assigned to developing the Water Quality Certificate for the LPSP.

Great Lakes Fisheries Trust (GLFT) and Scientific Advisory Team (SAT) – The GLFT and SAT are comprised of representatives from the Michigan Department of Natural Resources, Office of the Michigan Attorney General, Department of Fisheries and Wildlife-Michigan State University, Michigan United Conservation Clubs, US Fish and Wildlife Service, National Wildlife Federation, Chippewa-Ottawa Treaty Fishery Management Authority, Grand Traverse Bay Band of the Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, and Little Traverse Bay Bands of Odawa Indians. During a February 2013 joint GLFT/SAT meeting, questions were asked regarding the upcoming relicensing. The specific questions and associated discussion are included in the meeting notes.

Pre-FERC Process Stakeholder Meeting and Contacts

Stakeholders		**Meeting Date**
Invitees	Attendees	
Michigan Department of Environmental Quality Michigan Department of Natural Resources Michigan Department of the Attorney General Michigan State Historic Preservation Office US Army Corps of Engineers US Fish and Wildlife Service US Environmental Protection Agency National Park Service Michigan Hydro Relicensing Coalition Great Lakes Advisory Board Michigan United Conservation Clubs National Wildlife Federation 2nd District Representative – Federal 101st District Representative – State 35th District Senator – State City Clerk – Ludington Pere Marquette Township Clerk Summit Township Clerk Mason County Clerk Ottawa County Clerk Mason County Drain Commissioner Mountain Beach Association Mason County District 2 Commissioner Bay Mils Indian Community Red Lake Band of Chippewa Indians of Minnesota Saginaw Chippewa Indian Tribe of Michigan Sault Saint Marie Tribe of Chippewa Indians of Michigan Burt Lake Tribe of Ottawa an Chippewa Indians Grand River Band of Ottawa Indians Hannahville Potawatomi Indians Keweenaw Bay Indian Community Lac Vieux Desert Band of Lake Superior Chippewa Indians Match-e-be-nash-she-wish Band of Potawatomi Indians of Michigan Nottawaseppi Huron Band of Potawatomi Ottawa Tribe of Oklahoma Pokagon Band of Potawatomi Wyandotte Tribe of Oklahoma Grand Traverse Band of Ottawa and Chippewa Indians Little River Band of Ottawa Indians Little Traverse Bay Bands of Odawa Indians Chippewa-Ottawa Treaty Fishery Management Authority	Pere Marquette Township Supervisor Michigan United Conservation Clubs Mason County Supervisor Mountain Beach Association Michigan Department of Natural Resources Michigan Department of the Attorney General U.S. Fish and Wildlife Service Michigan Hydro Relicensing Coalition	May 9, 2013

APPENDIX C

CURRENT LICENSE REQUIREMENTS

LUDINGTON ORDERS
Project no. 2680

Order & License	Order Issuing License	July 30, 1969
42 F.P.C. 274	ORDER ISSUING LICENSE (MAJOR)	July 30, 1969
16 FERC P 62596	Order Approving Revised Exhibit L & M Drawings	1981
40 FERC P 62151	Order Modifying a Mitigative Plan for Turbine Mortality	1987
43 F.P.C. 544	ORDER APPROVING REVISED EXHIBIT L DRAWINGS FOR PROJECT AND MODIFYING LICENSE	April 16, 1970
44 FERC P 62324	Order Requiring Installation and Monitoring of Temporary Barrier Nets	September 30, 1988
49 F.P.C. 47	ORDER APPROVING EXHIBIT K	January 5, 1973
50 FERC P 62093	Order Approving Modifications to Barrier Net	February 9, 1990
52 F.P.C. 1809	ORDER APPROVING SETTLEMENT AGREEMENT AND TERMINATING PROCEEDING	December 16, 1974
59 F.P.C. 1891	ORDER APPROVING EASEMENT ACROSS PROJECT LANDS	September 15, 1977
74 FERC P 61055	Commission Opinions, Orders and Notices	January 23, 1996
84 FERC P 61147	Order Approving Angler Access Plan and Revised Exhibit M	August 4, 1998
84 FERC P 62168	Order Approving Exhibit L Drawing	August 21, 1998
87 FERC P 61150	Order Denying Rehearing	May 4, 1999
94 FERC P 62122	ORDER AMENDING LICENSE TO CORRECT EXHIBIT M AND TO REMOVE CERTAIN TRANSMISSION FACILITIES FROM PROJECT LICENSE	February 09, 2001
98 FERC P 62059	ORDER APPROVING REVISED EXHIBITS J, K, L AND M	January 31, 2002
99 FERC P 62063	ORDER APPROVING REVISED EXHIBIT J AND K DRAWINGS AND EXHIBIT R AS-BUILT DRAWINGS	April 25, 2002
123 FERC P 62087	ORDER AMENDING FEBRUARY 16, 2001 ORDER	May 01, 2008
139 FERC P 62101	Order Amending License	May 7, 2012

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42 F.P.C. 274, 1969 WL 5463 (F.P.C.)

1 **CONSUMERS POWER COMPANY
the detroit edison company/,

PROJECT NO. 2680

ORDER ISSUING LICENSE (MAJOR)

July 30, 1969

***274** LICENSE (MAJOR)-UNCONSTRUCTED PROJECT-RECREATION

Before Commissioners: Lee C. White, Chairman; L. J. O'Connor, Jr., Carl E. Bagge, John A. Carver, Jr. and Albert B. Brooke, Jr.
Application was filed on June 24, 1968, by **Consumers Power** Company of Jackson, Michigan and The Detroit Edison Company of Detroit, Michigan (Applicants) for a license under Section 4(e) of the Federal Power Act (Act) for proposed Project No. 2680, known as the **Ludington Pumped Storage** Project to be located on Lake Michigan in Mason, Oceana, Newaygo, Muskegon, and Ottawa Counties, Michigan. No lands of the United States are affected by the project.

Applicants propose to construct and operate hydroelectric facilities comprising a pumped storage development having a capacity of 1,872,000 kilowatts to be used ***275** for public utility purposes. The project will consist principally of an upper reservoir, six penstocks extending between the upper reservoir and Lake Michigan, a powerhouse, a substation, switchyard, a transmission line and six spur lines, and appurtenant facilities.

The Secretary of the Army and the Chief of Engineers reported that the plans of the structures affecting navigation are satisfactory, and recommended that any license include Article 22 of the Commission's Form L-4 which concerns dredged or excavated material being removed to the satisfaction of the Corps' District Engineer.

The Department of the Interior, in reporting on the application, stated that the recreation development plan and the fish and wildlife plan (Exhibits R and S, respectively) are adequate. The Department recommends that the appropriate L-Form be included in any license issued. It further recommends that precautions be taken to minimize visual effects of the transmission lines on the landscape and

that consideration be given to landscaping the dike and varying its elevation to blend the ridge line into the natural terrain. It also recommends that adequate fish barriers be installed at the intake-discharge lagoon and that the area around the jetties be studied relative to its availability for fishing.

Applicants commented on the Department of Interior's recommendations in a letter to the Commission dated December 20, 1968, stating that the smallest variation in elevation of the dike that would produce a meaningful change in appearance is thirty feet, and over half the perimeter of the dike would be affected. Such a variation would necessitate the addition of millions of yards of fill materials to the dike, increasing the costs in the neighborhood of ten million dollars. Applicants add that to vary the elevation would also entail design and construction problems resulting in more additional costs, and if the top of the dike were landscaped with trees the possibilities of erosion and root penetration would increase. Applicants oppose use of the jetties for fishing purposes due to their close proximity to the water intakes and discharges of the plant. Other areas better suited to fishing are located near the project. We believe that the Department of Interior's interests are essentially provided for in the Commission's Form L-4 and Article Nos. 37, 38 and 39 of this license.

****2** The Department of Agriculture reported that it would cooperate with Applicants to protect National Forest resources and scenic values where they may be affected by the construction of the transmission line from Ludington to Tallmadge Junction. Applicants replied that they do not anticipate that any portion of this transmission line would occupy National Forest land.

The recreational development proposed at the project will be as follows: a vista point will be developed at a bluff overlooking Lake Michigan for use both during and after construction; to coincide with project development, a second overlook, with shelter, will be located atop the upper reservoir dike; and in addition there will be a picnic and playground area, parking lots, a camping area, and natural trails, one of which will be open to snowmobiling. A roadside park will be developed by the Michigan Highway Department upon completion of the Route 31 highway. Adequate lands for future needs will be reserved for development as demand dictates, including expansion of the picnic and camping sites.

The Commission finds:
(1) The project affects navigable waters of the United States.

(2) Applicant Consumers is a corporation organized under the laws of the State of Michigan and Applicant Edison is a corporation organized under the laws ***276** of the States of Michigan and New York, and each has submitted satisfactory evidence of compliance with the requirements of all applicable State laws insofar as necessary to effectuate the purposes of a license for the project.

(3) Public notice of the filing of the application has been given. No protest or

petitions to intervene have been received. No conflicting application is before the Commission.

(4) Applicants have submitted satisfactory evidence of their financial ability to construct and operate the proposed project.

(5) The estimated annual cost of developing power from the proposed project is less than the estimated annual cost to Applicants of developing alternative sources of power.

(6) The power to be produced by the project is needed to meet the load growth in the service areas of Applicants.

(7) The project does not affect a Government dam, nor will the issuance of a license therefor, as hereinafter provided, affect the development of any water resources for public purposes which should be undertaken by the United States.

(8) Subject to the terms and conditions hereinafter imposed, the project will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, and for other beneficial public uses, including recreational purposes.

(9) The installed horsepower capacity of the project hereinafter authorized for the purpose of computing the capacity component of the administrative annual charge is 2,496,000 horsepower, and the amount of annual charges, based on such capacity, to be paid under the license for the project, for the costs of administration of Part I of the Act is reasonable.

****3** (10) The generator leads, the six step-up transformers at the plant, the six short 345 kv transmission lines from the plant transformers to the Ludington 345 kw switchyard, the 345 kv double circuit line extending from the Ludington switchyard to East Tallmadge, and appurtenant facilities, are parts of the project within the meaning of Section 3(11) of the Act and should be included in this license.

(11) The exhibits designated and described in paragraph (B) below conform to the Commission's rules and regulations and should be approved as part of this license.

The Commission orders:

(A) This license is hereby issued to **Consumers Power** Company and The Detroit Edison Company (Licensees) under Section 4(e) of the Federal Power Act (Act) for a period of 50 years, effective as of July 1, 1969, for the construction, operation, and maintenance of the **Ludington Pumped Storage** Project No. 2680, located on Lake Michigan, State of Michigan, subject to the terms and conditions of the Act which is incorporated herein by reference as a part of this license and subject to such rules and regulations as the Commission has issued or prescribed thereunder.

(B) The proposed **Ludington Pumped Storage** Project consists of:

(i) all lands constituting the project area and enclosed by the project boundary or the licensees' interest in such lands the limits of which are otherwise defined, and the use and occupancy of which are necessary for the purposes of the project; such project area and project boundary being shown and described by certain ***277** exhibits which form part of the application for license and which are designated and described as follows:

Exhibit	Sheet	FPC No. 2680-	Showing
J	1	3	General map of project area.
K	1	4	Detail map of project area property line.
	2	5	

(ii) project works would consist of:

(1) *An upper pool*-a storage reservoir, formed by a dike with a maximum height of 170 feet and a perimeter of six miles, with 82,300 acre-feet of gross storage capacity at maximum water surface elevation 942.

(2) *Conduits:* Six steel penstocks about 1,300 feet long with inside diameters varying from 28.5 to 24 feet.

(3) *Powerhouse:* An outdoor-type powerhouse located adjacent to Lake Michigan, containing six pump-turbine and motor-generator units each with a nominal rated capacity of 270,000 kw and a maximum capacity of 312,000 kw, operating under a gross head ranging from 295 feet to 362 feet.

(4) *Tailrace:* An excavated tailrace channel in Lake Michigan protected by jetties on the Northerly and Southerly sides and an outer breakwater paralleling the shoreline.

(5) *Transmission facilities:* The generator leads, the six step-up transformers at the plant, the six 345 kv transmission lines from the plant to the Ludington 345 kv switchyard, and the 345 kv double circuit line extending from the Ludington switchyard to East Talmadge Junction.

****4** (6) *Recreational facilities* consisting of sightseeing facility, parking areas, picnic areas, camping site, lake overlook, playground, and essential water supply and sanitary treatment facilities, and

(7) *Appurtenant facilities*, the location, nature and character of which are shown on the exhibits hereinbefore cited and are more specifically described by certain other exhibits which also form part of the application for license and which are designated and described as follows:

Exhibit	Sheet	FPC No. 2680	Showing
L	1	6	General plan.
	2	7	Profile and sections.
	3	8	Power intake plan and sections.
	4	9	Powerhouse plan and sections.
	5	10	Lakefront plans and sections.

Exhibit M, consisting of three typewritten pages entitled ‘Exhibit M’ filed as part of the application and revised on February 3, February 17, and March 12, 1969.

Exhibit R, consisting of pages 18 through 22 of the Consultant's report entitled ‘Recreation Facilities Plan’, pages 4 through 7 (paragraph (b)) of Applicants' Exhibit R text and the Exhibit R map (FPC No. 2680-22).

(iii) all other structures, fixtures, equipment or facilities used or useful in the maintenance and operation of the project and located on the project area, including such portable property as may be used or useful in connection with the ***278** project or any part thereof whether located on or off the project area, if and to the extent that the inclusion of such property as part of the project is approved or acquiesced in by the Commission; also all riparian or other rights the use or possession of which is necessary or appropriate in the maintenance or operation of the project.

(C) This license is also subject to the terms and conditions set forth in Form L-4 (Revised November 1, 1968) entitled ‘Terms and Conditions of License for Unconstructed Major Project Affecting Navigable Waters of the United States' (*infra*, p. 280) which terms and conditions, designated as Articles 1 through 30, are attached hereto and made a part hereof and subject to the following special conditions set forth herein as additional articles:

Article 31. Licensees shall pay to the United States the following annual charge, effective as of July 1, 1969:

For the purpose of reimbursing the United States for the costs of administration of Part I of the Act, a reasonable annual charge as determined by the Commission in accordance with the provisions of its regulations in effect from time to time. The authorized installed capacity for such purpose is 2,496,000 horsepower.

Article 32. Licensees shall, in accordance with the Commission's Rules and Regulations, submit revised Exhibit L drawings and Exhibit M showing the final design of the project works. The Licensees shall not begin construction of such project works until the Commission has approved such exhibits.

****5** *Article 33*. Licensees shall retain a board of three or more independent qualified consultants to assess and make recommendations, for safety and adequacy, as to the specifications, design, and construction of the project. Among other things, the board shall assess: the geology of the project site and surroundings; the proposed design, specifications, and construction of the dike embankment, asphaltic concrete lining, other linings, and drainage systems which constitute the upper reservoir, and the associated dike instrumentation and plans for surveillance thereof during test filling and operation; and proposed design, specifications, and the construction of the powerhouse, waterways, electrical and mechanical equipment involved in water control, emergency power supply, other project works, and the construction inspection program. The Licensees shall submit the board's reports to the Commission covering each portion of the project prior to or simultaneously with the submittal of the corresponding revised Exhibit L final design drawings and Exhibit M. The Licensees shall also submit the board's final report covering the construction of the entire project including a schedule for test filling of the upper reservoir; and the Licensees shall receive the approval of the Commission, prior to the initial filling of the project's upper reservoir.

Article 34. Primary and back-up systems shall be provided to stop the pumping cycle automatically when the upper reservoir water surface reaches a predetermined level not to exceed elevation 942. The licensees shall design the dike facilities facing Lake Michigan with a lower section so as to direct inadvertent overpumpage; and reservoir releases resulting therefrom, into a channel and thence into Lake Michigan. The design of the section of dike subjected to inadvertent overpumpage, and the extent of land purchases or flowage rights required for the channel, shall be based on competent hydraulic studies or model tests.

Article 35. Licensees shall submit the results of hydraulic model studies on the lake front structures, on the intake/discharge structure in the upper reservoir, and on the pump/turbine units, to insure their proper operation. The Licensees shall also submit the results of either computations or model studies of expected ***279** transient pressure conditions in the penstocks made in order to establish the basis for the final design of the penstocks.

Article 36. Licensees shall commence construction of the project works not later than two years after the issuance of this license, shall thereafter in good faith

and with due diligence prosecute such construction and shall complete construction of such project works not later than 6 years after the issuance of this license.

Article 37. Licensees, following consultation with the U.S. Fish and Wildlife Service and the Michigan Conservation Department, shall make or pay the cost of making biological and limnological studies before and after construction of the project to determine the effects of the project and its operation on the fishery resources of the project area, including an evaluation of the need to provide public fishing access to the jetties, and shall file with the Commission copies of reports of such studies within six months following their completion, and shall make such modifications in project facilities and operations as may be required under Article 16, herein.

**6 *Article 38*. Licensees, following consultation with the U.S. Fish and Wildlife Service and the Michigan Department of Conservation, shall make or pay the cost of making studies, including model studies, to determine the location and adequacy of various types of fish barriers at the project and the effect on the species of fish to be found in the project area of negative and positive pressures and pressure changes within the range expected to be found in the scroll case, penstocks, and draft tubes during the operation of the project and shall construct, operate, and maintain or provide for the construction, operation and maintenance of such fish barrier facilities or provide such deeper submergence of the turbine-pump runners and modify other project facilities and their operation as determined necessary to protect the fishery resources of the project area, as may be required by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the Michigan Conservation Department. Licensees shall file with the Commission quarterly progress and final reports on the studies required herein, and file for Commission approval prior to commencement of construction thereof plans for any fish protection facilities or for modification of any project facilities and operation which are determined to be desirable and appropriate for the protection of fish.

Article 39. Licensees shall minimize any disturbance caused by construction and maintenance of the project works to the scenic values of the area by consulting with the appropriate Federal and State agencies and professional landscape architects or planners in developing a plan for reasonable treatment as needed to soften the profile of the ridge line of the dike of the upper reservoir and shall within 6 months of issuance of this license submit for Commission approval an architectural rendering and general design drawing, conforming to Section 4.42 of the Commission's Regulations, showing the plan developed. In the event Licensee and the agencies are unable to agree on the matters herein, the Commission reserves the right to resolve any differences after notice and opportunity for hearing.

Article 40. Licensees, following consultation with appropriate Federal, State and local agencies, shall file for Commission approval, within one year after the date

of issuance of this license Exhibits J and K in conformity with Sections 4.41 and 4.42 of the Regulations for the 345 kv transmission line from the Ludington Switchyard to East Tallmadge and their plan for preservation and enhancement of the environment as it may be affected by powerhouse and transmission line design and siting. In preparing the plan Licensees shall give appropriate ***280** consideration to recognized guidelines for protecting the environment and to beneficial uses, including wildlife, of the transmission line right-of-way.

(D) The exhibits designated and described in paragraph (B) above conform to the Commission's rules and regulations and are hereby approved as part of this license to the extent that they show the general layout and scope of the project works.

****7** (E) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313(a) of the Act, and failure to file such an application shall constitute acceptance of this license. In acknowledgment of the acceptance of this license, it shall be signed for the licensee and returned to the Commission within 60 days from the date of issuance of this order.

Commissioner Bagge *concurring*.

BAGGE, *Commissioner, concurring:*

For the same reasons expressed in my concurring statement in the Order Issuing License (Major) for Project No. 2685 dated June 6, 1969, 41 FPC 712, 725, I concur in the issuance of the license to **Consumers Power** Company and The Detroit Edison Company for the **Ludington Pumped Storage** Project No. 2680. It is my hope that the licensees, in adhering to Article 40 of the license, which provides that they 'shall give appropriate consideration to recognized guidelines for protecting the environment and to beneficial uses, including wildlife, of the transmission line right-of-way', would look to any rely upon the explicit guidelines for the protection of aesthetic and other environmental values set forth in the Report of the Working Committee on Utilities of the President's Council on Recreation and Natural Beauty dated December 27, 1968. I believe that these guidelines, a copy of which is appended* to this concurring statement are especially apropos to licensees' approximately 78 miles of double circuit 345 kv primary transmission lines which are included within the project.

It seems to me that Article 40 of the license is totally meaningless in the absence of any definition by the Commission of what shall constitute 'recognized guidelines'. Since the Commission has not chosen to 'recognize' any guidelines, I am compelled to append the recent efforts of the Working Committee on Utilities to this license with an expression of hope that at least the licensees will act responsibility in this matter.

FORM L-4

(Revised November 1, 1968)

TERMS AND CONDITIONS OF LICENSE FOR UNCONSTRUCTED MAJOR PROJECT AFFECTING NAVIGABLE WATERS OF THE UNITED STATES

Article 1. The entire project, as described in the order of the Commission, shall be subject to all the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: *Provided, however:* That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval amended, supplemental, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the ***281** license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

****8** *Article 3*. Said project works shall be constructed in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, no substantial alteration or addition not in conformity with the approved plans shall be made to any dam or other project works under the license without the prior approval of the Commission; and any emergency alteration or addition so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in the project works or divergence from such approved exhibits may be made if such changes will not result in decrease in efficiency, in material increase in cost, or in impairment of the general scheme of developoment; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct. Upon the completion of the project, or at such other time as the Commission may direct, the Licensee shall submit to the Commission for approval revised maps, plans, specifications, and statements insofar as necessary to show any divergence from or variations in the project area and project boundary as finally located or in the project works as actually constructed when compared with the area and boundary shown and the works described in the license or in the maps, plans, specifications, and statements approved by the Commission, together with a statement in writing setting forth the reasons which in the opinion of the Licensee necessitated or justified variations in or devergence from the approved maps, plans, specifications, and statements. Such revised maps, plans, specifications, and statements shall, if and when approved by the Commission, be made a part of the license under the provisions of Article 2 hereof.

Article 4. The construction, operation, and maintenance of the project and any work incident to additions or alterations shall be subject to the inspection and supervision of the Regional Engineer, Federal Power Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of the project. Construction of the project works or any feature thereof shall not be initiated until the program of inspection for the project works or any such feature thereof has been approved by said representative. The Licensee shall also furnish to said representative such further information as he may require concerning the construction, operation, and maintenance of the project, and of any alteration thereof, and shall notify him of the date upon which work will begin, as far in advance hereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall allow him and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may from time to time prescribe for the protection of life, health, or property.

***9 *282** *Article 5*. The Licensee within two years from date of issuance of the license shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction, maintenance and operation of the project. The Licensee, its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deed or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. In the event the project is taken over by the United States upon the termination of the license, as provided in Section 14 of the Act, or is transferred to a new licensee under the provisions of Section 15 of the Act, the Li-

censee, its successors and assigns will be responsible for and will make good any defect of title to or of right of occupancy and use in any of such project property which is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and will pay and discharge, or will assume responsibility for payment and discharge, of all liens or incumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: *Provided*, That the provisions of this article are not intended to require the Licensee, for the purpose of transferring the project to the United States or to a new Licensee, to acquire any different title to or right of occupancy and use in any of such project property than was necessary to acquire for its own purposes as Licensee.

Article 7. The actual legitimate original cost of the original project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Act and the Commission's rules and regulations thereunder.

Article 8. After the first 20 years of operation of the project under the license, six percent per annum shall be the specified rate of return on the net investment in the project for determining surplus earnings of the project for the establishment and maintenance of amortization reserves, pursuant to Section 10(d) of the Act; one-half of the project surplus earnings, if any, accumulated after the first 20 years of operation under the license, in excess of six percent per annum on the net investment, shall be set aside in a project amortization reserve account as of the end of each fiscal year: *Provided*, That, if and to the extent that there is a deficiency of project earnings below six percent per annum for any fiscal year or year after the first 20 years of operation under the license, the amount of such deficiency shall be deducted from the amount of any surplus earnings accumulated thereafter until absorbed, and one-half of the remaining surplus earnings, if any thus cumulatively computed, shall be set aside in the project amortization reserve account; and the amounts thus established in the project amortization reserve account shall be maintained therein until further order of the Commission.

10 ***283 *Article 9*. For the purpose of determining the stage and flow of the stream or streams from which water is diverted for the operation of the project works, the amount of water held in and withdrawn from storage, and the effective head on the turbines, the Licensee shall install and thereafter maintain such gages and stream-gaging stations as the Commission may deem necessary and best adapted to the requirements; and shall provide for the required readings of such gages and for the adequate rating of such stations. The Licensee shall also install and maintain standard meters adequate for the determination of the amount of electric energy generated by said project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission and may be altered from time to time if necessary to secure adequate determinations, but such alteration shall not be made except with the approval of the Commission or upon the spe-

cific direction of the Commission. The installation of gages, the ratings of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of said project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient record of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 10. The Licensee shall install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so, after notice and opportunity for hearing.

