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United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-2105, Vol. 2

Draft Environmental Impact Statement for Combined License (COL) for Enrico Fermi Unit 3

Draft Report for Comment

U.S. Nuclear Regulatory Commission
Office of New Reactors
Washington, DC 20555-0001

Regulatory Office
Permit Evaluation, Eastern Branch
U.S. Army Engineer District, Detroit
U.S. Army Corps of Engineers
Detroit, MI 48226

US Army Corps

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Abstract

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Detroit Edison for a construction permit and operating license (combined license, or COL). The proposed actions related to the Detroit Edison application are (1) NRC issuance of a COL for a new power reactor unit at the Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site in Monroe County, Michigan, and (2) U.S. Army Corps of Engineers (USACE) permit action to perform certain construction activities on the site. The USACE is participating with the NRC in preparing this EIS as a cooperating agency and participates collaboratively on the review team.

This EIS includes the NRC staff's analysis that considers and weighs the environmental impacts of constructing and operating a new nuclear unit at the Fermi site and at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts. Based on its analysis, the staff determined that there are no environmentally preferable or obviously superior sites.

The EIS includes the evaluation of the proposed action's impacts on waters of the United States pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Appropriations Act of 1899. The USACE will base its evaluation of Detroit Edison's permit application, after public notice, on the requirements of USACE regulations, the Clean Water Act Section 404(b)(1) Guidelines, and the USACE public interest review process.

After considering the environmental aspects of the proposed action, the staff's preliminary recommendation to the Commission is that the COL be issued as proposed. This recommendation is based on (1) the application, including the Environmental Report (ER) submitted by Detroit Edison; (2) consultation with Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of comments related to the environmental review that were received during the public scoping process; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE permit decision would be made following issuance of the final EIS.

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Executive Summary

By letter dated September 18, 2008, the U.S. Nuclear Regulatory Commission (NRC or the Commission) received an application from Detroit Edison Company (Detroit Edison) for a combined license (COL) for a new power reactor unit, the Enrico Fermi Unit 3 (Fermi 3), at the Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site in Monroe County, Michigan.

The proposed actions related to the Fermi 3 application are (1) NRC issuance of COLs for construction and operation of a new nuclear unit at the Fermi site and (2) U.S. Army Corps of Engineers (USACE) permit action pursuant to Section 404 of the Federal Water Pollution Control Act, as amended (33 USC 1251, *et seq*.) (Clean Water Act), and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC 403 *et seq.*) (Rivers and Harbors Act of 1899) to perform certain construction activities as appropriate to the USACE scope of analysis on the site. The USACE is participating with the NRC in preparing this environmental impact statement (EIS) as a cooperating agency and participates collaboratively on the review team. The reactor specified in the application is an Economic Simplified Boiling Water Reactor (ESBWR) designed by GE-Hitachi Nuclear Energy Americas, LLC (GEH).

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321 *et seq*.), directs that an EIS be prepared for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in Title 10 of the Code of Federal Regulations (CFR), Part 51. Further, in 10 CFR 51.20, the NRC has determined that the issuance of a COL under 10 CFR Part 52 is an action that requires an EIS.

The purpose of Detroit Edison's requested NRC action – issuance of the COL – is to obtain a license to construct and operate a new nuclear unit. This license is necessary but not sufficient for construction and operation of the unit. A COL applicant must obtain and maintain the necessary permits from other Federal, State, Tribal, and local agencies and permitting authorities. Therefore, the purpose of the NRC's environmental review of the Detroit Edison application is to determine if a new nuclear power plant of the proposed design can be constructed and operated at the Fermi site without unacceptable adverse impacts on the human environment. The objective of Detroit Edison's anticipated request for USACE action would be to obtain a decision on a permit application proposing structures and/or work in, over, or under navigable waters and/or the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands. Upon acceptance of the Detroit Edison application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing in the *Federal Register* (FR) a Notice of Intent (73 FR 75142) to prepare an EIS and conduct scoping. On January 14, 2009, the NRC held two scoping meetings in Monroe, Michigan, to obtain public input on the scope of the environmental review. To gather information and to become familiar with the sites and their environs, the NRC and its contractors, Argonne National Laboratory, Energy Research, Inc., and Ecology and Environment, Inc., visited the Fermi site in February 2009 and the four alternative sites, Belle River/St. Clair, Greenwood Energy Center, and two greenfield sites (Petersburg and South Britton sites) in January 2009.

During the Fermi site visit, the NRC staff, its contractors, and the USACE staff met with Detroit Edison staff, public officials, and the public. The NRC staff reviewed the comments received during the scoping process and contacted Federal, State, Tribal, regional, and local agencies to solicit comments. Included in this EIS are (1) the results of the review team's analyses, which consider and weigh the environmental effects of the proposed action (i.e., issuance of the COL) and of building and operating a new nuclear unit at the Fermi site; (2) mitigation measures for reducing or avoiding adverse effects; (3) the environmental impacts of alternatives to the proposed action; and (4) the staff's recommendation regarding the proposed action.

To guide its assessment of the environmental impacts of a proposed action or alternative actions, the NRC has established a standard of significance for impacts based on Council on Environmental Quality guidance (40 CFR 1508.27). Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels – SMALL, MODERATE, and LARGE:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Mitigation measures were considered for each resource category and are discussed in the appropriate sections of the EIS.

In preparing this EIS, the NRC staff and USACE staff reviewed the application, including the Environmental Report (ER) submitted by Detroit Edison; consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in NUREG-1555, *Environmental Standard Review Plan*. In addition, the NRC staff considered the public comments related to the environmental review received during the scoping process. Comments within the scope of the environmental review are included in Appendix D of this EIS.

The NRC staff's preliminary recommendation to the Commission related to the environmental aspects of the proposed action is that the COL be issued as requested. This recommendation is based on (1) the application, including the ER submitted by Detroit Edison; (2) consultation with other Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of public comments related to the environmental review that were received during the scoping process; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE will base its evaluation of Detroit Edison's permit application, when received and after public notice, on the requirements of USACE regulations, the Clean Water Act Section 404(b)(1) Guidelines, and the USACE public interest review process. The USACE's permit decision will be based, in part, on this EIS and will be made after issuance of the final EIS.

A 75-day comment period will begin on the date of publication of the U.S. Environmental Protection Agency Notice of Availability of the draft EIS that was filed by the NRC and USACE to allow members of the public to comment on the results of the NRC and USACE staffs' review. During this period, the NRC staff will conduct a public meeting near the Fermi site to describe the results of the environmental review, provide members of the public with information to assist them in formulating comments on this EIS, respond to questions, and accept public comment. After the comment period, the review team will consider and disposition all the comments received. These comments and staff responses will be included in the final EIS.

The NRC staff's evaluation of the site safety and emergency preparedness aspects of the proposed action will be addressed in the NRC's Safety Evaluation Report anticipated to be published in the future.

Abbreviations/Acronyms

χ/Q	dispersion values
°F	degree(s) Fahrenheit
ABWR	advanced boiling water reactor
ac	acre(s)
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ADAMS	Agencywide Documents Access and Management System
ADG	ancillary diesel generator
ADT	average daily traffic
AEC	Atomic Energy Commission
AHS	Auxiliary Heat Sink
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
APE	area of potential effects
AQCR	Air Quality Control Region
Argonne	Argonne National Laboratory
AST	aboveground storage tank
AWEA	American Wind Energy Association
BA	Biological Assessment
BACT	Best Available Control Technology
BEA	Bureau of Economic Analysis (U.S. Department of Commerce)
BEIR	Biological Effects of Ionizing Radiation
BGEPA	Bald and Golden Eagle Protection Act of 1940
BIA	Bureau of Indian Affairs
BiMAC	basemat internal melt arrest and coolability
BMP	best management practice
Bq	Becquerel
Bq/MTU	Becquerel per metric ton uranium
Btu	British thermal unit(s)
BWR	boiling water reactor
CAA	Clean Air Act
CAES	compressed air energy storage
CAIR	Clean Air Interstate Rule
CCR	coal combustion residuals
CCRG	Commonwealth Cultural Resources Group, Inc.

CCS	carbon capture and sequestering/sequestration
CDC	Centers for Disease Control and Prevention
CDF	core damage frequency
CEQ	Council on Environmental Quality
CER	Capital Expenditure and Recovery
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony forming units
CH_4	methane
CHP	combined heat and power
Ci	curie(s)
CIRC	Circulating Water System
CIS	containment isolation system
CN	Canadian National
CNF	Capacity Need Forum (MPSC)
CO	carbon monoxide
CO_2	carbon dioxide
CO_2-e	carbon dioxide-equivalent
COL	combined construction permit and operating license
CSAPR	Cross-State Air Pollution Rate
CSP	concentrated solar power
CSX	CSX Transportation
CT	combustion turbine
CWA	Clean Water Act
CWIS	Cooling Water Intake Structure
CZMA	Coastal Zone Management Act
DA	Department of the Army
dB	decibel
dBA	A-weighted decibel
DBA	design-basis accident
dbh	diameter at breast height
DC	direct current
DCD	Design Control Document
DDT	dichlorodiphenyltrichloroethane
Detroit Edison	Detroit Edison Company
DNL	equivalent continuous sound level
DNR	Designated Network Resource
DOC	U.S. Department of Commerce
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy

DOT	Department of Transportation
D/Q	deposition factor
DRIWR	Detroit River International Wildlife Refuge
DSM	demand-side management
DTW	Detroit Metropolitan Wayne County Airport
DWSD	Detroit Water and Sewerage Department
E&E	Ecology and Environment, Inc.
EAB	Exclusion Area Boundary
EERE	U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
EGS	engineered geothermal system
EIA	Energy Information Administration
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPT	Ephemeroptera, Plecoptera Trichoptera (index)
ER	Environmental Report
ERI	Energy Research, Inc.
ESA	Endangered Species Act of 1973, as amended
ESBWR	Economic Simplified Boiling Water Reactor
ESRP	Environmental Standard Review Plan
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Fermi 1	Enrico Fermi Unit 1
Fermi 2	Enrico Fermi Unit 2
Fermi 3	Enrico Fermi Unit 3
FES	Final Environmental Statement
FIRM	Flood Insurance Rate Map
FIS	Financial Reporting and Analysis
FP	fire pump
fps	feet per second
FPS	Fire Protection System
FR	*Federal Register*
FSAR	Final Safety Analysis Report
ft	foot (feet)
ft/day	feet per day
ft^3	cubic feet

FTE	full-time equivalent
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GAF	Generation and Fuel
gal	gallon
GBq	gigabecquerel
GC	gas centrifuge
GD	gaseous diffusion
GEH	GE-Hitachi Nuclear Energy Americas, LLC
GEIS	*Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GEIS-DECOM	*Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*
GHG	greenhouse gas
GIS	geographical information system
GLC	Great Lakes Commission
GLENDA	Great Lakes Environmental Database
GLWC	Great Lakes Wind Council
gpd	gallon(s) per day
gpm	gallon(s) per minute
GWh	gigawatt hour(s)
GWP	global warming potential
ha	hectare
HAP	hazardous air pollutant
HCMA	Huron-Clinton Metropolitan Authority
HDR	hot dry rock
HEPA	high-efficiency particulate air
HFC	hydrofluorocarbon
HFE	hydrofluorinated ether
HLW	high-level waste
HQUSACE	U.S. Army Corps of Engineers Headquarters
hr	hour(s)
HRSG	heat recovery steam generator
HUD	U.S. Department of Housing and Urban Development
HVAC	heating, ventilating, and air-conditioning
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection

IEEE	Institute of Electrical and Electronics Engineers
IGCC	integrated gasification combined cycle
IGLD 85	International Great Lakes Datum of 1985
IJC	International Joint Commission
in.	inch(es)
INAC	Indian and Northern Affairs Canada
IOU	investor-owned utility
IPCS	Integrated Plant Computer System
IPP	independent power producer
IRP	Integrated Resource Plan
ISD	Intermediate School District
ISFSI	Independent Spent Fuel Storage Installation
ITC	ITC Holdings Corporation
JPA	Joint Permit Aplication
KiKK	Childhood Cancer in the Vicinity of Nuclear Power Plants (German acronym)
km	kilometer(s)
km^2	square kilometer(s)
kV	kilovolt(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
L	liter(s)
L_{90}	sound level exceeded 90 percent of the time
LaMP	Lakewide Management Plan
lb	pound(s)
L_{dn}	day-night average sound level
LEDPA	least environmentally damaging practicable alternative
LEOFS	Lake Erie Operational Forecast System
L_{eq}	equivalent continuous sound level
LET	Lake Erie Transit
LFA	Load Forecasting Adjustment
LOLE	Loss of Load Expectation
LOS	level of service
LPZ	low population zone
LRF	large release frequency
LTRA	Long-Term Reliability Assessment (NERC)
LWR	light water reactor

μg	microgram(s)
m	meter(s)
m^3	cubic meter(s)
MACCS2	MELCOR Accident Consequence Code System
MBTA	Migratory Bird Treaty Act of 1918
MCCC	Monroe County Community College
mCi	millicurie
MCL	maximum contaminant level; Michigan Compiled Laws
MCRC	Monroe County Road Commission
MDCH	Michigan Department of Community Health
MDCT	mechanical draft cooling tower
MDELEG	Michigan Department of Energy, Labor and Economic Growth
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MDSP	Michigan Department of State Police
MEI	maximally exposed individual
METC	Michigan Electric Transmission Company
mGy	milliGray
MGD	million gallons per day
mi	mile(s)
mi^2	square mile(s)
MichCon	Michigan Consolidated Gas Company
MISO	Midwest Independent System Operator
MIT	Massachusetts Institute of Technology
mL	milliliter(s)
MMT	million metric tons
$MMTCO_2$-e	million metric tons of carbon dioxide equivalent
MNFI	Michigan Natural Features Inventory
mo	month(s)
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
mph	mile(s) per hour
MPSC	Michigan Public Service Commission
mrad	milliradian
mrem	millirem(s)
MSA	Metropolitan Statistical Area
MSW	municipal solid waste
MT	metric ton(s) (or tonne[s])
MTEP	MISO Transmission Expansion Plan
MTU	metric ton(s) of uranium

MW	megawatt(s)
MW(e)	megawatt(s) electrical
MW(t)	megawatt(s) thermal
MWd	megawatt-day(s)
MWd/MTU	megawatt-day(s) per metric ton of uranium
MWh	megawatt hour(s)
NAAQS	National Ambient Air Quality Standard
NACD	Native American Consultation Database
NaCl	sodium chloride
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NAVD 88	North American Vertical Datum of 1988
NCI	National Cancer Institute
NCRP	National Council on Radiation Protection and Measurements
NDCT	natural draft cooling tower
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NESHAP	National Emission Standards for Hazardous Air Pollutants
NF_3	nitrogen trifluoride
NGCC	natural gas combined-cycle
NHPA	National Historic Preservation Act of 1966, as amended
NIEHS	National Institute of Environmental Health Sciences
NML	noise monitoring location
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPHS	normal power heat sink
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NREPA	Natural Resources and Environmental Protection Act
NRHP	*National Register of Historic Places*
NS	Norfolk Southern
NSPS	New Source Performance Standard
NSR	new source review
NTC	Nuclear Training Center

NTU	nephelometric turbidity unit
NWI	National Wetland Inventory
NWIS	National Water Information System
NWR	National Wildlife Refuge
O_3	ozone
ODCM	Offsite Dose Calculation Manual
ODNR	Ohio Department of Natural Resources
OGS	off-gas system
OSHA	Occupational Safety and Health Administration
PAP	personnel access portal
Pb	lead
PC	personal computer
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter
PCTMS	Plant Cooling Tower Makeup System
PEM	palustrine emergent marsh
PESP	Pesticide Environmental Stewardship Program
PFC	perfluorocarbon
PFO	palustrine forested wetland
P-IBI	Planktonic Index of Biotic Integrity
PIPP	Pollution Incident Prevention Plan
PJM	PJM Interconnection
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of less than or equal to 2.5 μm
PM_{10}	particulate matter with a mean aerodynamic diameter of less than or equal to 10 μm
PRA	probabilistic risk assessment
PRB	Powder River Basin
PSD	Prevention of Significant Deterioration
psia	pounds per square inch absolute
PSR	Physicians for Social Responsibility
PSS	palustrine scrub-shrub wetland
PSWS	Plant Service Water System
PTE	potential to emit
Pu-239	plutonium-239
PV	photovoltaic
PWSS	pretreated water supply system

RAI	Request for Additional Information
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RDF	refuse-derived fuel
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RESA	Regional Educational Service Agency
RFC	Reliability*First* Corporation
RHAA	Rivers and Harbors Appropriation Act of 1899
RHR	residual heat removal
RIMS II	Regional Input-Output Modeling System
ROI	region of interest
ROW	right-of-way
RPS	Renewable Portfolio Standard
RRD	Remediation and Redevelopment Division
RTP	Regional Transportation Plan
RV	recreational vehicle
Ryr	reactor-year
SACTI	Seasonal/Annual Cooling Tower Impact
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SCPC	supercritical pulverized coal
SCR	selective catalytic reduction
SDG	standby diesel generator
sec	second(s)
SEGS	Solar Energy Generating System
SEMCOG	Southeast Michigan Council of Governments
SER	Safety Evaluation Report
SESC	soil erosion and sedimentation control
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office(r)
SO_2	sulfur dioxide
SO_x	sulfur oxides
SRHP	*State Register of Historic Places*
SSC	system, structure, and component
STG	steam turbine generator
STORET	Storage and Retrieval Database
SUV	sport-utility vehicle
Sv	sievert
SWMS	solid radioactive waste management system

SWPPP	Stormwater Pollution Prevention Plan
SWS	Station Water System
TDS	total dissolved solids
TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Office
TIP	Transportation Improvement program
TLD	thermoluminescent dosimeter
TMDL	total maximum daily load
TRAGIS	Transportation Routing Analysis Geographic Information System
TRU	transuranic
U.S.	United States
USC	United States Code
U_3O_8	triuranium octoxide (“yellowcake”)
UF_6	uranium hexafluoride
UMTRI	University of Michigan Transportation Research Institute
UO_2	uranium dioxide
USACE	U.S. Army Corps of Engineers
USBLS	U.S. Bureau of Labor Statistics
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VIB	Vehicle Inspection Building
VOC	volatile organic compound
WHO	World Health Organization
WPSCI	Wolverine Power Supply Cooperative, Inc.
WRA	Wind Resource Area
WTE	waste-to-energy
WWSL	wastewater stabilization lagoon
WWTP	wastewater treatment plant
yd^3	cubic yard(s)
yr	year(s)

9.0 Environmental Impacts of Alternatives

This chapter describes alternatives to the proposed U.S. Nuclear Regulatory Commission (NRC) action for a combined license (COL) and the U.S. Army Corps of Engineers' (USACE's) action for a Department of Army (DA) permit and discusses the environmental impacts of those alternatives. Section 9.1 discusses the no-action alternative. Section 9.2 addresses alternative energy sources. Section 9.3 reviews Detroit Edison Company's (Detroit Edison's) region of interest (ROI) evaluated in the site selection process, its alternative site selection process, and issues common or generic to all the alternative sites; and summarizes the environmental impacts for the proposed and alternative sites. Section 9.4 examines plant design alternatives. Section 9.5 lists the references cited in this chapter.