Article 11. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems ad in such manner as the Commission may direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 12. Whenever the Licensee is directly benefited by the construction work of another licensee, a permittee, or of the United States of a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for such part of the annual charges for interest, maintenance, and depreciation thereon as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United States the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the costs of making the determinations pursuant to the then current Commission Regulations under the Federal Power Act within 60 days from the date of rendition of a bill therefore and, upon failure to do so, shall thereafter be subject to the payment of the penalties specified in the then current Regulations. The Licensee shall have the right to pay such amounts under protest within the 60-day period and to reconsideration of the determination of the amounts billed or a hearing as provided by the then current Regulations under the Act.

****11** *Article 13*. The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may ***284** be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the

Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes; and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

Article 14. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall, after notice and opportunity for hearing, permit such reasonable use of its reservoirs or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission in the interest of comprehensive development of the waterway or waterways involved and the conservation and utilization of water resources of the region, for water supply for the purpose of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation, at least full reimbursement for any damages or expenses which the joint use causes him to incur, for use of its reservoirs or other project properties or parts thereof for such purposes, any such compensation to be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to apoplicable State law, or a showing of cause why such evidence cannot be concurrently submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 15. In the construction or maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines and telegraph, telephone and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling or obstructing traffic or endangering life. None of the provisions of this article are intended to relieve the Licensee from any responsibility or requirement which may be imposed by other lawful authority for avoiding or eliminating inductive interference.

**12 *Article 16*. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance and operation lof such facilities and comply with such reasonable modifications of the project structures and operation as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which

the project or a part thereof is located, after notice and opportunity for hearing and upon findings based on substantial evidence that such facilities and modifications are necessary and desirable, reasonably consistent with the primary purpose of the project, and consistent with the provisions of the Act.

***285** *Article 17*. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of Licensee's lands and interest in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be prescribed by the Commission, reasonably consistent with the primary purpose of the project, in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 18. The Licensee shall construct, maintain and operate or shall arrange for the construction, maintenance and operation of such recreational facilities including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities and utilities, and shall comply with such reasonable modifications of the project structures and operations as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal and State agencies, after notice and opportunity for hearing and upon findings based upon substantial evidence that such facilities and modifications are necessary and desirable, and reasonably consistent with the primary purpose of the project.

Article 19. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and recreational purposes, including fishing and hunting, and shall allow to a reasonable extent for such purposes the construction of access roads, wharves, landings, and other facilities on its lands the occupancy of which may in appropriate circumstances be subject to payment of rent to the Licensee in a reasonable amount: *Provided*, that the Licensee may reserve from public access, such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property and *Provided, further*, that the Licensee's consent to the construction of access roads, wharves, landings, and other facilities shall not, without its express agreement, place upon the Licensee any obligation to construct or maintain such facilities. These facilities are in addition to the facilities that the Licensee may construct and maintain as required by the license.

****13** *Article 20*. The Licensee shall be responsible for and shall take reasonable measures to prevent soil erosion on lands adjacent to the stream and to prevent stream siltation or pollution resulting from construction, operation or maintenance of the project. The Commission upon request, or upon its own motion, may order the Licensee to construct and maintain such preventive works to accomplish these purposes and to revegetate exposed soil surface as the Commission may find to be necessary after notice and opportunity for hearing.

Article 21. The Licensee shall clear and keep clear to an adequate width lands along open conduits, shall clear lands within the bottom and margin of reservoirs (except as may be otherwise specified in the license), and shall dispose of all temporary structures, unused timber, brush, refuse, or inflammable material resulting from the clearing of lands or from the maintenance or alteration of the ***286** project works. In addition, all trees along the margins of reservoirs within the project boundaries, which may die during operations of the project shall be removed. The clearing of the lands and the disposal of the material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission.

Article 22. Insofar as any material is dredged or excavated in the prosecution of any work authorized under the license, or in the maintenance of the project, such material shall be removed and deposited so it will not interfere with navigation, and will be to the satisfaction of the District Engineer, Department of the Army, in charge of the locality.

Article 23. Whenever the United States shall desire to construct, complete, or improve navigation facilities in connection with the project, the Licensee shall convey to the United States, free of cost, such of its lands and its rights-of-way and such right of passage through its dams or other structures, and permit such control of pools as may be required to complete and maintain such navigation facilities.

Article 24. The Licensee shall furnish free of cost to the United States power for the operation and maintenance of navigation facilities at the voltage and frequency required by such facilities and at a point adjacent thereto whether said facilities are constructed by the Licensee or by the United States.

Article 25. The operation of any navigation facilities which may be constructed as a part of or in connection with any dam or diversion structure constituting a part of the project works shall at all times be controlled by such reasonable rules and regulations in the interest of navigation, including the control of the level of the pool caused by such dam or diversion structure, as may be made from time to time by the Secretary of the Army.

Article 26. The Licensee shall for the protection of navigation, construct, maintain and operate at its own expense such lights and other signals on fixed struc-

tures in or over navigable waters of the United States as may be directed by the Secretary of the Department in which the Coast Guard is operating.

**14 *Article 27*. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project for a period of three years, or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license, and not less than 90 days after public notice may in its discretion terminate the license.

Article 28. Upon abandonment of the project the Licensee shall remove all structures, equipment and power lines from the stream and restore said stream to a condition satisfactory to the Commission's authorized representative and shall fulfill such other obligations under the license as the Commission may prescribe.

Article 29. The right of the Licensee and of its transferees and successors to use or occupy waters, over which the United States has jurisdiction, under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless Licensee has obtained a new license pursuant to the then existing laws and regulations or an annual license under the terms and conditions of this license.

Article 30. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

FN* [Editor's note: Guidelines printed at 41 FPC 725.]

FEDERAL POWER COMMISSION

42 F.P.C. 274, 1969 WL 5463 (F.P.C.)
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16 FERC P 62596, 1981 WL 312879 (F.E.R.C.)

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1
Office Director Orders

Consumers
Power
Company and Detroit Edison Company

Project No. 2680

Order Approving Revised Exhibit L Drawings and Revised Exhibit M [FN1]

(Issued 1981)

***64126** William W. Lindsay, Director, Office of Electric Power Regulation.

The **Consumers Power** Company and the Detroit Edison Company, joint licensees for the **Ludington Pumped Storage** Project, FERC No. 2680, filed on November 5, 1976 and April 21, 1981 revised Exhibit L drawings and a revised Exhibit M for Commission approval.

The revised Exhibit L drawings show “as-built” details of the project, and confirm that the project was constructed in substantial conformity with the Exhibit L drawings originally approved and made part of the license. The revised Exhibit L drawings conform with the Commission's regulations and should be approved.

The revised Exhibit M shows that the installed capacity of the project has decreased from 1,872 MW to 1,657.5 MW, and that the transmission line extending from the Ludington Switchyard terminates at the Kenowa Substation instead of East Tallmadge Junction.

Approval of the revised Exhibits is purely an administrative matter and not a major federal action affecting the quality of the human environment.

It is ordered that:

(A) The following Exhibit L drawings are approved and made a part of the license for FERC Project No. 2680, superseding the drawings noted:

TABULAR OR GRAPHIC MATERIAL SET FORTH AT THIS POINT IS NOT DISPLAYABLE

(B) The superseded exhibit drawings are eliminated from the license.

(C) The revised Exhibit M titled “General Description of the Mechanical Equipment and Electrical Equipment of the Project”, consisting of four typed-pages filed on April 21, 1981, is approved and made a part of the license, superseding the Exhibit M previously approved and removing it from the license.

(D) The project description set forth in ordering paragraph (B, ii, 3) of the license is revised to read as follows:

(3) *Powerhouse:* an outdoor-type powerhouse adjacent to Lake Michigan, containing six pump-turbine and motor-generator units each with a name plate rating of 276,250 Kw.

***64127** (E) The project description set forth in ordering paragraph (B, ii, 5) of the license is revised to read as follows:

****2** (5) *Transmission facilities:* The generator leads, the ten single phase transformers (a total of three banks plus one spare transformer) at the plant, the three 345-Kv transmission lines from the plant to the Ludington 345-kv switchyard, and the 345-kv double-circuit line extending from the Ludington switchyard to Kenowa Substation.

(F) Article 31 of the license is revised to read as follows:

Article 31. Licensees shall pay to the United States the following annual charge. For the purpose of reimbursing the United States for the costs of administration of Part I of the Act, a reasonable annual charge as determined by the Commission in accordance with the provisions of its regulations in effect from time to time. The authorized installed capacity for such purpose is 2,210,000 horsepower.

(G) Within 90 days of the date of issuance of this order, the Licensees shall file reproductions of the originals of the approved Exhibit L drawings reproduced on silver or gelatin 35 mm microfilm mounted on type D (3 1/4' x 7 3/8') aperature cards. In addition, the Licensees shall file two Diazo-type duplicate aperature cards for each drawing. The FERC Drawing Number 2680-40 to 43, and 2680-54 to 2680-56 shall be shown in the margin below the title block of each of the microfilmed drawings, and also in the upper right corner of each aperature card with the Licensees' exhibit numbers.

(H) This order is final unless a petition appealing it ling it to the Commission is filed within 30 days from the date of its issuance, as provided in Section 1.7(d) of the Commission's regulations, 18 C.F.R. 1.7 (d) (1980).

FN1. Authority to act on this matter is dele gated to the Director, Office of Electric Power Regulation, under Section 375.308 of the Commission's Regulations, Sec. 375.308 (1980), as amended by 46 Fed. Reg. 14119 (1981).

Federal Energy Regulatory Commission

16 FERC P 62596, 1981 WL 312879 (F.E.R.C.)
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40 FERC P 62151, 1987 WL 117926 (F.E.R.C.)

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1
Office Director Orders

Consumers
Power
Company and Detroit Edison Power Company

Project No. 2680-002

Order Modifying a Mitigative Plan for Turbine Mortality

(Issued August 11, 1987)

***63253** Fred E. Springer, Acting Director, Office of Hydropower Licensing.

On August 11, 1986, **Consumers Power** Company and Detroit Edison Power Company (licensee) filed a mitigative plan pursuant to articles 16 and 37 of the license for the **Ludington Pumped Storage** Project. Article 37 of the license requires the licensee to conduct biological and limnological studies before and after project construction to determine the effects of the project on the aquatic resources of the area, to evaluate the need to provide public fishing access to the jetties, and to make such modifications in project facilities and operation as may be required under article 16. Article 16 requires the licensee to make changes in project structures or project operation to protect aquatic resources.

Studies conducted by the licensee show that large numbers of fish are being killed and injured as a result of project operation. The licensee's plan is intended to mitigate for the impacts to the fish resources of the Great Lakes caused by project operation and to provide offsite public access instead of developing onsite access at the jetties. The plan includes provisions for: modifying the operation of the Ludington facility; establishing minimum flows, installing recreational facilities, and imposing operational changes at the licensee's hydroelectric projects elsewhere in Michigan; constructing and funding fishery management projects throughout Michigan; and providing funds to state and local governments to install boat ramps and other recreational facilities.

Agency Comments
The U.S. Fish and Wildlife Service (FWS), in a letter dated July 25, 1986, says

that the licensee's plan does not provide sufficient or appropriate measures to mitigate the adverse effects of the Ludington facility on the Lake Michigan fishery and that additional actions are needed to prevent or reduce fish losses at the site. The Michigan Department of Natural Resources (MDNR), in a letter dated July 29, 1986, opposes the licensee's plan. The Michigan United Conservation Clubs (MUCC) and the National Wildlife Federation (NWF) in a letter dated January 7, 1987, state that the licensee's proposal does not constitute a mitigative plan, that it does not provide adequate compensation for the fish losses at Ludington, and that the Commission's acceptance of the plan would be premature. MUCC and NWF conclude that the licensee should study the feasibility of installing fish protection devices.

In a letter dated September 8, 1986, the Attorney General of Michigan (Michigan), on behalf of the State of Michigan, the Michigan Natural Resources Commission, and the MDNR filed a complaint against the effects of the Ludington facility on the fishery resources of the Great Lakes. The Department of the Interior (Interior), in a letter dated May 14, 1987, filed a motion to intervene in proceedings on the Ludington facility. Michigan and Interior recommend that the licensee do the following: (1) install temporary barrier nets at the entrance to the intake-discharge channel; (2) conduct engineering studies of alternative barrier methods and install permanent fish barriers; (3) provide mitigation for resources lost to previous project operation; (4) provide mitigation for unavoidable future fish mortality; and (5) develop public fishing access at the jetties or at comparable sites in the project vicinity. Michigan also recommends that the licensee make or pay for making biological and limnological studies to determine the continuing effects of the Ludington facility on the fishery resources.

****2** In response to Michigan's complaint, the licensee states, in a letter dated October 6, 1986, that no practical and feasible technology is available to prevent losses of aquatic organisms at the Ludington site. In response to Interior's petition to intervene, however, the licensee, in a May 29, 1987 letter, says it is ***63254** studying the feasibility of installing certain fish protection devices.

The Mitigative Plan

To reduce the levels of fish mortality, the licensee proposes to modify project operation by imposing a 30-minute delay between generation and pumping. The licensee states that this operational change would allow fish attracted to the discharge flows the opportunity to disperse before the start of pumping into the reservoir. FWS states that the project was operating with a 30-minute pause between generating and pumping when the licensee identified significant fish losses during the initial limnological studies, and that such a pause would not reduce fish mortality.

The licensee's proposal to impose a 30-minute delay between pumping and generating is not acceptable mitigation as the licensee has not demonstrated that the operational change would significantly reduce the levels of fish mortality. Changing

project operation would be an acceptable form of mitigation for the fish losses occurring at the Ludington facility, provided the licensee demonstrates that the operational changes would significantly reduce fish mortality. The licensee, after consulting with the resource agencies, should evaluate the feasibility of reducing fish mortality by altering project operation.

The licensee proposes to improve public access and to impose operational changes at its hydroelectric projects in other areas of Michigan as mitigation for the fish mortality occurring at the Ludington facility. These changes include establishing minimum flows, maintaining stable tailwater elevations, and improving public access at project reservoirs and tailrace areas. FWS states that fishery problems at other hydroelectric facilities should be resolved during the relicensing process for those facilities.

Changing project operation and improving public access at other hydroelectric projects would not protect the fish resources of the Great Lakes being affected by the Ludington project. The need to modify other hydroelectric projects to protect or enhance environmental resources or to add recreational facilities should be addressed when these projects are considered for relicensing or under existing standard license articles.

The licensee proposes to provide funds to the MDNR as mitigation for the fish mortality at the Ludington facility. These funds would be used for offsite fishery management projects, such as improving fish habitat and upgrading MDNR fish rearing facilities. FWS states that the licensee should take additional actions to prevent or reduce fish losses at the Ludington facility before considering offsite compensatory measures.

Offsite fishery enhancement measures, such as those proposed by the licensee, may be necessary to compensate for unavoidable fish injury and mortality at the project. The licensee should consider compensation for unavoidable fish losses occurring at the Ludington facility only after specific onsite measures to reduce fish injury and mortality are evaluated and, if found to be feasible, are implemented.

****3** The licensee proposes to provide funds to enhance fishing and other recreational access to areas in the vicinity of, but outside, the project boundary rather than develop public access at the project jetties. The licensee believes that providing safe access to the jetties is not economically feasible.

FWS does not oppose offsite development of public access, but it says that providing access to the jetties is feasible. MDNR opposes the licensee's proposal to exclude onsite access and states that the jetties could be modified to provide an additional 1,700 angler-days per year.

The licensee does not provide sufficient information to show that onsite access is infeasible. Some measure of access appears not only feasible, but appropriate;

therefore, the licensee, after consulting with the resource agencies, should develop a public access plan that includes a projection of costs and recreational use estimates associated with providing both onsite public access and offsite mitigation.

Conclusions

The mitigative plan filed by the licensee on August 15, 1986, pursuant to articles 16 and 37, proposes offsite measures to compensate for the fishery impacts associated with operation of the Ludington Project. Although the licensee has responded to the requirements set forth in the articles, the plan does not provide an evaluation of modifications to project facilities and project operation to effectively reduce levels of fish injury and mortality.

The licensee's studies show that large numbers of fish are being killed and injured by project operation. The licensee has not provided sufficient information to support the statement that installing fish protection measures is infeasible. Currently there is insufficient information for staff to determine the feasibility or effectiveness of installing fish protection structures or implementing alternate modes of project operation to reduce fish mortality.

***63255** The licensee should conduct a comprehensive analysis of the feasibility of installing permanent fish protection devices and of altering project operation to significantly reduce the levels of fish injury and mortality. The licensee's analysis should include, but need not be limited to, an examination of the following: (1) physical barriers, such as screens and barrier nets; (2) behavioral barriers, such as acoustical stimuli; (3) diversion systems, such as louvers and angled wedge wire screens; (4) operational changes, including a time delay between generation and pumping, reduced project operation during periods of high mortality, and total project shutdown during periods of high mortality; and (5) integrated systems, such as using one or more fish protection devices in conjunction with changes in project operation.

If permanent fish protection measures are found to be feasible, the licensee must submit recommendations for installing these fish protection devices and modifying project operation to minimize fish mortality. The licensee must also submit recommendations for monitoring the effectiveness of any proposed measure and quantifying the amount of unavoidable fish injury and mortality associated with implementing any fish protection measure proposed. If monitoring shows that significant numbers of fish continue to be killed and injured, alternate fish protection devices and changes in project operation may be imposed.

****4** If, however, after all reasonable efforts to reduce fish mortality have been taken, project operation still results in significant fish losses, the licensee should examine appropriate compensation for unavoidable fish injury and mortality. Additional measures such as fish habitat improvements, fish habitat creation, and funding fishery management projects may be used to compensate for the fish losses.

The amount of compensation would depend on the effectiveness of permanent fish protection measures in reducing injury and mortality.

Because the licensee's studies demonstrate that large numbers of adult fish are being killed and injured by project operation, an immediate solution to this problem is needed to reduce these impacts while a permanent solution is being developed. The licensee should install barrier nets in the project tailrace as soon as possible to reduce injury and mortality of adult fish. Since most of the fish losses occur in the spring, summer, and fall, the licensee should operate and maintain barrier nets in the project tailrace during these times until permanent fish protection measures are installed and are operating.

The Director orders:

(A) The licensee, after consulting with the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, must develop a plan to examine the feasibility of implementing permanent mitigative measures for reducing or eliminating fish injury and mortality at the **Ludington Pumped Storage** Project. The plan must include, but need not be limited to, an evaluation of the following: (1) installing physical barriers, such as screens and barrier nets; (2) installing behavioral barriers, such as acoustical stimuli; (3) installing diversion systems, such as louvers and angled wedge wire screens; (4) imposing operational changes, including delaying the time between generation and pumping, reducing project operation during periods of high mortality, and total project shutdown during periods of high mortality; and (5) implementing integrated systems such as using one or more fish protective devices in conjunction with changes in project operation.

The plan must also include the following: a schedule for conducting the study and for filing the results with the Commission, provisions for determining the structural and economic feasibility of each fish protection measure examined, and, for measures associated with altering project operation, provisions for identifying the expected power losses. The plan must be submitted to the Commission for approval within 90 days from the date of this order. The filing must include comments from the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service on the study plan or copies of letters, dated no later than 60 days from the date of this order, requesting the agencies' comments on the plan. The licensee must include the reasons for rejecting any agency recommendations. The Commission reserves the right to require changes to the plan.

The licensee must file the results of the study, with recommendations for fisheries mitigation, with the Commission for approval in accordance with the approved schedule. The results must include, but need not be limited to, recommendations for the following: installing fish protective devices and modifying project operation to minimize fish mortality, monitoring the effectiveness of any proposed measure, and quantifying the unavoidable fish injury and mortality associated with implementing any measure proposed. The filing must include comments from the

Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service on the results of the study. The licensee must include reasons for rejecting any agency ***63256** recommendations. The Commission reserves the right to require changes to the recommended mitigation.

****5** (B) The licensee, after consulting with the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, must prepare functional design drawings and a schedule for installing and maintaining barrier nets in the tailrace of the Ludington PumpStorage Project. The licensee must file the functional design drawings and the schedule for Commission approval within 60 days of issuance of this order. The filing must include comments from the agencies or copies of letters, dated no later than 30 days from the date of this order, requesting the agencies' comments on the drawings and schedule. The Commission reserves the right to require changes to the design drawings and schedule.

(C) The licensee, after consulting with the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, must submit for Commission approval a plan for providing onsite public access to the jetties at the **Ludington Pumped Storage** Project and for providing offsite public access as proposed in section 1.7 of the licensee's mitigative plan. The plan must include: (1) a cost estimate of providing safe access to the jetties at the project site and the cost of providing the offsite mitigation proposed in section 1.7 of the licensee's mitigative plan, and (2) an estimate of the amount of recreational use that would be generated by providing public access to the jetties and by providing offsite mitigation. The plan must include a description of the proposed access facilities, a map showing the type and location of the facilities, and a construction schedule. The plan must be filed with the Commission within 90 days from the date of this order. The filing must include comments from the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service on the plan, or copies of letters, dated no later than 60 days from the date of this order, requesting comments from these agencies on the plan. The licensee must include in the filing the reasons for rejecting any agency recommendations. The Commission reserves the right to require changes to the plan.

(D) This order is issued under authority delegated to the Director, and is final, unless appealed to the Commission under rule 1902, within 30 days from the date of this order.

40 FERC P 62151, 1987 WL 117926 (F.E.R.C.)
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43 F.P.C. 544, 1970 WL 6764 (F.P.C.)

1 **CONSUMERS POWER COMPANY & THE DETROIT EDISON COMPANY,

PROJECT NO. 2680

ORDER APPROVING REVISED EXHIBIT L DRAWINGS FOR PROJECT AND MODIFYING LICENSE

April 16, 1970

***544** Before Commissioners: John N. Nassikas, Chairman; Lawrence J. O'Connor, Jr., John A. Carver, Jr. and Albert B. Brooke, Jr.
On February 24, 1970, **Consumers Power** Company and The Detroit Edison Company, joint licensees for Project No. 2680, known as the **Ludington Pumped Storage** Project, to be located on Lake Michigan in Mason, Oceana, Newaygo, Muskegon, and Ottawa Counties, Michigan, filed with the Commission, an application for amendment of plans involving the approval of two revised Exhibit L drawings depicting (a) a change in the drainage system for the continuous embankment forming the upper reservoir, and (b) a lowered section of the dike and a channel to handle and direct inadvertent over-pumpage and reservoir releases resulting therefrom into Lake Michigan.

The major change in the drainage system for the upper reservoir dike consists of substituting for the presently proposed asphalt lining, backed by a stone and gravel drainage zone, a sandwiched type of asphaltic lining whereby a crushed rock drainage zone is placed between two layers of asphaltic material using submersible pumps to remove any seepage from the drainage zone. Detailed modifications of other features are also shown on Exhibit L, Sheet 2A presented in the application. These changes and modifications have been adopted as improvements for making the dike less susceptible to damage resulting from possible passage of seepage water through the soil forming the embankment.

The design of this drainage system was adopted by the licensees' board of independent consultants in a report to the licensees dated January 5, 1970. The revised plan as adopted by the panel would require (1) appropriate instrumentation in all pump casings, with the cables leading to a central control station where water levels will be recorded and malfunctioning indicated by warning signals, and (2) the performance of comprehensive testing and development work, including the effects of frost action, before the details of the design are finalized. The results of this testing and development work will be reviewed by the panel.

The locations of the lowered section of dike and discharge channel as depicted in Sheet 1A of the revised Exhibit L are satisfactory, but the final design of the lowered section to limit erosion of the dike, after overtopping, and the design of a turning dike used to prevent water from flowing down an existing road are not finalized. Therefore, approval of Exhibit L-Sheet 1A is limited to the locations of the lowered section of the dike and dischrge channel.

In accordance with the provisions of Article 32 of the license, the licensees are required to submit revised Exhibits L and M showing the final design of the project works and obtain Commission approval thereof prior to construction. In order to expedite construction, it is appropriate to add the words 'or the Chief, Bureau of Power' after the word 'Commission' in Article 32 of the license. This change is intended to authorize the Chief, Bureau of Power to approve the revised Exhibits L and M showing the final design, provided the project works are substantially those authorized by the Commission.

The Commission finds:

****2** (1) The following described and designated revised Exhibit L drawings conform to the Commission's rules and regulations and should be approved as part of the license for the project:

Exhibit	Entitled	FPC No.
L Sheet 1A	General plan	2680 23
L Sheet 2A	Profile and sections	2680 24

***545** The license Exhibit L drawings, Sheets 1 and 2 (FPC Nos. 2680-6 and -7), which have been superseded, should be eliminated from the license for the project.

(2) It is appropriate and consistent with the public interest to modify the license for Project No. 2680 as hereinafter provided.

The Commission orders:

(A) The revised Exhibit L drawings designated and described in finding (1) above are hereby approved as part of the license for Project No. 2680, and the superseded license Exhibit L drawings referred to in the same finding are hereby eliminated from the license for the project.

(B) The license for Project No. 2680 is hereby further modified by amending Article 32 thereof and adding thereto Articles 41 and 42-as follows:

> *Article 32.* Licensees shall, in accordance with the Commission's Rules and Regulations, submit revised Exhibit L drawings and Exhibit M showing the final design of the project works. The licensees shall not begin construction of

such project works until the Commission, or the Chief, Bureau of Power, has approved such exhibits.