The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(C)(iii) of the National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321), that environmental impact statements (EISs) include an analysis of alternatives to the proposed action. NRC implements this requirement through regulations in Title 10 of the *Code of Federal Regulations* (CFR) Part 51 and its Environmental Standard Review Plan (ESRP) (NRC 2000). The environmental impacts of the alternatives are evaluated using the NRC's three-level standard of significance – SMALL, MODERATE, or LARGE – developed using Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. The issues evaluated in this chapter are the same as those addressed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG-1437, Volumes 1 and 2 (GEIS) (NRC 1996, 1999)[a] with the additional issue of environmental justice. Although NUREG-1437 was developed for license renewal, it provides useful information for this review and is referenced throughout this chapter. Additional guidance on conducting environmental reviews is provided in the NRC Staff Memorandum *Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements* (NRC 2011a).

As part of the evaluation of a permit application submitted to USACE that is subject to Section 404 of the Clean Water Act (CWA), USACE must define the overall project purpose in addition to the basic project purpose. The overall project purpose establishes the scope of the alternatives analysis and is used for evaluating practicable alternatives under the Environmental Protection Agency's (EPA's) CWA Section 404(b)(1) Guidelines (40 CFR Part 230). In accordance with the Guidelines and USACE Headquarters guidance (HQUSACE 1989), the

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(a) NUREG-1437 was originally issued in 1996. Addendum 1 to NUREG-1437 was issued in 1999. Hereafter, all references to the GEIS or NUREG-1437 include NUREG-1437 and its Addendum 1.

overall project purpose must be specific enough to define the applicant's needs, but not so narrow and restrictive that it precludes a proper evaluation of alternatives. USACE is responsible for controlling every aspect of the Guidelines analysis. In this regard, defining the overall project purpose is the sole responsibility of USACE. While generally focusing on the applicant's statement, USACE will, in all cases, exercise independent judgment in defining the purpose and need for the project from both the applicant's and the public's perspective (33 CFR Part 325 Appendix B(9)(c)(4); see also 53 FR 3120).

Section 230.10(a) of the Guidelines requires that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." Section 230.10(a)(2) of the Guidelines states that "an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, utilized, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered." Thus, this analysis is necessary to determine which alternative is the least environmentally damaging practicable alternative (LEDPA) that meets the project purpose and need. The Fermi 3 onsite alternative analysis is included in Appendix J.

Where the activity associated with a discharge is proposed for a special aquatic site (as defined in 40 CFR Part 230, Subpart E) and does not require access or proximity to or siting within these types of areas to fulfill its basic project purpose (i.e., the project is not "water dependent"), practicable alternatives that avoid special aquatic sites are presumed to be available, unless clearly demonstrated otherwise (40 CFR 230.10(a)(3)).

The NRC's determination as to whether an alternative site is environmentally preferable to the proposed site for Fermi 3 is independent of the USACE's determination of a LEDPA pursuant to the CWA Section 404(b)(1) Guidelines at 40 CFR Part 230. USACE will conclude its analysis of both offsite and onsite alternatives in a regulatory permit decision document issued for Detroit Edison's permit application.

9.1 No-Action Alternative

For purposes of an application for a COL, the no-action alternative refers to a scenario in which the NRC would deny the COL requested by Detroit Edison. USACE could also take no action or deny the request for a DA permit. Upon such a denial by NRC, the construction and operation of a new nuclear unit at the proposed location on the Fermi site in accordance with 10 CFR Part 52 would not occur and the predicted environmental impacts associated with the project would not occur. Preconstruction impacts associated with activities not within the definition of construction in 10 CFR 50.10(a) and 51.4 may occur. The no-action alternative would result in the proposed facility not being built, and the predicted environmental impacts from the project would not occur. If no other facility would be built or strategy implemented to take its place, the electrical capacity to be provided by the proposed project would not become available. If no additional conservation measures were enacted to decrease the amount of electrical capacity that would otherwise be required for power in the ROI, the need for power discussed in Chapter 8 would not be met. Therefore, the purpose of and need for this project would not be satisfied if the no-action alternative was chosen and the need for power was not met by other means.

If other generating sources were built, either at another site or using a different energy source, the environmental impacts associated with these other sources would eventually occur. As discussed in Chapter 8, Detroit Edison has regulatory responsibilities in Michigan to provide electrical service in its service area. This needed power may be provided and supported through a number of energy alternatives and alternative sites, which are discussed in Sections 9.2 and 9.3, respectively.

9.2 Energy Alternatives

The purpose and need for the proposed project identified in Section 1.3.1 of this EIS is to provide for additional large baseload electrical generating capacity to address Michigan's expected future peak electric demand. This section examines the potential environmental impacts associated with alternatives to construction of a new baseload nuclear generating facility. Section 9.2.1 discusses energy alternatives not requiring new generating capacity. Section 9.2.2 discusses energy alternatives requiring new generating capacity. Other alternatives are discussed in Section 9.2.3. A combination of alternatives is discussed in Section 9.2.4. Section 9.2.5 compares the environmental impacts from new nuclear, coal-fired, and natural-gas-fired generating units and a combination of energy technologies at the Fermi site. For analysis of energy alternatives, Detroit Edison assumed a bounding target value of 1535 megawatt electrical [MW(e)] (net) output. The review team also used this level of output in its analysis of energy alternatives.

9.2.1 Alternatives Not Requiring New Generating Capacity

Four alternatives to the proposed action that do not require Detroit Edison to construct new generating capacity involve taking some or all of the following actions.

- purchase the needed electric power from other suppliers
- reactivate retired power plants
- extend the operating life of existing power plants

- implement conservation or demand-side management (DSM) programs.

Power to replace the capacity of a new nuclear unit would have to be purchased from sources within the United States and/or from sources within Canada, and involve a generating technology likely to be one of those previously described by the NRC staff in its GEIS for license renewal (NRC 1996) or those currently in use for electricity production (e.g., coal, natural gas, nuclear, or renewable energy sources). The description of the environmental impacts of other technologies in the GEIS is representative of the impacts associated with the construction and operation of new generating units at the Fermi site. Under the purchased-power alternative, the environmental impacts of power production would still occur but would be located elsewhere within the region or nation or in Canada. The environmental impacts of electricity-generating technologies that are feasible alternatives to nuclear power are discussed in Section 9.2.2. In addition, purchased power is generally economically adverse in that the cost of generated power is typically less than the cost of the same power provided by a third party.

If the purchased-power alternative is implemented, the most significant environmental unknown is whether new transmission line corridors would be required. The construction of new transmission lines could have environmental consequences, particularly if new transmission line corridors were needed. The review team concludes that the local environmental impacts from purchased power would be SMALL when existing transmission line corridors with sufficient uncommitted current carrying capacity are used, and could range from SMALL to LARGE, depending on the nature of the affected environment, if the existing transmission infrastructure needed to be significantly upgraded (i.e., by adding circuits on existing support towers; by upgrading voltage, including when support tower replacements are necessary; or by adding a second transmission line in the existing or expanded right-of-way [ROW]) or if acquisition of a new ROW is required to meet new power transfer levels. The environmental impacts of power generation would depend on the generation technology and location of the generation site and, therefore, are unknown at this time.

Nuclear power facilities are initially licensed by the NRC for a period of 40 years. The operating license can be renewed for up to 20 years, and NRC regulations permit additional license renewals. Detroit Edison currently operates the Fermi 2 nuclear reactor under an NRC operating license. Detroit Edison submitted an application to the NRC for license renewal for Fermi 2. The environmental impacts of continued operation of a nuclear power plant are significantly smaller than those of constructing a new plant. However, continued operation of an existing nuclear plant does not provide additional generating capacity.

Older operating fossil-fueled plants, predominately coal-fired and natural gas-fired plants, tend to be old enough that refurbishment to extend plant life and meet current environmental requirements would also be costly. The review team concludes that the environmental impacts of a refurbishment scenario would be bounded by the coal- and natural gas-fired alternatives (see Section 9.2.2) and that extending the life of existing generating plants would not be a reasonable alternative to the proposed action.

Similar to older operating plants, retired generating plants, predominantly coal-fired and natural-gas-fired plants that could be reactivated, would ordinarily require extensive refurbishment prior to reactivation. Such plants would typically be old enough that refurbishment would be very costly, and the refurbished plants would likely be viewed as new sources, subject to the current-day complement of regulatory controls on air emissions and waste management. The environmental impacts of any reactivation scenario would be bounded by the impacts associated with coal-fired and natural gas-fired alternatives (see Section 9.2.2). The staff concludes that reactivating retired generating plants would not be a reasonable alternative to the proposed action.

Detroit Edison already offers several conservation and DSM programs to its customers to reduce peak electricity demands and daily power consumption. In its most recent Renewable Energy and Energy Optimization filings to the Michigan Public Service Commission (MPSC) in March 2009 (MPSC Case U-15806-EO and Case U-15806-RPS, respectively), Detroit Edison summarized its energy optimization plan and renewable energy plan and demonstrated both plans' conformance with the relevant MPSC Temporary Order (MPSC Case 15800) implementing State law. MPSC approved both the renewable energy plan and the energy optimization plan in an order issued June 2, 2009, but required Detroit Edison to amend certain portions of its plan after consultation with MPSC staff (MPSC Order in Case U-15806). Orders subsequently issued on August 25 and September 29, 2009, approved amended portions of the initially filed plans.[a]

Based on the preceding discussion, as well as information and discussions provided in the need for power analysis in Chapter 8, the review team concludes that the options of purchasing electric power from other suppliers, reactivating retired power plants, extending the operating life of existing power plants, and conservation and DSM programs are not reasonable or sufficient alternatives in and of themselves to providing new baseload power generation in the amounts represented in the proposed project or amounts sufficient to satisfy projected future power needs.

9.2.2 Alternatives Requiring New Generating Capacity

This section discusses the environmental impacts of energy alternatives to the proposed action that would require Detroit Edison to build new generating capacity. Each year, the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an annual energy outlook. In its *Annual Energy Outlook 2010, With Projections to 2035*

(a) All related electronic filings to the MPSC as well as MPSC orders can be accessed at http://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=15806&submit.x=21&submit.y=16.

(DOE/EIA 2010c), the EIA reference case projects that electricity demand will increase by 30 percent from 3873 billion kWh in 2008 to 5021 billion kWh in 2035. Based on the assumption that no greenhouse gas (GHG) emission regulations are in place, while coal still represents the largest percentage among generating technologies, its share would drop from 48 percent in 2008 to 44 percent in 2035. The natural gas share is expected to fall in the near term but then steadily rise, so that over the period 2008 to 2035, it remains essentially constant at 21 percent. Although generation from nuclear actually increases, its share falls from 20 percent in 2008 to 17 percent in 2035. Finally, renewable generation technologies are projected to enjoy the largest growth, from 9 percent in 2008 to 17 percent in 2035. However, the capacity factors of key renewable energy sources (e.g., wind and solar) are too low to satisfy a need for baseload power when acting separately as discrete alternative technologies.

In keeping with the NRC's evaluation of alternatives to operating license renewal for nuclear power plants, a reasonable set of energy alternatives to the construction and operation of a new nuclear unit at the Fermi site should be limited to an analysis of discrete power generation sources and those power generation technologies that are technically reasonable and commercially viable (NRC 1996). In 2009, total net generation of electricity in Michigan (from industrial and commercial generation sources) was 101,202,605 MWh (DOE/EIA 2011b). Of the in-state generation amount, 82,787,341 MWh (81.8 percent) was produced in the Electric Power Sector (DOE/EIA 2011b). Coal is the predominant fuel for production of electricity in Michigan. The energy sources and their contributions to electricity produced in Michigan in 2009 include: coal (66,847,683 MWh, 66 percent), nuclear (21,851,009 MWh, 22 percent), natural gas (8,419,551 MWh, 8.3 percent), hydroelectric (1,371,926 MWh, 1.4 percent), and petroleum (399,249 MWh, 0.4 percent).[(a)] Other renewable sources (other than large hydroelectric), including biomass (municipal solid waste, wood wastes, and agricultural products), geothermal, solar thermal, or solar photovoltaic accounted for only 2,623,184 MWh of power, 2.6 percent. The three primary energy sources for generating electric power in the United States in 2009 and their relative percentages were coal (44 percent), natural gas (23 percent), and nuclear energy (20 percent) (DOE/EIA 2011a).

For both the United States and Michigan, the three primary energy sources for generating electric power are coal, nuclear, and natural gas. It is reasonable to assume that these same energy sources would be the most viable discrete alternatives to the proposed introduction of baseload power that would be produced by Fermi 3. The discussion in Section 9.2.2 is therefore limited to coal and natural gas, which the review team considers to be viable discrete alternatives to the proposed Fermi 3 reactor.

The review team assumed that new coal-fired or natural-gas-fired alternative generation capacity would be located on the Fermi site and that Lake Erie would provide water for the steam cycle, for steam condensate heat rejection in a wet closed cycle cooling system using a

(a) Totals do not equal 100 percent due to independent rounding.

natural draft cooling tower, and for ancillary industrial applications. The review team also assumed that the same transmission infrastructure planned to support Fermi 3 would also serve the coal-fired or natural-gas-fired alternatives with no substantive modifications to either technical parameters or route.

9.2.2.1 Coal-Fired Power Generation

For the coal-fired generation alternative, the review team assumed construction and operation of supercritical pulverized coal (SCPC) units with a net electricity generation equivalent to Fermi 3. The review team also assumed that new transmission lines would be needed to deliver power from the alternative coal-fired plant and that these lines would be identical in both capacity and location to the lines being proposed to support Fermi 3. The coal plant is assumed to have an operating life of 60 years.

The review team also investigated an integrated gasification combined cycle (IGCC) coal-fired plant. IGCC is an emerging technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. However, IGCC plants are expensive to build and operate, and the technology continues to be plagued by reliability problems, relatively high parasitic loads (primarily associated with operation of the gasifiers), and low-capacity factors. Therefore the review team determined that, at this time, IGCC is unsuitable as a baseload power alternative.

Finally, the review team also considered fluidized bed designs for the coal-burning alternative. However, while fluidized beds are the technology of choice for fuels that are difficult to burn or that have great variability in critical parameters, wall-fired pulverized coal boilers are the preferred technological approach for combustion of bituminous and subbituminous coals. Because Detroit Edison already has the infrastructure in place to receive, handle, and distribute substantial quantities of subbituminous coals and lesser but still significant amounts of bituminous coals for burning in its existing coal-fired units, these are coals likely to be used for a coal-fired alternative built at the Fermi site, thus favoring pulverized coal boiler technology. Finally, fluidized bed boilers are available in much smaller sizes than pulverized coal boilers, making them less attractive for baseload units.

Various sizes of pulverized coal boilers and steam turbine generators (STGs) are available; however, the review team recognizes that no single boiler/STG combination could match the net electrical generation capacity of the proposed Fermi 3 reactor. Clearly, multiple units would be required. To complete this analysis, the review team has elected not to specify the number or discrete sizes of the coal-fired units that could collectively serve as an alternative, but instead presumes that all units, regardless of size, would have the same features, operate at generally the same conditions, affect the environment to an extent proportional to their power capacity, and be equipped with the same pollution control devices, such that once all parasitic loads are overcome, the net power collectively produced would be equivalent to the power expected from a nuclear reactor with a nameplate rating of 1535 MW(e) net [1605 MW(e) gross].

Current regulations require that these coal-fired generating units be fitted with pollution control equipment to control criteria pollutants (e.g., particulates, sulfur oxide, and nitrogen oxide emissions). Recently proposed EPA regulations (EPA 2011) would require such plants to be outfitted with equipment to control hazardous air pollutants (including mercury, acid gases, and other toxic pollution), and considerations have been given to promulgation of regulations that would require the capture and sequestration of CO_2 from the power plant's exhaust gas stream. All such pollution controls will impose parasitic loads such that the net electric power available will be reduced from gross nameplate values. The review team has accounted for the impact of those parasitic loads in estimating the gross nameplate capacity of fossil fuel alternatives necessary to allow for production of amounts of power equivalent to the proposed Fermi 3 reactor. Gross nameplate adjustments are reflected in calculations of environmental impacts from fossil fuel plant operation.

To compare a coal-fired alternative to the proposed Fermi 3 plant, the review team selected an SCPC plant. Supercritical steam technologies[a] are increasingly common in new coal-fired plants installed to deliver baseload power. Supercritical plants operate at higher temperatures and pressures than older subcritical coal-fired plants and therefore can attain higher thermal efficiencies. While supercritical facilities are more expensive to construct, they consume less fuel for a given output, reducing environmental impacts throughout the fuel life cycle. Based on technology forecasts from EIA, the review team expects that a new, supercritical coal-fired plant beginning operation in 2014 would operate at a heat rate of 9069 Btu/kWh,[b] or approximately 38 to 39 percent thermal efficiency.

The review team also assumes that a closed loop cooling system of the type proposed for Fermi 3 would be used to support the coal-fired alternative, with Lake Erie as the source of cooling water. Because nuclear plants require somewhat more cooling capacity per megawatt-hour generated than comparably sized SCPC plants (because of the difference in thermal

(a) "Supercritical" refers to the thermodynamic properties of the steam being produced. Steam whose temperature and pressure is below water's "critical point" (3200 psia and 705°F) is subcritical. Subcritical steam forms as water boils and both liquid and gas phases are observable in the steam. The majority of coal boilers that currently operate in the United States produce subcritical steam with pressures of about 2400 psia and temperatures as high as 1050°F. Above the critical point pressure, water expands rather than boils, and the liquid and gaseous phases of water are indistinguishable in the supercritical steam that results. Newer model boilers are likely to use pulverized coal instead of the lump coal used in older boilers. More than 150 pulverized coal boilers currently operating in the United States produce supercritical steam with pressure between 3300 and 3500 psia and temperatures between 1000 and 1100°F.

(b) Heat inputs could be less, depending on the fuel source. A coal-fired alternative would likely burn subbituminous western coal, which generally has a slightly lower average heat content.

efficiency), a lesser amount of water would be required for the SCPC plant than projected for Fermi 3.