Article 41. Licensees shall submit a new Exhibit L drawing showing details of design of the lowered section of the reservoir dike and discharge channel and shall get approval thereon in accordance with amended Article 32.

Article 42. Licensees shall submit a report showing the results of comprehensive testing and development work for the asphaltic lining system of the dikes, including full scale tests and effects of frost action, together with the final report thereon by the board of consultants, and shall get approval prior to commencement of construction thereon in accordance with amended Article 32.

(C) This order shall become final 30 days from the date of its issuance unless application for rehearing shall be filed as provided in Section 313(a) of the Act, and failure to file such an application shall constitute acceptance of this order.

FEDERAL POWER COMMISSION

43 F.P.C. 544, 1970 WL 6764 (F.P.C.)
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44 FERC P 62324, 1988 WL 245661 (F.E.R.C.)

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1
Office Director Orders

Consumers
Power
Company and Detroit Edison Company

Project No. 2680-007

Order Requiring Installation and Monitoring of Temporary Barrier Nets

(Issued September 30, 1988)

***63450** J. Mark Robinson, Dir., Division of Project Compliance and Administration.

On April 19, 1988, **Consumers Power** and Detroit Edison Companies (licensees) filed functional design drawings of temporary fish barriers for the **Ludington Pumped Storage** Project, pursuant to paragraph B of the Commission's order issued August 15, 1987 [40 FERC ¶62,151]. The temporary barrier nets would provide interim fish protection at the facility until permanent measures are required, based upon the results of studies required by paragraph A of the Commission's August 15, 1987 order.

The licensees propose two alternative temporary barrier nets for the project site. Each barrier net would be located between the two project jetties. Alternative Net 1 would extend toward the intakes from a support post in the center of the tailrace and would connect to both the north and south jetties. Alternative Net 2 would consist of a net placed between the ends of the north and south jetties. The net would be supported by vertical posts spaced at 100-foot intervals. The mesh size of each net would be 3.5 inches. The licensees estimate that Alternate Net 1 would cost between $1,500,000 and $2,100,000, and Alternate Net 2 would cost between $700,000 and $1,000,000 to install and to maintain. Manufacturing and installing either net would take 9 to 10 months.

On March 15, 1988, the Michigan Department of Natural Resources (MDNR) filed functional design drawings of an alternate design for a temporary barrier net for the Ludington facility. The MDNR's barrier net would surround both jetties and the breakwater and would prevent fish from approaching the project area. The mesh size

would be 1.5 inches. The MDNR states the net would cost approximately $550,000 and could be manufactured and installed in 12 to 16 weeks.

Comments
The U.S. Fish and Wildlife Service (FWS), in a letter dated March 8, 1988, states that of the three temporary barrier nets proposed, the MDNR's design is the most appropriate. FWS recommends that the licensees install and monitor the operation of the net to determine its effectiveness in reducing fish mortality.

The MDNR states the following regarding the licensees' two proposed nets: (1) neither net could withstand the high water velocities occurring within the jetties during project operation; (2) gilling of fish in the net may increase the levels of fish mortality; (3) neither net would be efficient in reducing entrainment of fish under 30 inches; and (4) the nets would require daily inspection. The MDNR, in a letter dated March 15, 1988, states that because its net is designed to be set outside the area of artificially induced currents from project operation, it would be more efficient in reducing fish mortality than either of the licensees' proposals.

In their April 19, 1988 filing, the licensees state that there is insufficient information to determine if a barrier net would be effective in deterring fish or if the net is durable enough to be maintained in position. They recommend further study of the barrier nets prior to implementing any proposal. In addition, the licensees, in a letter dated April 6, 1988, state the following regarding the MDNR's proposed net: (1) the net has not been utilized under conditions similar to those encountered at the project; (2) the net would not be practical to maintain nor would it be effective; (3) the net would be susceptible to storm damage; (4) the MDNR's cost estimate is inaccurate; and (5) the net would pose a navigational hazard to small boats.

***63451** *Conclusions*
****2** Due to the high levels of fish mortality occur ring at the Ludington Project, interim protective measures are needed while a permanent solution is being developed.

The MDNR's net is technically superior to either net proposed by the licensees and, since the net is designed to keep fish away from the project area, it would be most effective in reducing fish mortality. The licensees' proposed nets would not be as effective in reducing mortality because the mesh size would pass larger species of fish and would not keep fish away from the project jetties and the high currents associated with project operation. These high currents are believed to attract fish into the project area and, as a result, the fish are entrained within the project.

Although the MDNR's net has not been used at this site, the net would be effective in reducing fish mortality, particularly the largest members of a species. The MD-

NR's net would be more susceptible to storm damage, as stated by the licensees; however, as discussed below, the net would be removed from late fall through early spring, a time of high potential for storm damage. For the net to function properly, the licensees would need to actively main tain the net during the remainder of the year, particularly after storms. Further, the net would constitute a navigational hazard; how ever, it would be no more a hazard than the existing jetties and breakwater. The navigational hazards of the net would be reduced if the licensees are required to consult with the U.S. Coast Guard prior to installing the net to determine the most appropriate methods of marking the net, to implement the U.S. Coast Guard's recommendations for marking the net, and to register the net as a navigational hazard.

As an interim solution to reducing fish mortality at the project, the licensees should install the net as described in the MDNR's March 15, 1988 filing. However, since the expected manufacturing and installation time of the MDNR's net is 12 to 16 weeks, installing the net in 1988 is impractical. Therefore, installation of the net should be delayed until the spring of 1989.

To protect large fish from the project turbines, the MDNR's net should be installed as soon as possible after ice-out to reduce the mortality occurring during the spring. Also, because most of the fish mortality occurs before the end of October and the onset of inclement weather would hamper operation of the net, the net should be removed by October 31. Thus, the licensees should install the net as soon as weather and ice conditions permit, or by April 15, whichever comes first, and it should be removed by October 31 of each year until directed otherwise by the Commission. To assist the licensees in installing the net, the licensees should provide the opportunity for the FWS and the MDNR to observe and to assist in the installation of the net. If inclement weather delays installation of the net in the spring, the licensees may ask the Commission for an extension of time to install the net. The net may be temporarily removed or modified to assist the licensees in conducting on-site studies of potential permanent fish protection measures. During non-study periods, the net should remain in place.

**3 In addition, the licensees should periodically monitor the net to ensure it is maintained and that it effectively reduces fish mortality. Since fish are entrained within the project facilities during the pumping phase and most of the pumping occurs during the weekends, monitoring of the net should be conducted, at a minimum, on both Monday and Friday of each week. This would enable the licensees to deter mine the levels of gilling on the net that occur under the pumping mode. Monitoring for maintenance purposes should be conducted as needed. To assist the licensees in monitoring, the MDNR and the FWS should be given the opportunity to accompany the licensees during any inspection.

Progress reports of the operating efficiency of the net would assist the Commission, the licensees, and the agencies in determining the effectiveness of the net in reducing fish mortality. Therefore, the licensees should submit, to the agen-

cies and the Commission, an annual report on the performance of the net for each year the net is operated. The report should be filed with the Commission by December 31 of each year. Prior to filing the report with the Commission, the agencies should be served a copy of the annual report and should be given at least 30 days to provide their comments. The annual report should include the recommendations of the agencies. The Commission also reserves the right to require modifications of this net or to require installation of an alter native net, if the net does not operate effectively or does not reduce fish mortality.

The Director orders:

(A) The licensees shall install the MDNR barrier net at the **Ludington Pumped Storage** Project as described in the MDNR's March 15, 1988, filing with the Commission. The net must be installed each spring as soon as weather and ice conditions permit, or by April 15, whichever comes first, and must be removed by October 31 of each year until the Commission directs otherwise. The net may be temporarily removed or modified to assist the licensees in conducting on-site studies of potential permanent***63452** fish protection measures. The net must remain in place during non-study periods. The licensees must provide the opportunity for the FWS and the MDNR to observe and to assist in installation of the net.

(B) The licensees shall monitor the net at least twice each week, on Monday and Friday, and as needed for maintenance purposes. The licensees must provide the opportunity for the FWS and the MDNR to observe and to assist in any of the inspections. The licensees shall submit an annual progress report of the operation and maintenance of the net to these agencies and to the Commission. The report shall be filed with the Commission by December 31 of each year; the first report is due December 31, 1989. Prior to filing the report with the Commission, the agencies shall be served a draft copy of the annual report and shall be given at least 30 days to provide comments. The annual report filed with the Commission shall include the written comments and recommendations of the agencies. The Commission reserves the right to require the licensees to modify the net or to install an alternative net if the net does not operate effectively or does not reduce fish mortality.

****4** (C) The licensees, prior to installing the net, shall consult with the U.S. Coast Guard to determine the appropriate methods for marking the net to reduce the navigational hazards of the net and to register the net as a navigational hazard. Prior to installing the net, the licensees shall file with the Commission, a plan and a schedule to implement the U.S. Coast Guard's recommendations for marking.

(D) This order is issued under authority dele gated to the Director, and is final unless appealed under rule 1902 to the Commission by any party within 30 days from issuance date of this order. Filing an appeal does not stay the effective date of this order or any data submittal specified in this order. The licensees' failure to appeal this order shall constitute its acceptance of this order.

Federal Energy Regulatory Commission

44 FERC P 62324, 1988 WL 245661 (F.E.R.C.)
END OF DOCUMENT

H
49 F.P.C. 47, 1973 WL 13358 (F.P.C.)

**1 CONSUMERS POWER
COMPANY AND THE DETROIT EDISON COMPANY,

PROJECT NO. 2680

ORDER APPROVING EXHIBIT K

January 5, 1973

47 Before Commissioners: John N. Nassikas, Chairman; Albert B. Brooke, Jr., Pinkney Walker and Rush Moody, Jr.
Consumers Power Company and The Detroit Edison Company, joint Licensees of the **Ludington Pumped Storage** Project No. 2680, filed on February 1, 1971, and revised on January 24, 1972, Exhibits F and K for a 345 kv project transmission line. The exhibits were filed in compliance with Article 40 of the license. The *48 project is located near Ludington, Michigan, in Mason, Oceana, Newaygo, Muskegon and Ottawa Counties.

Article 40 of the license requires Licensee to file for Commission approval an Exhibit K for its 345 kv transmission line extending from the Ludington Switchyard to East Tallmadge. The Exhibit K filed on February 1, 1971, showed that a few parcels of the right-of-way remained to be acquired. Licensee indicated by letter dated July 12, 1971, that the remaining parcels would be acquired by January 30, 1972, as required by Article 5 of the license. The Exhibit K, sheets 3a and 4a (FPC Nos. 2680-27 and -28) filed on January 24, 1972, reflect that Licensee acquired all land rights necessary or appropriate for the construction of the project transmission line. The revised Exhibit F sets forth the details of the right-of-way acquired subsequent to the February 1, 1971, filing. The subject transmission line is constructed.

No lands of the United States were included in the 345 kv transmission line right-of-way.

The Commission finds:
The Exhibit K drawings (FPC Nos. 2680-27 and -28) conform to the Commission's Rules and Regulations and should be approved and made part of the license for Project No. 2680.

The Commission orders:

The Exhibit K drawings designated and described in the above finding are hereby approved as part of the license for Project No. 2680.

FN* This order was adopted on December 29, 1972, before Commissioner Walker left the Commission.

FEDERAL POWER COMMISSION

49 F.P.C. 47, 1973 WL 13358 (F.P.C.)
END OF DOCUMENT

H
50 FERC P 62093, 1990 WL 316441 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Office Director Orders

Consumers Power
Company and Detroit Edison Company

Project No. 2680-013 - Michigan

Order Approving Modifications to Barrier Net

(Issued February 9, 1990)

***63091** J. Mark Robinson, Dir., Division of Project Compliance and Administration.

On December 27, 1989, **Consumers Power** Company and Detroit Edison Company (licensees) filed the 1989 Annual Report on Barrier Net Operation for the **Ludington Pumped Storage** Project. The report was required by paragraph B of the Commission's Order Requiring Installation and Monitoring of Temporary Barrier Nets, issued on September 30, 1988 [44 FERC P 62,324].

As part of the report, the licensees proposed some modifications to the existing barrier net. These modifications include: adding top and bottom skirts to the net; using a continuous weighing system on the bottom skirt; using 3/4-inch bar mesh netting on the bottom skirt and 1-inch bar mesh netting on top skirt; using 1-inch bar mesh netting on the main net instead of the current 3/4-inch mesh; and having the net square-hung versus diamond-hung. The objective of these and other proposed minor changes are to improve the net's adherence to the bottom contours to prevent fish from passing under net, and to provide a better floatation system to keep the top of the net at the lake surface at all times. The proposed changes to the net would not alter the general configuration of the net, and therefore will not alter navigational safety or fisherman access in the project vicinity.

The licensees consulted with the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service prior to filing the report with the Commission. These agencies and the Michigan United Conservation Clubs generally concur with the proposed changes to the net.

The proposed changes should help improve the efficiency of the barrier net and should be implemented in 1990.

***63092** *The Director orders*:

(A) The proposed changes to the barrier net, described in the licensees' 1989 Annual Report on Barrier Net Operation, filed on December 27, 1989, are approved. These changes shall be implemented during the 1990 testing of the barrier net.

(B) This order is issued under authority delegated to the Director, and is final unless appealed to the Commission under Rule 1902 within 30 days from the date of this order.

50 FERC P 62093, 1990 WL 316441 (F.E.R.C.)
END OF DOCUMENT

H
52 F.P.C. 1809, 1974 WL 12678 (F.P.C.)

**1 CONSUMERS POWER
COMPANY AND THE DETROIT EDISON COMPANY,

DOCKET NO. E-7984

ORDER APPROVING SETTLEMENT AGREEMENT AND TERMINATING PROCEEDING

December 16, 1974

1809 Before Commissioners: John N. Nassikas, Chairman; Albert B. Brooke, Jr., William L. Springer and Don S. Smith.
On December 27, 1971 and March 6, 1972, **Consumers Power** Company (Consumers) and The Detroit Edison Company (Detroit) tendered for filing, two similar June 1, 1971 initial Sales Agreements, as amended August 15, 1971, with Commonwealth Edison Company (Commonwealth) entitling Commonwealth to purchase up to 1/3 of the initial output of the **Ludington Pumped Storage** Plant for the first ten years of operation, and up to 1/6 of plant output for five years thereafter. The **Ludington Pumped Storage** Plant is a jointly-owned project of Consumers and Detroit, comprising six units of 312 MW generating and 323 MW pumping capacity each upon completion in 1974.

1810 By order issued August 28, 1973, 50 FPC 568, the Commission instituted a Section 206 investigation and hearing herein to determine the justness and reasonableness of the terms of the filings in general, and the derivation of the return component of the proposed annual fixed charge factor in particular. Subsequent discussion among the parties resulted in the preparation and offer of a proposed settlement herein, which with the concurrence of all parties was offered and transcribed in the October 12, 1973 prehearing conference record and certified to the Commission by the Presiding Administrative Law Judge on October 12, 1973 along with a Staff Motion to accordingly terminate the proceeding. Written notice of the certification was issued by the Commission on October 23, 1974 (30 F.R. 38723), stating that any person desiring to make comments or suggestions thereupon should submit them in writing on or before November 1, 1974. No comments or suggestions have been received.

The offer of settlement tendered by Consumers, Detroit and Commonwealth explains that (1) the proposed compensation formula initially submitted excludes consideration of an additional investment of $33,234,000 for the construction of necessary transmission facilities within the State of Michigan apart from the capital costs

of the Ludington Plant itself, and (2) inclusion of the additional transmission facilities investment in calculating the fixed charge level produced by the tendered compensation formula reduces the resultant annual fixed charge rate from 15.77% to 13.89%, and reduces the rate of return component from 10.32% to 9.05%.

Based upon our review of the offer of settlement certified to us by the Presiding Administrative Law Judge on October 12, 1973, as well as the entire record in this proceeding, we find that the offer of settlement provides a reasonable and appropriate resolution of the issues in this proceeding, and that the offer of settlement should be accepted for filing, approved and made effective as hereinafter ordered and conditioned. In light of this action, Staff's motion to terminate the proceedings is granted.

The Commission finds:
****2** The offer of settlement certified to the Commission on October 12, 1973, in this docket should be accepted for filing, approved, and made effective as hereinafter ordered and conditioned.

The Commission orders:

(A) The offer of settlement certified to the Commission on October 12, 1973, is hereby accepted for filing, incorporated herein by reference, approved and made effective.

(B) Staff's motion to terminate the proceedings is hereby granted.

(C) The Secretary shall cause prompt publication of this order in the Federal Register.

FEDERAL POWER COMMISSION

52 F.P.C. 1809, 1974 WL 12678 (F.P.C.)
END OF DOCUMENT

H
59 F.P.C. 1891, 1977 WL 16887 (F.P.C.)

1 **CONSUMERS POWER COMPANY,

PROJECT NO. 2680

ORDER APPROVING EASEMENT ACROSS PROJECT LANDS

September 15, 1977

***1891** EASEMENT

Before Commissioners: Charles B. Curtis, Chairman; Don S. Smith and Georgiana Sheldon.
On March 24, 1977, **Consumers Power** Company (Licensee) filed an application for a change in land rights within the project boundary of the **Ludington Pumped-Storage** Project, FPC Project No. 2682, located on the shores ***1892** of Lake Michigan in Mason, Oceana, Newaygo, Muskegon, and Ottowa Counties, Michigan.

Licensee requests authorization to grant an easement across an existing transmission line corridor to Dow Chemical Company (Dow) so that Dow may construct and maintain those underground brine lines and underground and overhead electric lines necessary to connect existing brine wells lying east of the project transmission line with an existing brine gathering line lying west of said transmission line. The proposed electric lines to be constructed on the easement would carry energy to power the brine well pumps.

The 33-foot wide easement would cross perpendicularly an existing 230-foot wide transmission line right-of-way owned in fee by Licensee, and would be located approximately 3,000 feet south of the main project works in the Township of Summit. The easement would cross project lands used for transmission line purposes only, and would have a negligible effect upon project lands and no effect upon project waters.

Licensee included in its application a copy of the proposed easement. The instrument requires, *inter alia*, that Dow construct the proposed overhead electric lines no closer than 12 feet to the existing FPC Project No. 2680 transmission lines, and that Dow not affect or interrupt the continuity of service provided by said transmission lines.

Environmental impacts resulting from construction across project lands of the proposed brine lines and overhead and underground transmission lines would be minimal and would cause no changes in project operation. We conclude, therefore, that our approval of Licensee's application would not constitute a major Federal action having a significant impact on the quality of the human environment.

The Commission finds:

(1) It is appropriate for the purposes of the Federal Power Act and in the public interest that Licensee be authorized to grant the proposed easement discussed herein.

(2) Our approval of this action does not constitute a major Federal action having a significant impact on the quality of the human environment.

The Commission orders:

(A) The application for change in land rights filed by the **Consumers Power** Company is hereby approved as discussed in this order, *Provided*, That the instrument of conveyance be modified to include convenants stating: (1) the right to use the land, which is the subject of this conveyance, for project purposes is hereby reserved to the FPC Project Licensee, its successors and assigns; (2) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with over-all FPC project recreational use; and (3) the party to undertake any construction contemplated as a result of this conveyance shall take all necessary precautions ***1893** during construction and subsequent operation and maintenance to protect and enhance the environmental values of any affected FPC project land and waters.

****2** (B) Licensee shall file with the Commission a copy of the executed easement within 60 days of its execution.

FEDERAL POWER COMMISSION

59 F.P.C. 1891, 1977 WL 16887 (F.P.C.)
END OF DOCUMENT

H
74 FERC P 61055, 1996 WL 23993 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Commission Opinions, Orders and Notices

Consumers
Power
Company and The Detroit Edison Company

Project No. 2680-0

(Issued January 23, 1996)

***61135** Before Commissioners: Elizabeth Anne Moler, Chair; Vicky A. Bailey, James J. Hoecker, William L. Massey, and Donald F. Santa, Jr.
On February 28, 1995, **Consumers Power** Company and the Detroit Edison Company, licensees for the **Ludington Pumped Storage** Project No. 2680, filed for Commission approval an uncontested offer of settlement, resolving fish protection and angler access issues pending before the Commission.

The settlement resolves long-standing issues concerning fish mortality resulting from operation of the Ludington Project. The agreement calls for the licensees to mitigate fish entrainment mortality by the seasonal installation of a 2.5-mile-long barrier net around the project intakes. The licensees will examine new mortality abatement technologies, monitor local fish populations, and create a scientific advisory team to review these matters. The agreement also provides for fishing 61135 access at off-project sites, in view of the impracticality of providing such access at the project.

As discussed below, the terms of the settlement appear fair, reasonable, and in the public interest and accordingly will be approved.

Background

Project Description
The Ludington Project, licensed in 1969,[FN1] is a 1,872-megawatt pumped storage project on the eastern shore of Lake Michigan that uses the lake as the lower reservoir. The 842-acre upper reservoir is situated about 370 feet above Lake Michigan 61135 within a man-made embankment. The project is operated to provide

power during peak demand periods.[FN2]

Water transfer between Lake Michigan and the upper reservoir occurs through six steel penstocks, each 1,300 feet long with an upper diameter of 28.5 feet and a lower diameter of 24 feet. Each penstock is connected to a Francis-type reversible turbine about 40 feet below the surface of Lake Michigan. In front of the draft tubes (penstock intakes) in Lake Michigan are large trashracks, with 12-inch by 23-inch openings, which protect the turbines from large debris and drifting ice during pumping, but do not exclude fish. The project tailrace is an excavated channel in Lake Michigan protected on each side by jetties and at the end by a breakwater.

Fish from Lake Michigan are entrained daily in the intakes of the Ludington Project during ***61136** normal operations. The fish are subject to the risk of injury or death as they pass through the pump turbines, first upon entering the upper reservoir during pumping and again upon exiting the reservoir during generation.

Procedural History
The Ludington Project license required the licensees to conduct studies and file reports on the effects of project operation on the fishery resources in the project area; to evaluate the provision of public fishing access to the project jetties; and to make such modifications in project facilities and operation as may be required to protect the fishery resources.[FN3]

****2** Studies conducted by the licensees during 1975 through 1978 indicated that project operation was killing an estimated 532 million fish annually, of which about 99 percent were larval and juvenile fish, and about 1 percent were adult fish.[FN4] Most of the fish were small forage fish (principally alewife), but some were important sport and commercial fish.

On June 26, 1986, the National Wildlife Federation (NWF) and the Michigan United Conservation Clubs (Conservation Clubs) filed with the Commission a petition seeking fishery protection studies, the preparation of an environmental impact statement (EIS), the conduct of an evidentiary hearing, and an order either rescinding the license or requiring mitigation of all adverse impacts on fisheries.

On August 11, 1986, the licensees filed their fisheries mitigation plan. Most of the licensees' proposals did not involve reducing the mortality rate but instead involved mitigation at their other licensed projects and payments for state fishery and recreation programs. With respect to fishing access, the licensees asserted that providing safe public access to the jetties was not economically feasible. They proposed instead to fund recreational access to Lake Michigan in areas outside the project boundaries. FWS and Michigan opposed the licensees' proposal as inadequate, and recommended the installation of temporary barrier nets at the entrance to the intake-discharge (tailrace) channel while the licensees studied an

appropriate permanent fish barrier system.

On September 5, 1986, the Attorney General of Michigan, on behalf of the State of Michigan, the Michigan Natural Resources Commission, and the Michigan Department of Natural Resources (Michigan), filed a complaint with the Commission concerning 61136 the effects of the Ludington facility on the fishery resources of the Great Lakes.

By order issued August 11, 1987, the Commission's Acting Director of the Office of Hydropower Licensing (OHL) directed the licensees to file a schedule and specifications for installing a temporary barrier net in the project tailrace, and to develop a plan to study permanent fish protection measures, including operational changes or even total project shut-down during periods of high mortality. With respect to angler access, the Director determined that the licensees had not submitted sufficient information to show that providing access to the jetties was infeasible, and therefore required them to evaluate the recreational use that would be generated by providing public fishing access at the jetties versus at comparable sites in the project vicinity.[FN5]

In April 1988, the licensees filed their specifications for alternative temporary barrier nets, and Michigan filed its own design. By order issued September 30, 1988, OHL's Director of the Division of Compliance and Administration (Division Director) approved the Michigan design and required the licensees to install a 2.5-mile-long net each spring and remove it each fall, and to monitor the net bi ***61137** weekly and file annual reports on its effectiveness.[FN6]

****3** On February 1, 1989, the licensees filed the results of their studies of permanent measures to reduce fish mortality at the project. They concluded that none of the barrier technologies studied would be cost-effective, and requested and received three additional years to evaluate the temporary barrier net to determine its optimal level of performance.

On December 26, 1991, the licensees filed their plan for permanently mitigating fish mortality, which entailed making the temporary barrier net permanent[FN7] and funding various state fishery-related programs. With respect to angler access, the 61137 licensees stated that providing access to the project jetties would not be appropriate in light of considerations of safety and cost-effectiveness, and since in any event the barrier net precludes catchable-size fish in catchable numbers in that vicinity. Instead, the licensees proposed to give Michigan $180,000 to develop angler-related recreational facilities in the Ludington area, and to provide $20,000 annually for the maintenance of such facilities. Interior, Michigan, the NWF and the Conservation Clubs all intervened and opposed the licensees' plan as failing to prevent unacceptable losses of fish and to substantiate their cost-benefit analysis.[FN8]

On February 26, 1992, the NWF and the Conservation Clubs, this time joined by

Michigan, filed a renewed petition for an EIS and evidentiary hearing on the final mitigation plan, as well as on the question of the continued operation of the Ludington Project. On December 11, 1992, Interior filed a similar petition.

Thereafter, the parties began settlement discussions, which culminated in a settlement of all pending fishery and angler access issues with respect to the project.

The Settlement
The parties' settlement of fish mortality and angler access issues at the Ludington Project encompasses two agreements resolving proceedings in three fora: the FERC, Michigan state court, and Michigan administrative agencies. The agreement before us is styled the **Ludington Pumped Storage** Project Settlement Agreement=FERC Offer of Settlement (the FERC Agreement).[FN9] The second agreement, involving related issues not before us, is styled the **Ludington Pumped Storage** Project Settlement Agreement=Courts and Non-FERC Agencies (the State Agreement).[FN10]

The Agreements provide that neither Agreement is effective unless and until both become effective.[FN11] For the entire Settlement (both Agreements) to become effective, (1) the FERC must approve the FERC Agreement in a manner acceptable to the parties; (2) the Michigan Public Service Commission (Michigan PSC) must approve certain licensee rate and accounting filings; and (3) Michigan DNR must issue the licensees a new National Pollutant Discharge Elimination System (NPDES) permit, without those portions of the May 20, 1988 permit pertaining to release of turbine ***61138** generating water.[FN12] The latter two matters are still pending before the state agencies.[FN13] Once effective, both agreements are to be in force only during “the present term of the FERC license.”[FN14]

The FERC Agreement
****4** The major provisions of the FERC Agreement are as follows:

Barrier Net. The licensees will annually install and maintain the 2.5-mile (13,100-foot) barrier net outside the project jetties until expiration or revocation of the current project license, or permanent project shut-down. The net will be placed not later than April 15 each year and removed not earlier than October 15. The licensees will fund studies to monitor the effectiveness of the barrier net, and will submit annual reports to the Commission and the Agreement parties.[FN15]

Review of Alternative Technologies. Every five years after execution of the Agreement, the licensees will review evolving technologies for abating fish entrainment, and five years after execution of the Agreement any party may petition the Commission for the installation of additional technologies. The Agreement establishes a Scientific Advisory Team (comprising representatives of the licensees, Interior, Michigan DNR, NWF, the Conservation Clubs, and the tribal parties), which will evaluate all information that is developed pursuant to the Agreement.

The licensees and the Advisory Team will determine the technical feasibility of technologies to ascertain, in real time, fish populations near the project, and if a feasible technology is found, the licensees will deploy it at the project, upon 61138 receipt of FERC approval, as necessary. The licensees and the Advisory Team will pursue development of a model to determine whether lake and weather conditions are predictive of nearby fish populations. This information could be used to modify project operations to reduce fish entrainment, subject to FERC review and approval, as necessary.[FN16]

Public Fishing Access. Because the barrier net will curtail fishing around the project jetties, the Agreement provides for the establishment of angler access and related facilities in the City of Ludington,[FN17] about four miles north of the Ludington Project, and at Port Sheldon,[FN18] about 70 miles south of the project. The capital cost of these projects is about $659,000.[FN19] The proposals can be modified if the parties so agree.[FN20] All proposals are subject to FERC review and approval, as necessary.

Project Retirement Studies and Trust Fund. Five years after the Agreement becomes effective, the licensees will begin consulting with other parties on a plan to study the costs of permanent non-power operation, partial project removal, or 61138 total project removal, and will file the study plans for FERC approval. After completion of the studies and the submittal of the study reports to the FERC and other parties, the licensees will, in their subsequent retail and wholesale rate filings with the Michigan PSC and the FERC, seek to recover from their ratepayers the costs of one of these options, such moneys to be placed in a trust fund. However, the Settlement does not create any obligation on the part of the licensees to retire the Ludington 61138 Project.[FN21]

Environmental Assessment of the FERC Agreement
****5** Notice of the FERC Agreement was published in the *Ludington Daily News* on April 4, 1995, with a comment deadline of May 5, 1995. ***61139** No comments, protests, or motions to intervene were received.

Draft EA. On July 27, 1995, the Commission staff issued for comment its draft Environmental Assessment (EA) of the fish mortality abatement and angler access measures proposed in the FERC Agreement.[FN22] The draft EA concluded that long-term seasonal use of the barrier net provides the most effective available method to reduce fish mortality at the project. Use of the net reduces entrainment by 77 to 89 percent for fish longer than four inches.[FN23] While there would be some mortality from fish that are gilled on the net, the draft EA concluded that the overall reductions in entrainment and mortality that would be achieved with the barrier net would significantly benefit the local inshore fish community and important sport and commercial fisheries of Lake Michigan.[FN24]

With respect to public fishing access to Lake Michigan, the FERC Agreement provides, among other things,[FN25] for the improvement of angler access to the

north and south piers of the City of Ludington harbor breakwater, including construction of walkways from parking lots to each pier, and landscaping, signs, and benches.[FN26] At Port Sheldon, the Agreement provides for the development of angler access on the piers that jut into Lake Michigan from either side of the mouth of the Pigeon River, and for the construction of a 3,500-foot-long fishing boardwalk leading to the north pier. With respect to the Port Sheldon site, the draft EA noted that the area proposed for the boardwalk is susceptible to erosion, and that the boardwalk would cross several private boat docks, possibly necessitating fencing and locked gates to exclude the public from these docks. The EA also noted that anglers wishing to fish from the north pier would be required to walk the entire length of the boardwalk, some two-thirds of a mile.[FN27]

The draft EA stated that an alternative suggested by local residents, a pier into Lake Michigan from Windsnest municipal park, two miles north of Port Sheldon, would provide easier access to Lake Michigan shorefishing than the proposed boardwalk, and with less intrustion onto existing private facilities.[FN28]

The EA concluded that the Agreement's provision for licensee funding of substitute angler access facilities at the City of Ludington and Port Sheldon, or alternative access improvements such as the suggested pier at Windsnest park if acceptable 61139 to all parties, would provide adequate alternative public recreation facilities. The EA added that the ultimately approved facilities might need to be brought within the project boundary for regulatory purposes.[FN29]

In their August 22, 1995 comments on the draft EA, the licensees do not oppose the inclusion within the project boundary of the Port Sheldon angler access lands, which are owned by **Consumers Power**, but object to the inclusion of the access lands in the City of Ludington, which are state and municipally owned and are occupied by Corps of Engineers facilities, including the two piers at which fishing access is to be developed.

****6** On August 23, 1995, the Mountain Beach Association filed comments supporting the Agreements' goals but opposing the location of the angler access proposed to be provided at Port Sheldon. The Beach Association, an organization of owners of property adjacent to the north side of Pigeon Lake, where the boardwalk is proposed, alleges that the construction and operation of a public boardwalk across their members' lands would disturb their privacy and security, exceed the scope of the licensees' riparian easements on these lands, and adversely affect a variety of sensitive habitats and plant and animal species. The Association contends moreover that fishing at the north pier is both poor and hazardous, and that two alternative sites adjacent to **Consumers Power** lands=Windsnest Park and Muskegon Lake, in North Muskegon some 26 miles to the ***61140** north[FN30]=offer excellent fishing and problem-free access, and would therefore better fulfill the objectives of the Settlement.

In reply comments filed September 11, 1995, the licensees stated that

Power in fact has the requisite fee title to the lands in question along Pigeon Lake's north shore. They asserted further that none of the plants and birds listed by the Beach Association are found in the area of the proposed boardwalk; that if fishing at the north pier is as poor as the Association claims, then public foot traffic past the Association members' homes won't be a problem; and that the boardwalk would be no more disruptive to local plants and wildlife than are the Association members' private docks and boardwalks.

The licensees assert that the alternative sites suggested by the Beach Association are inadequate to meet the goals of the Settlement, which is to provide expanded angler access to Lake Michigan. The licensees state that Windsnest Park is a small public beach on Lake Michigan with no pier or boat docking facilities and only limited opportunity for expansion. The Muskegon Lake site is in the licensees' view also a poor candidate for improving Lake Michigan angler access, as the site is several miles from Lake Michigan. By contrast, they note, the Port Sheldon facilities would expand existing, sheltered public boat access to Lake Michigan and provide public fishing access to an existing Lake Michigan pier.

Final EA. The final EA, issued November 8, 1995,[FN31] expanded somewhat on the discussion of proposed angler access facilities at Port Sheldon by noting that the general area of the proposed access has species of plants and birds that are 61140 on Michigan DNR's lists of “Michigan's Special Plants” and “Michigan's Special Animals.”[FN32] However, the EA stated that the environmental effects of the proposed action would be dependent on the specific design of the angler access facilities and would be determined in the review of the detailed plans for the proposed construction. The Final EA did not address the Beach Association's proposed alternative access facilities at Lake Muskegon, or the licensees' objection to including in the project boundary the fishing access facilities proposed for the Ludington city piers. The EA's final recommendation with respect to the angler access proposals remained the same as in the draft EA.[FN33]

Discussion
****7** We commend the parties for their efforts in bringing to a resolution the long-standing and difficult issues surrounding the Ludington Project's adverse effect on the Lake Michigan fishery. Based on our review of the record in this case and the Commission staff's environmental analysis of the FERC Agreement, we conclude that the Agreement is in the public interest and meets the comprehensive development standard of section 10(a)(1) of the Federal Power Act (FPA),[FN34] and we will approve it.

Consistent with the terms of the FERC Agreement and our obligations under the FPA, this order requires the licensees to file for our review and approval plans, specifications, and schedules for the activities and facilities within the Ludington 61140 Project boundary.

With respect to whether the fishing access lands and facilities proposed to be de-

veloped in the City of Ludington must be included in the project boundary, we will decide that question in the context of reviewing the licensees' specific access plans. In this regard, we are concerned that the interests of the Beach Association receive careful attention. We are therefore requiring the licensees to consult with the Association on the issue of angler access lands and facilities at Port Sheldon or 61140 an alternative site.

***61141** *The Commission orders*:

(A) The **Ludington Pumped Storage** Project Settlement Agreement =FERC Offer of Settlement, filed in this proceeding on February 28, 1995, is approved, subject to the terms of Ordering Paragraphs (B), (C) and (D) of this order. The Commission's approval of the Agreement does not constitute approval of, or precedent regarding, any principle or issue in this proceeding.

(B) Within 90 days of the issuance date of this order, the Licensees shall file as-built drawings of the barrier net.

(C) Within one year of the issuance date of this order, the licensees shall file for Commission approval a final plan and a schedule for installation of angler access facilities at Port Sheldon or at an alternative site agreed to by all the parties to the FERC Agreement. The plan shall include, but not be limited to, functional design drawings of the facilities, construction schedules, copies of necessary permits, access agreements or easements, an implementation schedule for installing the facilities, a report on the effects, if any, of the developments on terrestrial resources, and proposed measures for providing environmental protection of fish and wildlife resources, including any threatened, endangered, or special concern species, 61141 during construction of the facilities.

The licensees shall prepare the plan after consultation with the parties to the FERC Agreement and with the Mountain Beach Association (Association). The licensees shall keep the Association informed of the progress of the angler access proposal and shall serve on the Association copies of all correspondence regarding the Port Sheldon or alternative access sites. The licensees shall include in the plan filed with the Commission documentation of consultation, copies of comments and recommendations on the final plan after it has been prepared and provided to the settlement parties and the Association, and specific descriptions of how the comments are accommodated by the plan. The licensees shall allow a minimum of 30 days for the settlement parties and the Association to comment and make recommendations before filing the plan with the Commission. If the licensees do not adopt a recommendation, the filing shall include the licensees' reasons, based on project-specific information. The Commission reserves the right to require changes to the proposed facilities and schedule to ensure a safe and adequate project. Upon Commission approval, the licensees shall implement the plan, including any changes required by the Commission.

**8 (D) Licensees shall submit, at the time of filing the plan required under Ordering Paragraph (C) herein, revised exhibit L drawings and exhibit M showing the final design of the angler access facilities at Port Sheldon or at an alternative site 61141 agreed to by all the parties to the FERC Agreement.

(E) The pleading filed in this proceeding on September 5, 1986, by the Attorney General of Michigan on behalf of the State of Michigan, the Michigan Natural Resources Commission, and the Michigan Department of Natural Resources, is dismissed.

(F) The pleading filed in this proceeding on October 7, 1992, by the Michigan Department of Natural Resources is dismissed.

FN1 42 FPC 274. The license expires in 2019. The project began commercial operation in 1972.

FN2 Power is usually generated during the day, and the upper reservoir is refilled at night by pumping.

FN3 Article 37 of the license states (42 FPC at 279):

> Licensees, following consultation with the U.S. Fish and Wildlife Service and the Michigan Department of Conservation, shall make or pay the cost of making biological and limnological studies before and after construction of the project to determine the effects of the project and its operation on the fishery resources of the project area, including an evaluation of the need to provide public fishing access to the jetties, and shall file with the Commission copies of reports of such studies . . . , and shall make such modifications in project facilities and operations as may be required under Article 16, herein.

Article 16 of the license provides:

> The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance and operation of[,] such facilities and comply with such reasonable modifications of the project structures and operation as may be ordered by the Commission .-.-. after notice and opportunity for hearing and upon findings based on substantial evidence that such facilities and modifications are necessary and desirable, reasonably consistent with the primary purpose of the project, and consistent with the provisions of the [Federal Power] Act.

Article 16 is published at 42 FPC 280, 284 (1969), and is incorporated by reference in the Ludington Project license, 42 FPC at 278, Ordering Paragraph C.

FN4 Licensees' final study report, dated February 1981.

FN5 40 FERC P 62,151. No rehearing requests were filed.

FN6 44 FERC P 62,324. No rehearing requests were filed.

FN7 The licensees reported that the barrier net was 30 percent effective in 1989 and 37 percent effective in 1990. After design enhancements, the effectiveness rate was 84 percent in 1991 and 77 percent in 1992.

FN8 Filings of February 25, 1992. On February 26, 1992, the Grand Traverse Band of Ottowa and Chippewa Indians intervened, claiming treaty-reserved commercial and subsistence fishing rights in the waters of Lake Michigan affected by the Ludington Project. The Band took no specific position on the merits of the case.

FN9 The same entities are parties to both settlements, to wit: **Consumers Power** Company; Detroit Edison Company; the State of Michigan; Michigan Department of Natural Resources; U.S. Department of the Interior, on behalf of the Fish and Wildlife Service and, as Trustee for Indian tribes, bands or communities with reserved treaty rights in the Michigan waters of Lake Michigan; Michigan United Conservation Clubs; National Wildlife Federation; Grand Traverse Band of Ottawa and Chippewa Indians; Little River Band of Ottawa Indians; and the Little Traverse Bay Bands of Odawa Indians. The FERC Agreement was signed over the period February 22-27, 1995.

FN10 The State Agreement was filed with the Commission for its information, not for its review and approval. *See* Offer of Settlement filed with the Commission on February 28, 1995, Explanatory Statement at Section IV. The State Agreement provides for the licensees to provide compensation=in the form of land, money, and the funding of angler access projects=for past and future fish mortality at the Ludington Project during the current license term. *Id*.

FN11 FERC Agreement, section IV.B. Specifically, the FERC Agreement will be effective on the first day of the first month following the date the last regulatory approval described in section IV.C. becomes final and no longer subject to judicial review, or as soon thereafter as the State Agreement becomes effective. *Id*. The State Agreement has a corresponding effective date. On August 7, 1995, Interior, the State of Michigan, the Conservation Clubs, and the National Wildlife Federation filed a notice of the withdrawal of their petitions for an EIS and a hearing (pleadings filed June 26, 1986, February 26, 1992, and December 11, 1992, described above), effective as of the effective date of the FERC Agreement.

FN12 FERC Agreement, section IV.C. An NPDES permit is required under section 402 of the Clean Water Act, 33 U.S.C. 1342, for the discharge of pollutants into Commerce Clause waters. In December 1988, a court of appeals agreed with the licensees that the discharge of dead fish and fish remains from the project turbines is not a discharge of pollutants for Clean Water Act purposes. *See National Wildlife Federation v.* ***Consumers Power*** *Company*, 862 F.2d 580 (6th Cir. 1988), *reversing* 657 F. Supp. 989 (W.D. Mich. 1987). Pending resolution of related matters, the project has been operating under an interim permit.

FN13 On March 15, 1995, the Michigan Supreme Court remanded relevant pending appeals to the Thirtieth Circuit Court, which on March 17, 1995, found the terms of the State Agreement to be fair, reasonable, and consistent with the public interest, and incorporated the State Agreement as an enforceable part of a consent order and consent judgment among the non-federal parties, contingent upon the licensees obtaining all the regulatory approvals set forth in the State an*See* Attachments to **Consumers Power's** filing of March 21, 1995, in this proceeding. On August 8, 1995, a Michigan PSC administrative law judge issued a Proposal for Decision recommending grant of the licensees' rate and accounting filings. The matter is currently pending before the full PSC. By letter dated April 21, 1995, the licensees formally asked Michigan DNR to issue the project an NPDES permit. That request also is pending.

FN14 FERC Agreement, section IV.F.

FN15 *Id*., section II.A.1-3.

FN16 *Id*., section II.B., C., and D.

FN17 *Id*., appendix A, pp. 3-5.

FN18 *Id*., appendix A, pp. 1-3.

FN19 *Id*., section I.B.

FN20 *Id*., appendix A, pp. 1-3.

FN21 FERC Settlement at IV.I.

FN22 Draft Environmental Assessment: Proposed Permanent Measures for Fish Protection and Angler Access at the Ludington Project (July 12, 1995) (available in the public files of this proceeding).

FN23 As the result of design enhancements that improved the durability of the net and its ability to maintain a “seal” at the surface and bottom, the effectiveness of the barrier net has been significantly improved over time (*see supra* n.7). The net's effectiveness was about 77 percent in 1993 and 89 percent in 1994 (draft EA at pp. 35-38, final EA at pp. 33-36), and 93 percent in 1995 (Consumers' filing of December 22, 1995).

FN24 Draft EA at pp. 38-40 (final EA at pp. 36-38).

FN25 The FERC Agreement also provides for the expansion of parking at a Michigan DNR-operated boat launch located on **Consumers Power**-owned property (by its Campbell coal-fired steam electric plant) on the east end of Pigeon Lake, which connects to Lake Michigan via the Pigeon River; the upgrading of shorefishing access and boat launching facilities at a township park on the north side of Pigeon Lake; and related improvements, including a parking lot at the head of the fishing

boardwalk. FERC Agreement, appendix A, pp. 1-3.

FN26 FERC Agreement, appendix A, pp. 3-5.

FN27 Draft EA at p. 40.

FN28 *Id*. at pp. 40-41.

FN29 *Id*. at pp. 34, 43.

FN30 Windsnest Park, where **Consumers Power** discharges warm water from its Campbell plant, is a township park which currently can accommodate some 50 cars. The Beach Association suggests that the licensees consider building a peer along the plant discharge pipe and modify the warm-water outlets to attract fish along such pier. The Association proposes that the licensees develop **Consumers**-**Power**-Owned land along Muskegon Lake (near **Consumers Power's** Cobb Plant) for public fishing access. August 23, 1995 filing, second attachment.

FN31 Final Environmental Assessment: Proposed Permanent Measures for Fish Protection and Angler Access at the Ludington Project (November 6, 1995) (available in the public files of this proceeding).

FN32 Final EA at p. 31. Listed plant species include wild bean and ginseng. Listed bird species include several varieties of hawks, terns, and warblers, as well as the common loon, bald eagle, osprey, and double-breasted cormorant.

FN33 *Id*. at p. 41.

FN34 16 U.S.C. §803(a)(1). Section 10(a)(1) states:

> That the project adopted-.-.-.-shall be such as in the judgment of the Commission will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreignimprovement and utilization of waterpower development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes-.-.-.-.

74 FERC P 61055, 1996 WL 23993 (F.E.R.C.)
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84 FERC P 61147, 1998 WL 765456 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Commission Opinions, Orders and Notices

Consumers Energy
Company and The Detroit Edison Company

Project No. 2680-039

Order Approving Angler Access Plan and Revised Exhibit M

(Issued August 4, 1998)

***61808** Before Commissioners: James J. Hoecker, Chairman; Vicky A. Bailey, William L. Massey, Linda Breathitt, and Curt H (acute)ebert, Jr.
On January 22, 1997, **Consumers Power** Company (Consumers),[FN1] co-licensee for the **Ludington Pumped Storage** Project No. 2680, filed a plan for the installation of angler access facilities at the proposed Port Sheldon site, located outside the existing project boundary, in Ottawa County, Michigan. It also filed revised Exhibits L and M, showing the final ***61809** design of the angler access facilities. The plan and exhibits were filed pursuant to the Commission's January 23, 1996 order approving a settlement agreement.[FN2]

Public notice of the plan was issued on February 25, 1997, with a comment deadline of April 12, 1997. The U.S. Army Corps of Engineers (Corps), Ottawa County Planning Commission, Ottawa County Tourism Council, North Ottawa Rod and Gun Club, Michigan United Conservation Clubs (Conservation Clubs),[FN3] National Wildlife Federation (NWF), and, jointly, Michigan Department of Natural Resources (Michigan DNR) and Michigan Attorney General submitted comments. The Commission also received almost 100 filings, representing the views of more than 1,700 individuals. The comments were overwhelmingly in favor of the access plan. The Mountain Beach Association (Association), a group of owners of cottages and homes on Pigeon Lake and Lake Michigan, adjacent to the Port Sheldon site, intervened in opposition to the angler access plan.[FN4]

The Commission's staff prepared a draft Environmental Assessment (EA) that evalu-

ated the access plan and several alternative proposals and recommended adoption of the Port Sheldon alternative.[FN5] The Association filed comments on the draft EA. Commission staff has prepared a final EA, which is issued with, and attached to, this order.

For the reasons discussed below, we are approving the angler access plan for the Port Sheldon site.

Background

The 1,872-megawatt Ludington Project, located on the eastern shore of Lake Michigan, near the City of Ludington, Michigan, uses Lake Michigan as its lower reservoir and includes an 832-acre upper reservoir situated about 370 feet above Lake Michigan within a man-made embankment. The project, which was licensed in 1969,[FN6] began commercial operation in 1972.

Studies conducted by the licensees from 1975 through 1978 showed that the project's use of Lake Michigan as a lower reservoir was resulting in turbine entrainment and mortality of millions of fish each year. To mitigate for this entrainment and mortality, the licensees installed, and studied the effectiveness of, a temporary fish barrier net to keep fish from entering the turbines. In 1991, the licensees filed a proposal to permanently install the fish barrier net, fund state fishery-related programs, and provide angler access on licensee- owned property, because angler access to the project jetties posed safety concerns. The U.S. Department of the Interior, Michigan DNR, NWF, and Michigan United opposed a permanent fish barrier net, arguing that the level of fish losses with the barrier net was still unacceptable, and that it was moreover not cost- effective to ratepayers.

****2** In response to these concerns, settlement discussions were initiated among the licensees, the State of Michigan, Michigan DNR, Interior, Conservation Clubs, NWF, Grand Traverse Band of Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, and Little Traverse Bay Bands of Odawa Indians. These discussions culminiated in the 1995 filing of a settlement agreement for Commission approval (FERC Agreement).

The FERC Agreement settled all issues relating to the twenty-year dispute over appropriate, permanent mitigation measures that should be implemented to address fish entrainment at the Ludington Project and the need for angler access. Under the FERC Agreement, the licensees would mitigate fish mortality at the project with the seasonal installation of a 2.5-mile-long barrier net around the project intakes. To address the loss of fishing access behind the barrier net, the licensees would provide for the construction of angler access and related facilities at off-project sites in the City of Ludington, about four miles north of the Ludington Project, and at Port Sheldon, about 70 miles south of the project. The Port Sheldon site is located on Pigeon Lake and Lake Michigan.[FN7]

With respect to the Port Sheldon site, the FERC Agreement provided for the development of angler access on the piers that jut into Lake Michigan on the north and south sides of the mouth of the Pigeon River. Consumers would construct a 3,500-foot-long boardwalk along the shore of Pigeon Lake to the north pier on Lake Michigan, a 50-car parking area at the beginning of the boardwalk, and two vault toilets (one at the parking area, the other at the north pier). In addition, at a nearby Michigan ***61810** DNR site on Pigeon Lake that provides boating access to Pigeon Lake and Lake Michigan, Consumers would add 36 car/trailer spaces to the 65 that are already there.