The boilers constituting the supercritical coal-fired alternative are presumed to have the following characteristics and be equipped with the following pollution control devices:

- dual wall-fired, dry bottom boilers, configured to be New Source Performance Standard- (NSPS-) compliant
- overall thermal efficiency of 39 percent
- capacity factor of 79 percent
- collective nameplate rating of 1788 MW(e) (net)[(a)]
- supercritical steam
- Powder River Basin (PRB) coal; caloric value 8820 Btu/lb, ash 6.44 percent, sulfur 0.48 percent, pulverized to greater than 70 percent passing a 200-mesh sieve[(b)]
- fabric filter for particulate control operating at 99.9 percent efficiency
- wet calcium carbonate sulfur dioxide (SO_2) scrubber operating at 95 percent efficiency
- low-nitrogen oxide (NO_x) burners with overfire air and selective catalytic reduction for NO_x controls capable of attaining an NO_x removal of 86 percent (an emission rate less than or equal to 2.5 parts per million by volume [dry basis]).

Air Quality

The following sections provide a brief discussion of the status of ambient air quality in that portion of Michigan that includes the Fermi site and an overview of the Federal and State regulations in effect in Michigan that would be applicable to a coal-fired alternative built on the Fermi site. Nothing in these sections is meant to preempt the interpretation of their regulations by Federal or State authorities or to usurp the authorities to include specific provisions and emission limitations in construction or operating permits that would be required.

(a) A higher net nameplate rating is required to account for the differences in expected capacity factors between an SCPC boiler and the Fermi 3 reactor, 79 percent versus 92 percent, respectively.

(b) Detroit Edison already uses PRB coal in its existing coal-fired power plants. To meet environmental regulations and limitations, some eastern bituminous coals are also blended with PRB coal. Such blending may also be required for a new coal-fired alternative to Fermi 3, but the extent of any required blending would be difficult to precisely determine at this time. Nevertheless, coal transportation and handling infrastructures are already in place and would be able to meet the fuel demands of this coal-fired alternative with only minor modifications. Average coal characteristics of PRB coal were used in this analysis as per Stricker and Ellis (1999).

Air Pollution Control Regulations in Michigan Applicable to a Coal-Fired Alternative

The Fermi site is located in Monroe County, Michigan. Monroe County is in nonattainment of the $PM_{2.5}$ (particulate matter with a mean aerodynamic diameter of less than or equal to 2.5 μm) National Ambient Air Quality Standards (NAAQS) and a maintenance area for the 8-hr ozone NAAQS. In July 2011, the Michigan Department of Environmental Quality (MDEQ) submitted a request asking the EPA to redesignate Southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011). This request is based, in part, on air quality monitoring data collected in the 2007–2010 period showing all seven counties in Southeast Michigan in attainment for the $PM_{2.5}$ NAAQS. A new coal-fired generating plant would qualify as a new major source of criteria pollutants and would be subject to Prevention of Significant Deterioration of Air Quality Review under requirements of Clean Air Act (CAA), and Michigan State regulations. A new coal-fired generating plant would need to comply with the NSPS for coal-fired plants set forth in 40 CFR 60 Subpart Da: particulate matter and opacity (40 CFR 60.42(a)); SO_2 (40 CFR 60.43(a)), and NO_x (40 CFR 60.44(a)). The new coal-fired generating plant would qualify as a major source because of its potential to emit (PTE) greater than 100 tons/yr of criteria pollutants and would be required to secure a Title V operating permit from MDEQ.

Section 169A of the CAA (42 USC 7401) establishes a national goal of preventing future, and remedying existing, impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. The Regional Haze Rule, promulgated by EPA in 1999 and last amended in October 2006 (71 FR 60612), requires States to demonstrate reasonable progress toward the national visibility goal for Class I areas established in 1977. The only Class I areas in Michigan are the Isle Royale National Park (about 500 mi from the site) and the Seney National Wildlife Refuge (about 340 mi from the site), both located in the Upper Peninsula of Michigan. Neither of these Class I areas could reasonably be expected to be adversely affected by the operation of a coal-fired plant at the Fermi site. There are no Class I areas in the neighboring State of Ohio.

Michigan is one of 28 States whose stationary sources of criteria pollutants would have been subject to revised emission limits for SO_2 and NO_x under the Clean Air Interstate Rule (CAIR). The Federal rule was vacated by the D.C. Circuit Court on February 8, 2008; however, in December 2008, the U.S. Court of Appeals for the D.C. Circuit reinstated the rule, but required EPA to revise both the rule and its implementation plan. However, on July 6, 2010, EPA instead proposed replacing CAIR with the Transport Rule for control of SO_2 and NO_x emissions that cross state lines.[a] Regulations implementing the Transport Rule would be promulgated starting in 2011 and finalized in 2012. Michigan stationary sources of SO_2 and NO_x would be subject to this rule, as well as complementary regulatory controls developed at the State level

(a) See this EPA Web site for additional details regarding the Transport Rule: http://www.epa.gov/airtransport/actions.html#jul10.

(EPA 2010a).[(a)] On July 6, 2011 EPA announced the finalization of the Cross-State Air Pollution Rule (CSAPR, previously referred to as the Transport Rule) as a response to previous court decisions and as a replacement to the CAIR.[(b)] Beginning in 2012, fossil fuel power plants in Michigan would be subject to the CSAPR and would be required to reduce emissions of SO_2 and NO_x to help reduce downwind ambient concentrations of fine particulates ($PM_{2.5}$) and ozone. Because drafts of the Michigan rules are not available, their impacts on a coal-fired alternative cannot be assessed at this time. However, the review team recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from Fermi 3, even after application of the CSAPR.

Sulfur Oxides

A new coal-fired power plant at the Fermi site would likely use wet limestone-based scrubbers to remove SO_2. EPA indicates that this technology can remove more than 90 percent of SO_2 from flue gases (EPA 2002). SO_2 emissions from a new coal-fired power plant would be subject to the requirements of Title IV of the CAA. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances but must secure allowances (or offsets) from existing sources to cover their SO_2 emissions. Owners of new units must therefore purchase allowances from owners of other power plants or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, provided a new coal-fired power plant is able to purchase sufficient allowances to operate, Title IV ensures that the new source of pollution would not add to net regional SO_2 emissions, although it might do so locally.

Nitrogen Oxides

A coal-fired power plant at the Fermi site would most likely employ various available NO_x control technologies, which can include combustion modifications and postcombustion processes. Combustion modifications include low-NO_x burners, over-fire air, and operational modifications. Postcombustion processes include selective catalytic reduction and selective noncatalytic reduction. A combination of the combustion modifications and postcombustion processes may allow the reduction of NO_x emissions by up to 95 percent (EPA 1998). The most likely NO_x control would involve a combination of low-NO_x burners and selective catalytic reduction technologies in order to reduce NO_x emissions from this alternative. For the coal-fired alternative, the review team assumed a more likely reduction of 86 percent.

(b) Additional details regarding the CAIR program in Michigan can be found at the MDEQ Web site: http://www.michigan.gov/deq/0,1607,7-135-3310-122941--,00.html.
(b) Details of the CSAPR can be found on EPA's Web site, http://www.epa.gov/crossstaterule/.

Section 407 of the CAA establishes technology-based emission limitations for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants as indicated in 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453), limits the discharge of any gases that contain NO_x to 1.6 lb/MWh of gross energy output, based on a 30-day rolling average.

Particulates

A new coal-fired power plant would use fabric filters to remove particulates from flue gases with an expected 99 percent removal efficiency. When present, wet SO_2 scrubbers further reduce particulate matter emissions (EPA 2008a). Coal-handling equipment would introduce fugitive dust emissions when fuel is being transferred to onsite storage and then reclaimed from storage for use in the plant. Coal preparation activities (e.g., cleaning, pulverizing) would be additional sources of fugitive dust. The onsite management of coal combustion residuals (CCR) and scrubber sludge may be additional sources of fugitive dust during operation.

The review team also presumed that the coal-fired alternative would use a closed cycle cooling system with a natural draft cooling tower. The cooling tower would also be a source of particulate matter through salt drift. In addition, smaller mechanical draft cooling towers are used to support plant operations. Detroit Edison estimated the total drift from the cooling towers to be 8.47 tons/year (Detroit Edison 2011a, 2009b). Because heat rejection demands for a nuclear reactor can be expected to be greater than the demands of a coal-fired power plant of equivalent capacity, these estimates of drift are considered to be bounding conditions for any thermoelectric power generating technology relying on fossil fuels.

Carbon Monoxide

Based on firing conditions and the boiler’s overall firing efficiency, SCPC boilers would emit CO in limited quantities. Emission limits for CO would be based on heat input and typically expressed as pounds per million Btu input.

Hazardous Air Pollutants

EPA determined that coal-fired and oil-fired electric utility steam-generating units are significant emitters of the following hazardous air pollutants (HAPs): arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (65 FR 79825). EPA concluded that mercury is the HAP of greatest concern and that (1) a link exists between coal combustion and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects resulting from mercury exposures caused by the consumption of contaminated fish (65 FR 79825). EPA is developing mercury emission standards for power plants under the CAA Section 112 authority (EPA 2011). On March 16, 2011, EPA proposed a rule to control mercury and other toxic pollutants from power plants (see http://www.epa.gov/airquality/powerplanttoxics/ for additional details and the rule's implementation schedule). However, the review team recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from Fermi 3, even after application of any new mercury emissions standards.

<u>Carbon Dioxide</u>

Historically, CO_2, an unavoidable byproduct of combustion of carbonaceous fuels, has not been regulated as a pollutant. However, regulations are now under development for CO_2 and other GHGs. In response to the Consolidated Appropriations Act of 2008 (Public Law 110-161), EPA promulgated final mandatory GHG reporting regulations[a] in October 2009, effective in December 2009 (74 FR 56260) (see also http://www.epa.gov/climatechange/emissions/ghgrulemaking.html). The rules are applicable to major sources of CO_2 (those emitting greater than 25,000 tons/yr). New utility-scale coal-fired power plants would be subject to those regulations.

The coal-fired alternative plant would qualify as a major generator of GHGs under the "Tailoring Rule" recently promulgated by EPA (see 75 FR 31514). Beginning January 2, 2011, operating permits issued to major sources of GHG under the Prevention of Significant Deterioration (PSD) or Title V Federal permit programs must contain provisions requiring the use of best available control technology (BACT) to limit the emissions of GHGs if those sources would be subject to PSD or Title V permitting requirements because of their non-GHG pollutant emission potentials and their estimated GHG emissions are at least 75,000 tons/yr of CO_2 equivalents (CO_2-e).[b] The amount of CO_2 released per unit of power produced would depend on the quality of the fuel and the firing conditions and overall firing efficiency of the boiler. Subbituminous coal from the Powder River Basin has an average CO_2 emission factor of 212.7 lb/million Btu of coal input (Hong and Slatick 1994). Meeting permit limitations for GHG emissions may require installation of carbon capture and sequestering (CCS) devices on any new coal-fired power plant, which could add substantial power penalties. However, the review team recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from Fermi 3, even after application of any new GHG emissions standards.

(a) The GHGs covered by the final rule are CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), SF_6, and other fluorinated gases including NF_3 and hydrofluorinated ethers (HFEs).
(b) Full text of the Tailoring Rule can be found at http://www.gpo.gov/fdsys/pkg/FR-2010-06-03/pdf/2010-11974.pdf.

Estimated Impacts on Air Quality from the Construction of a Coal-Fired Alternative

Construction of a coal-fired power plant would result in the release of various criteria pollutants from the operation of internal combustion engines in construction vehicles and equipment, delivery vehicles, and vehicles used by the commuting construction workforce. Volatile organic chemical releases will also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite activities would also generate fugitive dust. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction best management practices (BMPs, such as development and execution of an appropriate fugitive dust control plan) would mitigate such impacts. Construction-related impacts on air quality from a coal-fired alternative would be of relatively short duration and would be SMALL.

Estimated Impacts on Air Quality from the Operation of a Coal-Fired Alternative

NRC (1996) did not quantify emissions from coal-fired power plants, but suggested that air impacts would be substantial. During operation, a coal-fired power plant would emit criteria pollutants, as well as hazardous pollutants such as mercury.[a] Detroit Edison (2011a) provided estimates of emissions from a coal-fired plant alternative with a capacity of 1600 MW(e) and a design that would minimize air emissions through a combination of boiler technology and postcombustion pollutant removal. Detroit Edison's estimates of emissions from a coal-fired alternative are as follows:

- SO_2, 2260 tons/yr
- NO_x, 1330 tons/yr
- PM_{10}, 48 tons/yr
- CO_2, 17,750,000 tons/yr
- Mercury, 0.1 tons/yr.

Although the review team has identified the primary features and operating parameters of the supercritical pulverized coal boiler represented in this coal-fired power plant alternative, many additional aspects of system design, boiler firing conditions, and operating procedures can influence the amount of criteria pollutants ultimately released to the environment. Further, because any new coal-fired power plant constructed in Monroe County would be subject to NSPS and PSD controls, any new operating permit will likely require the application of BACT.

(a) Depending on the coal source, precombustion coal cleaning, and boiler firing conditions, many other pollutants can be emitted, including acid gases such as hydrogen chloride, various heavy metals besides mercury, a wide array of organic compounds, and various GHGs, including (especially) CO_2. However, because neither the coal source nor the firing conditions can be precisely specified, except for CO_2, this assessment does not extend to quantifying those other pollutant emissions.

However, the performance metrics for BACT would change over time as real-world experience grew, and the ultimate performance requirements contained in any operating permit would be subject to negotiations among the EPA and/or State permit writers and the applicant. Consequently, the quantifications of pollutant emissions appearing below should be considered only as estimates. Algorithms and emission coefficients developed by EPA (EPA 1998) were used to estimate the amounts of pollutants that would result from operation of the coal-fired power plant alternative.

Operating at a capacity factor of 92 percent, the proposed 1535 MW(e) (net) Fermi 3 reactor can be expected to produce 12.4 million MWh of power annually. To produce a more or less equivalent amount of power, an SCPC boiler operating at a capacity factor of 79 percent would need to have a rated capacity of approximately 1886 MW(e) (net). The review team assumes that approximately 5.2 percent of the boiler's gross megawatt capacity is needed to supply typical parasitic loads (i.e., plant operation, including control devices for limiting emissions of criteria and hazardous air pollutants to meet NSPS). Introducing controls for GHG emissions (i.e., CCS) would cause the parasitic load to increase to 17.8 percent of the boiler's gross rated capacity (NETL 2010). However, given the significant uncertainty regarding the details of any CCS and when such controls might be required, the review team has elected to include parasitic losses from conventional pollution control devices and plant operation, but to not include parasitic losses from CCS in its calculations of environmental impacts. Based on a parasitic load of 5.2 percent, the coal plant would have a gross electrical generation capacity of 1886 MW(e).

To produce the required amount of power, the SCPC boilers described above, operating at a capacity factor of 79 percent, would burn 6.5 million tons of PRB coal annually (5.9 MMT/yr).

Applying EPA emission factors and reasonably expected pollution control equipment efficiencies results in the estimated annual pollutant releases shown in Table 9-1.

While the GEIS analysis mentions global warming from unregulated CO_2 emissions and acid rain from SO_2 and NO_x emissions as potential impacts, it does not quantify emissions from the operation of coal-fired power plants. However, the GEIS analysis does indicate that air impacts would be substantial (NRC 1996). The above analysis shows that emissions of air pollutants, including sulfur oxides (SO_x), NO_x, CO, particulates, HAPs and CO_2, exceed those that would result from operation of the proposed Fermi 3 nuclear power plant by significant margins (see Section 5.7.2), as well as those of the other alternatives considered in this section.

The analysis for an SCPC power plant at the Fermi site indicates that air quality impacts from the operation of an SCPC power plant alternative would have clearly noticeable effects, but with the expected application of regulatory requirements, permit limitations, and emissions controls, would not destabilize air quality. Participation in emissions trading schemes may also be

Table 9-1. Estimated Emissions (in tons/yr) of Criteria Pollutants and Carbon Dioxide from the Coal-Fired Power Generation Alternative

Pollutant	Annual Uncontrolled Emissions	Annual Controlled Emissions	Notes
SO_2	54,381	2719	Assumes PRB coal at 0.48 percent sulfur and a 95 percent efficient limestone scrubber. Emission factor: 35× (percent sulfur) lb/ton of coal
NO_x	23,953	3353	Assumes 86 percent efficient pre- and postcombustion NO_x controls. Emission factor: 7.4 lb/ton of coal
CO	1618	1618	Assumes typical NSPS-compliant firing conditions. Emission factor: 0.5 lb/ton of coal
Particulates (filterable)	208,459	208	Assumes PRB coal at 6.44 percent ash and a 99.9 percent efficient fabric filter control device. Emission factor: 10× (percent ash) lb/ton of coal
Particulates (filterable PM_{10})[(a)]	47,829	48	Assumes 99.9 percent efficient fabric filter control device. Emission factor: 2.3× (percent ash) lb/ton of coal
CO_2	12.1 million	12.1 million	Assumes no CO_2 capture. Emission factor: 212.7 lb/million Btu

(a) PM_{10} = particulate matter with a mean aerodynamic diameter of less than or equal to 10 μm.

required. Therefore, because of these expected controls, the review team concludes that air impacts from an SCPC power plant alternative located at the Fermi site would be MODERATE.

Waste Management

Construction Waste Management

Both sanitary wastes resulting from support of the construction crew and industrial wastes (some with hazardous character) would be generated during the construction of the coal-fired power plant alternative from activities such as clearing the construction site of vegetation, excavating and preparing the site surface before other crews begin actual construction of the plant, modifying existing infrastructure, and constructing any additionally required infrastructure. Minor amounts of industrial wastes will result from the onsite management of construction vehicles and equipment and from the use of cleaning solvents and the application of corrosion control coatings. Construction-related wastes are expected to be properly characterized and initially managed onsite and eventually removed to properly permitted offsite treatment or disposal facilities. New transmission lines identical to those proposed for the Fermi 3 reactor would be constructed to connect to the ITC*Transmission* Milan Substation. The existing rail spur would be sufficient to support both construction and operation of a coal-fired plant. Waste impacts from construction are expected to be SMALL.

Operational Waste Management

Coal combustion generates several waste streams including ash (a dry solid recovered from both pollution control devices [fly ash] and from the bottom of the boiler [bottom ash]) and sludge (a semisolid byproduct of emission control system operation, in this case, primarily calcium sulfate from the operation of the wet calcium carbonate SO_2 scrubber). Combustion of 6.5 million tons/yr of PRB coal would result in substantial amounts of CCR recovered from the fabric filter and from the bottom of the boiler. Recycling options that may exist for some of the CCR generated include road sub-base fill material, an admixture in lightweight concrete products, and highway embankment stabilization. However, much of the CCR would require disposal. Although EPA has not declared CCR as hazardous (65 FR 32214), it does contain hazardous constituents that may leach from improperly designed or operated disposal cells and that may threaten surface or groundwater resources. Coal-fired power plant operation would also result in substantial quantities of calcium sulfate recovered from the SO_2 scrubber. Most such sludge may be recycled for use in production of gypsum wallboard for the construction industry. However, temporary holding facilities as well as drying facilities may need to be constructed. Spent catalysts from NO_x catalytic reduction would also be produced. Scrubber sludge and CCR may have beneficial uses, but, in the worst case, all solid wastes resulting from operation would require disposal. Wastes typical of the construction of large industrial facilities would also be generated.