Public notice of the FERC Agreement was issued, and, on July 27, 1995, a draft EA was issued for comment. Comments were received from the licensees and the Association, whose members own property in the area where the boardwalk is to be built. The final EA was issued November 6, 1995.

The Association objected to the proposal for angler access at Port Sheldon, arguing that it would violate the private property and riparian rights of the Association's residents, that the boardwalk and north pier would be hazardous, the quality of the fishery at Port Sheldon is poor, and there are threatened and endangered species present near the site. The Association also suggested several alternative sites that it contended would be preferable.

On January 23, 1996, the Commission issued its order approving the FERC Agreement (settlement order). The settlement order noted that the licensees disagreed with the Association's contentions regarding property rights, explained why the Port Sheldon site was preferable to the Association's alternatives, and stated that the facilities would be constructed so as to avoid harm to any threatened or endangered species.[FN8] As for the quality of the fishing, the final EA noted that Port Sheldon lies within one of the most heavily fished areas in the state; during peak fishing weekends, anglers have to park on nearby Lake Shore Drive; and the DNR boat access facility is used by an estimated 37,000 vehicles annually.[FN9] The settlement order required the licensees[FN10] to prepare the Port Sheldon access plan in consultation with the Association and the parties to the FERC Agreement.[FN11] If the Port Sheldon site proved infeasible, the licensees would provide angler access at another site agreed to by all the parties to the FERC Agreement. The Association did not intervene in the proceeding or seek rehearing of the settlement order.

Port Sheldon Angler Access Plan

****3** Licensees conducted several meetings with the parties and the Association and distributed a draft plan for comment. The final plan filed with the Commission includes documentation of the consultation meetings, and copies of comment letters received from NWF, Michigan DNR, and the Association. With the exception of Michigan and Michigan DNR, no parties to the FERC Agreement had any objections or concerns regarding the licensees' proposal.

On January 22, 1997, the licensees filed their angler access plan for Port Sheldon, as required by the settlement order. The plan would develop the angler access facilities as outlined in the FERC Agreement, with minor modifications. The boardwalk would be 2,500 feet long, instead of 3,500 feet;[FN12] the parking area to be built at the beginning of the boardwalk would have 31 car spaces, rather than the 50 proposed;[FN13] and only one toilet, located at the parking area, would be built. At the DNR boat access site, a minimum of 30 additional car/ trailer parking spaces would be added.

A. *Comments on the Plan*

As noted, the Commission received almost 100 filings that represented the views of over 1,700 individuals, the vast majority of whom support angler access at Port Sheldon. Ottawa County Planning Commission, Ottawa County Tourism Council, North Ottawa Rod and Gun Club, the Conservation Clubs, and the NWF filed comments in support of the plan.

The Michigan Attorney General and Michigan DNR (jointly, Michigan) are concerned that, while 31 car spaces at the pier parking area may be appropriate now, 50 spaces may be warranted in the future. Michigan also asks that the fishing platforms that will extend out from the boardwalk at several locations be extended farther out in Pigeon Lake, and that a toilet facility be constructed near the pier.

We agree that expansion of the parking area at the pier should be considered in the future, if warranted. Therefore, in the event the parking ***61811** area's capacity fails to meet recreationists' needs, we will require the licensees to study the feasibility of expanding the parking area and submit the results, with appropropriate recommendations, to the Commission for approval. Since the primary purpose of the Port Sheldon facility is to provide fishing access to Lake Michigan, we think that extending fishing platforms out on Pigeon Lake is unnecessary and will therefore not require the licensees to do so. As for a toilet at the pier, we agree with the licensee that this location is not feasible.[FN14]

The Association and numerous individuals who live in the vicinity of Port Sheldon object to angler access at Port Sheldon. They argue, for the most part, that angler access should be provided at a site other than Port Sheldon, that no fish are present in this area of Lake Michigan, and that access to their beachfront property may be disturbed or their property rights violated if the boardwalk is built.[FN15]

These are the same arguments that the Association raised in the settlement proceeding where the Commission considered and approved the construction of angler access facilities at Port Sheldon. The Association presents no new information that would warrant a different conclusion.

****4** The angler access facilities that are to be developed at the Port Sheldon site

will provide increased recreational opportunities for anglers and are a part of the resolution of long-standing concerns regarding fishing access to Lake Michigan. We believe that development of the facilities is in the public interest. That the licensees and the Association disagree as to whether the licensees possess sufficient property rights to construct and maintain the Port Sheldon facilities does not affect this conclusion. The interests of private landowners may not override the public's right to enjoy the recreational resources associated with licensed hydropower projects.[FN16] To the extent the licensees do not have sufficient property rights, they must obtain them from the beachfront residents.[FN17]

As for the quality of the fishing at the Port Sheldon site, the final EA explains that the piers jutting into Lake Michigan provide an environment that may attract invertebrates and smaller baitfish, which in turn can attract larger fish.[FN18] In addition, the movement of water into and out of Pigeon Lake creates currents that can attract fish to the piers during their seasonal migration.

During the consultation stage of the angler access plan, the Association provided a total of 14 alternative sites that it considered appropriate for angler access. Commission staff evaluated each of the Association's proposed alternatives in the draft EA, and found that none of the sites would be a suitable alternative to the Port Sheldon site.[FN19] The final EA attached to this order reaches the same conclusion,[FN20] which we find to be reasonable.

B. *Other Matters*

By letter dated November 21, 1997, the Commission staff requested concurrence from the Michigan State Historic Preservation Officer (SHPO) that there are no historic properties within the area of potential effect. This consultation was conducted pursuant to Section 106 of the National Historic Preservation Act.[FN21] In its response letter, dated December 2, 1997, the SHPO concurred with the staff's determination of no historic properties.

The draft EA found that two federally and state-listed threatened plant species occur in the proposed Port Sheldon access area. On January 23, 1998, the Commission staff forwarded a copy of the draft EA to the U.S. Fish and ***61812** Wildlife Service (FWS), requesting concurrence with the draft EA's conclusion that the proposed action will have no adverse impact on the federally-threatened plant species near the Port Sheldon site. This consultation was conducted pursuant to Section 7 of the Endangered Species Act.[FN22] In a letter filed on February 4, 1998, FWS concluded that construction of the Port Sheldon access facilities and subsequent recreation use will not likely have an adverse effect on threatened species.

Although some distance from the Ludington Project, the angler access at the Port Sheldon site fulfills a Ludington Project purpose, *i.e.*, mitigation for lost fishing access at the Ludington Project intakes. To ensure that the licensees are able to carry out their responsibilities with respect to these lands and facilities

throughout the term of the license, we are requiring that the Port Sheldon site be included within the Ludington Project boundary.[FN23]

**5 C. *Approval of Exhibits*

The licensees also filed revised Exhibits L and M with the angler access plan. The revised Exhibit L drawings consist of detailed site plans for the parking area and boardwalk/trail. The revised Exhibit M incorporates a description of the Port Sheldon Access in the original project description of the Ludington Project features.

The revised Exhibits L and M adequately show and describe the proposed facilities. The revised Exhibit M conforms to the Commission's rules and regulations and should be included in the project license. We note, however, that the revised Exhibit L drawings are preliminary site plans and do not show the facilities as built, or as located within the Ludington Project boundary.[FN24] Licensees should file for Commission approval revised Exhibit L drawings after the facilities are constructed; we will accordingly not approve the Exhibit L drawings filed with the plan.

D. *Summary*

The final EA contains background information, analysis of impacts, and the basis for a finding of no significant impact on the environment. The EA evaluated the effects of constructing the Port Sheldon access facilities on the environmental resources of the project area and concluded that any impacts that result from the proposed action would be minor in nature and would only occur during the period of project construction. We therefore find that an environmental impact statement is not required, and that approval of the angler access plan is not a major federal action significantly affecting the quality of the human environment.

Based on our review of the record, including the information on alternative sites and staff's findings in the final EA, we believe that the proposed facilities will enhance angler access to Lake Michigan and mitigate for the loss of such access at the Ludington Project piers. In addition, the plan meets the conditions of the FERC Agreement approved in our settlement order. For these reasons, we approve the plan.

The Commission orders:
(A) The angler access plan for the installation of Port Sheldon angler access facilities, filed by **Consumers Power** Company on January 22, 1997, is approved. Pursuant to this approval, the Port Sheldon angler access facilities are included in the boundary of the Ludington Project No. 2680, and made a part of the license for the project.

(B) The revised Exhibit M, filed by **Consumers Power** Company on January 22, 1997, is approved and made a part of the license for Project No. 2680.

(C) The licensees shall complete construction of the Port Sheldon angler access facilities within three years of the date of issuance of this order.

(D) Within 90 days of completing construction, the licensees shall file, for Commission approval, as-built drawings of the approved angler access facilities and revisions to Exhibit K. The as-built drawings should be similar to the revised Exhibit L drawings filed on January 22, 1997, but should include a project boundary line around all approved facilities and associated land. The revisions to the Exhibit K should show the project boundary encompassing the Port Sheldon site and that ***61813** site's location in relation to the **Ludington Pumped Storage** Project.

****6** (E) This order is final unless a request for rehearing is filed within 30 days of the date of issuance of this order, pursuant to Section 313 of the FPA. The filing of a request for rehearing does not operate as a stay of the effective date of this order or of any other date specified in this order, except as specifically ordered by the Commission. The licensees' failure to file a request for rehearing shall constitute acceptance of this order.

Final Environmental Assessment

Port Sheldon Angler Access Plan

Project Name: Ludington Project

FERC Project No. 2680-039

A. *Application*
1. Application Type: Plan for Port Sheldon Angler Access

2. Date Filed With Commission: January 22, 1997

3. Applicant: **Consumers Power** Company

4. Water Body: Lake Michigan and Pigeon Lake

5. Nearest City or Town: West Olive

6. County and State: Ottawa County, Michigan

B. *Purpose and Need for Action*
On January 22, 1997, **Consumers Power** Company (Consumers), licensee for the **Ludington Pumped Storage** Project in Michigan, currently doing business as **Consumers Energy** Company, filed on behalf of itself and its colicensee, Detroit Edison Company (DEC), a plan for the installation of angler access facilities at what is known as the Port Sheldon site. This site is located on Lake Michigan and Pigeon Lake, near the Town of West Olive, Michigan, about 70 miles south of the project. The plan was filed pursuant to Ordering Paragraph (C) of the Order Approving Settlement Agreement Regarding Fishery Issues, issued by the Federal Energy Regulatory Com-

mission (Commission or FERC) on January 23, 1996.[FN25] The plan has been submitted for approval by the Commission.

Ordering Paragraph (C) of the January 23, 1996 order, required the licensees to file the "final plan and a schedule for installation of angler access facilities at Port Sheldon or at an alternative site agreed to by all parties to the FERC Agreement."[FN26] The FERC Agreement, approved in the January 23, 1996 order, resolved long-standing issues concerning fish mortality resulting from operation of the Ludington Project, and called for the licensees to install a barrier net to mitigate project-related fish impacts and to develop the angler access facilities that were evaluated in the final plan.[FN27]

Under Ordering Paragraph (C) of the January 23, 1996 order, the plan is to include design drawings of the proposed access, construction schedules, copies of necessary permits, access agreements or easements, and a report on the possible environmental impacts of the proposed facilities on terrestrial resources, including measures for protecting fish and wildlife resources. The plan was required to be developed in consultation with the parties to the FERC Agreement and with the Mountain Beach Association (Association), an organization of owners of property adjacent to the Port Sheldon site. In addition, Ordering Paragraph (D) of the January 23, 1996 order, requires the licensees to file revised Exhibit L drawings and an Exhibit M (project description) showing the final design of the proposed angler access facilities.

****7** An environmental assessment was completed during the Commission's review of the FERC Settlement Agreement.[FN28] That assessment, however, evaluated the general impacts of the proposed angler access. Since detailed drawings of the facility were not complete at the time of that review, and the possibility remained for an alternative site to be selected for the angler access, the environmental effects of the action were not evaluated in detail. This assessment therefore evaluates the potential environmental impacts of the proposed plan.

C. *Proposed Action and Alternatives*
1. Proposed Action

***61814** The licensees propose to develop angler access to the north pier at the Port Sheldon site and to develop related facilities specifically outlined in the FERC Agreement; however, the licensees propose certain modifications. The facilities outlined in the FERC Agreement include:

* A minimum of 30 additional car/trailer parking spaces at the current Michigan Department of Natural Resources (MDNR) access site.
* A 50 car-only parking area on the west side of the inlet channel.
* 3,500 feet of accessible fishing boardwalk from the parking area to the north pier.
* One vault toilet at the parking area and one near the north pier.

Additional enhancements approved as part of the FERC Agreement include:

* Relocating approximately 200 feet of the steel discharge pipe from the south side to the north side of the pier, leaving a minimum 5-foot-wide walkway and providing fishing access to the north and south sides of the pier for the last 200 feet.
* Shortening the discharge pipe 15 feet at the pier's west end.
* Making surface improvements to the pier.
* Developing the township park east of the MDNR access over the next five years to improve accessibility for shore fishing, small boat launching, and overflow parking for Great Lakes boating access, and utilizing approved funds as a result of a township request for State matching grants.

The final angler access plan indicates the licensees will provide the facilities and enhancements required by the FERC Agreement, with the following proposed modifications:[FN29]

* Constructing 31 car-only parking spaces rather than the previously identified 50 spaces.
* Constructing one unisex fully accessible vault toilet at the parking area and no toilet facility near the pier.

The licensees propose to construct only 31 car-only spaces because of site constraints posed by sand dunes and the presence of the Pigeon Cove Boat Club Inc (PCBC). Employees at Consumers' Campbell Plant currently lease a parcel under the PCBC name for docking purposes on Pigeon Lake. Preliminary site designs indicate a 50-car parking area in this location would either encroach further into the dune or require the PCBC lease to be terminated. With regard to the toilet facilities, the licensees identify operation and maintenance constraints as the reasons for not constructing a facility near the pier. The licensees indicate such a facility will need to be accessible by a septic truck. The proposed 8-foot-wide boardwalk/trail is not designed to be accessible by motor vehicles. Further, the licensees do not have access rights through the Mountain Beach residential area, as a means of accessing the pier. With this, there is no road access available for a restroom facility near the pier.

****8** In addition to the above, the final plan indicates only 2,500 feet of accessible fishing boardwalk will be constructed from the parking area to the north pier. This length is shorter than that identified in the FERC Agreement, since the parking area has been located closer to the pier than originally proposed. The “boardwalk” will be constructed of a variety of surface materials (asphalt, boardwalk, and composite gravel/binder mix), in order to maintain accessibility standards for persons with disabilities.

2. Alternatives to the Proposed Action

Under the January 23, 1996 order, the licensees were required to provide a plan for developing angler access facilities at Port Sheldon, or at an alternate site

agreed to by all parties to the FERC Agreement. As stated, this plan was to be developed in consultation with the parties to the FERC Agreement and with the Association. As identified in the Consultation section of this document (Section D), the licensees consulted with all identified parties. During the consultation process the Association provided a total of 14 alternate sites which it thought would be more appropriate for angler access.

Commission staff reviewed each of the alternate sites. None of the sites were found to be a suitable alternative to the Port Sheldon site. The reasons for not further considering the alternate sites include one or more of the following:

(1) the site does not provide angler access to Lake Michigan, where the project is located (a primary objective of the FERC Agreement and a requirement of the license for mitigating project-related impacts);
(2) the property on which the pier would be constructed is too small for the proposed facilities;
(3) development would include the construction of a new pier within the bed of Lake Michigan (this option causes more adverse***61815** environmental impacts than rehabilitating an existing pier);
(4) upgrades at the site were already required by the FERC Agreement; and/or,
(5) the projected costs for developing equivalent facilities exceeds the projected costs for constructing the facilities at the Port Sheldon site.

The alternate sites were further reviewed by the parties to the FERC Agreement. The parties to the FERC Agreement which commented on the proposed plan unanimously support the Port Sheldon site. Given that the Port Sheldon site is the location agreed to by the parties to the FERC Agreement, and the reasons identified above, no alternatives to the proposed action are evaluated in this document.

3. No-Action Alternative

Under the no-action alternative, the Commission would not approve the plan for angler access at the Port Sheldon site, and the facilities which would provide access to the north pier would not be constructed. The north pier would therefore continue to be inaccessible to the public. Under the no-action alternative, the conditions of the FERC Agreement would continue to be unresolved, since there would be no mitigation for the loss of Lake Michigan angler access near the Ludington Project.

D. *Consultation*
****9** 1. Proposed Plan

As stated, the licensees consulted with the parties to the FERC Agreement and the Association, prior to filing the subject plan. This consultation involved several meetings with the parties and the Association, and the distribution of a draft plan for comment. In addition to the identified parties, the licensees provided a copy of the plan to The Nature Conservancy's Michigan Chapter for comment. The fi-

nal plan includes documentation of the consultation meetings. The comment letters received by the licensees on the plan and included in the filed material are as follows:

Agency/Organization=Date of Letter

National Wildlife Federation (NWF)=January 10, 1997

MDNR=January 13, 1997

Association=Undated

The NWF concurred with the licensees' assessment of the alternative sites proposed by the Association and stated they support the plan for the Port Sheldon access. The January 13 letter from MDNR states the 31 spaces proposed in the plan are acceptable at this time, but 50 car-only spaces will be needed as the fishery develops. MDNR states the toilet facility near the pier is also essential to the project and must be included. In addition, MDNR's letter recommends the fishing platforms along the boardwalk be extended farther into Pigeon Lake to reach deeper waters.

The letter from the Association contains comments on the licensees' right of access to the Port Sheldon site, Consumers' rejection of all alternate proposals submitted by the Association, and the expanded costs of the access. The Association states it cooperated in the consultation process in a reasonable manner and the alternate sites were not fairly considered. The Association contends that certain alternate sites were rejected because of high costs, yet the draft proposal submitted to the Commission is more than twice the amount estimated in the FERC Agreement. With regard to the licensees' right to access the land, the Association believes the boardwalk will violate the private property and riparian rights of the Association's residents. In addition, the Association believes the presence of threatened and endangered species at the site should preclude construction at this location.

2. Public Notice

A public notice of the licensees' plan was issued on February 20, 1997. Joint comments were received from MDNR and the Michigan Attorney General. Comments were also received from the Corps of Engineers (Corps), and comments and a motion to intervene were filed by the Association. Petitions of support from more than 1,700 local residents were also received in response to the notice.

The joint comments from MDNR and the Michigan Attorney General reiterate the parking, toilet, and platform concerns expressed in MDNR's January 13, 1997 letter to the licensees. The letter received from the Corps outlines its application process for any structures or work over, in, or affecting the navigable waters of the United States. The filing indicates that any work lakeward of the Ordinary High

Water Mark of Lake Michigan and Pigeon Lake, including adjacent wetlands, will require authorization by the Corps.

**10 3. Draft Environmental Assessment

Commission staff issued a Draft Environmental Assessment (DEA) and Notice of Availability of the DEA on September 22, 1997. The only comments received in response to the DEA were from the Association and were dated October 30, 1997. Responses to the Association's comments are presented in Appendix A. Where appropriate, the DEA was revised to incorporate the Association's comments. All changes to the DEA are reflected in this document.

On January 23, 1998, Commission staff sent a copy of the DEA to the U.S. Fish and Wildlife**61816 Service (FWS), requesting concurrence with the DEA's conclusion that the proposed action will have no adverse impact on Federally-threatened plant species. This consultation was conducted pursuant to Section 7 of the Endangered Species Act. In a letter filed on February 4, 1998, the FWS stated it concurred with the conclusions of the DEA.

E. *Affected Environment*

Port Sheldon is an unincorporated area in Ottawa County, Michigan, consisting of private cottages and homes on Pigeon Lake and Lake Michigan. Ottawa County is in southwestern Michigan and lies between Kent County and Lake Michigan. The City of Holland is the largest city in Ottawa County, with a population around 30,700. The City of Grand Rapids is the largest city in Kent County, with a population of approximately 189,126. The City of Grand Rapids is approximately 40 miles from the site while the City of Holland is approximately 10 miles south of the site.

The angler access facilities at Port Sheldon will be on lands along the north shore of Pigeon Lake. The proposed facilities will be located in a sand dune environment typical of the southeastern Lake Michigan shoreline. The dune area to the north of the proposed trail is known as the Mt. Baldy dune area. The Mt. Baldy dune area and its resources are cooperatively managed by Consumers and the Nature Conservancy under the Nature Conservancy Registry Program. This dune area is established with grasses and trees, and the eastern side of the dune contains relatively old growth hardwood forests. This dune area is further bordered by a road and residential development along the Lake Michigan shoreline (west and southwest), an existing access road to the Campbell Power Plant Complex (north and east), and Pigeon Lake, private boat docks, and the proposed trail/boardwalk area (south). There are no historic properties in the project area listed for inclusion in the *National Register of Historic Places* (Preservation Press, 1996).

The section of the proposed boardwalk to be constructed between the parking area and the pier will be along the base of a dune that borders the north shore of Pigeon Lake and its outlet into Lake Michigan. At present, a portion of this area is used by adjoining residents to access their boat docks on Pigeon Lake. There is

secondary vegetative growth, mature growth, and established grasses along much of the trail's length. Wetland areas are present along portions of the proposed boardwalk. These wetlands are primarily marginal/fringe wetlands along the shoreline of Pigeon Lake.

****11** Public shorefishing access is limited at Port Sheldon. The north and south piers into Lake Michigan are not currently open to the public and much of Pigeon Lake and the adjacent Lake Michigan frontage is privately owned. Winds Nest Park is located on Lake Michigan about 4,000 feet north of Pigeon Lake's outlet into Lake Michigan. Winds Nest Park primarily provides for swimming and picnicking activities and general beach access. There are no boat launch facilities or fishing piers available at this park. The nearest pier that provides fishing access on Lake Michigan is located at Holland State Park, approximately 10 miles from the proposed site. Holland State Park is one of the more popular parks within the state and receives nearly one million visitors annually.

Public access for anglers at Port Sheldon is provided by the MDNR-operated boat launch on the east end of Pigeon lake and a private boat ramp on the south side of Pigeon Lake. Numerous private docks are located in Pigeon Lake, especially on the south side of the lake. The PCBC docking area and boat launch is located on the north side of Pigeon Lake on Consumers property.

Fish species which may be present in the pier area (Pigeon Lake and Lake Michigan) consist of brown trout (*Salmo trutta*), chinook salmon (*Oncorhynchus tshawytscha*), rainbow trout (*Oncorhynchus mykiss*), northern pike, smallmouth bass, walleye, yellow perch, freshwater drum, and catfish. None of the species are listed as Federally or state-threatened or endangered.

Species of birds which are present in the Mt. Baldy dune/north pier area consist primarily of terns, warblers, hawks, and gulls. The double-crested cormorant (*Phalarocorax auritus*) and common loon (*Gavia immer*) are also know to exist in the area. However, no threatened or endangered bird species have been identified in the area proposed for development of the Port Sheldon angler access facilities.

Two species of plants in the Port Sheldon area are listed as threatened. One species, is both Federally and state listed, while the other is only state listed. A site survey conducted by the licensees found that both species occur within the Mt. Baldy dune area. Neither species will be near the proposed trail; however, one species is located in close proximity to the parking area as currently designed. If it is later determined that the proposed parking area would encroach upon the species, the plan indicates the licensees would redesign the parking area.

F. *Environmental Impacts*
1. Proposed Action

***61817** a. **Geology and Soils**. The sand dune/beach environment near the Port Sheldon site is similar to other dune areas along the Lake Michigan shore. The dunes and

beach are subject to wind and water erosion, and/or erosion created by human disturbance. The Mt. Baldy dune area is considered fairly stable, however, given the presence of grasses and relatively old-growth trees on its eastern side. The vegetation on the dunes limits sand movement and lessens the erosive activity of the wind.

****12** While the dune area will endure human disturbance during construction of the proposed facilities, no long-term impacts are likely to result from the proposed action. The trail will be constructed along the base of the dune near the water's edge. Some vegetation, primarily grasses and secondary vegetation, will be lost due to construction of the trail, but the long- term stability of the dune will not be diminished by this construction. The construction methods proposed by the licensees are appropriate for the sandy soils of the site and are designed to retain the stability of the dune. The paved and boardwalk surfaces of the trail will eliminate the erodibility factor associated with pedestrians walking on the direct surface of the dune. The open-type fencing to be used along the trail will not restrict wind flow and/ or the natural movement of the sand. Further, the timber retaining walls to be used in areas where the dune will be cut into will prevent the dune from sloughing and/or eroding. While it is possible that sand deposits will occur along the trail, this situation can easily be remedied by periodic maintenance of the trail.

In addition to the above, the proposed plan identifies the various local, state, and Federal permits which the licensees will obtain prior to constructing on the dune. These permits will include review by the Michigan Department of Environmental Quality, for construction within a “critical dune area.” Any work to be conducted along the shoreline, within the “ordinary high water mark,” will further require Section 404 or Section 10 permits from the Corps.

b. **Terrestrial Resources**. The proposed construction will not adversely affect wetland areas. The boardwalk will be a raised platform on a pole support system, typical of construction in bog/wetland parks. Water flow into and out of the fringe wetland areas along the shoreline of Pigeon Lake will not be impeded by the boardwalk structure. Any impacts to the fringe/marginal wetlands along the boardwalk will be minor and will occur only during the period of construction. With regard to the work to be done near the shoreline, or within the “ordinary high water mark,” the licensees' plan acknowledges that Section 404 or Section 10 permits may be required by the Corps and that the licensee will consult as appropriate.

The proposed action will not adversely impact Federally-threatened plant species. With regard to state-threatened plant species, the licensees' proposal includes appropriate provisions for minimizing impacts. The licensees acknowledge that increased pedestrian and vehicular use of the area could adversely impact the state-threatened plant species that exists in the area. With this, the licensees propose to install a fence along the entire length of the access road (north and east sides of the Mt. Baldy dune area). This fence will restrict vehicular access to

the dune. The fence will also be posted with signs prohibiting pedestrian access to the dune.

****13** Along the boardwalk/access path, the licensees propose to install fencing along the entire landward side of the trail. In areas with private boat docks, the lakeward side of the trail will also be fenced. Private residents will have access to their docks through gates along the trail. The fencing will limit public access only to those facilities provided by the licensees, and will restrict access to the Mt. Baldy dune area and private residential parcels.

Since the exact layout and location of the parking area has not been determined, the degree of impact to the state-threatened plant species cannot be determined. If it is determined during the layout phase of construction that the parking area will affect the state- threatened plant species, the licensees state they will modify the design of the parking area to avoid such impacts. The licensees further state they will work with MDNR, as necessary, to mitigate any effects while still accommodating the identified parking need. Commission staff concurs with this proposal and believes that it appropriately addresses terrestrial impacts at this site. No other terrestrial impacts are associated with the proposed action.

c. **Aquatic/Fishery Resources**. There are no long-term adverse impacts to aquatic or fishery resources associated with the proposed action. While the licensees propose to construct fishing platforms with footings in Pigeon Lake, this type of construction is considered to be similar to that of nearby boat docks. Any impacts caused by the construction of such platforms will be short-term and only during the period of construction. Again, the licensees acknowledge that Section 404 or Section 10 permits may be required by the Corps for construction below the ordinary high water mark. The licensees' plan indicates consultation will be undertaken.

d. **Recreation and Land Use**. The proposed action will enhance shorefishing opportunities to Pigeon Lake and Lake Michigan. The proposed***61818** action will provide access to portions of the Pigeon Lake and Lake Michigan shorelines which are presently closed to the public. The proposed action will also enhance angler access opportunities in the area by creating new fishing platforms and modifying an existing pier to accommodate pedestrian access. The shorefishing opportunities provided by the plan will provide non-boat opportunities in an area which was previously only accessible by boat.

The land use of the site will change in that it will now be open for public recreational use. The existing access road and parking area have been limited to use by employees of the Campbell Power Plant. Further, most of the trail area is currently used by private homeowner's (members of the Association) to access their boat docks on Pigeon Lake. We acknowledge the Association's belief that the licensees do not have access or riparian rights to the portion of the parcel abutting the Association's plots, but note that land ownership is not a matter to be

addressed in this environmental document.

****14** For the purposes of this document, we are charged with evaluating the recreational value of the parcel for the proposed use. From our review of the available information, we conclude the parcel has recreational value and the proposed action will improve Lake Michigan shorefishing access in southwestern Michigan.

e. **Cultural Resources**. Commission staff has reviewed the *National Register of Historic Places* 1966 to 1994 (Preservation Press, 1996) and concludes there are no historic properties within the project area. In addition, Commission staff does not believe cultural resources are present at the site, or that any will be discovered during construction of the proposed facilities, given the presence of residential development, dock facilities, roads, and a parking area.

By letter dated November 21, 1997, Commission staff requested concurrence on the above determination, from the Michigan State Historic Preservation Officer (SHPO), pursuant to Section 106 of the National Historic Preservation Act. By letter dated December 2, 1997, SHPO concurred with staff's conclusions and further stated, on their own accord, that “no historic properties exist within the area of potential effect for the project.”

f. **Aesthetic Resources**. The proposed action will not have an adverse impact on the aesthetic values of the site. While the trail will change the present appearance of the site, the design proposed by the licensees is not considered aesthetically unpleasing. The licensees propose to use materials that are typical for the facilities to be provided, and the beach- type environment which they are to be provided in. In addition, the licensees propose to use open-type fencing material that will restrict access to private property, but not create a solid visual barrier between adjacent homeowner's and their docks. With the existing slope in the area of the residential parcels, the fencing along the access path is also likely to be below the natural sight line of any windows that face the path. Again, the trail will change the present view from the residences, but this change is not considered an adverse visual impact (*i.e.* the fence will not obstruct views, will not be constructed with “unnatural” material or colors, etc).

Any aesthetic impacts caused by the proposed action would be the result of construction equipment in the area. These impacts would therefore only be short-term.

2. No-Action Alternative

Under the no-action alternative, the north pier at the Port Sheldon site would not be open to use by the public and fishing opportunities along Pigeon Lake and Lake Michigan would not be enhanced. Since no construction would occur at the Port Sheldon site the environmental conditions and current land use would remain the same. The licensees would further continue to be responsible for fulfilling the requirements of Ordering Paragraph (C) of the January 23, 1996 order. With this, an alternate Lake Michigan angler access site would need to be agreed upon by the

parties to the FERC Agreement.

G. *Conclusion*
**15 We evaluated the environmental effects of the proposed action and the no-action alternative. No adverse long-term environmental impacts were found to be associated with either proposal. With this, our evaluation concludes that neither the proposed action or the no- action alternative would constitute a major federal action significantly affecting the quality of the human environment.

H. *Literature Cited*
Preservation Press, The. 1996. National Register of Historic Places 1966 to 1994: cumulative list through January 1, 1994. Washington, DC. 1996.

I. *List of Preparers*

Patti Pakkala - Outdoor Recreation Planner

Robert Fletcher - Aquatic Ecologist

FN1 Consumers subsequently changed its name to **Consumers Energy** Company.

FN2 74 FERC P 61,055.

FN3 Michigan United Conservation Clubs is a non- profit federation consisting of over 400 local Michigansports conservation organizations.

FN4 Consumers filed a response to the Association.

FN5 Draft Environmental Assessment: Port Sheldon Angler Access Plan, Ludington Project, FERC Project No. 2680-039 (September 1997) (available in the public files of this proceeding).

FN6 42 FPC 274.

FN7 Pigeon Lake empties into Lake Michigan.

FN8 *See* final EA, dated November 6, 1995; and settlement order, 74 FERC at pp. 61,139-140.

FN9 *See* final EA, at pp. 30 and 39-40.

FN10 In a letter filed January 21, 1997, co-licensee Detroit Edison states that, as part of the FERC Agreement, Consumers accepted sole responsibility for the costs and risks associated with development of the angler access facilites at Port Sheldon. *See* FERC Agreement, Appendix A, at pp. 1-3. Co-licensees are however jointly and severally responsible for fulfilling all the statutory and regulatory obligations the license imposes on them, regardless of their varying interests in project property or their contractual obligations toeach other regarding project operation or the division of project costs and responsibilities. *Confederated*

Tribes of the Warm Springs Reservation of Oregon and Portland General Electric Company, 77 FERC P 61,267 (1996); *Dan River, Inc.,* 48 FERC P 62,078 (1989); *KAMO Electric Cooperative, Inc.,* 41 FERC P 61,046 (1987).

FN11 The order also required the licensees to file revised Exhibits L (final design drawings of access facilities) and M (project description).

FN12 The boardwalk is shorter because the parking area will be closer to the pier than originally planned.

FN13 Preliminary site designs indicated that a 50-car parking area in this location would either encroach further into the dune area or require termination of the lease for the adjacent Pigeon Cove Boat Club.

FN14 Licensees explain that a toilet at the pier is not feasible, due to problems accessing the facility. The proposed 8-foot-wide boardwalk/trail would not be wide enough to accommodate a septic truck, nor is it structurally designed to accommodate motorized vehicles.

FN15 In its most recent comments, dated July 1, 1998, the Association contends that an environmental impact and biological assessment study must be completed before a decision is made on the Port Sheldon access plan, because the licensees are dumping chemical waste into Pigeon Lake at the site of the proposed boardwalk, thereby endangering the public. This concern is best addressed under Michigan state's permit program. A National Pollutant Discharge Elimination System (NPDES) permit, issued by Michigan DNR, is required under Section 402 of the Clean Water Act, 33 U.S.C. § 1342, for the discharge of pollutants into Commerce Clause waters. The licensees are currently operating under a temporary NPDES permit.

FN16 *See, e.g., West Penn Power Company,* 81 FERC P 61,362, at p. 62,736 (1997), *reh'g denied*, 83 FERC P 61,225 (1998).

FN17 *See* standard Article 5 of the Ludington Project license, 42 FPC at 282. If the licensees cannot acquiresuch rights through agreement with affected residents, they may exercise the power of eminent domain. *See* Section 21 of the Federal Power Act, 16U.S.C. § 814.

FN18 *See* final EA, Appendix A, response to item 12. These fish may include brown trout, chinook salmon, rainbow trout, northern pike, smallmouth bass, walleye, yellow perch, freshwater drum, and catfish [omitted in printing].

FN19 *See* draft EA, at pp. 4-5.

FN20 *See* final EA, at pp. 4-5.

FN21 42 U.S.C. §§ 4321 *et seq*.

FN22 16 U.S.C. §§ 1536 *et seq*. Section 7(a)(2) of the Endangered Species Act,

16 U.S.C. § 1536(a)(2), requires that formal consultation (including issuance of a biological opinion by FWS) be initiated if the proposed agency action is likely to affect a listed species, unless through informal consultation (including correspondence) the action agency and FWS determine that the action is not likely to adversely affect the listed species.

FN23 The licensees support inclusion of the Port Sheldon site within the Ludington Project boundary. *See* letters from **Consumers Energy** Company, filed January 30, 1998, and January 31, 1997; and letter from Detroit Edison Company, filed January 21, 1997. As discussed below, the revised Exhibit K to be filed after the Port Sheldon facilities are built will show the revised project boundary.

FN24 We are also requiring the licensees to file revisions to Exhibit K (project boundary).

FN25 74 FERC P 61,055 (1996).

FN26 74 FERC at p. 61,141.

FN27 The parties to the FERC Agreement are: **Consumers Power** Company; Detroit Edison Company; the State of Michigan; Michigan Department of Natural Resources; U.S. Department of the Interior, on behalf of the Fish and Wildlife Service and, as Trusteefor Indian tribes, bands or communities with reserved treaty rights in the Michigan waters of Lake Michigan; Michigan United Conservation Clubs; National Wildlife Federation; Grand Traverse Band of Ottawa and Chippewa Indians; Little River Band of Ottawa Indians; and the Little Traverse Bay Band of Odawa Indians. The FERC Agreement was signed over the period February 22-27, 1995.

FN28 Final Environmental Assessment, Proposed Permanent Measures for Fish Protection and Angler Access at the Ludington Project, FERC Project No. 2680-017. This document was issued by the Commission on November 6, 1995, and is part of the record for the Ludington Project.

FN29 These modifications were deemed necessary after an additional review of the site's constraints was completed by the licensees.

Appendix A

****16 [Appendix A has been omitted in printing, it is available however, through the Commission's Records and Information Management System (RIMS) via the Internet through FERC's Homepage using the *61819 RIMS link or the Energy Information Online icon.]**

84 FERC P 61147, 1998 WL 765456 (F.E.R.C.)
END OF DOCUMENT

H
84 FERC P 62168, 1998 WL 516101 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Office Director Orders

Consumers Energy
Company and Detroit Edison Company

Project No. 2680-034

Order Approving Exhibit L Drawing

(Issued August 21, 1998)

***64272** Carol L. Sampson, Director, Office of Hydropower Licensing.
Consumers Energy Company filed an as- built drawing of a fish barrier net for the **Ludington Pumped Storage** Project, FERC No. 2680. The **Ludington Pumped Storage** Project is located on Lake Michigan in Mason, Oceana, Newaygo, Muskegon, and Ottawa Counties, Michigan.

Background
A Commission Order Approving Settlement Agreement Regarding Fishery Issues[FN1] authorizes the seasonal installation of a 2.5-mile-long barrier net around the project intakes to mitigate fish entrainment mortality. The barrier net, required to be placed not later than April 15 each year and removed not earlier than October 15, has been installed and operational every year since 1989.

Review
The 1997 Annual Report of Barrier Net Operation filed by the licensees on December 19, 1997, indicates a new fish barrier net was installed in 1997. In telephone conversations with Commission staff on August 6 and 11, 1998, a representative of **Consumers Energy** stated the new barrier net is essentially the same design as previous installations and is accurately depicted on the as-built drawing. However, the licensee stated the color of the lighted navigational buoys has changed. Note No. 2 on the as-built drawing indicates the color of the lighted buoys placed around the barrier net as black with a white light. The licensee indicated the color of the buoys has changed to white with orange lettering as required by the

U.S. Coast Guard.

The as-built exhibit drawing accurately reflects the design of the fish barrier net. The exhibit conforms to the Commission's rules and regulations and is approved by this order. This order will designate the as-built drawing as Exhibit L-18 and require the licensees to file a paper copy of the Exhibit L-18 drawing with Note No. 2 revised, in addition to aperture cards of the approved drawing. In accordance with Article 2 of the **Ludington Pumped Storage** Project license,[FN2] this order also requires the licensees to file a revised drawing of the barrier net if future reviews of its effectiveness result in significant design changes.

In addition, our review indicates the Commission's records do not contain aperture cards of the following drawings approved in 1981.[FN3]

[HR249,R1,R4] [BVR1, R2,R3, R4]

EXHIBIT	FERC NO.	TITLE
[HR249,R1,R4]		
L-1 B	2680-54	General Plan
[HR249,R1,R4]		
L-3 A	2680-55	Power Intake; Plan and Sections
[HR249,R1,R4]		
L-17 B	2680-56	Emergency Overflow; Plan and Sections
[HR249,R1,R4] [EV]		
[HR249,R1,R5] [BVR1,R2,R3,R4,R5]		
EXHIBIT	FERC NO.	TITLE SUPERSEDED/ DELETED
[HR249,R1,R5]		
L-18	2680-57	General = Design; Barrier

Net

[HR249
,R1,R5]
[EV]

H
87 FERC P 61150, 1999 WL 263577 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Commission Opinions, Orders and Notices

Consumers Energy
Company and The Detroit Edison Company

Project No. 2680-050

Order Denying Rehearing

(Issued May 4, 1999)

***61617** Before Commissioners: James J. Hoecker, Chairman; Vicky A. Bailey, William L. Massey, Linda Breathitt, and Curt H (acute)ebert, Jr.
On August 4, 1998, the Commission issued an order approving an angler access plan and a revised license Exhibit M, filed by **Consumers Energy** Company (Consumers), co-licensee for the **Ludington Pumped Storage** Project No. 2680.[FN1] The plan and revised Exhibit M are for the installation of angler access facilities at Port Sheldon, near West Olive, Michigan, located outside the existing project boundary in Ottawa County, Michigan.

The Mountain Beach Association (Association), a group of owners of lots and homes in West Olive, near the Port Sheldon site, filed a timely request for rehearing of the Commission's order.[FN2] For the reasons discussed below, we deny the Association's rehearing request.

Background
The 1,872-megawatt Ludington Project, located on the eastern shore of Lake Michigan, near the City of Ludington, Michigan, uses Lake Michigan as its lower reservoir. The project, which was licensed in 1969,[FN3] began commercial operation in 1972.

Studies conducted by the licensees from 1975 through 1978 showed that the project's use of Lake Michigan as a lower reservoir was resulting in turbine entrainment and mortality of millions of fish each year. Because no acceptable permanent mitigation measure had been adopted at the project, settlement discussions

on the matter were initiated among the licensees, state and federal fish and wildlife agencies, and other interested parties. The ***61618** discussions culminated in the filing of a settlement agreement, which the Commission approved on January 23, 1996.[FN4]

The settlement agreement resolved issues relating to appropriate, permanent mitigation measures to address fish entrainment at the Ludington Project, as well as the need for angler access. Under the agreement, the licensees would mitigate fish mortality at the project with the seasonal installation of a 2.5-mile-long barrier net around the project intakes. To address the loss of fishing access behind the barrier net, the licensees would provide for the construction of angler access and related facilities at off-project sites in the City of Ludington, about four miles north of the Ludington Project, and at Port Sheldon, or an alternative agreed to by the parties to the settlement agreement. The angler access plan was required to be developed in consultation with the parties to the settlement agreement and the Association. The Port Sheldon site is located on Lake Michigan and Pigeon Lake, near the Town of West Olive, Michigan, about 70 miles south of the Ludington Project. All proposals were subject to Commission review and approval, as necessary.

With respect to the Port Sheldon site, the settlement agreement provided for the development of angler access on the piers that jut into Lake Michigan on the north and south sides of the mouth of the Pigeon River. Consumers would construct a 3,500-foot-long boardwalk along the shore of Pigeon Lake to the north pier on Lake Michigan, a 50-car parking area at the beginning of the boardwalk, and two vault toilets (one at the parking area, and the other at the north pier). In addition, Consumers would add 36 car/trailer spaces to the 65 that are already at a nearby Michigan Department of Natural Resources (DNR) site on Pigeon Lake that provides boating access to Pigeon Lake and Lake Michigan.

****2** On January 22, 1997, the licensees filed theirangler access plan and exhibits for Port Sheldon, as required by the 1996 settlement order, and on August 4, 1998, the Commission approved the plan and the revised Exhibit M (project description).[FN5] The final plan provides for development of the angler access facilities as outlined in the settlement agreement, with minor modifications. The boardwalk would be 2,500 feet long, instead of 3,500 feet; the parking area to be built at the beginning of the boardwalk would have 31 spaces, rather than the 50 proposed; and only one toilet, located at the parking area, would be built. At the DNR boat access site, a minimum of 30 additional car/trailer parking spaces, instead of 36, would be added.

In our order approving the angler access plan and revised Exhibit M, we required that the Port Sheldon site be included within the Ludington Project boundary to ensure that the licensees are able to carry out their responsibilities with respect to the Port Sheldon lands and facilities throughout the license term.[FN6]

On rehearing, the Association argues that inclusion within the project boundary of the lands needed for the angler access facilities materially amends the license without proper notice, constitutes an abuse of the intent of the eminent domain provisions of Section 21 of the Federal Power Act (FPA),[FN7] and fails to adequately address the Association members' property rights.[FN8]

Discussion

A. *The Association Members' Property Rights*

The Association contends that the legal rights of its members, who own property in the Port Sheldon area where the boardwalk is to be built, were not given proper consideration. We considered and rejected a similar argument by the Association in our previous orders on angler access. In both the settlement proceeding and the proceeding involving approval of the angler ***61619** access plan, the Association objected to angler access at Port Sheldon, arguing that angler access should be provided at a site other than Port Sheldon, and that access to the members' beachfront property may be disturbed or their property rights violated if the boardwalk is built. For its part, Consumers has stated that it holds all the property rights along Pigeon Lake's north shore necessary to build the boardwalk and related facilities.[FN9] After reviewing the Port Sheldon site, and 14 alternative sites suggested by the Association, we concluded, as we do now, that development of the access facilities, which will provide increased recreational opportunities for anglers and resolve long-standing concerns regarding fishing access to Lake Michigan, is in the public interest.[FN10] If any of the Association members' legal rights are affected, Consumers can be required to acquire such rights, either by contract or in the appropriate state forum.

B. *Expansion of the Project Boundary*

The Association contends that including the Port Sheldon access lands within the Ludington Project boundary and making them subject to the federal power of eminent domain under FPA Section 21 is an abuse of that section's intent. The Association asserts (without elaboration) that Section 21 is intended to authorize condemnation of lands in and around a project, and not lands nearly 100 miles away.

****3** In most cases, lands adjacent to or in the vicinity of the project can serve all licensed project purposes. However, where sites near the project are infeasible for a project purpose,[FN11] Section 10(a)(1) of the FPA[FN12] authorizes the Commission to require project modification, including a change in project boundaries, in order to achieve that project purpose.[FN13] Off-site angler access is necessary here to address the loss of fishing access behind the barrier net, which precludes catchable-size fish in catchable numbers in the vicinity of the project's jetties.[FN14]

During the consultation process the Association proposed 14 alternative sites for angler access, some of them not far from Port Sheldon. Based on its analysis of

these sites, Commission staff concluded that each site had one or more of the following drawbacks:[FN15]

(1) The site does not provide angler access toLake Michigan, a primary Commission and settlement objective.
(2) The site is too small for the proposed facilities.
(3) The site would entail placing a new pier into Lake Michigan, with greater environmental impacts than merely rehabilitating an existing pier.
(4) The license already includes the site as one the licensee must upgrade.
(5) The projected costs for developing equivalent facilities exceed those of the Port Sheldon site. We therefore concluded that the angler access at the Port Sheldon site, better than the alternative sites reviewed, fulfills two Ludington Project purposes: mitigation for lost Lake Michigan fishing access at the Ludington Project intakes, and protection of recreational opportunities.

C. *Notice Procedures*

The Association argues that the Commission failed to follow proper notice procedures for the material amendment of the project boundaries. The Association avers that Consumers did not seek an amendment to its license, nor did the Commission "indicate to the public, as required by [unidentified] law, that its August 1998 Order would result in a material modification of the license" for the project.[FN16]

The Association is mistaken on all counts. Consumers' plan for the installation of angler access facilities at the Port Sheldon site, filed January 22, 1997, was in fact an application to amend the license. Indeed, all revisions to a license, no matter how small, are by definition amendments, although the procedural and substantive requirements will vary according to the nature of the amendment. The Commission issued public notice of the proposed plan on February 25, 1997, in response to which the Association intervened in opposition, and subsequently filed the rehearing request that is the subject of this order.

***61620** *The Commission orders:*

The request for rehearing filed by the Mountain Beach Association on September 3, 1998, is denied.

FN1 84 FERC P 61,147.

FN2 The Association requests a stay of the August 4, 1998 order, based on its arguments on rehearing. In light of the denial of the rehearing request, the stay request is moot.

FN3 42 FPC 274.

FN4 74 FERC P 61,055.

FN5 The licensees also filed revised Exhibit L drawings, showing the preliminary design of the access facilities. The exhibit did not show the facilities as built, or as located within the Ludington Project boundary, and was not approved. The licensees were required to file for Commission approval revised Exhibit L drawings after the facilities are constructed.

FN6 The Association requests correction of a statement in the order (84 FERC at p. 61,810) which refers to the “expansion of the parking area at the pier.” The proposed parking area would in fact be built at the beginning of the boardwalk.

FN7 16 U.S.C. § 814.

FN8 The Association also argues that the Commission failed to adequately assess the impacts of approving the Port Sheldon angler access site on endangered plant species near the site. It asserts that exchangingconsultation letters with the U.S. Fish and Wildlife Service (FWS), a signatory to the settlement agreement with what the Association asserts has a vested interest in approving the boardwalk, fails to meet the Commission's obligations to assess such impacts. However, the Commission's staff independently analyzed the impact of the Port Sheldon site on the endangered plant species (*see* the Draft Environmental Assessment of the Port Sheldon Angler Access Plan, issued September 26, 1997, at p. 9) and, pursuant to the consultation requirements of Section 7 of the Endangered Species Act, received FWS's concurrence in staff's conclusion that the Port Sheldon site would notadversely affect the involved species. *See* 84 FERC, *supra*, at pp. 61,811-12.

FN9 *See* Consumers' filing of September 11, 1995.

FN10 We noted as a general proposition that the interests of private landowners may not override the public's right to enjoy the recreational resources associated with licensed hydropower projects. *See West Penn Power Company*, 81 FERC P 61,362, at p. 62,736 (1997), *reh'g denied*, 83 FERC P 61,225 (1998).

FN11 Public recreational access is an important project purpose. *See* the Commission's policy on recreational development at licensed projects, 18 C.F.R. § 2.7, and Order No. 313, 34 FPC 1546 (1965), which promulgated the policy.

FN12 16 U.S.C. § 803(a)(1).

FN13 *See*, *e.g.*, *Georgia Power Company*, 31 FERC P 61,014 (1985), *reh'g denied*, 32 FERC P 61,237 (1985). Section 10(a)(1) includes no geographical limitation.

FN14 *See* 74 FERC P 61,055, at p. 61,137, and 84 FERC at p. 61,809. The Commission also noted that angler access to the project jetties poses safety concerns.

FN15 *See* the Environmental Assessment, attached to our prior order, 84 FERC at pp. 61,814-15.

FN16 Rehearing request at 2-3.