The review team estimates that 416,918 tons/yr of ash would be either recovered from the boiler as bottom ash or captured as fly ash in the fabric filter,[a] and the remainder, 208 tons/yr, released to the atmosphere. Detroit Edison notes that approximately 40 percent of CCR is currently recycled and that the published EPA goal is to increase this amount to 50 percent (Detroit Edison 2011a). The review team assumes that the EPA goal of recycling 50 percent of CCR would be realized, leaving about 208,251 tons/yr requiring disposal. Disposal of this amount of ash annually by landfilling over the expected 40-year lifetime of the coal-fired plants could noticeably affect land use and groundwater quality. Landfill locations would require proper siting in accordance with State solid waste regulations,[b] and leachate from the disposal cells would need to be monitored and possibly captured for treatment, because of leaching of toxic components (including heavy metals) in the ash. The review team has not presumed the location of this ash disposal landfill, but presumes that insufficient area would be available on

(a) Some additional fly ash may also be captured in the SO_2 scrubber downstream of the fabric filter. However, that amount has not been quantified.

(b) In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels" (EPA 2000a) stating that it would issue regulations for disposal of coal combustion waste under Subtitle D of the Resource Conservation and Recovery Act. EPA has not yet issued these regulations. Until such rules are issued at the Federal level, State regulations concerning solid waste disposal are the primary controls.

the Fermi site to accommodate any onsite disposal. After closure of the waste site and revegetation, the land could be available for other uses.

Combustion of 6.5 million tons/yr of PRB coal with 0.48 percent sulfur would result in the generation of 51,914 tons/yr of SO_2, 95 percent of which would be captured in the wet scrubber and converted to an equimolar amount of calcium sulfate, or 110,310 tons/yr (dry basis). Although Detroit Edison notes that 77 percent of scrubber sludge is currently put to beneficial use (Detroit Edison 2011a), the review team presumes that as much as 90 percent of the scrubber sludge could be recycled in the future for such applications as gypsum wallboards and that the remainder, 11,031 tons/yr, would be codisposed with the CCR that is not recycled.

The review team has not made an estimate of the amount of spent catalysts that would be produced, but presumes that the entire amount would have no recycling potential and thus would require disposal. Depending on the catalysts used, special handling might also be required to address the potential hazardous character of these spent catalysts.

The impacts from waste generated during operation of this coal-fired power plant alternative would be MODERATE; the impacts would be clearly noticeable but, with proper design and operation of waste management systems, would not destabilize any important resource.[a] The extent of the impacts of disposal would depend on the percentage of the CCR and scrubber sludge that could be recycled.

Therefore, the review team concludes that the overall impacts of wastes resulting from the construction and operation of the coal-fired alternative would be MODERATE.

Human Health

Coal-fired power plants introduce worker risks from coal and limestone mining, from coal and limestone transportation, and from disposal of CCR and scrubber wastes. In addition, there are public risks from inhalation of stack emissions and the secondary effects of eating foods grown in areas subject to deposition of pollutants emitted from plant stacks.

Human health risks of coal-fired power plants are described in general in Table 8-2 of the GEIS (NRC 1996). Cancer and emphysema resulting from the inhalation of toxins and particulates are identified as potential health risks to occupational workers and members of the public (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risk. Air emissions from a coal-fired power generation plant

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(a) The NRC is aware of the significant environmental impacts that resulted from recent failures of coal waste ponds in Alabama and Tennessee (see *http://www.msnbc.msn.com/id/28579190/ns/us_news-environment/t/utility-waste-pond-ruptures-time-ala/).* However, NRC believes that such wholesale failures are rare and preventable with proper design and maintenance of CCR impoundments and other waste management facilities.

located at the Fermi site would be regulated by MDEQ. Coal-fired power generation also introduces worker risks from coal and limestone mining, worker and public risk from coal and lime/limestone transportation, worker and public risk from disposal of coal combustion waste, and public risk from inhalation of stack emissions. In addition, natural uranium and thorium contained in routine air emissions from coal-fired power plants could result in radiological doses that could be in excess of those from nuclear power plant operations (Gabbard 1993).

Regulations restricting emissions enforced by either EPA or delegated State agencies have reduced potential health effects but have not entirely eliminated them. These agencies also impose site-specific emissions limits as needed to protect human health. Even if the coal-fired power plant alternative were located in a nonattainment area, emission controls and trading or offset mechanisms could prevent further regional degradation; however, local effects could be visible. Many of the byproducts of coal combustion responsible for health effects are largely controlled, captured, or converted in modern power plants, although some level of health effects may remain.

Aside from emission impacts, the coal-fired alternative would introduce the risk of coal pile fires and, if lined impoundments were used to contain CCR and scrubber sludge, the risk of accidental release of the waste due to a failure of the impoundment[a] or leaching of hazardous constituents due the impoundment liner's failure.[b]

Overall, given health-based regulation and controls likely to be imposed as permit conditions by either EPA or delegated State agencies, the review team concludes that human health impacts of a coal-fired power plant alternative would be SMALL.

Climate Change-Related Impacts

Climate changes are under way in the United States and globally, and these are projected to continue to grow substantially over the next several decades unless intense, concerted measures are taken to reverse this trend. Many of the projected climate changes are believed to be the result of the release of GHGs. The primary GHG of concern for global climate change because of its global warming potential as well as the amounts being emitted worldwide is CO_2 and the major anthropogenic source of CO_2 is the combustion of fossil fuels. Climate-related changes include rising temperature and sea level; increased frequency and intensity of extreme weather conditions (e.g., heavy snows and downpours, floods, and droughts); earlier snowmelts and associated frequent wildfires; and reduced snow cover, glaciers, permafrost, and sea ice. After a thorough examination of the scientific evidence and careful consideration of public

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(a) Although there have been incidents in recent years of waste impoundment failures, such incidents are nevertheless considered rare.
(b) Leachate capture and recycling or treatment would typically be required to reduce the probability of such occurrences.

comments, the EPA announced on December 7, 2009, that GHGs threaten the public health and welfare of the American people and fit the CAA definition of air pollutants. The coal-fired power plant alternative would contribute GHG emissions to climate change. This section presents an assessment of the potential impacts that construction and operation of the coal-fired power plant alternative would have on climate.

Impacts on climate change from the construction of a coal-fired power plant alternative would result primarily from the consumption of fossil fuels in reciprocating internal combustion engines (RICE) of construction vehicles and equipment, workforce vehicles used in commuting to and from the work site, and delivery vehicles. As noted elsewhere, construction-related releases of criteria pollutants and GHGs such as CO_2 would be temporary. Estimates of CO_2 emissions related to the building of Fermi 3 are provided in Section 4.7.1. Overall, impacts of constructing a new coal-fired power plant would be expected to have a lesser impact on climate change than would the building of Fermi 3, because of both a smaller workforce and a shorter construction period. Overall, as with the impact on air quality from releases of criteria pollutants, the impact on climate change from the releases of GHGs during construction would be SMALL.

A comprehensive inventory of Michigan GHG emissions was published in 2008 with projections from the 2005 "business as usual" base case through the year 2025 (CCS 2008). In 2005 (the latest year for which data were available at the time of publication of the Michigan inventory), all anthropogenic sources of GHGs in Michigan accounted for the generation of approximately 248 million MMT of CO_2-e gross emissions (excluding Michigan forests that serve as GHG sinks and emissions associated with exported electricity). Energy-related emissions of GHG totaled 214.7 MMT of CO_2-e (CO_2, CH_4, and N_2O emissions combined).[(a)] Of that amount, 70.8 MMT was related to in-state electricity production using coal (67.7 MMT), natural gas (2.38 MMT), or oil (0.71 MMT). The U.S. total GHG emissions and total emissions of CO_2 from coal combustion for electricity production in 2005 were 7108.6 MMT and 2381 MMT, respectively (EPA 2009a). Thus, the Michigan total GHG emissions accounted for 0.99 percent of the nationwide total GHG emissions and 2.8 percent of the nationwide total GHG emissions related to coal-fired electricity production. Although Michigan's GHG emissions are rising more slowly than the U.S. average, they nevertheless rose by 12 percent over the period 1990 to 2005 (versus a national GHG growth rate of 16 percent) (CCS 2008).

As discussed above, the review team estimates that the emission of 12.1 million tons/yr (11.0 MMT/yr) of CO_2 would result from the operation of a coal-fired power plant alternative to produce the amount of power equivalent to that expected annually from Fermi 3. Consequently, operation of Fermi 3 instead of a coal-fired power plant would represent an avoidance of these

(a) The total CO_2-e emissions reported represent a total of the three primary GHG emissions related to fossil fuel combustion: CO_2, CH_4, and N_2O. However, of these three, CO_2 is by far the largest source. For simplicity, the percentages that follow disregard the contributions of CH_4 and N_2O to statewide energy-related GHG totals.

CO_2 emissions.[a] A coal-fired alternative would represent approximately 16 percent and 0.46 percent of the GHGs emitted in Michigan and in the United States, respectively, in 2005 from coal-fired power plant operations. While any single project would be inconsequential when compared to global GHG emissions, the review team doesn't believe that this is the correct way to measure the impacts. A 16 percent increase in emissions from coal plants within the State cannot be construed as undetectable. The review team concludes, therefore, that the impact of the operation of a coal-fired power plant at the Fermi site on global climate change would be MODERATE.

Groundwater Use and Quality

Impacts on groundwater from construction and operations of the coal-fired power plant alternative would be minimal. Except for potable uses, the immediate availability of lake water suggests that groundwater resources would not likely be utilized to support operation of the coal-fired plant. Total usage for potable purposes would likely be less for operations of a coal-fired power plant than for reactor operation because of a smaller operating workforce. No effect on groundwater quality would be apparent.

Construction of a coal-fired plant may have a limited and minor impact on groundwater due to changes to surface drainage patterns during construction and operation, and the onsite storage of coal and CCR. However, no onsite disposal of CCR would occur, and controls to capture and treat any hazardous leachate from coal and CCR piles would limit impacts. The review team concludes that the impact on groundwater from the coal-fired power plant alternative would be SMALL.

Surface Water Use and Quality

Minor impacts on surface water would occur during construction of a new coal-fired power plant because of ground disturbances, alteration of natural drainage patterns, and potential increases in sediment loadings in surface drainage. A site-wide stormwater pollution prevention plan (SWPPP) would be established for the construction period and would include controls and mitigations that would limit adverse impacts on surface water quality. The elements of that plan would be incorporated into a General Stormwater Permit, enforceable under the MDEQ's National Pollutant Discharge Elimination System (NPDES) program authority. The relatively small amount of water withdrawn from Lake Erie for cooling purposes would not cause a destabilizing effect on other potential uses of Lake Erie water. The review team therefore concludes that impacts on surface water use and quality would be SMALL.

(a) Figures presented here represent CO_2-e emissions directly related to energy production. Although it is estimated that a nuclear reactor will generate 20,000 tons/yr of CO_2-e (see Table 5.7-1), those releases are the result of routine preventative maintenance of fossil-fueled emergency generators and routine operation of ancillary equipment using fossil fuels and not the direct result of the operation of the reactor. No GHGs are emitted from reactor operation.

Aquatic Ecology

Lake Erie would be the primary source of water to support the construction and operation of the coal-fired alternative. Impacts on aquatic ecosystems during construction would be minimal, due to the relatively small amount of water required (compared to the volume of water in Lake Erie) and controls on the quality of surface water discharges imposed by a SWPPP permit issued by MDEQ. Impacts on aquatic ecosystems during operation would be virtually equivalent to projected impacts from Fermi 3 operation and would take the form of both impingement and entrainment impacts associated with water withdrawals to support the cooling system, as well as thermal impacts associated with blowdown discharges from that cooling system (which may be required to undergo treatment prior to discharge).[a] All such impacts would be controlled by an NPDES permit issued by MDEQ. The review team concludes, therefore, that impacts on aquatic ecology from the construction and operation of the coal-fired alternative would be SMALL.

Terrestrial Ecology

Detroit Edison estimates a 1600-MW(e) coal-fired plant would require approximately 2720 ac. As discussed earlier, a coal-fired alternative of equivalent power producing capability would have a gross nameplate rating of 1886 MW(e) to account for differences in capacity factors between the proposed nuclear reactor and the coal-fired alternative and to accommodate parasitic loads. By simple proportioning, a 1886 MW(e)-plant would require 3210 ac. The entire Fermi site including the existing facilities occupies only 1260 ac. Utilizing the Fermi site to the fullest possible extent to build a coal-fired plant and ancillary activities would not be possible without disturbing substantially greater areas of wetlands, including forested wetlands, than would be necessary for a nuclear facility. To avoid extensive wetland impacts, Detroit Edison would have to acquire additional contiguous parcels of land. Those parcels would most likely comprise a mix of land uses including agriculture and could include wetlands (Detroit Edison 2011a).

Onsite impacts on terrestrial ecology would generally be as described in Sections 4.3.1 and 5.3.1 for a nuclear project but would be substantially more extensive. Additional impacts would result from development of newly acquired parcels adjacent to the site, but terrestrial ecology impacts on those parcels could be limited because they consist largely of agricultural land. The review team assumes that a coal plant on the Fermi site would require building and operating the same new transmission lines described for the Fermi 3 nuclear project.

Coal-mining operations would also disturb terrestrial habitats in offsite coal-mining areas. Detroit Edison estimates that 35,200 ac would be required to mine the amount of coal needed to

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(a) Because of differences in operating temperatures, cooling demands for coal-fired plants are slightly smaller than cooling demands for similarly sized nuclear plants.

support a 1600-MW(e) plant. Using a 1886 MW(e) gross nameplate rating and a 79 percent capacity factor, the review team estimates that a coal-fired alternative would require 41,492 ac to mine the coal. For comparison, uranium mining to support a 1600-MW(e) nuclear reactor is estimated to require a 1600-ac uranium mine (Detroit Edison 2011a).

Onsite temporary storage of coal, CCR, spent catalysts, and scrubber sludge, as well as any offsite waste disposal by landfilling of CCR, would also affect terrestrial ecology by requiring conversion of existing habitat. Deposition of acid rain resulting from NO_x or SO_x emissions and deposition of other pollutants could also affect terrestrial ecology. Considering the emission controls discussed previously, air deposition impacts might noticeably affect terrestrial vegetation and wildlife but would likely not be regionally destabilizing. Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift; however, these impacts would be generally be minimal, about the same as those that are now occurring from the operation of Fermi 2.

Primarily because of the potential disturbances to offsite habitats from coal mining and onsite and offsite impacts on wetlands caused by building the coal plant and associated facilities, impacts on terrestrial resources from a coal-fired power plant would be MODERATE. While the greatest impacts would result from the offsite coal mining, wetland losses resulting from building the onsite facilities would also be noticeable, although it might be possible to reduce the impacts through wetland mitigation. Impacts on terrestrial habitats caused by air emissions could also be noticeable.

Noise

Coal-fired power generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations and mechanical draft cooling towers. Intermittent sources include the equipment related to coal handling, solid waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly increases noise levels near the rail corridor, the short duration of the noise reduces the impacts. Nevertheless, given the expected frequency of coal and limestone deliveries, the potential impacts of noise on residents in the vicinity of the facility and the rail line are considered MODERATE. Noise and light from the plant would be detectable offsite.

Land Use

The following analysis of land use impacts focuses on land requirements for construction and operation of a new supercritical coal-fired power plant on the Fermi site. The review team assumes that situating such a plant on the Fermi site would require building and operating the same new transmission lines described for the Fermi 3 nuclear project.

Detroit Edison indicated that approximately 1700 ac of land would be needed to support a 1000-MW(e) coal-fired plant (Detroit Edison 2011). The review team has reviewed these estimates and found them to be reasonable and consistent with the GEIS (NRC 1996). Although the power blocks of a nuclear plant and a similarly sized coal plant are approximately the same size, the coal plant would require additional land to support ancillary activities such as onsite storage and handling of coal (including sizing and blending, when required) and lime (or limestone) and temporary onsite storage of CCR and scrubber sludge. As discussed earlier, a coal-fired alternative of equivalent power-producing capability would have a gross nameplate rating of 1886 MW(e) to account for differences in capacity factors between the proposed nuclear reactor and the coal-fired alternative and to accommodate parasitic loads. By simple proportioning, a 1886-MW(e) plant would require 3210 ac.[a]

The Fermi site is approximately 1260 ac, including wetland areas. As noted earlier, new land parcels would need to be acquired to support a new coal-fired power plant on the Fermi site. Offsite land acquisition would likely involve mostly agricultural or forest land and may affect prime farmland.

Depending on how much offsite adjacent land can be obtained, development of the coal plant would almost certainly cause the loss of much of the land on the Fermi site that is managed as part of the DRIWR, especially upland areas that are not subject to wetland permitting limitations.

Offsite land use impacts would occur from coal mining. However, most of the land in existing coal-mining areas has already experienced some level of disturbance. Detroit Edison estimates that 35,200 ac would be required to mine the amount of coal needed to support a 1600-MW(e) plant. Using a 1886MW(e) gross nameplate rating and a 79 percent capacity factor, the review team estimates that a coal-fired alternative would require 41,492 ac to mine the coal. Uranium mining to support a 1600-MW(e) nuclear reactor is estimated to require a 1600-ac uranium mine. The elimination of the need for uranium mining to supply fuel for the proposed reactor would partially offset the impact of this offsite land use. Additional land areas would be required for disposal of CCR, scrubber sludge (gypsum), and other operational solid wastes, although the land areas requirements for disposal would be affected by the extent to which operational wastes could be recycled.

(a) Increasing the nameplate capacity of the boiler can be expected to result in only incremental changes in land requirements for the power block, supporting infrastructures, and ancillary activities such as coal and waste storage or onsite fuel blending. Consequently, using a simple ratio to calculate resulting increases in land area requirements is expected to produce a conservative result.

Based on this information, land use impacts of the coal-fired alternative would be MODERATE. Even without considering the land demands for coal mining, the land use impacts to build and operate the coal plant facilities would be MODERATE.

Socioeconomics

Socioeconomic impacts are defined in terms of changes to the baseline demographic and economic characteristics and social conditions of a region. For example, the number of jobs created by the construction and operation of a new coal-fired power plant could affect regional employment, income, and expenditures. The socioeconomic baseline discussed for the Fermi 3 plant in Section 2.5 of this EIS serves as the baseline for this alternative analysis.