87 FERC P 61150, 1999 WL 263577 (F.E.R.C.)
END OF DOCUMENT

H
94 FERC P 62122, 2001 WL 275208 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Office Director Orders

Consumers Energy Company

Project Nos. 2680-060 and 2680-061

ORDER AMENDING LICENSE TO CORRECT EXHIBIT M AND TO REMOVE CERTAIN TRANSMISSION FACILITIES FROM PROJECT LICENSE

(Issued February 09, 2001)

***64189** On September 19, 2000, **Consumers Energy** Company (Consumers), licensee for the **Ludington Pumped Storage** Project, FERC No. 2680,[FN1] filed a corrected version of Exhibit M, ***64190** relating to Commission's August 4, 1998 Order [FN2] (FERC Docket No. P-2680-060) . On November 13, 2000, Consumers also filed an amendment application to delete non-jurisdictional transmission facilities as project features from the project license (FERC Docket No. P-2680-061). The project is located on the eastern shore of Lake Michigan, in the City of Ludington, in Mason, Oceana, Newaygo, Muskegon, and Ottawa Counties, Michigan. The project does not occupy any federal lands.

BACKGROUND
A. Correction to Exhibit M
On January 22, 1997, Consumers filed a revised Exhibit M, to include a description of the Port Sheldon angler access facilities, pursuant to Commission's Order Approving Settlement Agreement Regarding Fisheries Issues.[FN3] This revised Exhibit M was approved on August 4, 1998.[FN2] Since 1998, Consumers has discovered that the 1997 Exhibit M included outdated information on the project's installed capacity. To remedy this oversight, Consumers filed the corrected Exhibit M on September 19, 2000. This Exhibit M contains information on the project's installed capacity that are consistent with Commission's September 29, 1981 Order, which approved a decrease in the total project installed capacity from 1,872 megawatts (MW) to 1,657.5 MW.[FN4]

B. Transmission Line Facilities

Pursuant to Section 4(e) of the Federal Power Act (FPA), the Commission licenses "dams, water conduits, reservoirs, powerhouses, transmission lines, or other project works necessary or convenient for .....the development, transmission, and utilization of power.."[FN5]. FPA Section 3(11) [FN6] defines a "project" as including "the primary line or lines transmitting power therefrom to the point of junction with the distribution system or with interconnected primary transmission system."

Consumers proposes to delete the following transmission facilities as project features from the project license: (1) two parallel, 78-mile-long[FN7], 345-kilovolt (kV) transmission lines, extending from the 345-kV Ludington switchyard to the Kenowa substation, and (2) the 345-kV Ludington switchyard. Consumers proposes to remove these facilities from the project license because they are part of Consumers's transmission and distribution system. Consumers indicates that the only primary lines to remain as project features are the three parallel, 1,800-foot-long, 345-kV transmission lines, extending from the powerhouse to the Ludington switchyard.

A public notice of Consumers's proposals was issued on December 21, 2000. The Commission did not receive any comments from any federal, state, local agencies, nor the public.

REVIEW

A. Correction to Exhibit M

**2 We reviewed the corrected Exhibit M and found that it contains information on the project's installed capacity and the angler access facilities consistent with what was approved in 1981 and 1998, respectively. This order approves the Exhibit M, filed on September 19, 2000, which contains an accurate project description prior to the change in transmission facilities as discussed in this order.

B. Transmission Line Facilities

The test applied by the Commission to define what is a "primary transmission line" for FPA Part I purposes is that primary lines are:

> " those necessary to ensure the "viability" of the project in the event of Federal takeover. If a line is used solely to transmit power from [[[[Commission] licensed projects to load centers, and if, without it "there would be no way to market the full capacity of the project, then that line is a primary to the project." [FN8]

In our review of the Consumers' amendment application and the licensed one-line diagram, we found that the interconnected point of the project's primary transmission lines with the licensee's transmission system is located at the Ludington switchyard. Based on our review, we conclude that the two parallel, 78-mile-long, 345-kV transmission lines, extending from the Ludington switchyard to the Kenowa substation, are not primary lines requiring to be included in the project's li-

cense. Accordingly, these lines will be deleted from the license.

We agree with Consumers that the only primary transmission lines to remain as project features are the three parallel, 1,800-foot-long, 345-kV transmission lines, extending from the powerhouse to the Ludington switchyard. Ordering***64191** paragraph (B) of this order revises the project description to reflect the revised description of the project's primary transmission lines. Ordering paragraph (D) requires the licensee to file a revised Exhibit M to include the approved primary transmission lines in its project description.

C. Exhibit Drawings

We reviewed the exhibit drawings and find that Consumers should revise Exhibits J-1, K-1, and K-2 drawings to show labels of “Non-Project Transmission Lines” and to have an indication added, describing that the switchyard and transmission strip are excluded from the project license by this order. We also find that Exhibit K-3 and K-4 drawings, showing the transmission lines from the Ludington switchyard to the Kenowa substation, should be deleted from the project license.

In reviewing the one-line diagram in Exhibit L-16 drawing, we find that since the one-line diagram is not an exhibit drawing, it should be deleted from the project license as an exhibit drawing. However, we find that instead of deleting the Ludington switchyard portion from the one-line diagram, Consumers should submit a revised one-line diagram, showing a separation line of the switchyard from the project's primary transmission facilities, with a label of “Ludington Switchyard: Non-Project Transmission Facilities”.

The Director orders

****3** (A)The license for the **Ludington Pumped Storage** Project, FERC No. 2680, is amended as provided in this order, effective with the issuance date of this order.

(B)The corrected Exhibit M, filed on September 19, 2000, is approved and made part of the license, superseding the Exhibit M, filed on January 22, 1997.

(C)The following transmission facilities are no longer part of the project:

1. two parallel, 78-mile-long, 345-kV transmission lines, extending from the 345-kV Ludington switchyard to the Kenowa substation, and
2. the 345-kV Ludington switchyard

(D)The project description set forth in ordering paragraph (B, ii, 5) of the license is revised to read as follows:

> ” (5) Transmission facilities: The generator leads, the ten single phase transformers (a total of three banks plus one spare transformer) at the plant, the three parallel, 1,800-foot-long, 345-kilovolt transmission lines, extending from the powerhouse to the 345-kV Ludington switchyard.“

(E)The following exhibit drawings are deleted from the project license:

FERC Drawing No. 2680-	Exhibit	Title
27	K-3	Project Transmission Line
28	K-4	Project Transmission Line
43	L-16	One Line Wiring Diagram

(F)Within 90 days of the issuance date of this order, the licensee shall file revised Exhibit M with a one-line diagram and revised Exhibits J-1, K-1, and K-2 drawings, as follows:

(a)The revised Exhibit M shall contain the approved description of the project primary transmission lines and its appurtenant facilities. Along with the Exhibit M, the licensee shall file a revised one-line diagram, showing a separation line of the Ludington switchyard portion of the diagram from the project's primary transmission facilities, with a label of “Ludington Switchyard: Non-Project Transmission Facilities”.

(b)The revised exhibit drawings shall show labels of “Non-Project Transmission Lines” and an indication added, describing that the switchyard and transmission strip are excluded from the project license by this order.

(G)This order constitutes final agency action. Requests for rehearing by the commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. §385.713.

Mohamad Fayyad
Compliance Team Lead, Group 2
Division of Hydropower Administration and Compliance

FN1. 16 FERC ¶62,596 (September 29, 1981).

FN2. 84 FERC ¶61,147 (August 4, 1998).

FN3. 74 FERC ¶61,005 (January 23, 1996).

FN4. 16 FERC ¶62,596 (September 29, 1981).

FN5. 16 U.S.C. 797(e).

FN6. 16 U.S.C. 796(11)

FN7. Consumers cited in its amendment application that the length of the transmission lines to be removed as being 70 miles long. However, the more accurate length is 78 miles, as noted in the Exhibit M, filed in April 21, 1981, and approved In Commission order on September 29, 1981.

FN8. See Pacific Gas and Electric Company, 85 FERC ¶ 61,411 at p.62,559 (1998) and the orders cited therein.

94 FERC P 62122, 2001 WL 275208 (F.E.R.C.)
END OF DOCUMENT

H
98 FERC P 62059, 2002 WL 123317 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Office Director Orders

Consumers Energy
Company

Project No. 2680-066

ORDER APPROVING REVISED EXHIBITS J, K, L AND M

(Issued January 31, 2002)

***64100** On May 10, 2001, **Consumers Energy** (licensee for the **Ludington Pumped Storage** Project, FERC 2680) filed revised Exhibits J, K-1, K-2, L-1, M and a new Exhibit K-3. The filing is in compliance with ordering paragraph (F) of the Order Amending License to Correct Exhibit M and to Remove Certain Transmission Facilities from Project License, issued February 9, 2001.[FN1] The project is located on the eastern shore of Lake Michigan in the City of Ludington, Michigan.

The revised exhibits adequately show the project features as modified by the February 9, 2001 order amending the license, conform to the Commission rules and regulations, and are approved by this order. Ordering paragraph ***64101** (C) of this order requires the licensee to file microfilm copies of approved drawings.

The Director orders:

(A) The Exhibit M, filed on May 10, 2001, is approved and made part of the license, superseding the old exhibit M under the license.

(B) The following exhibit drawings, filed on May 10, 2001, are approved and made part of the license:

Exhibit	FERC No.	Title	Superseded Drawing No.
J-1	2680-58	General Map of Project Area	2680-3
K-1	2680-59	Detail Map of Project	2680-4

		Area Property Line	
K-2	2680-60	Detail Map of Project Area Property Line	2680-5
K-3	2680-61	Detail Map of Project Area Property Line	-------
L-1	2680-62	General Plan	2680-54

(C) Within 90 days of the date of issuance of this order, the licensee shall file three sets of aperture cards of the above approved exhibit drawings. The aperture cards should be reproduced on silver or gelatin 35 mm microfilm. All microfilm should be mounted on Type D (3 1/4 inch x 7 3/8 inch) aperture cards.

Prior to microfilming, the FERC Drawing Number (2680-58 through 2680-62) shall be shown in the margin below the title block of the approved drawings. After mounting, the FERC Drawing Number should be typed in the upper right corner of each aperture card. Additionally, the Project Number, FERC exhibit designation (J-1, K-1, K-2, K-3, L-1), Drawing Title, and date of this order should be typed in the upper left corner of each aperture card. See Figure 1.

TABULAR OR GRAPHIC MATERIAL SET FORTH AT THIS POINT IS NOT DISPLAYABLE

****2** Two sets of aperture cards should be filed with the Secretary of the Commission. The third set of aperture cards should be filed with the Commission's Chicago Regional Office.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of ***64102** issuance of this order, pursuant to 18 C.F.R. § 385.713.

Mohamad Fayyad
Engineering Team Lead,
Engineering and Jurisdiction Branch
Division of Hydropower Administration and Compliance

FN1. 94 FERC ¶ 62,122.

98 FERC P 62059, 2002 WL 123317 (F.E.R.C.)
END OF DOCUMENT

H
99 FERC P 62063, 2002 WL 730998 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

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1
Office Director Orders

Consumers Energy Company

Project No. 2680-074

ORDER APPROVING REVISED EXHIBIT J AND K DRAWINGS AND EXHIBIT R AS-BUILT DRAWINGS

(Issued April 25, 2002)

***64227** On January 31, 2002, **Consumers Energy** (licensee for the **Ludington Pumped Storage** Project, FERC No. 2680) filed one exhibit J revised drawing, four exhibit K revised drawings, and six exhibit R as-built drawings. The filing is in compliance with ordering paragraph (D) of the Order Approving Angler Access Plan and Revised Exhibit M, issued August 4, 1998.[FN1] The project is located in Michigan on the eastern shore of Lake Michigan, in Mason County and the City of Ludington.

The exhibits adequately show the location of the Pigeon Lake Recreation Center in Port Sheldon Township in relation to the **Ludington Pumped Storage** Project, show details of the project area property line around all approved facilities and associated land, and include as-built drawings of Pigeon Lake North Pier Access recreation facilities at the Port Sheldon Township site in Ottawa County. The exhibits conform to Commission rules and regulations and are approved by this order. Ordering paragraph (B) of this order requires the licensee to file microfilm copies of the filed drawings.

The Director orders:

(A) The following exhibit drawings, filed on January 31, 2002, are approved and made part of the license, old exhibits J and K under the license being superceded:

Exhibit	FERC No.	Title	Superseded Drawing No.
J-1	2680-63	General Map of Project	58

		Area	
K-1	2680-64	Detail Map Project Area Property Line	59
K-2	2680-65	Detail Map Project Area Property Line	60
K-3	2680-66	Detail Map Project Area Property Line	61
K-4	2680-67	Detail Map Project Area Property Line	-----
R-1	2680-68	Pigeon Lake North Pier - Plan View Index	-----
R-2	2680-69	Pigeon Lake North Pier - Project Boundary Plan View Sheet 1	-----
R-3	2680-70	Pigeon Lake North Pier - Project Boundary Plan View Sheet 2	-----
R-4	2680-71	Pigeon Lake North Pier - Project Boundary Plan View Sheet 3	-----
R-5	2680-72	Pigeon Lake North Pier - Project Boundary Plan View Sheet 4	-----
R-6	2680-73	Pigeon Lake North Pier - Project Boundary Plan View Sheet 5	-----

****2** (B) Within 90 days of the date of issuance of this order, the licensee shall file three sets of aperture cards of the above approved exhibit drawings. The aperture cards should be reproduced on silver or gelatin 35 mm microfilm. All microfilm should be mounted on Type D (3 1/4 inch x 7 3/8 inch) aperture cards.

Prior to microfilming, the FERC Drawing Number (2680-63 through 2680-73) shall be shown in the margin below the title block of the approved drawings. After mounting, the FERC Drawing Number should be typed in the upper right corner of each aperture card. Additionally, the Project Number, FERC exhibit designation (J-1, K-1 through K-4, R-1 through R-6), Drawing Title, and date of this order should be typed in the upper left corner of each aperture card. See Figure 1.

TABULAR OR GRAPHIC MATERIAL SET FORTH AT THIS POINT IS NOT DISPLAYABLE

***64228** Two sets of aperture cards should be filed with the Secretary of the Commission. The third set of aperture cards should be filed with the Commission's Chicago Regional Office.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance of this order, pursuant to 18 C.F.R. § 385.713.

Charles K. Cover, P.E.
Engineering and Jurisdiction Branch
Division of Hydropower Administration and Compliance

FN1. 84 FERC ¶ 61,147.

99 FERC P 62063, 2002 WL 730998 (F.E.R.C.)
END OF DOCUMENT

H
123 FERC P 62087, 2008 WL 1907972 (F.E.R.C.)

FEDERAL ENERGY REGULATORY COMMISSION

Office Director Orders
Consumers
Energy
Company
Detroit Edison Company

PROJECT 2680-094

ORDER AMENDING FEBRUARY 16, 2001 ORDER [FN1]

(Issued May 01, 2008)

Consumers Energy Company filed on February 2, 2007, a request to amend a February 16, 2001 Commission order by deleting the annual reporting requirement of ordering paragraph (B). The licensee supplemented its filing on October 2, 2007. [FN2] The **Ludington Pumped Storage** Project is located on the shore of Lake Michigan, in Mason County, Michigan.

BACKGROUND
A September 30,1988 Commission Order [FN3] required seasonal installation and removal of a temporary barrier net to exclude fish from the project's intake. The order required the licensees to monitor the net twice weekly and as necessary for maintenance purposes. It further required the licensees to file an annual report on the operation and maintenance of the barrier net.

On January 23, 1996, the Commission approved a settlement agreement resolving long-standing issues concerning fish mortality resulting from the operation of the Ludington Project. [FN4] The settlement established a Scientific Advisory Team (SAT) comprised of representatives of the licensees, Department of the Interior, Michigan Department of Natural Resources, National Wildlife Federation, Michigan United Conservation Clubs, and tribal parties. The SAT is to evaluate all information developed pursuant to the agreement.

The February 16, 2001 order approved the licensee's request to temporarily eliminate the requirement for an independent barrier net observer, with the condition that the SAT would annually revisit the need for the observer. Paragraph (B) of the order required the licensee to annually inform the Commission of the SAT's annual decision regarding the need for the barrier net observer.

LICENSEE'S AMENDMENT REQUEST
The licensee's February 2 and October 2, 2007 filings proposed to eliminate the requirement to annually report the SAT's decision regarding the need for an independent barrier net observer. The licensee stated that, after several years of experience without the independent observer, the SAT found that the observer requirement should continue to be held in abeyance indefinitely, with the SAT retaining the right to reinstate the observer requirement if again needed in the future. The licensee requested that the annual reporting requirement of paragraph (B) of the February 16, 2001 order be deleted.

RESOURCE AGENCY CONSULTATION
The licensee's filings included letters from the SAT, dated September 19, 2006 and September 18, 2007. The SAT recommended that the independent observer requirement be deleted for an extended time, with the SAT reserving the right to require reinstatement of the independent observer if it deems the observer is again needed in the future.

DISCUSSION AND CONCLUSIONS
The licensee's filing requested the removal of a filing requirement, without eliminating the annual discussion of the need for the barrier net observer. Letters of comment from the SAT document its intention to regularly revisit the question of the observer, and to reserve the right to reinstate the barrier net observer requirement at any time.

The licensees' request to delete the requirement to report the decision of the SAT regarding the need for a barrier net observer should be approved, while recognizing the right of the SAT to reinstate the requirement for the barrier net observer at any time it sees a need for the observer. If the SAT reinstates the requirement for the barrier net observer, the licensees should notify the Commission within 30 days of the decision. The licensees' filing should include documentation of the SAT's decision in its filing. The licensees' proposed amendment of the February 16, 2001, with the modification discussed above should, therefore, be approved.

The Director Orders:

(A) The licensees' proposal to delete paragraph (B) of the February 16, 2001 order, filed with the Commission on February 2 and October 2, 2007 under the February 16, 2001 Commission order, as modified by paragraph (B), is approved. Paragraph (B) of the February 16, 2001 order is hereby deleted.

(B) The Scientific Advisory Team (SAT) retains the right to reinstate the requirement for a barrier net observer at any time in the future. If the SAT reinstates the requirement for the barrier net observer, the licensees shall notify the Commission within 30 days of the decision. The licensees' filing shall include documentation of the SAT's decision in its filing.

(B) This order constitutes final agency action. Requests for rehearing by the Com-

mission may be filed within 30 days of the date of issuance of this order, pursuant to 18 CFR § 385.713.

George H. Taylor
Chief, Biological Resources Branch
Division of Hydropower Administration and Compliance

FN1. Order Approving Elimination of Barrier Net Observer Under September 30, 1988 Order, 94 FERC ¶ 62,158.

FN2. The October 2, 2007 filing repeated the licensees' February 2, 2007 request to amend the February 16, 2001 order, and included a second letter from the SAT supporting the amendment request.

FN3. Order Requiring Installation and Monitoring of Temporary Barrier Nets, 44 FERC ¶ 62,324.

FN4. Order Approving Settlement Agreement Regarding Fishery Issues, 74 FERC ¶ 61,055.

123 FERC P 62087, 2008 WL 1907972 (F.E.R.C.)
END OF DOCUMENT

139 FERC ¶ 62,101
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Consumers Energy Company
Detroit Edison Company

Project No. 2680-105

ORDER AMENDING LICENSE

(Issued May 7, 2012)

1. On December 16, 2011, and supplemented on January 30, February 8 and March 5 2012, Consumers Energy Company and Detroit Edison Company (licensees), licensees for the Ludington Pumped Storage Project, FERC No. 2680, filed an application to amend the license. The licensees request authorization to upgrade and overhaul all six pump-turbine/motor generating units. The project is located on the shore of Lake Michigan in Mason County, Michigan.

Background

2. On July 30, 1969, a license was issued to construct, operate and maintain the Ludington Pumped Storage Project.[1] The project consists of: (1) an upper storage reservoir with a storage capacity of 28,300 acre-feet at a minimum elevation of 875 feet and 81,300 acre-feet at a maximum elevation of 942 feet; (2) a lower reservoir, Lake Michigan; (3) six steel penstocks approximately 1,300-foot-long and 28-to 24-foot (tapered) in diameter; and (4) an outdoor-type powerhouse located adjacent to Lake Michigan, containing six pump-turbine generating units with an authorized installed capacity of 2,210,000 horsepower (1,657.5 megawatts (MW)).[2]

3. The project began commercial operation in 1973. The project is operated to provide power during peak demand periods. Power is usually generated during the day, and the upper reservoir is replenished at night by pumping. Starting with a full reservoir, the project can generate at maximum capacity for eight hours. Refilling the upper reservoir takes about 10 hours of pumping. The average annual generation during the years 2000 to 2010 was 2,624,189 megawatt hours (MWh) and the average annual pumping consumption during the same period was 3,618,396 MWh.

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[1] 42 FPC 274 Order Issuing License (Major).

[2] 16 FERC ¶ 62,596 Order Approving Revised Exhibit L Drawings and Revised Exhibit M (1981).

4. The mean head for project operations is 320 feet which accounts for 8.5 feet of penstock losses. According to the licensees, the hydraulic capacity for each pump-turbine unit was not provided in the original application or subsequent revised exhibits. Based on the 1969 Hitachi Stepped-Up Performance of Pump-Turbine for Turbine Operation-Curves, that were developed and filed with the Commission during the development of the project, the hydraulic capacity of each unit at best gate is 11,100 cubic feet second (cfs) at a net mean head of 320 feet.

Proposed Amendment

5. The licensees request authorization to upgrade and overhaul all six pump-turbine/motor generating units at the project, one unit at a time over the years 2013 through 2019. The proposed overhaul would increase the authorized installed capacity of the project from 1657.5 MW to 1,785 MW, an increase of 127 MW. The hydraulic capacity of the project would increase by approximately 14.5 percent from 66,600 cfs to 76,290 cfs, and the pumping discharge rate would increase by approximately 22.2 percent.

6. The hydraulic capacity of 12,715 cfs for each upgraded unit was based on best efficiency point at a net mean head of 320 feet from an independent testing laboratory in France and testing was witnessed by representatives of the licensees and pump-turbine manufacturer.

7. As discussed above, the licensees intend to complete one unit overhaul per year starting with the first unit in September 2012 and ending with the sixth unit in 2019.

Pre-Filing Consultation

8. Before filing the amendment application with the Commission, the licensees consulted with interested resource agencies and stakeholders, including: Bay Mills Indian Community, Chippewa-Ottawa Treaty Fishery Management Authority, Grand Traverse Band of Ottawa and Chippewa Indians, Little River Band of Ottawa Indians, Michigan Department of Environmental Quality (MDEQ), Michigan Department of Natural Resources (MDNR), Michigan United Conservation Clubs, National Wildlife Federation, Red Lake Band of Chippewa Indians of Minnesota, Sault Ste. Marie Tribe of Chippewa Indians of Michigan, Michigan State Historic Preservation Office (Michigan SHPO), U.S. Fish and Wildlife Service (FWS), U.S. Environmental Protection Agency, Michigan State University Department of Fish & Wildlife, U.S. National Park Service, U.S. Army Corps of Engineers and the U.S. Coast Guard.

9. Only two entities filed letters in response to the licensees' pre-filing application. In a November 18, 2011 letter, Little River Band of Ottawa Indians emphasized the importance of management of lake sturgeon, and encouraged the licensees to consider the

risk of entrainment to sturgeon as a result of the upgrade, and to make modifications to increase protection if necessary. In response, the licensees recognize the historic significance of lake sturgeon and the importance of restoring the species to self-sustainability. Based on barrier net effectiveness and the critical swim speed of the species, the licensees believe the upgrade would not pose a threat to the sturgeon.

10. The MDNR in a November 10, 2011 letter stated that they believe that the amendment proposal and the supporting documentation show that the increased flow for pumping and generation at the project would have minimal effect on the fish populations.

Public Notice

11. On January 31, 2012, the Commission issued a Notice of Application Accepted for filing, Soliciting Comments, Motions to Intervene and Protests with a filing deadline of February 29, 2012, for any comments, motions to intervene, and protests. We did not receive any comments or motions to intervene.

Water Quality Certification

12. Under section 401 of the Clean Water Act (CWA),[3] the Commission may not issue a license or permit that may result in a discharge from the project unless the water quality certifying agency either has issued water quality certification for the project or has waived certification by failing to act on a request for certification within a reasonable period of time, not to exceed one year. Section 401(d) of the CWA provides that the certification shall become a condition of any federal license that authorizes construction or operation of the project.

13. By letter to the licensees, dated April 8, 2010, the Michigan Department of Natural Resources and Environment [4] stated that a section 401 water quality certification would not be required for this amendment.

Threatened and Endangered Species

14. Section 7(a)(2) of the Endangered Species Act (ESA) of 1973[5] requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of their designated critical habitat.

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[3] 33 U.S.C. § 1341(a) (2006).

[4] At the time of the letter, the MDEQ and MDNR were combined into a single department; the Michigan Department of Natural Resources and Environment (MDNRE). In March 2011, the MDNRE was spilt back into two departments. The MDEQ is currently the department administering Section 401 water quality certificates.

[5] 16 U.S.C. § 1536(a) (2006).