Detroit Edison projected a peak employment construction workforce of 2900 workers (an average employment level of 1000 workers) for the building of Fermi 3. The review team anticipates that the majority (about 85 percent) of the workforce would come from a three-county economic impact area comprising of Monroe and Wayne County in Michigan (which includes the Detroit Metropolitan Statistical Area [MSA]), and Lucas County in Ohio (which includes the Toledo MSA). Because the majority of the workforce would already live in the region, the relative economic contributions of these workers to local business and tax revenues in the region would remain generally the same. The review team expects the remainder of the building-related workforce would in-migrate from outside the 50-mi region in the same residential distribution as the current operations workers at the Fermi site (see Section 4.2.2 for a detailed discussion of these assumptions). About 87 percent of the in-migrating construction workers would settle with their families in Monroe or Wayne County in Michigan or Lucas County in Ohio.

Detroit Edison estimates that 2500 workers would be required for the construction of a coal-fired alternative. For comparative purposes, the review team applied the same residential distribution assumptions used for the analysis of Fermi 3 to the 2500 construction workers for the alternative coal-fired electrical generating units.

The review team does not expect many in-migrating construction workers will permanently relocate to the region, so any socioeconomic effect the in-migrating workers would induce would be temporary. Based on the site’s proximity to the Detroit and Toledo MSAs and expected limited worker relocation, the review team concludes that construction impacts on the local infrastructures and services would be SMALL and adverse.

Section 4.4.2.3 discusses the impact on the regional tax base from the construction and operation of Fermi 3. Impacts from construction of the coal-fired alternative would also occur in each of the four categories discussed in Section 4.4.2.3 but would be proportionally smaller in size, based on the projected differences in construction workforce sizes, 2900 for the nuclear reactor and 2500 for the coal fired alternative. Once operational, the coal-fired alternative would provide a beneficial impact on the regional tax base comparable to that of Fermi 3. To the extent to which local suppliers are used to provide necessary materials for construction and operations of the alternative plant and members of the local workforce are employed at the plant, local sales taxes would increase. Impacts on the local tax base would result primarily from the property taxes that would be paid for the new alternative coal-fired units. Because coal-fired plants are not subject to the safety requirements necessary for the construction and operation of a nuclear power plant, the review team expects the cost of construction of the alternative coal-fired plants would be somewhat less than for Fermi 3, but still would result in a substantial increase in Monroe County property tax revenues. However, the construction period for the coal-fired alternatives would be shorter, and therefore the assessment of property taxes during operations would begin sooner than for Fermi 3. As would be the case for the proposed action of constructing and operating Fermi 3, the review team concludes that impacts on the regional and local tax bases from construction and operation of the coal-fired alternative would be SMALL and beneficial, with the exception of property taxes to Monroe County, Michigan, which would be LARGE and beneficial.

Traffic

During construction, 2500 workers would be commuting to the plant site, most coming primarily from the Detroit and Toledo MSAs. The review team assumes for this comparison that all the traffic-related conditions described in Sections 4.4 and 5.4 for the Fermi 3 project would also apply to the alternative coal-fired power plants, with the following exceptions:

- The construction workforce for the alternative coal-fired plants would be smaller (2500 employees at peak employment versus 2900 employees for Fermi 3).
- The operations and maintenance workforce for the coal-fired plants would be smaller than that for Fermi 3.
- The construction phase for the coal-fired plants would be shorter.
- Fewer truck deliveries would be made for the coal-fired plants.

As described in Section 4.4.4.1, the review team determined that traffic-related impacts from the construction of Fermi 3 would be short-term, and MODERATE, and adverse, occurring only during peak construction employment periods. Given the conditions discussed above, the review team concludes that traffic-related impacts associated with a coal-fired alternative constructed on the Fermi site are likely to also be short-term, MODERATE, and adverse. The mitigation opportunities that resulted from the transportation study commissioned by Detroit Edison in coordination with the State would also apply to the coal-fired alternative and a commitment by Detroit Edison to work with the Michigan Department of Transportation (MDOT) and the Monroe County Road Commission (MCRC) to identify and execute appropriate mitigations would reduce transportation impacts to manageable levels. Traffic impacts would be greatly reduced after construction but would not disappear during plant operations.

Operations-related traffic impacts would result from (1) the commuting of the operating workforce, (2) rail deliveries of coal and limestone, and (3) large vehicles transporting CCR, scrubber sludge, and spent catalyst to recycling and/or disposal sites. Onsite coal storage facilities would be designed to have the capacity to receive several trainloads per day. Limestone delivered by rail could also add traffic but less than that generated by coal deliveries. By comparison, transportation-related impacts from the operation of a nuclear plant would be considerably smaller due to less frequent deliveries; however, transportation impacts from the commuting workforce would be greater due to the expected larger operating workforce for the reactor. The review team determines that because of the scale of deliveries of coal and limestone, combined with the large number of disposal truckloads leaving the plant, operating a new coal-fired power plant would result in MODERATE and adverse impacts on transportation. These impacts would be reduced by mitigation measures still in place after the construction period, but their presence would not reduce the assessed impact from MODERATE and adverse.

Aesthetics

Aesthetic impacts result primarily from the degree of contrast between the coal-fired power plant and the surrounding rural landscape, as well as the visibility of the coal-fired power plant in offsite areas. However, because there is industrial activity already on the site associated with operation of Fermi 2, the contrast between a coal plant at the site and the rural surroundings would be dramatically reduced.

Each power block building of a new coal-fired power plant would be up to 200-ft tall, which is somewhat taller than the proposed Fermi 3 reactor building. Each power block would also have an exhaust stack up to 500 ft in height, which would likely be taller and more prominent than the reactor’s offgas stack and, during some weather conditions, release a visible plume resulting from water vapor and combustion gases. These structures would be high enough to require illumination, which would exacerbate their visibility in the night. The cooling towers would generate a condensate plume, but this would be no more noticeable than the plume expected from a similarly sized cooling system for the Fermi 3 reactor. The transmission lines supporting the coal-fired plant would be the same as those proposed for Fermi 3 and would, therefore, have identical aesthetic impacts. In Section 4.4.1.6 and 5.4.1.6, the review team concludes that visual impacts from the construction and operation of Fermi 3 would be SMALL and adverse. Given the similar appearance of a coal-fired alternative to a nuclear plant and the industrial character of the existing viewscape because of Fermi 2, the review team determined the aesthetic impacts associated with the construction and operation of the coal-fired power plant alternative at the Fermi site would be SMALL and adverse.

Environmental Justice

This environmental justice impact analysis evaluates the potential for disproportionately high and adverse human health and environmental effects on minority and low-income populations that could result from the construction and operation of a new coal-fired power plant. The minority and low-income demographic characterization of the 50-mi region surrounding the proposed Fermi 3 site is discussed in Section 2.6 of this EIS. The characterization of minority and low-income populations for Fermi 3 is the same as that for the alternative coal-fired power plant. In Section 4.4.3 and 5.4.3 the review team concludes that there are no pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the construction and operation of Fermi 3. Since the construction of a coal-fired power plant system of comparable size to the Fermi 3 plant would have very similar physical and socioeconomic impacts, the review team determines that the impacts on minority or low-income populations from the construction of a coal-fired alternative would also be similar. Therefore, the review team determines the environmental justice impacts on minority or low-income populations of interest from constructing a coal-fired plant would be SMALL.

While many of the characteristics of operating a coal-fired power plant system would be similar to those for operating Fermi 3, there is one significant difference: a coal-fired plant emits substantially more air pollution and produces substantially more solid waste (some of which are heavy metals or hazardous wastes) than its nuclear powered analog. Therefore, while emission limits imposed by operating permits would help ensure the general population would not receive adverse air quality and noise impacts from emission levels beyond those permitted by environmental standards from the operation of the coal-fired alternative, the general population would experience increased environmental impacts from the byproducts of operating a coal-fired power plant. However, the review team did not identify any pathway or circumstance through which any minority or low-income population might experience a disproportionately high and adverse impact, relative to the general public. Therefore, the review team concludes that the environmental justice impacts on minority and low-income populations of interest from operating a coal-fired alternative plant would be SMALL.

Historic and Cultural Resources

The Fermi site contains one *National Register of Historic Places*- (NRHP-) eligible historic property, the nonoperating Fermi Unit 1 (Fermi 1). In Section 7.5, the review team concludes that impacts on onsite historic and cultural resources from building and operating Fermi 3 would be MODERATE, because portions of the Fermi 3 plant would be located on the land currently occupied by Fermi 1 and if demolition of Fermi 1 were necessary, the adverse impacts of demolition would be mitigated in accordance with measures stipulated in a Memorandum of Agreement (MOA) between the NRC, the Michigan State Historic Preservation Officer (SHPO), and Detroit Edison. Similar adverse impacts on the NRHP-eligible Fermi 1 historic property would result from construction of a coal plant on the same footprint that was proposed for

Fermi 3. In addition, because the land area requirements for a coal-fired alternative are greater than those for a nuclear reactor, impacts may occur on disturbed and undisturbed land parcels both on the Fermi site and on adjacent offsite properties for support of ancillary activities such as fuel and waste storage. While surveys of previously undisturbed land parcels would provide a basis for mitigation of impacts on historic and cultural resources, the review team nevertheless concludes that impacts on historic and cultural resources from construction and operation of a new coal-fired power plant at the Fermi site would be MODERATE, primarily due to the demolition of the NRHP-eligible Fermi 1 and the implementation of mitigation measures for the adverse impacts of demolition that would be similar to those developed for a new nuclear reactor.

Summary of the Construction- and Operation-Related Impacts of the Coal-Fired Power Generation Alternative

The construction and operation impacts of coal-fired power generation at the Fermi site are summarized in Table 9-2.

9.2.2.2 Natural Gas-Fired Power Generation

In this section, the review team evaluates the environmental impacts of natural gas combined-cycle (NGCC) generation at the Fermi site.

In 2009, natural gas was responsible for 8.3 percent of electricity generated by all sources within the electric industry (utilities, combined heat and power, independent power producers) in Michigan, 8,419,551 MWh of the statewide total of 101,202,605 MWh (DOE/EIA 2011b), but only 0.7 percent, 563,510 MWh, of the 82,787,341 MWh of electricity generated by electric utilities. Like coal-fired power plants, natural gas-fired plants are sources of criteria pollutants and GHGs and are subject to emission-limiting regulations promulgated under the CAA and analogous State legislative directives, although they emit markedly fewer criteria pollutants and GHGs per unit of energy produced than do comparably sized coal-fired plants. The technology most likely to be employed in a natural gas-fired alternative is “combined cycle.”

NGCC power plants differ significantly from coal-fired and existing nuclear power plants. They derive the majority of their electrical power output in the primary power cycle, a gas combustion turbine (CT), without the production of steam. Additional power is generated by recovering latent heat from gases exiting the CT delivered to a heat recovery steam generator (HRSG), with the resulting steam subsequently directed to a conventional Rankine cycle STG set – the secondary power cycle. Power resulting from this secondary cycle is completely pollution-free since it involves no fuel combustion, although management of the steam cycle does introduce a small internal load. This “combined cycle” approach provides significantly greater thermal efficiency than any single-cycle system, with overall thermal efficiencies routinely attaining 60 percent (as compared to typical thermal efficiencies of coal-fired plants using only Rankine

Table 9-2. Summary of Environmental Impacts of a Coal-Fired Power Generation Alternative

Impact Category	Impact	Comment
Air Quality	MODERATE	SO_2, 2719 tons/yr NO_x, 3353 tons/yr CO, 1618 tons/yr $PM_{filterable}$, 208 tons/yr $PM_{2.5}$, 48 tons/yr Small, unquantified amounts of hazardous air pollutants, including mercury. CO_2, 12.1 million tons/yr (without CO_2 removal). Air quality impacts will be mitigated by emission limits contained in operating permits.
Waste Management	MODERATE	CCR waste volume projections include 416,918 tons/yr of ash that would be recovered as bottom ash or fly ash; with 50 percent of the recovered amount (208,251 tons/yr) recycled and an equal amount requiring disposal annually. SO_2 scrubber sludge projected generation of 110,310 tons/yr, 90 percent of which is projected for recycling, leaving 11,031 tons/yr requiring disposal.
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Water Use and Quality	SMALL	Impacts would be less than the impacts for Fermi 3 due to lesser heat rejection demands.
Ecology	SMALL (aquatic) to MODERATE (terrestrial)	Expected to require disturbance of substantially greater areas of natural habitat, including wetlands, on the Fermi site, as well as result in habitat losses in offsite areas on contiguous parcels. Offsite areas used for CCR disposal are expected to be already in use as disposal facilities to which the local ecology has already adjusted.

Table 9-2. (contd)

Impact Category	Impact	Comment
Ecology (contd)		Impacts on aquatic ecology from operation of the cooling system would be comparable to those anticipated from Fermi 3 and would be SMALL. Impacts on terrestrial ecology from cooling tower drift would be comparable to those anticipated from Fermi 3. Additional impacts on terrestrial ecosystems are associated with coal mining and construction of onsite areas for temporary storage of CCR and other operation-related solid wastes.
Noise	MODERATE	Continuous and intermittent noise would be created by mechanical equipment associated with normal plant operations, mechanical cooling towers, coal handling, solid waste disposal, and coal and limestone deliveries.
Land Use	MODERATE	Onsite land requirements for the power block and cooling system would be substantially greater than the requirements for Fermi 3. Additional onsite and possibly some offsite land areas would be required for storage of coal and temporary storage of CCR and other operation-related wastes. Approximately 41,492 ac would be required to mine the required amount of coal. Substantial land areas may be required for the permanent disposal of CCR and scrubber sludge that cannot be recycled. Offsite land requirements for transmission would be comparable to or the same as those for Fermi 3.
Socioeconomics (economy and taxes)	SMALL to LARGE (beneficial)	Increased economic activity from new jobs and spending in the region would stimulate economic growth and tax revenues. Local property tax base would benefit mainly during operations to an extent slightly less than is expected for Fermi 3, due to the smaller operating workforce expected. This stimulus would be SMALL beneficial for all areas except for property tax impacts in Monroe County, which would be LARGE beneficial.

Table 9-2. (contd)

Impact Category	Impact	Comment
Socioeconomics (all other areas)	SMALL to MODERATE	Construction-related impacts would be limited and temporary. Construction workforce projected at 2500; likely to originate primarily from the Detroit and Toledo MSAs. Impacts on local communities with regard to housing and services are expected to be short-term, SMALL and adverse for construction and SMALL and adverse for operation. Traffic-related impacts will be greatest during peak construction employment periods, which the review team has determined would constitute a short-term MODERATE adverse impact. Cumulative impacts from traffic result from the simultaneous commuting to the site by three separate workforces during certain periods: coal plant construction, Fermi 2 operation, and Fermi 2 refueling, as well as from non-Fermi related traffic. The plant and new transmission line would have aesthetic impacts comparable to those anticipated for Fermi 3. The aesthetic impact would be SMALL and adverse, since the Fermi site is already industrialized.
Environmental Justice	SMALL	Impacts are expected to be similar to those evaluated for the nuclear alternative. No disproportionate adverse impacts were identified.
Historic and Cultural Resources	MODERATE	Impacts onsite would be similar to the nuclear alternative. Demolition of the NRHP-eligible Fermi 1 would result in adverse impacts on a historic resource, which would be mitigated. Some of the facility and supporting infrastructure would be built on previously disturbed ground onsite, but additional previously undisturbed onsite and offsite areas that may be required may not have been surveyed for resources.

cycle STGs of 39 percent) (Siemens 2007; NETL 2010). Since the natural gas-fired power plant alternative derives much of its power from a gas turbine without production of steam and because it has greater thermal efficiency than either the coal-fired power plant alternative or the proposed Fermi 3 reactor, it requires significantly less cooling.

Typical powertrains for large-scale NGCC power generation would involve one, two, or three CTs operating simultaneously with the heat extracted from each directed to one HRSG (commonly known as a “1 × 1,” “2 × 1,” or “3 × 1” configuration, respectively). CTs, HRSGs, and STGs are available in a wide variety of sizes and can be configured in a variety of powertrain configurations to attain virtually any desired level of net power production. To complete the assessment of an NGCC alternative, the review team presumed that appropriately sized CTs, HRSGs, and STGs would be assembled in appropriate powertrain configurations to produce net electrical power virtually equivalent to the 1535 MW(e) proposed for Fermi 3. Because NGCC plants can be expected to operate at a capacity factor of 85 percent, power equivalency to the Fermi 3 reactor in terms of the equivalent amount of electricity delivered to the grid would be 1661 MWe.

Although operation of the NGCC plant introduces some parasitic loads, unlike coal-fired plants, the resulting performance penalty is relatively minor, and no adjustments have been made to calculations of NGCC operational impacts to account for parasitic loads. In addition, given the significant uncertainty regarding the details of any CCS and when such controls might be required, the review team did not include parasitic losses from CCS in its calculations.

The review team further assumed that 75 percent of the net power produced (1246 MW) would result from the operation of the CTs, with the remainder (415 MW) resulting from operation of the HRSG-STG powertrains; the CTs are Advanced F-Class designs equipped with water or steam injection as a precombustion control to suppress NO_x formation and selective catalytic reduction (SCR) (ammonia introduction) for postcombustion control of NO_x emissions.[a] The facility would use natural gas meeting interstate pipeline specifications[b] and would operate at a capacity factor of 85 percent, with load factors for the CTs greater than 80 percent, thermal efficiencies of the CTs of 42 percent, and an overall facility thermal efficiency of 60 percent. The facility would consume 73,900 million ft^3 of natural gas to produce 12,400 GWh of power annually.

Air Quality

A review of the status of ambient air quality at the Fermi site is provided in Section 9.2.2.1. The following sections provide brief overviews of the Federal and State regulations that would apply to the NGCC alternative operating at the Fermi site and also evaluate the impacts of construction and operation of a NGCC alternative.

(a) SCR involves introducing ammonia into the exhaust ducts of the CTs, where it combines with NO_x in a nickel catalyst bed to form zero-valent nitrogen and water. Referring to data provided by the Institute of Clean Air Companies, EPA acknowledges that typical SCR devices can demonstrate removal efficiencies of between 70 and 90 percent (EPA 2000b).

(b) Interstate pipeline specifications for natural gas include chemical composition (volume percent): $CH_{4,}$ 93.9; ethane, 3.2; propane, 0.7; *n*-butane, 0.4; CO_2, ; and nitrogen, 0.8; and higher heating value, 22,792 Btu/lb (1040 Btu/standard ft^3), and lower heating value of 20,552 Btu/lb (939 Btu/ standard cubic foot) and average value of 1020 Btu/standard ft^3. EPA further defines “pipeline natural gas” as having sulfur content less than 0.6 grains/100 standard ft^3.

Air Pollution Controls Regulations in Michigan Applicable to an NGCC Alternative

Federal and State regulations in Michigan are discussed in Section 9.2.2.1 with respect to a coal-fired alternative. Except as noted below, the majority of those requirements would also apply to a NGCC alternative operating at the Fermi site. A new natural gas-fired generating plant would qualify as a new major source of criteria pollutants and would be subjected to Prevention of Significant Deterioration of Air Quality Review under requirements of CAA and Michigan State regulations. As such, it would need to comply with the NSPS for NGCC plants set forth in 40 CFR 60 Subpart Da: particulate matter and opacity (40 CFR 60.42(a)), SO_2 (40 CFR 60.43(a)), and NO_x (40 CFR 60.44(a)). The new NGCC generating plant would qualify as a major source because of its PTE being greater than 100 tons/yr of criteria pollutants and CO_2 greater than 75,000 tons/yr, and would be required to secure a Title V operating permit from MDEQ. However, although new permits issued after January 2011 must address GHG emissions and require the permittee to report them, regulations specifically requiring carbon capture and sequestration have not been promulgated. A new NGCC plant in Michigan would also be subject to the CSAPR finalized by EPA on July 6, 2011.

The combustion turbines of the combined-cycle plant would be subject to EPA's National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines (40 CFR 63, Subpart YYYY) if the NGCC was a major source of HAPs (having the potential to emit 10 tons/yr or more of any single HAP or 25 tons/yr or more of any combination of HAPs (40 CFR 63.6085(b)). In December 2000, EPA published its determination that HAPs such as arsenic, formaldehyde, and nickel could be emitted from natural gas-fired electric utility-scale steam generating units (i.e., natural-gas-fired boilers), but that such emissions were negligible, making regulations directed at their control neither appropriate nor necessary (65 FR 79825). However, this interpretation does not automatically extend to natural-gas-fired combustion turbines.

Estimated Impacts on Air Quality from the Construction of a NGCC Alternative

Construction of a NGCC power plant would result in the release of various criteria pollutants from the operation of internal combustion engines in construction vehicles and equipment, delivery vehicles, and vehicles used by the commuting construction workforce. Volatile organic chemical releases will also result from the onsite storage and dispensing of vehicle and equipment fuels. Onsite and offsite (e.g., pipeline) activities would also generate fugitive dust and equipment-related criteria pollutants. These impacts would be intermittent and short-lived, however, and adherence to well-developed and well-understood construction industry best practices (including development and execution of an appropriate fugitive dust control plan) would mitigate such impacts. Construction-related impacts on air quality from an NGCC alternative would be of relatively short duration and would be SMALL.

Estimated Impacts on Air Quality from the Operation of a NGCC Alternative

Operation of the NGCC alternative would result in the release of modest amounts of criteria pollutants, hazardous air pollutants, and GHGs, principally CO_2. As with the coal-fired alternative discussed above, particulate drift would also be released from either a natural draft cooling tower (NDCT) or a mechanical draft cooling tower (MDCT) that would provide cooling for the steam in the secondary power cycle. As noted in Section 9.2.2.1, Detroit Edison estimates drift releases from plant cooling towers that would support the proposed reactor to be 8.47 tons/yr. Because the cooling demands of a NGCC facility of equivalent capacity are significantly lower than those of a nuclear reactor, those estimates represent a bounding condition for either cooling tower alternative of a NGCC alternative.

In its application, Detroit Edison identified a 1500-MW(e) natural gas-fired alternative and estimated that such a plant equipped with appropriate pollution control technology would have approximately the following emissions:

- SO_2, 41 tons/yr
- NO_x, 3800 tons/yr
- CO, 1600 tons/yr
- PM, 290 tons/yr
- CO_2, 4,800,000 tons/yr (without CCS).[(a)]

The review team's estimates of emissions from a 1661-MW(e) NGCC facility, based on emissions factors provided in EPA AP-42 (EPA 1998), are shown in Table 9-3.

The emissions from the NGCC alternative would be significantly less than those from the coal-fired alternative. The impact of the emissions from the NGCC plant would be noticeable but would not be sufficient to destabilize air resources. Overall the review team concludes that the air quality impacts resulting from the construction and operation of a new NGCC plant located at the Fermi site would be SMALL to MODERATE.

Waste Management

In the GEIS for license renewal, the staff concluded that waste generation from natural-gas-fired technology would be minimal (NRC 1996). During construction of a new natural-gas-fired power plant, land clearing and other construction activities would generate waste that could be

(a) The Detroit Edison analysis defined a different nameplate capacity and a different configuration for the natural gas alternative evaluated in the ER than the review team presents here. Consequently, Detroit Edison's projected air emissions are not directly comparable to those presented in this analysis.

Table 9-3. Estimated Emissions (in tons/yr) from a 1661-MW(e) (net) NGCC Alternative[(a)]

Pollutant	Annual Uncontrolled Emissions	Annual Controlled Emissions	Notes
SO_2	128	128	Emission factor of 0.0034 lb/MMBtu; 99 percent SO_2 and trace amounts of SO_3. Assumes no H_2S formation
NO_x	4900	490	Emission factor of 0.13 lb/MMBtu; assumes water-steam injection and 90 percent conversion in SCR.
Particulate[(b)]	249	249	Emission factor of 0.0066 lb/MMBtu; all as PM_{10}
CO	1130	1130	Emission factor of 0.03 lb/MMBtu; assumes 95 percent conversion of carbon in fuel.
N_2O	113	113	Emission factor of 0.003 lb/MMBtu
VOC	79	79	Emission factor of 0.0021 lb/MMBtu
CO_2	4.15 million	4.15 million	Emission factor of 110 lb/MMBtu; assumes 95 percent conversion of carbon in the fuel and no CCS in place.

(a) Combustion of natural gas also releases other GHGs, such as CH_4 and N_2O, so that the total GHG emission is typically represented as CO_2-e. However, CO_2 predominates, and for simplicity, contributions of CH_4 and N_2O were ignored in the calculations.

(b) Although expected to be relatively minor, particulate emissions from the cooling tower cannot be specified with precision at this time. Consequently, the estimates presented do not include cooling tower particulate emissions.

recycled or shipped to an offsite waste disposal facility. A small fraction of the anticipated construction-related wastes would exhibit hazardous characteristics that would require special handling, treatment, or disposal. Because Detroit Edison believes that the NGCC alternative and ancillary facilities could be constructed largely on previously disturbed portions of the Fermi site, the amounts of wastes produced during land clearing of native vegetation would be minimal.

During NGCC operation, spent SCR catalysts used to control NO_x emissions from the CTs would make up the majority of the waste generated under this alternative. Such wastes might exhibit hazardous characteristics that dictate special handling and disposal. All disposals of spent catalysts would be expected to occur at existing offsite facilities. Small amounts of wastes would result from the treatment of cooling water in circulating systems and from typical maintenance and cleaning operations. Overall, the review team concludes that waste impacts from natural gas-fired power generation would be SMALL.

Human Health

Like the coal-fired power plant alternative discussed above, an NGCC plant would emit criteria air pollutants but in lesser quantities. Human health effects of gas-fired generation are generally low, although in Table 8-2 of NRC (1996), the NRC staff identified cancer and emphysema as potential health risks from gas-fired plants. NO_x emissions contribute to ozone formation, which in turn contributes to human health risks. Emission controls on this gas-fired alternative can be expected to maintain NO_x emissions well below air quality standards established for the purposes of protecting human health (the primary NAAQS), and emissions trading or offset requirements mean that overall NO_x releases in the region would not increase. Health risks to workers might also result from handling spent catalysts that might contain heavy metals.

Overall, human health risks to occupational workers and to members of the public from gas-fired power plant emissions sited at the Fermi site would be less than the risks described for the coal-fired power plant alternative and would likely be SMALL.

Climate Change-Related Impacts

This section presents anticipated impacts on climate change from the construction and operation of the NGCC alternative.

Because construction of an NGCC alternative would occur over a shorter period of time and involve a smaller workforce than Fermi 3, the construction-related GHG emissions for Fermi 3 (see Section 4.7.1) are considered to be a bounding condition, and there would be fewer GHG emissions from construction of the NGCC alternative. The impact on climate change from the construction of a NGCC alternative would be SMALL.

Of the 214.7 MMT of energy-related CO_2-e emissions in Michigan in 2005, 2.38 MMT was related to in-state electricity production using natural gas (CCS 2008). The U.S. total GHG emissions and total emissions of CO_2 from combustion of fossil fuels for electricity production in 2005 were 7108.6 MMT and 2381 MMT, respectively (EPA 2009a). Thus, the Michigan total GHG emissions from combustion of natural gas for electricity production accounted for 0.033 percent of the nationwide total GHG emissions and approximately 0.10 percent of the nationwide total CO_2 emissions related to electricity production using fossil fuels.

EIA reports that the total GHG emissions in the United States in 2007 were 7282.4 MMT of CO_2 equivalents ($MMTCO_2$-e), a growth of 1.4 percent from 2006. Of this amount, 5916.7 $MMTCO_2$-e (81.2 percent) was CO_2, 699.9 $MMTCO_2$-e (9.6 percent) was CH_4, and 383.9 $MMTCO_2$-e (5.3 percent) was N_2O (DOE/EIA 2008). CO_2, CH_4, and N_2O emissions would all result from the operation of an NGCC facility. Both N_2O and CH_4 (which is the primary component of pipeline natural gas) are also potent GHGs with global warming potentials in a 20-year time horizon that are 310 and 21 times as great as CO_2, respectively (EPA 2009a).

However, only insignificant amounts of N_2O are released from CT operation, and significant emissions of natural gas would result only through incomplete combustion and/or fuel supply system leaks and are therefore presumed to be improbable. As noted above, an estimated 95 percent of the carbon contained in the natural gas being combusted would be converted to CO_2.

As discussed above, the review team estimates that 4.15 million tons/yr (3.76 MMT/yr) of CO_2 would result from the operation of a natural-gas-fired alternative. The power produced by the Fermi 3 reactor that might otherwise have been generated by a natural-gas-fired alternative represents GHG emissions avoided. Consequently, operation of the Fermi 3 reactor instead of a natural-gas-fired alternative would result in the net savings of 4.15 million tons/yr (3.76 MMT/yr) of CO_2.[a] This amount represents approximately 3.04 percent and 0.02 percent of the total anthropogenic GHGs related to electricity production emitted in Michigan and in the United States, respectively, in 2005.

While any single project would be inconsequential when compared to global GHG emissions, the review team doesn't believe that this is the correct way to measure the impacts. A 3 percent increase in emissions from electricity production within the State cannot be construed as undetectable. The review team concludes that the impacts on GHG concentrations in the atmosphere from the operation of an NGCC alternative would be SMALL to MODERATE.

Groundwater Use and Quality

No groundwater is expected to be used in the construction or operation of the NGCC alternative. Some foundation excavations may intrude on groundwater zones and require dewatering while they are being constructed. Surface water drainage from active construction sites could contain contaminants that could affect groundwater, but major construction sites would be required to have an SWPPP general permit that would preempt such adverse impacts. Otherwise, no impacts on groundwater quality would be expected. The impact of the natural gas-fired alternative on groundwater would be SMALL.

Surface Water Use and Quality

During construction, production of concrete and other construction activities would result in consumption of minimal amounts of surface water, presumably acquired from Lake Erie. Ground disturbance might result in some impacts on surface water quality in the form of increased sediment loading to stormwater runoff from active construction zones; however, an

(a) Figures presented here represent CO_2 emissions directly related to energy production. Although it is estimated that a nuclear reactor will generate 20,000 tons/yr of CO_2-e (see Table 5-22), those releases are the result of routine preventive maintenance of fossil-fueled emergency generators and routine operation of ancillary equipment using fossil fuels and not the direct result of the operation of the reactor. No GHGs are emitted from reactor operation.

SWPPP general permit is expected to require BMPs that would prevent or significantly mitigate such impacts. The impacts on water quality from sedimentation during construction of a natural gas-fired plant were characterized in NUREG-1437 as SMALL (NRC 1996).

The NGCC alternative would be expected to use a closed loop cooling system virtually identical to the one proposed for Fermi 3, employing either MDCTs or NDCTs. During operation, Lake Erie would provide the water source for cooling and other industrial applications and would receive blowdown from the cooling tower, while industrial wastewaters would be discharged to the sanitary sewer under a treatment agreement with the municipal treatment facility that currently serves the Fermi site. Discharges to Lake Erie would be controlled by an NPDES permit. Discharges to the sanitary sewer would be controlled by a pretreatment agreement with the operator of the sewage treatment plant accepting the discharges. However, only the steam produced in the HRSGs and exhausted from the Rankine cycle STGs would require cooling. Consequently, because the majority of power would be produced by the CTs, which require no cooling, the cooling system would use less water than has been projected for Fermi 3. The slightly lower operating temperatures and relatively high thermal efficiencies of an NGCC plant would also result in smaller cooling water requirements than those of the comparably sized nuclear plant. NRC also noted in NUREG-1437 that the impacts on water quality from operations would be similar to, or less than, the impacts from other generating technologies. The review team concludes the impact on surface water from construction and operation of a NGCC alternative would be adequately controlled by permits and would, therefore, would be SMALL.

Aquatic Ecology

As noted above, Lake Erie would be the primary source of water to support the construction and operation of the NGCC alternative. Impacts on aquatic ecosystems during construction would be minimal due to the relatively small amount of water required (compared to the volume of water in Lake Erie) and controls on the quality of surface water discharges imposed by a SWPPP permit issued by MDEQ. Impacts on aquatic ecosystems during operation would be less than the projected impacts from Fermi 3 operation because of expected smaller heat rejection demands, and would take the form of both impingement and entrainment impacts associated with water withdrawals to support the cooling system, as well as thermal impacts associated with blowdown discharges from that cooling system (which may be required to undergo treatment prior to discharge). All such impacts would be controlled by an NPDES permit issued by MDEQ. The review team concludes, therefore, that impacts on aquatic ecology from the construction and operation of a NGCC alternative would be SMALL.

Terrestrial Ecology

Detroit Edison estimates that a 1600-MWe natural-gas-fired (closed cycle) alternative would require approximately 176 ac of land for permanent structures, not substantially different than the estimated 155 ac of land required for a nuclear facility.[a] It is unclear whether permanent or temporary wetland impacts would be necessary on the site, but the review team believes that the onsite wetland impacts would be similar to those for a nuclear facility. The review team believes that the footprint of the natural gas plant considered here would be generally the same size as the conventional natural gas boiler envisioned by Detroit Edison, and therefore concludes that sufficient land area would available on the Fermi site to accommodate its natural gas alternative. Although the review team does not know exactly how much natural habitat on the Fermi site would have to be disturbed, it expects that the overall onsite terrestrial ecological impacts would be generally similar to those resulting from a nuclear facility.

The transmission line for a gas facility on the Fermi site would result in the same forest and wetland impacts as a transmission line for a nuclear facility. However, Detroit Edison estimates that an additional 200 ac would be disturbed to build the 10-mi natural gas pipeline needed to connect the Fermi site to the existing natural gas pipeline infrastructure. Although some of the affected land would be agricultural fields, where impacts would be largely temporary, installing the gas pipeline could require some forest clearing and fragmentation, as well as temporary disturbance of wetlands. Forest cover in the pipeline corridor, including wetlands in the corridor, would have to be kept clear during operation of the pipeline. The forest and wetland impacts from the gas pipeline would not be necessary for a nuclear facility.

Detroit Edison offered no estimates for additional land potentially needed for a new or upgraded compressor station. Given the large amount of agricultural land in the area, it is reasonable to conclude that a compressor station could be located on agricultural land, thereby minimizing terrestrial ecological impacts. Additional offsite impacts would occur at the locations where natural gas is extracted. In NRC (1996), the NRC staff estimated that approximately 3600 ac would be needed for a natural gas well field of sufficient size to support a 1000-MW(e) gas-fired plant. Correspondingly, a 1661-MW(e) facility would require approximately 6000 ac of gas well field. Existing natural gas fields would initially be expected to provide the necessary amount of gas for this facility. However, operation of the NGCC plant would contribute to a cumulative increase in the demand for gas, thereby contributing to a need to develop and exploit new gas sources.

Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soil from cooling tower drift. These impacts would be similar to but somewhat less than those that are now occurring from the operation of Fermi 2 and those that would result from operation of Fermi 3. As noted in Section 5.3.1, the terrestrial ecological impacts from cooling tower drift from Fermi 3 would be minimal.

(a) As noted above, Detroit Edison estimates for impact land area were based on a hypothetical 1600-MW(e) plant, rather than the 1661-MW(e) plant assumed for this assessment. The differences in land requirements are, however, negligible.

Based on the above analysis, the review team concludes that impacts on terrestrial resources from the construction and operation of a NGCC alternative would be MODERATE but could possibly be reduced through wetland mitigation. In addition to the onsite and transmission line impacts, as well as impacts from gas field development, noticeable impacts would also result from installation and maintenance of a new gas supply pipeline along an as-yet-unspecified route.

Noise

The construction-related noise sources for an NGCC alternative would be virtually the same as those for construction of the coal-fired alternative. However, the construction period for the NGCC alternative would be shorter and the construction less extensive (i.e., no facilities needed for management of coal and only limited facilities needed for management of operational wastes). Consequently, with construction-related noise for the coal-fired alternative as a bounding condition, the review team concludes that construction-related noise associated with the NGCC alternative would be SMALL.

Operation-related noise for the NGCC would be less than operation-related noise for the coal-fired alternative, because outdoor fuel-handling activities would not occur and outdoor waste-handling activities would be limited, and there would be few, if any, rail deliveries of emissions control materials. Pipelines delivering natural gas fuel could be audible offsite near gas compressor stations, but such sound impacts would be similar to impacts already occurring in the vicinity of the existing pipeline to which the Fermi site would connect. The review team concludes that operation-related noise from the NGCC alternative would be SMALL.

Land Use

The analysis of land use impacts focuses on the amount of land area that would be affected by the construction and operation of a NGCC power plant at the Fermi site.

Detroit Edison estimated that approximately 176 ac of land would be permanently needed to support a natural-gas-fired alternative to Fermi 3, not substantially different than the 155 ac required for Fermi 3 (but presumably in approximately the same location).[a] Detroit Edison also indicated that an area of sufficient size in a previously disturbed area of the site was available for the natural gas plant, thus minimizing the amount of disturbance in undeveloped portions of the site (Detroit Edison 2011a). Detroit Edison stated, however, that they could not estimate the additional land requiring temporary disturbance during construction of the gas-fired plant (Detroit Edison 2011a). The review team does not believe that the additional land temporarily required

(a) Detroit Edison land estimates were based on a hypothetical 1600-MW(e) plant, rather than the 1661-MW(e) plant assumed for this assessment. The differences in land requirements are, however, negligible.

would be substantially greater than that estimated for the nuclear Fermi 3 plant. The resulting onsite land use impacts from construction would therefore be minor. Impacts on wetlands and prime farmland on the Fermi site, as well as on lands on the site managed as part of the DRIWR, would likely be no greater than described for Fermi 3, and hence minor.