15. The following federally threatened or endangered species are known to occur in Mason County, Michigan: piping plover (*Charadrius melodus*), Karner blue butterfly (*Lycaeides melissa samuelis*), Indiana bat (*Myotis sodalis*), and Pitcher's thistle (*Cirsium pitcheri*). Considering that the area for construction activities is limited to the powerhouse and area immediately adjacent to the powerhouse, the project upgrades are unlikely to adversely affect these species. By letter dated June 23, 2011, the FWS concurred with a determination of no effect to listed species within the project area.

National Historic Preservation Act

16. Under section 106 of the National Historic Preservation Act,[6] and its implementing regulations,[7] federal agencies must take into account the effect of any proposed undertaking on properties listed or eligible for listing in the National Register of Historic Places (defined as historic properties) and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking. This generally requires the Commission to consult with the Michigan SHPO to determine whether and how a proposed action may affect historic properties, and to seek ways to avoid or minimize any adverse effects.

17. By letter dated February 21, 2012, the Michigan SHPO stated that the proposed amendment would have no adverse effect on the Ludington Pumped Storage Hydroelectric Plant, which meets the criteria for listing in the National Register of Historic Places.

Coastal Zone Management Act

18. Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of receipt of the applicant's certification.

19. By letter dated May 4, 2011, MDEQ stated that provided all required permits are issued and complied with, no adverse impacts to coastal resources are anticipated, and issuance of all required permits would certify the proposed amendment as consistent with Michigan's Coastal Management Program.

[6] 16 U.S.C. § 470 (2006).
[7] 36 CFR Part 800 (2011).

Environmental Review

20. In this section we discuss the effect of the proposal on relevant environmental resources. Only those resources that would be affected, or for which comments were received, are addressed. In general, areas of the project that would be affected by the licensees' proposed amendment are limited to previously disturbed, unvegetated and developed areas, including the powerhouse and adjacent areas, and the project tailrace in Lake Michigan. The proposed construction and operation of the upgraded units would not affect geology, soils, terrestrial resources, land use, recreation or aesthetics. Resources that could be affected include water quality and quantity, fisheries and historic properties.

Background

21. The Ludington Pumped Storage Project is located on approximately 1000 acres along the Lake Michigan shoreline. Water is pumped from, or discharged into, a 1,100-foot-wide, 2,715-foot-long tailrace area in Lake Michigan. Two parallel 1,600-foot-wide jetties and a 1,700-foot-long breakwall protect the powerhouse from wave action and form the tailrace.

22. In 1995, the licensees entered into two settlement agreements with interested stakeholders concerning project effects. One of those agreements was filed for Commission approval on February 28, 1995. This agreement requires the licensees, in part, to seasonally install a 12,850-foot-long barrier net around the project's intakes from April 15 to October 15. The purpose of the net is to reduce fish entrainment and mortality. The licensees are also required to monitor the effectiveness of the net. The net extends from the lake bottom to the surface and is composed of 62 individual but interconnected panels.

Water Quality and Quantity

23. Pre- and post-operation studies conducted in the 1960s and 1970s concluded that the project has little effect on water temperature, turbidity, and that pH, total alkalinity, dissolved solids and dissolved oxygen did not differ between Lake Michigan and the upper reservoir.

24. During the proposed work, the affected areas of each unit would be dewatered and isolated from Lake Michigan and the upper reservoir. The licensees have obtained the required state permits for infrastructure work near Lake Michigan. Operation of the upgraded units would increase the project's hydraulic capacity by approximately 14.5 percent and would increase the project's pumping discharge rate by approximately 22.2 percent. Since there will be no in-water work, there would be no construction impacts on water quality. Also, considering that the project currently does not impact water quality,

and that an increase in discharge by 14.5 percent is negligible given the volume of water in the tailrace area, the proposed amendment is not expected to affect water quality.

Fisheries Resources

25. The Lake Michigan fishery consists of over 78 species of freshwater fish in about 22 families. This includes minnows (shiner, daces and chubs), coldwater salmonids (whitefishes, trout, and salmon), coolwater species (walleye, pike and perch) and warmwater sunfishes, suckers, and catfish. The principle sport fish along the eastern shore of Lake Michigan are Chinook salmon, coho salmon, lake trout, steelhead, brown trout, yellow perch and walleye.

26. Current velocities, immediately in front of the powerhouse when all six units are generating, reach an upper limit of approximately 9 feet per second (fps). Maximum current velocity diminishes to about 3 to 4 fps between the end of the jetties and the outer breakwater during generation. At the outer barrier net, the maximum measured flow during generation was 2.8 fps. During pumping mode, flow patterns at the net are more uniform and lower in velocity. Maximum current velocity measured when all six units are pumping ranges from 0.4 to 0.8 fps.

27. The licensees have monitored performance of the barrier net since 1989. Barrier net effectiveness is calculated based on weekly gill net sampling inside and outside of the net. Monitoring data collected from 1991 through 2010 demonstrates that the barrier net effectively excludes the majority of fish susceptible to collection. Target species effectiveness averages 90.7 percent, large game fish averages 83.6 percent, and large forage species averages about 94 percent. Since installation of the net in 1989, a total of 60 lake sturgeon, a species listed as threatened by the State of Michigan, have been collected, with only four of those fish found inside the barrier net.

28. The licensees conducted a computational fluid dynamics model to identify changes in water velocity and flow patterns between existing and proposed operating conditions, and to provide flow conditions at the barrier net under various operating conditions. As described below, the model found slightly increased velocities approaching the barrier net during pumping operation of the upgraded units. However, these increases would be inconsequential compared to existing velocities, and in relation to fish swimming speeds. Therefore, the licensees concluded there would be no increase in impingement upon the net as a result of the proposed upgrades.

29. The licensees' evaluation assessed whether the pumping rate would affect the density of fish entrained when the net is not in place (approximately October 16 to April 14). An evaluation of swim speed, along with flow pattern changes, indicated that fish would not be any less capable of escaping the projected upgraded pumping velocities proximal to the project. Average flow velocity just outside of the tailrace entrances during six-unit pumping is currently 1.3 fps for the south entrance and 1.4 fps for the

north entrance. Estimated flow rates after the upgrade at the entrance of the tailrace as a whole is expected to be about 2.0 fps, which is below the burst swimming speed, if not the sustained swimming speed of the majority of fish expected to be present during the winter.

30. The licensees' evaluation also concluded that the increased generating capacity of the units, and associated flow rates, may increase the frequency and magnitude of barrier net submergence events. Barrier net submergence, when both the main net and top skirt buoys are submerged, already occurs on a regular basis during generation. However, the licensees believe that submergence during generation does not in and of itself decrease the biological efficacy of the barrier net and may not necessarily lead to increased entrainment. The licensees would continue to implement the barrier net monitoring program through at least the duration of the current project license. The licensees expect that monitoring and adaptive management (to modify the net as needed) would mitigate for any barrier net impacts following completion of the proposed upgrades.

31. For the upgrade, heavy equipment and parts would need to be transported to the project via barge, prior to each of the six unit upgrades. The licensees are proposing a project outage for approximately one week each year to accommodate the barge traffic (up to three barges per annual outage). At this time the barrier net would be partially breached for a brief period during the outage to allow for barge access. Divers would split a chosen seam between panels to a depth enabling barge passage (a width of approximately 60 feet). Once the barge has passed, the seam would be re-secured, and the process would be repeated when the barge disembarks and another comes in. The project would not be operating during barge movement, and the net would only be open during the time required to allow the barge to pass over the net, and therefore, impacts to the fishery should be minimal. The licensees propose to coordinate the final plan for partial barrier net breaches with members of the Scientific Advisory Team (composed of representatives from the parties to the settlement agreements) and in accordance with the settlement agreement approved by the Commission.

32. Based on the data presented from the licensees' computational fluid dynamic model, and the performance of the barrier net, the proposed unit upgrades would have no adverse effect on fisheries resources.

Historic Properties

33. At the time the project was constructed, the project had the largest generating capacity in the world for pumped storage projects, and it remains the third largest pumped storage facility in the world and the second largest in the United States. The licensees voluntarily conducted a National Register of Historic Places (NRHP)-eligibility study in 2011. The assessment found that the project meets several eligibility criteria for NRHP listing, but that the upgrade would not adversely affect the project's eligibility for

listing on the NRHP. By letter dated February 21, 2012, the Michigan SHPO stated that the effects of the proposed undertaking would have no adverse effect on the Ludington Pumped Storage Project.

Project Operation

34. The unit upgrades under the proposed amendment would not have a significant effect on the normal project operation. However, the increase in capacity would improve the project efficiency, and enhance the project's ability to support system energy needs during times of peak demand.

Capacity Changes and Administrative Issues

A. Installed Capacity

35. The proposed amendment would increase the project's installed capacity. The Commission's regulations at 18 C.F.R. section 11.1(i) state in part "authorized installed capacity means the lesser of the ratings of the generator or turbine units.....The rating of a turbine is the product of the turbine capacity in horsepower (hp) at best gate (maximum efficiency point) opening under the manufacturer's rated head times a conversion factor of 0.75 kW/hp.....".

36. The authorized installed capacity of the Ludington Pumped Storage Project after completing the overhaul of all six units would be 1,785 MW as shown in the Table 1 below.

37. Ordering paragraph (B) of this order revises the project description in ordering paragraph (B)(ii)(3) of the license to reflect changes in installed and hydraulic capacities.

Table 1.

Before Upgrade					After Upgrade				
Unit No.	Turbine Capacity MW	Hydraulic Capacity cfs	Geneator Capacity MW	Authorized Capacity MW	Unit No.	Turbine Capacity MW	Hydraulic Capacity cfs	Geneator Capacity MW	Authorized Capacity MW
1	276.25	11,100	276.25	276.25	1	311	12,715	297.5	297.5
2	276.25	11,100	276.25	276.25	2	311	12,715	297.5	297.5
3	276.25	11,100	276.25	276.25	3	311	12,715	297.5	297.5
4	276.25	11,100	276.25	276.25	4	311	12,715	297.5	297.5
5	276.25	11,100	276.25	276.25	5	311	12,715	297.5	297.5
6	276.25	11,100	276.25	276.25	6	311	12,715	297.5	297.5
Total Authorized Capacity				1,657.5	Total Authorized Capacity				1,785

B. Start of Construction

38. The licensees intend to complete one unit overhaul per year starting with the first unit in September 2012 and ending with the sixth unit in 2019. As such, we are requiring

in ordering paragraph (C) that the licensees start and complete the upgrades construction within 2 years and 8 years, respectively. The licensees must perform all construction work in consultation with the Commission's Division of Dam Safety and Inspection's Chicago Regional Office.

C. Annual Charges

39. The increase in authorized installed capacity requires a revision to the annual charges under Article 31 of the license. The authorized installed capacity for that purpose after the upgrade and overhaul of six units is 1,785 MW. In accordance with the Commission's regulations at 18 C.F.R. § 11.1 (c)(5), the assessments for new authorized capacity start on the date of commencement of construction of such new capacity. Accordingly, ordering paragraph (D) of this order requires the licensees to file with the Commission the date construction started, which we will use to revise license Article 31.

D. Exhibits

40. The revised Exhibit M included in the amendment application reflects the changes proposed in the amendment and conforms to the Commission's regulations and is approved in ordering paragraph (E) of this order. Ordering paragraph (F) of this order requires the licensees to file photographs of nameplates of turbines and generators within 60 days of completion of construction of each unit.

Conclusion

41. Based upon the review of the information provided by the licensees, agency comments, and staff's independent analysis, Commission staff concludes that approving the amendment of the license is not a major federal action significantly affecting the quality of the human environment. This order approves the amendment of license to upgrade and overhaul all six pump-turbine/motor generating units at the Ludington Pumped Storage Project.

The Director orders:

(A) The application to amend the license for the Ludington Pumped Storage Project, FERC No. 2680, filed on December 16, 2011, and supplemented on February 8 and 21, 2012, is approved, effective the day this order is issued.

(B) Item (ii)(3) of the project description under ordering paragraph (B) of the license is revised to read as follows:

(4) "an outdoor-type powerhouse located adjacent to Lake Michigan, containing six pump-turbine generating units, each pump-turbine unit with an installed

capacity of 311 megawatts (MW) and hydraulic capacity 12,715 cfs connected to a generator of 297.5 MW, for total authorized installed capacity of 1,785 MW as shown in Table 1 of this order.

(C) The licensees must start refurbishing the six generating units and appurtenant equipment within one year and complete all construction within eight years from the date of this order. The licensees must perform all construction work in consultation with the Commission's Division of Dam Safety and Inspection's Chicago Regional Office.

(D) Within 60 days of start of construction of each unit, the license must file with the Commission, the date construction started, which we will use to revise the annual charges under license article 31.

(E) The revised Exhibit M filed along with the amendment application filed on December 16, 2011, is approved, and made part of the license, superseding the old Exhibit M.

(F) Within 60 days of completion of construction of each unit, the licensees must file with the Commission, and the Division of Dam Safety and Inspection's Chicago Regional office, photographs of turbine and generator name plates.

(G) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance, as provided in section 313(a) of the FPA, 16 U.S.C. § 8251 (2006), and the Commission's regulations at 18 C.F.R. § 385.713 (2011). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensees' failure to file a request for rehearing shall constitute acceptance of this order.

M. Joseph Fayyad
Engineering Resources Branch
Division of Hydropower Administration
and Compliance

Document Content(s)

APPENDIX D

PUBLIC SAFETY PLAN

Consumers Energy

A CMS Energy Company

Ludington Pumped Storage Plant
3525 S. Lakeshore Drive
Ludington, MI 49431-9756

Tel: 231 843 5227

William A. Schoenlein
Plant Manager

March 27, 2008

Ms. Peggy A. Harding, PE
Regional Engineer
Federal Energy Regulatory Commission
230 South Dearborn Street, Room 3130
Chicago, IL 60604

D2SI-OHL-CH
PROJECT NUMBER 2680
NATDAM NO. MI00180
LUDINGTON PUMPED STORAGE PLANT
CONSTRUCTION DOCUMENT RELOCATION/PUBLIC SAFETY PLAN UPDATE

As a result of the 2006 annual FERC inspection, FERC staff recommended that "By March 31, 2008, the construction documents currently stored above the powerhouse in a building with no climate control should be moved to a suitable storage facility located outside of the estimated inundation limits for the project" (see FERC letter dated June 9, 2006). Those documents have since been moved to Consumers Energy Company's Ludington Service Center. The Service Center is a secure location outside of the estimated inundation limits in the event of a failure of the Project's earthen embankment and/or steel penstocks. In addition, FERC staff had indicated that "thought should also be given to making digital copies of these documents for ease of use and to prevent loss of the data". At this time, Consumers does not feel that digital copies of these documents are necessary given their relocation to a secure Company facility located outside of the Plant's estimated inundation limits.

As a result of the 2007 annual FERC inspection, FERC staff noted that the latest public safety plan for the Project was dated 1992 and recommended that the "public safety signage and details should be confirmed and an updated public safety plan should be developed" and the updated public safety plan should be submitted by the end of the first quarter of 2008. The signage and details of the Project's public safety plan have since been confirmed and an updated plan is attached to this letter in the form of three copies each of two full size drawings (1140-4-002, Public Safety Devices - Safety Signs and 1140-4-003, Public Safety Devices - Barrier Net Buoys) and three copies of a seven page document showing the details of each of the public safety signs.

If there are any questions concerning either of the above two items, please call me at 231-843-5227 or David Battige of my staff at 231-843-5229.

Sincerely,

William Schoenlein
Plant Manager

Enclosures

Sign Legend - A

NO

TRESPASSING

CONSUMERS POWER CO.

These signs are generally located every 200 feet along the entire perimeter fence line.

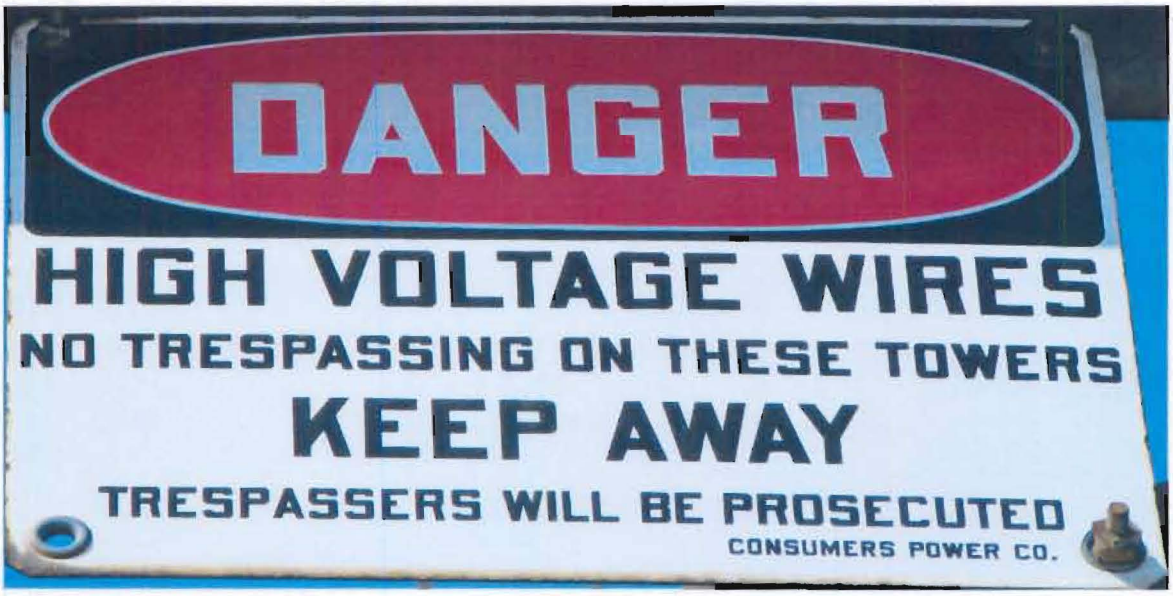
Sign size:	21 inches wide by 12 inches high
Sign color:	blue
Letter size:	top two lines is 2-1/2 inch lettering; all other lettering is 1 inch
Letter color:	white letters on a blue background

Sign Legend - DH

DANGER
HIGH VOLTAGE
WIRES OVERHEAD

There are three of these signs, one located west of the entrance gate to Ramp 9 on Kistler Road (sign faces west) and two east of the entrance gate to Ramp 9 (inside the security fencing with one sign at the bottom of Ramp 9 facing northeast and one sign south of the entrance gate facing south along the reservoir embankment patrol road at the downstream toe of the embankment) warning of the overhead power lines.

Sign size:	20 inches wide by 14 inches high
Sign color:	upper portion is a red oval on a black background; lower portion is a white background
Letter size:	DANGER is 2-3/4 inch lettering; all other lettering is 2 inches
Letter color:	DANGER is white letters on a red oval background; all other lettering is black on a white background



Sign Legend - HV

DANGER

HIGH VOLTAGE WIRES

NO TRESPASSING ON THESE TOWERS

KEEP AWAY

TRESPASSERS WILL BE PROSECUTED

CONSUMERS POWER CO.

These signs are generally located on each non-project 345 kV transmission tower.

Sign size:	21 inches wide by 14 inches high
Sign color:	upper portion is a red oval on a black background; lower portion is a white background
Letter size:	DANGER is 2-3/4 inch lettering; the words HIGH VOLTAGE WIRES KEEP AWAY is 2 inch lettering, all other lettering is 1 inch except CONSUMERS POWER CO. is 1/2 inch lettering
Letter color:	DANGER is white letters on a red oval background; all other lettering is black on a white background

Sign Legend - SI

NOTICE

ALL
VEHICLES AND PARCELS
ARE SUBJECT TO
SECURITY INSPECTION

CONSUMERS POWER CO.

There are three of these signs, one located at the entrance gate to Ramp 9 on Kistler Road (facing west), one at the northeast entrance gate to the non-project 345 kV substation (facing north) and one at the main Plant entrance gate (facing east).

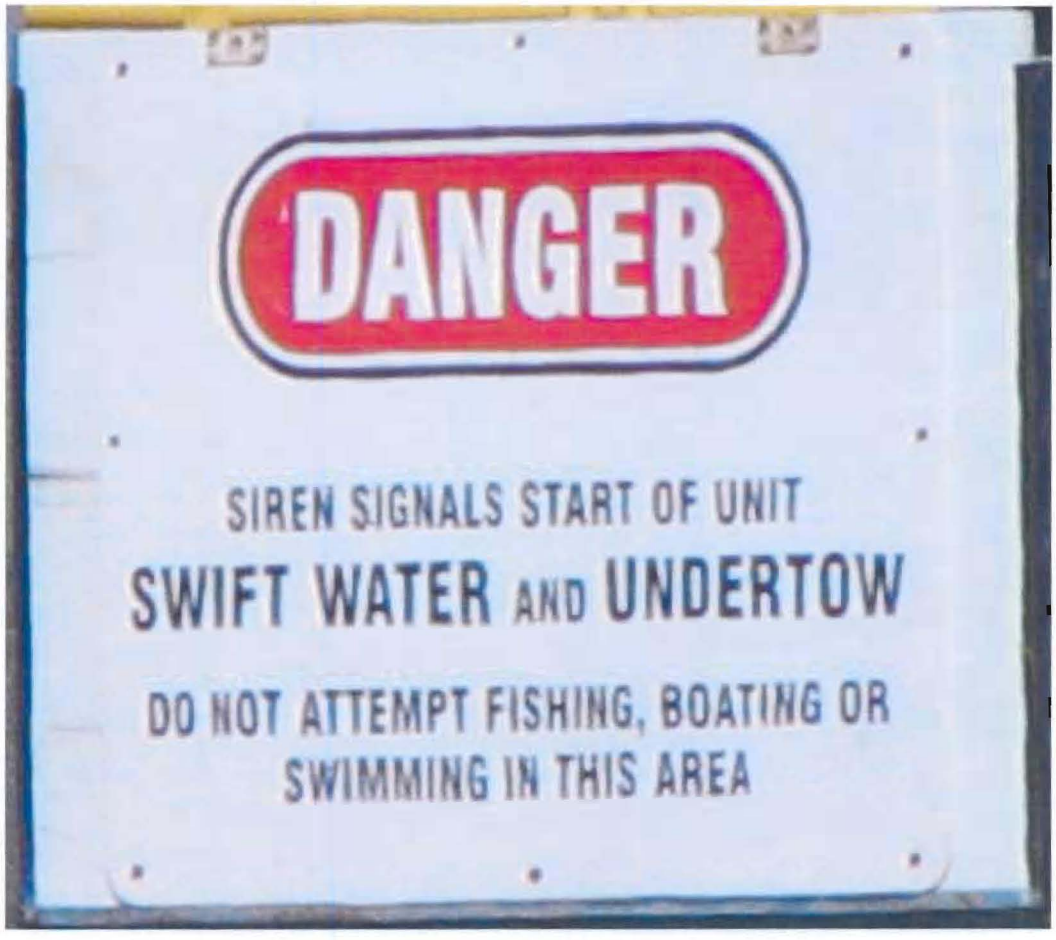
Sign size:	28 inches wide by 20 inches high
Sign color:	upper portion is a blue rectangle on a white background; lower portion is a white background
Letter size:	NOTICE is 3-1/4 inch lettering; lettering of next four lines is 2 inches while bottom line is 1 inch lettering
Letter color:	NOTICE is white letters on a blue rectangular background; all other lettering is black on a white background

Sign Legend - SR

DANGER
SUBMERGED ROCKS, UNDERTOW
NO SWIMMING OR BOATING
NO TRESPASSING

There are two of these signs located on the fencing extending from the shore to the jetties (one sign on the north and one on the south fencing) facing Lake Michigan.

Sign size:	60 inches wide by 48 inches high
Sign color:	upper is red and lower is white
Letter size:	DANGER is 7 inch lettering; all other lettering is 3-1/2 inches
Letter color:	DANGER is white letters on a red oval background; all other lettering is black on a white background



Sign Legend - SW

DANGER

SIREN SIGNALS START OF UNIT

SWIFT WATER AND UNDERTOW

DO NOT ATTEMPT FISHING, BOATING OR
SWIMMING IN THIS AREA

Three of these signs are located on the powerhouse facing the Lake Michigan tailrace.

Sign size:	60 inches wide by 48 inches high
Sign color:	upper is red and lower is white
Letter size:	DANGER is 7 inch lettering, the words SWIFT WATER UNDERTOW is 4-1/2 inch lettering, all other lettering is 3 inches
Letter color:	DANGER is white letters on a red oval background; all other lettering is black on a white background

Sign Legend - V

DANGER

HIGH VOLTAGE

KEEP AWAY

FROM ALL
WIRES AND APPARATUS
IN THIS VICINITY

This sign is on the northeast entrance gate off of Lakeshore Drive and the two east gates (accessed from inside the security fence) leading to the non-project 345 kV switchyard.

Sign size:	10-1/2 inches wide by 12 inches high
Sign color:	upper portion is a red oval on a black background; lower portion is a white background
Letter size:	DANGER is 1-1/2 inch lettering; the words HIGH VOLTAGE KEEP AWAY is 1 inch lettering, all other lettering is 5/8 inch
Letter color:	DANGER is white letters on a red oval background; all other lettering is black on a white background