In addition to onsite, land would be required offsite for natural gas pipelines and gas wells. This would include land for a new 10-mi-long pipeline segment connecting the site to existing natural gas distribution infrastructure. A new or expanded compressor station may also be required. Detroit Edison estimates offsite land impacts from the gas pipeline and compressor station to total 200 ac (Detroit Edison 2011a). The review team expects that at least some wetlands and prime farmland would be temporarily disturbed to install the pipeline.

In the GEIS (NRC 1996), the staff estimated that approximately 3600 ac would be needed for a natural gas well field of sufficient size to support a 1000-MW(e) gas-fired plant (NRC 1996). The 1661-MWe NGCC plant considered here would require more gas than the 1000-MWe reference plant evaluated in the GEIS, although that may not necessarily result in a proportional increase in land area for the gas field. Detroit Edison estimates that 5760 ac would be required to support the 1600-MWe natural gas alternative it evaluated. Although natural gas is widely available throughout the Detroit Edison service territory, it represented only 8.3 percent of the electricity generated in the State in 2009 (DOE/EIA 2011b).[(a)] The 12.4 million MWh of electricity that would be produced by a 1661-MWe NGCC power plant would be a substantial increase over the 8.4 million MWh of electricity produced from natural gas in 2009. The review team concludes that the impacts on land use from onsite activities and the 10-mi pipeline would be minor. It isn't clear to what extent well fields might have to be expanded. However, inasmuch as most of the land around wells can be used for other purposes (e.g., grazing livestock), the review team concludes that these impacts may also be minor.

The EIA reported that flow of natural gas into Michigan through 2007 amounted to 4820 million ft^3/day , but delivery capacity into Michigan by existing interstate transmission pipelines was 9347 million ft^3/day (through 2008) – an unused delivery capacity of 4527 million ft^3 (DOE/EIA 2011c). As noted earlier, the NGCC alternative is projected to consume 73,900 million ft^3 of natural gas annually, or a daily average of 202 million ft^3. The NRC review team concludes, therefore, that the existing interstate natural gas pipeline transmission infrastructure has sufficient, uncommitted capacity to accommodate a new NGCC facility without significant expansion. The review team further concludes that regardless of the interstate pipeline by which natural gas enters Michigan, the interstate and intrastate transmission pipeline infrastructures in Michigan are sufficiently complex that the required amount of gas could be delivered to the Fermi site. However modifications to the existing network (increasing flow capacity in certain segments, adding compressor stations) may

(a) However, Detroit Edison notes in its ER that natural gas power plants represent as much as 29 percent of the State's generating capacity (Detroit Edison 2011a).

nevertheless be required to ensure natural gas is provided to the Fermi site with sufficient flow and pressure to support the NGCC alternative.

Offsite land impacts for transmission lines would be minimal, since the NGCC plant is expected to connect to the ITC*Transmission* Milan Substation in existing transmission corridors owned by ITC*Transmission*. The review team expects that a gas-fired power plant at the Fermi site would require building the same transmission lines following the same route proposed for Fermi 3. The transmission line impacts would be equivalent to those anticipated from the proposed Fermi 3 reactor.

Overall land use impacts from construction of a gas-fired power plant on the Fermi site would be SMALL; modifications to the existing pipeline infrastructure would also result in minor offsite land impacts; however, offsite land impacts would increase if expanded natural gas extraction activities were necessary to meet increased demand of the NGCC alternative.

Socioeconomics

Socioeconomic impacts are defined in terms of changes to the baseline demographic and economic characteristics and social conditions of a region, especially resulting from the creation of new jobs. Three types of job creation would result: (1) direct construction-related jobs, which are short-term and less likely to have a long-term socioeconomic impact; (2) direct operation-related jobs in support of power plant operations and maintenance, which have the greater potential for permanent, long-term socioeconomic impacts; and (3) indirect jobs created by the economic stimulus of new workers and new jobs during the building and operation of the new plant. For the NGCC alternative, Detroit Edison estimates a peak employment construction workforce that would be less than the 2900 required for Fermi 3 and an operations workforce of 150. The review team finds both of these estimates to be reasonable and has used them to support its own analysis of socioeconomic impacts.

The review team expects the construction and operations workforces for an NGCC alternative at the Fermi site would be drawn from the same communities as those for the coal-fired alternative. The review team expects that the impacts on the local economy from construction and operation of an NGCC alternative would be less than the impacts for the proposed Fermi 3 reactor, because the NGCC alternative would require smaller construction and operations workforces and a shorter construction period, and have a much lower construction cost. Impacts on local tax bases, including property taxes, are expected to be SMALL and beneficial, except that the property tax impacts in Monroe County would be MODERATE and beneficial. Likewise, given the review team's assumptions regarding the distribution of construction and operations workers, the review team expects the impacts on local infrastructure (e.g., housing, schools, and utilities) are also likely to be SMALL and adverse for all areas in the 50-mi region.

Traffic

Traffic impacts associated with construction of the NGCC alternative would result from commuting construction and operating workforces and truck and rail deliveries of construction materials to the Fermi site. As noted above, the construction workforce for the NGCC alternative would be smaller than that projected for Fermi 3, and the construction period would be substantially shorter. Some major NGCC plant components, such as CTs and STGs, are likely to be delivered by rail via the existing onsite rail spur. Pipeline construction and modification of existing natural gas pipeline systems could also have a temporary impact on local traffic, especially if the new pipeline segment crosses existing road or rail infrastructure. The review team determined that in aggregate, all the traffic-related impacts for the NGCC alternative during construction would be SMALL and adverse. The operating workforce for the NGCC alternative, estimated by Detroit Edison to be approximately 150 full-time workers, would be substantially smaller than the workforce projected for Fermi 3 operation. Some equipment and material deliveries are expected to continue throughout operation, but traffic-related impacts from such deliveries would be negligible. The review team therefore concludes that the overall traffic-related impacts during operation would be SMALL and adverse.

Aesthetics

The aesthetics impact analysis focuses on the degree of contrast between the natural-gas-fired alternative and the surrounding landscape and the visibility of the natural-gas-fired plant. However, because there already is industrial activity on the site associated with operation of Fermi 2, the contrast between a natural-gas-fired power plant at the site and the rural surroundings is dramatically reduced.

The power block of the NGCC alternative (the turbine building) would have an appearance similar to the power block and containment building of the existing nuclear plant. Likewise, the NGCC NDCT, which is expected to be similar in appearance to that proposed for Fermi 3 cooling towers, would generate a condensate plume visible from great distances during certain meteorological conditions. The plume’s visual impact would be additive to a similar plume emanating from the existing NDCTs for Fermi 2.

The NGCC CTs would each have an exhaust stack (or might share a common stack) that would be higher and more prominent than the offgas stack for the proposed Fermi 3. Given their expected height, the exhaust gas stacks of the NGCC alternative would also likely require lighting to comply with Federal Aviation Administration (FAA) regulations. The transmission lines supporting the NGCC plant would be the same as those proposed for Fermi 3 and would, therefore, have identical aesthetic impacts. Because transmission lines run from the Fermi site to support Fermi 2, the impacts of the NGCC alternative’s transmission lines would be minimal.

In general, aesthetic changes would be limited to the immediate vicinity of the Fermi site and would likely be generally similar to impacts already occurring as well as similar to those expected from the proposed nuclear plant. Given the current industrial character of the Fermi site, aesthetic impacts of an NGCC alternative would be SMALL and adverse.

Environmental Justice

The review team expects the environmental justice impacts of construction and operation of a NGCC power plant at the Fermi site would be similar to, but smaller than, those resulting from the construction and operation of Fermi 3 (see Sections 4.5 and 5.5 of this EIS for a detailed discussion of these impacts) or the coal-fired alternative discussed in the previous section. These impacts are judged to be SMALL.

Historic and Cultural Resources

As is the case for the coal-fired alternative, impacts on historic and cultural resources would occur because of the presence of the NRHP-eligible Fermi 1 property onsite, and if previously undisturbed areas of the site were disturbed during construction without having first been surveyed and any identified resources evaluated for NRHP eligibility. The review team concludes, therefore, that impacts on historic and cultural resources on the Fermi site would be MODERATE, as is the case for the coal-fired alternative. A ROW for the required new 10-mi pipeline segment has not been specified, so it is impossible to determine whether historic or cultural resources would be present along that path. The review team assumes that appropriate surveys would be completed prior to commencement of construction of a supporting natural gas pipeline segment. However, because of the adverse impacts on the NRHP-eligible Fermi 1 property, the review team concludes that impacts on cultural, historic, and archaeological resources from construction and operation of the NGCC alternative would be MODERATE, as is the case for the coal-fired alternative.

Summary of the Construction- and Operation-Related Impacts of a Natural Gas-Fired Generation Alternative

The construction and operation impacts of a natural gas-fired power generation alternative at the Fermi nuclear site are summarized in Table 9-4.

9.2.3 Other Alternatives

This section discusses other electricity generating alternatives that have been considered by the review team for possible application as a baseload power alternative to Fermi 3. The review team's evaluation of the overall technical feasibility of such applications, as well as its conclusions about the overall environmental impacts, of each alternative are provided here. Detroit Edison has proposed a new nuclear reactor at the Fermi site for the generation of

Table 9-4. Summary of Environmental Impacts of a Natural-Gas-Fired Power Generation Alternative

Impact Category	Impact	Comment
Air Quality	SMALL to MODERATE	SO_x, 128 tons/yr NO_x, 490 tons/yr CO, 1130 tons/yr Particulates, 249 tons/yr N_2O, 113 tons/yr VOC, 79 tons/yr CO_2, 4.15 million tons/yr (without CCS) The NGCC facility is a major source of NO_x, a precursor to photochemical smog; however, emission controls (water injection and selective catalytic reduction) are expected to reduce emissions to acceptable levels.
Waste Management	SMALL	Minimal construction- and operation-related wastes are projected.
Human Health	SMALL	NGCC is a source of NO_x, a precursor to photochemical smog. However, regulatory controls and oversight would reduce emissions to a level protective of human health.
Water Use and Quality	SMALL	Impacts would be smaller than the impacts for Fermi 3, due to reduced cooling demands.
Ecology	SMALL (aquatic) to MODERATE (terrestrial)	Impacts on terrestrial ecology and wetlands on the Fermi site would generally be similar to those from Fermi 3. Offsite parcels would be affected by construction of 10-mi natural gas pipeline. Impacts on terrestrial and aquatic ecology from operation of the cooling system would be minimal. Additional impacts would be associated with natural gas extractions if expansions of gas fields were determined to be necessary.
Noise	SMALL	Most noise-producing equipment is located inside the power block buildings. No outside fuel-handling activities will occur. Minor offsite noise source from pipeline compressor stations.

Table 9-4 (contd)

Impact Category	Impact	Comment
Land Use	SMALL	Onsite land requirements for the power block and cooling system are about the same as for Fermi 3 and could be accommodated within the Fermi site; however, additional offsite land areas estimated at 200 ac are required for construction of a 10-mi natural gas pipeline. Gas extraction is expected to occur on previously established gas well fields, but some expansions of the pipeline infrastructure may be necessary to support the NGCC alternative. Offsite land requirements for transmission are comparable to, or the same as those for Fermi 3.
Socioeconomics (economy and taxes)	SMALL to MODERATE (beneficial)	Increased economic activity from new jobs and spending in the region would stimulate economic growth and tax revenues. Local property tax base would benefit Monroe County during construction and operations, but at a lower level than the impacts characterized for Fermi 3 because of the lower property values associated with the NGCC alternative. All beneficial tax-related impacts elsewhere in the 50-mi region would also be less than for the Fermi 3 plant because of the smaller workforce needed to operate the NGCC alternative. This stimulus would be SMALL beneficial for all areas except for property tax impacts in Monroe County, which would be MODERATE beneficial.
Socioeconomics (all other categories)	SMALL (adverse)	Construction-related impacts would be limited and temporary. Construction workforce projected to be less than the 2500 required for the coal-fired alternative and the 2900 required for the Fermi 3 reactor. Operating workforce projected to be approximately 150, less than expected for the coal-fired alternative and substantially less for Fermi 3 operation. Construction workforce would be likely to originate primarily from the Detroit and Toledo MSAs.

Table 9-4 (contd)

Impact Category	Impact	Comment
Socioeconomics (all other categories) (contd)		Impacts on local communities with regard to housing and services would be expected to be short-term, SMALL, and adverse for construction and SMALL and adverse for operation. Construction-related traffic impacts will be temporary and less than those expected for Fermi 3 due to a smaller workforce and an expected shorter construction period; operation-related transportation impacts will be less due to a smaller workforce than for Fermi 3 and relatively few deliveries required to support operation. The plant and new transmission line would have aesthetic impacts comparable to those anticipated for Fermi 3. Overall increase in adverse impact on aesthetics is SMALL, because Fermi site is already industrialized.
Environmental Justice	SMALL	Impacts are expected to be similar to those evaluated for the nuclear alternative. No disproportionate adverse impacts were identified.
Historic and Cultural Resources	MODERATE	Construction activities would involve removal of some portions of NRHP-eligible Fermi 1 and would thus have a MODERATE impact on historic and cultural resources. Most of the facility and infrastructure would be built on previously disturbed ground onsite, but additional offsite areas that might be required to support a new natural gas pipeline might not have been surveyed for resources.

baseload electricity with a target of 1535 MW(e) net. Any feasible alternative to the proposed new reactor would need to also be capable of generating an equivalent amount of baseload power with reliability and capacity factors similar to those expected from a nuclear reactor. In performing its initial evaluation for the ER, Detroit Edison relied on the GEIS for license renewal (NRC 1996). The review team reviewed the information submitted by Detroit Edison; however, through an independent review, the review team has utilized information contained in the GEIS as well as more recently developed information on certain electricity generating technologies and has determined that the other energy alternatives discussed here are not reasonable alternatives to a new nuclear unit for provision of reliable baseload power.

The review team has not assigned significance levels to the environmental impacts associated with the alternatives discussed in this section because, in general, the generation alternatives would have to be installed at a location other than the proposed site. Any attempt to assign significance levels would require speculation about the unknown site.

9.2.3.1 Oil-Fired Power Generation

In its *Annual Energy Outlook 2010*, EIA projects that electricity from oil-fired power plants will remain essentially unchanged through 2035, rising by only 0.4 percent (DOE/EIA 2010c). Oil-fired generation is more expensive than nuclear, natural-gas-fired, or coal-fired generation options. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive. The high cost of oil has resulted in a decline in its use for electricity generation. In Section 8.3.11 of the GEIS for license renewal, the staff estimated that construction of a 1000-MW(e) oil-fired plant would require about 120 ac of land and further concluded than an oil-fired power plant would have environmental impacts that would be similar to those of a comparably sized coal-fired plant (NRC 1996).

For the preceding economic and environmental reasons, the staff concludes that an oil-fired power plant at or in the vicinity of the Fermi site would not be a reasonable alternative to construction of a 1535-MW(e) nuclear power generation facility that would be operated as a baseload plant.

9.2.3.2 Wind Power

All renewable energy accounted for 7.3 quadrillion Btu, approximately 7 percent of the 99.3 quadrillion Btu of energy consumed in the United States in 2008. Wind accounted for 0.49 quadrillion Btu, approximately 7 percent of the total contribution of all renewable energy sources. The American Wind Energy Association (AWEA) reported that a total of 25,369 MW of wind energy capacity had been installed in the United States by the end of 2008, with 8545 MW installed just in 2008 (AWEA 2009). Texas is by far the leader in installed capacity with 2671.3 MW, followed by Iowa (1599.8 MW), Minnesota (455.65 MW), Kansas (450.3 MW), and New York (407 MW). At the end of 2008, Michigan had three operating wind farms with a collective wind energy generating capacity of 129.6 MW (AWEA 2009). AWEA also reported that in 2008, four manufacturing facilities for various wind turbine components were established in Michigan. EIA reports that the net summer capacity for wind-generated electricity in Michigan in 2008 was 124 MW and that the total amount of electricity generated by wind in 2008 was 117,000 MWh, approximately 3.1 percent of the 3,800,000 MWh of power generated from all renewables in Michigan in 2008 (DOE/EIA 2009a). Comparing the installed capacity to the amount of electricity generated yields a capacity factor of about 11 percent for the wind turbines.

At the current state of wind energy technology development, wind resources of Category 3 or better[a] are required to produce utility-scale amounts of electricity. Maps of wind resources

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(a) By industry convention, wind resource values are categorized on the basis of the power density and speed of the prevailing wind at an elevation of 50 meters, from Category 1 with wind power densities of 200 to 300 W/m^2 (typically existing with constant wind speeds between 12.5 to 14.3 mph) through Category 7 with power densities of 800 to 1800 W/m^2 (wind speeds of 19.7 to 24.8 mph). Category 3 wind has a power density of 300 to 400 W/m^2 with wind speeds of 15.7 to 16.8 mph.

produced by the DOE Office of Energy Efficiency and Renewable Energy (EERE) and its National Renewable Energy Laboratory (NREL) (DOE/EERE 2010) indicated that a large geographic area of the State along the western shore of Lake Erie, in Huron, Tuscola, and Sanilac Counties, known as the “Thumb,” possesses wind resources of sufficient value to support utility-scale wind generation. Similarly valued wind resource areas also exist in the western part of the State along the eastern shoreline of Lake Michigan; however, only the Thumb is within the Detroit Edison service area.

Detroit Edison undertook a study to identify wind resources of sufficient strength and accessibility within its service area with which it could expand its energy generation portfolio and comply with the then-proposed Michigan Renewal Portfolio Standard (RPS) (Detroit Edison 2009a). Comparing existing wind energy maps with exclusionary factors that could preempt wind farm development, Detroit Edison determined that 500 MW of wind energy potential could be realized and economically delivered to its major load centers over the existing transmission network, but a theoretical maximum development capacity of 2800 MW could be realized with appropriate upgrades and expansions to the transmission network. As discussed below, a 2009 collaborative study by ITC*Transmission* and Wolverine Power Supply Cooperative confirmed the inadequacy of the existing 120-kV transmission system in the Thumb and estimated the costs of various options for the major upgrades to transmission system capacity that would be required to effectively exploit wind resources in the Thumb (ITC and WPSCI 2009). Detroit Edison further anticipates a 30 percent capacity factor and 95 percent turbine availability factor, suggesting reasonably attainable estimates for maximum and minimum power outputs of 7000 GWh and 1300 GWh. (For comparison, the proposed 1535-MW(e) Fermi 3 reactor, operating at an expected capacity factor of 92 percent, would be expected to produce 12,400 GWh of baseload electricity each year.)

The MPSC Wind Energy Resource Zone Board undertook its own independent assessment of wind resources within the Thumb and concluded in its final report that potential generating capacity for land-based wind farms in the Thumb was between 2367 MW and 4236 MW (depending on how exclusionary siting criteria were applied) and that maximum buildout would result in potential annual electricity production of 12,000 GWh (Michigan Wind Energy Resource Zone Board 2009). In response to a legislative directive in Michigan’s Clean, Renewable and Energy Efficiency Act (295 MCL 1-6) and MPSC Order U-15899,[a] ITC Holdings Corporation’s subsidiary, ITC*Transmission*, and Wolverine Power Supply Cooperative, Inc. (WPSCI) completed a joint transmission planning study for the Thumb, concluding that the two existing relatively low-capacity 120-kV transmission lines in the Thumb were inadequate to deliver wind-generated electricity to the grid for delivery to other portions of the Michigan’s lower peninsula (ITC and WPSCI 2009). On August 19, 2010, the Midwest Independent System Operator

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(a) All documents filed with the MPSC relating to Order U-15899 are available through the MPSC Electronic Docket Web site at http://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=15899&submit.x=21&submit.y=13.

(MISO) approved a proposal by ITC*Transmission* to expand the transmission infrastructure in the Thumb by construction of approximately 140 mi of double-circuit 345-kV transmission lines and three new 345-kV substations, forming a loop through the Thumb region (ITC Holdings 2010). Under the provisions of the Clean, Renewable and Energy Efficiency Act, ITC*Transmission* was authorized to apply to MPSC for expedited siting approval of the project (which must be accomplished within 6 months of the application date). On August 30, 2010, ITC submitted its application to MPSC for an expedited siting certificate (see MPSC case U-16200).[a] The Commission granted the certificate on February 25, 2011.[b] ITC has targeted completion of the upgrade project by 2015 but has published no firm schedules.

The Wind Energy Resource Zone Board's estimate of 12,000 GWh, together with the announced and MISO-approved plans of ITC*Transmission* to upgrade the transmission infrastructure in the Thumb and the MPSC's Expedited Siting Certificate for that upgrade promise improved efficiency of power distribution throughout the ITC*Transmission* grid in the lower peninsula and improve the viability of wind energy in the Thumb. However, the Bureau of Energy Systems of the Michigan Department of Energy, Labor and Economic Growth (MDELEG) has reported that, as of the close of 2009, only two wind farms were operative in the Thumb, with a capacity of 122 MW of wind-generated electricity (MDELEG 2010).

The lack of a firm schedule for transmission infrastructure enhancements in the Thumb, the limited generating potential in the Thumb projected by MDELEG, the uncertainty about the extent to which that potential would ultimately be realized by yet-to-be-built wind farms, the anticipated relatively low capacity factors for the turbines of those future wind farms, and the substantial land requirements for utility-scale wind farms all contribute to a conclusion by the review team that wind farms in the Thumb area would not be a feasible discrete alternative to the Fermi 3 reactor.

Wind energy technology can also be deployed in offshore locations. Land-based wind turbines have individual capacities as high as 3 MW, with the 1.67-MW turbine being the most popular size installed in 2008 (offshore wind turbines have capacities as high as 5 MW).[c] The capacity factors of wind farms primarily depend on the constancy of the wind resource, and while offshore wind farms can have relatively high capacity factors due to high-quality winds throughout much of the day (resulting primarily from differential heating of land and water

(a) All documents related to Case U-16200 can be accessed electronically at http://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=16200.
(b) Three parties filed motions for stay of the Commission's February 25 Order. All three motions were denied by the Commission's Order of April 12, 2011.
(c) To date, the great majority of offshore turbine installations have occurred on the shallow continental shelves of Europe and the United States; however, it is feasible that turbines designed for offshore locations could also be installed off the shores of the Great Lakes, although current foundation technology would limit the depth of the water that could be tolerated at offshore locations.

areas), land-based wind farms have capacity factors less than 40 percent, with 30 percent typically used for planning purposes.

The Great Lakes Wind Council (GLWC), an advisory body within the then Michigan Department of Energy, Labor and Economic Growth, was charged with providing recommendations to State policymakers with respect to wind energy development in Michigan. The GLWC's October 2010 report identified prime offshore locations for wind farms (Wind Resource Areas, WRAs) and provided recommendations on model legislation that would authorize implementing regulations for an offshore wind energy program in Michigan (GLWC 2010). Five WRAs were identified in the Great Lakes bordering Michigan, two of which are adjacent to the Detroit Edison service area: Central Lake Huron, out from Saginaw Bay, and southern Lake Huron, near Sanilac County. All WRAs are in waters with depths of 148 ft or less. To support mapping of the WRAs, the GLWC established 22 evaluation criteria, including sensitive or important biological habitats, commercial fishing areas, scenic vistas, military operations, national park lakeshores, State bottomland preserves, shoreline parks and wilderness, shipping lanes, underwater archaeological sites, harbors and marinas, and underwater power cables. Appropriate buffer zones were then established for each criterion.

The GLWC's recommendations for supporting legislation were submitted to the State legislature in March 2010. As of May 2011, no legislation had been proposed.

Despite the relatively high availability factors for wind turbines, there are shortcomings to the use of wind energy as an alternative to Fermi 3; these include the following: capacity factors are much lower than desirable for baseload power; many hundreds of turbines would be required to provide equivalent amounts of power; wind farms would occupy very large areas to avoid inter-turbine interferences to wind flow through the wind farm[a]; and there is often poor time-of-day correlation between the periods when meteorological conditions produce high-value winds and periods of peak loads.[b]

One way to better ensure that maximum power production coincides with peaks in demand is to couple conventional wind technology with energy storage technologies. Pumped storage and compressed air energy storage (CAES) are two energy storage technologies that have been independently developed and that could be paired with wind energy to improve the availability and dispatchability of wind energy. Detroit Edison is co-owner (with Consumers Energy) of the Ludington Hydroelectric plant, the largest pumped storage facility in the State. During off-peak periods, Ludington uses grid power to pump Lake Michigan water through six reversible turbines

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(a) However, the permanent components of wind farms, the individual turbines, electrical substations, and maintenance/control/storage buildings, occupy roughly five percent of the area of a typical wind farm, with the remaining land areas available for most other nonintrusive land uses once construction is completed.

(b) In a typical diurnal cycle, strong winds are generally not available during hot summer afternoons when peaks in power demand occur to support air conditioning loads.

to a 27-billion-gal, 842-ac reservoir located on a bluff over 350 ft above the plant. Water is released during peak demand through the six turbines for a maximum capacity of 1,870 MW at a generation efficiency of more than 70 percent (Bernier 2010). However, because the Ludington facility is already part of Detroit Edison's generating portfolio and routinely provides power to Detroit Edison and Consumers Energy customers, it cannot be claimed as an alternative to Fermi 3.[a]

EIA reports that the Ludington pumped storage facility had an effective capacity of 1872 MW in 2009 and was responsible for 100 percent of the state's electricity from pumped storage (DOE/EIA 2011d). Section 9.2.3.4 provides additional details on hydroelectric facilities in Michigan and the potential for further development. As discussed in that section, there is limited potential for expansion of hydroelectric power, and EIA isn't projecting any growth in this energy alternative. The review team concludes that pumped storage is not likely to be available as an energy storage mechanism to couple with wind energy.

A CAES plant uses motor-driven air compressors powered by low-cost off-peak electricity to compress air, storing it in a suitable underground repository such as a salt cavern or a porous rock formation. When coupled with wind, power from the wind turbines at off-peak times would be used to drive the compressors. During high-electricity-demand periods, the potential energy contained in the compressed air is recovered by using it to support operation of a combustion turbine or using it directly to generate electricity. Experience with utility-scale CAES is limited. Only two large-scale CAES plants are currently in operation; a 290-MW facility near Bremen, Germany, and a 110-MW plant in McIntosh, Alabama, which has been operating since 1991. Both facilities use salt caverns for storage (Succar and Williams 2008), and both use the compressed air to enhance the performance of modified combustion turbines in combined cycle configurations. A number of CAES facilities have been proposed, including the Iowa Stored Energy Park near Des Moines, Iowa, a 268-MW plant that would operate in conjunction with a wind farm. The facility would use a porous rock storage reservoir for the compressed air it produces (Succar and Williams 2008). Other pilot, demonstration, prototype, and research projects involving CAES have been announced, including projects in California, New York, and Texas.

At its current state of technological advancement and limited real-world experiences, CAES has been proven capable of producing fully dispatchable electricity in the range of hundreds of megawatts consistently over tens of hours, but long-term reliability and costs are as yet

(a) Consumers Energy and Detroit Edison recently announced plans for an $800 million maintenance and upgrade project for the Ludington facility that will replace existing turbines, increasing capacity to 2,172 MW. The project is expected to be completed by 2019. Consumers also announced plans for a land-based 56-turbine Lake Winds Energy Park to be located near the Ludington facility; however, necessary permits for the wind farm have not yet been secured from Mason County. For more details, see: http://www.mlive.com/business/west-michigan/index.ssf/2011/02/ludington_pumped_storage_plant.html.

undetermined. Higher levels of power generation are technically feasible with CAES but have not yet been proven. Further, the overall technical and economic feasibility of CAES is highly dependent on the existence of conveniently located appropriate geologic formations in which to store the compressed air. The review team is not aware of any evaluations of Michigan geology in areas of highest wind value for that purpose. While CAES can enhance the value of wind as a source of baseload power, the review team concludes that the use of CAES in combination with wind turbines to reliably generate 1535 MW(e) net at an effective capacity factor of 92 percent in the Detroit Edison service territory is technically unproven at this time.

For the preceding reasons, the review team concludes that wind power is not capable of supplying baseload capacity of 1535 MW(e) net and is therefore not a reasonable alternative to the proposed project.

9.2.3.3 Solar Power

Solar technologies use the sun's energy to produce electricity. Solar power technologies include photovoltaic (PV) and concentrated solar power (CSP). In PV systems, sunlight incident on special photovoltaic materials results in the direct production of direct current (DC) electricity. Two types of CSP technology that have enjoyed the greatest technological development are the parabolic trough and the power tower. Both involve using the sun's energy to produce steam to power a conventional Rankine cycle STG. The Solar Energy Generating System (SEGS), a collection of nine parabolic trough plants in three locations in the Mojave Desert in California with a combined nameplate capacity of 310 MW, represents the earliest utility-scale solar plants in the United States (The Energy Library 2009). However, in recent years, many utility-scale CSP plants have been proposed, primarily for the desert southwest areas of southern California.[a] Typical solar-to-electric power plants require 5 to 10 ac for every megawatt of generating capacity (TSECO 2008). Thus, approximately 8000 to 16,000 ac would be needed for a hypothetical 1600-MW(e) solar power plant. To increase their value as baseload power sources, CSP facilities can also be equipped with thermal storage that allows production of electricity during periods when the sun is not shining. However, the addition of thermal storage capabilities dramatically increases the required size of the solar field.

All renewable energy accounted for 7.3 quadrillion Btu, approximately 7 percent of the 99.3 quadrillion Btu of energy consumed in the United States in 2008. Solar accounted for 1 percent of that total (0.0703 quadrillion Btu). Currently, the Fermi site receives approximately 4.0 kWh of solar insolation per square meter per day (kWh/m^2/day) for fixed-plate solar collectors oriented at an angle equal to the installation's latitude (NREL 2008). This is a relatively modest value for a solar resource. Although adequate to support off-grid applications

(a) Additional information regarding utility-scale CSP plants proposed for the desert regions of southern California can be obtained from the California Energy Commission Web site at http://www.energy.ca.gov/siting/solar/.

or even distributed energy systems, Michigan's solar resource would be insufficient for cost-effective generation of baseload power using PV technologies, given the current state of PV technology development and operational conversion efficiencies averaging 25 percent (although that is expected to improve with the development of inexpensive, more efficient photocells). EIA reports that in 2008 no electricity was generated in Michigan by the electric power industry using solar PV technology (DOE/EIA 2009b). As noted above, significant land areas would be required for a utility-scale PV power plant while virtually preempting all other uses for that land. In the GEIS, the NRC staff noted that, by its nature, PV solar power is intermittent (i.e., it does not work at night and cannot serve baseload when the sun is not shining), and the efficiency of collectors varies greatly with weather conditions. The PV alternative would require energy storage or backup power supply to provide electric power at night. Although development of battery storage options is ongoing, none is currently available that would provide baseload amounts of power. Given the challenges and requirements in meeting baseload requirements, the review team believes that because of its intrinsic limitation, PV solar power is not qualified as a reasonable alternative to Fermi 3.

Where PV technology captures the light energy of the sun and converts it directly to electricity, CSP typically transfers the sun's heat energy to a heat transfer fluid, subsequently using that heat to produce steam to power a conventional STG. Because CSP technology is based on heat capture and transfer, it has the intrinsic potential to store some of the captured heat in such materials as molten salt for delayed production of electricity. Thus it has the potential to overcome some of PV's inherent intermittency and is better suited to meeting the demands of baseload power. However, to do so without sacrificing nameplate capacity requires a CSP with thermal storage to have a substantially greater solar field area to allow the heat captured in that additional field area to be stored in the salt rather than used immediately to produce electricity. To improve power availability, CSP facilities often employ small-scale boilers or heaters burning conventional fossil fuels to maintain the sensible heat in the heat transfer fluid system, thus overcoming thermal inertia and allowing the CSP facility to begin producing power at or near its nameplate rating earlier in the day. CSP also relies on direct normal radiation from the sun and is therefore generally more immune to reduced capacity as a result of cloud cover than is PV technology, with capacity factors slightly greater than PV. However, because it is a thermoelectric technology, CSP requires a cooling system similar in function to those used at nuclear or fossil fuel power plants. At its current state of technology development, CSP requires approximately 5 ac of land for every megawatt of power produced. If wet closed loop cooling is used to cool the steam cycle, an amount of water equal to or greater than the amount now projected for the Fermi 3 reactor (as much as 15 ac-ft/yr/MW, or approximately 4.89 million gal/yr/MW) would also be required. The relatively modest value of solar resources within the Detroit Edison service area, the exceptionally large land area required for utility-scale power, power intermittency, and expected capacity factors all contribute to the review team's conclusion that solar power technologies do not present a reasonable alternative to the proposed nuclear reactor.

9.2.3.4 Hydropower

Three technology variants of hydroelectric power exist in Michigan: dam-and-release, run-of-the-river, and pumped storage. Dam-and-release facilities affect large amounts of land behind the dam to create man-made reservoirs but can provide substantial amounts of power at capacity factors greater than 90 percent. Power-generating capacities of run-of-the-river dams fluctuate with the flow of water in the river, and the operation of such dams is typically constrained so as not to create undue stress on the aquatic ecosystems present. Pumped storage facilities pump water from surface water features such as lakes or rivers to higher elevations during off-peak load periods, in order to release the water during peak load periods through turbines to generate electricity.

The latest and only comprehensive statewide study of hydropower resources in Michigan, published in 1998 by the DOE Idaho National Engineering and Environmental Laboratory (now, Idaho National Laboratory) (INEEL 1998), indicated that there was an estimated 613 MW of developable hydroelectric resources in Michigan at the time of the study. The INEEL study identified 86 sites on 11 major river basins: 11 with dams producing power, 53 with dams (for flood control) that were not producing power, and 22 undeveloped sites with favorable characteristics. The INEEL study determined that 64 percent of the undeveloped hydropower resources were in the St. Mary's River Basin, but that all potential sites had relatively low Project Environmental Suitability Factors, a dimensionless value calculated by a model developed for the study, which took into account the various environmental impacts that could result from development of each identified site for hydropower production. A map of hydroelectric dams in Michigan published by the Michigan Department of Natural Resources (MDNR) shows a number of hydroelectric dams within the Detroit Edison service area, but many of them have since been retired (MDNR 2003).

All three hydropower technologies are technically possible for development in Michigan; however, river characteristics, topography, and existing land uses favor run-of-the-river hydropower facilities. As stated in Section 8.3.4 of the GEIS for license renewal (NRC 1996), the percentage of U.S. generating capacity supplied by hydropower is expected to decline, because dam-and-release hydroelectric facilities have become difficult to site as a result of public concerns about flooding, destruction of natural habitat, and alteration of natural river courses. In the GEIS, the staff estimated that land requirements for dam-and-release hydroelectric power are approximately 1 million ac per 1000 MW(e) (NRC 1996). Similar land requirements can be anticipated for pumped storage facilities of equivalent capacities. Although run-of-the-river hydroelectric facilities avoid concerns for excessive land use and widespread habitat alteration, their productivity is directly affected by a number of factors; seasonal low-flow conditions and sustenance requirements of the rivers' aquatic ecosystems can lead to temporary or extended interruptions in power production.

The resulting low annualized capacity factors suggest marginal suitability of these technologies as discrete baseload power sources. EIA's reference case in its *Annual Energy Outlook 2010* projects that U.S. electricity production from hydropower plants will remain essentially stable through the year 2035 (DOE/EIA 2010c). EIA reports that in 2008, conventional hydroelectric power in Michigan had a collective net summer capacity of 249 MW and generated 1,280,978 MWh of power, approximately 34 percent of power from all renewables in Michigan in 2008 (DOE/EIA 2009a).

Existing conventional dam-and-release and run-of-the-river hydroelectric facilities in Michigan have limited capacities compared to the Ludington Pumped Storage facility discussed above, and many in the Detroit Edison service territory have been retired. Few if any new hydroelectric facilities are expected to be built, and even with repowering of existing facilities to improve efficiency and performance, hydroelectric resources in Michigan are not sufficient to serve as a replacement for Fermi 3.

Because of the relatively low amount of undeveloped hydropower resources in Michigan, the large land use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to produce 1535 MW(e), and the absence of announced plans for construction of new large pumped storage or dam-and-release facilities that could match Fermi 3's expected production, the review team concludes that hydropower is not a feasible alternative to the proposed Fermi 3 reactor.

9.2.3.5 Geothermal Energy

As with most renewable energy sources, value, accessibility, and availability within a geographic area determine the feasibility of geothermal energy for baseload power generation. Two geothermal energy generation technologies have been developed: "hydrothermal technology" and "hot dry rock" (HDR) technology. Hydrothermal technology involves extracting heat from hot, pressurized groundwater located in readily accessible formations relatively close to the surface. Either the heated water is pumped to the surface, where the sharp reduction in pressure allows it to flash into steam that is directed to an STG, or a heat transfer fluid is pumped into the formation in a closed-loop system, where it is heated by the groundwater before being returned to the surface and its latent heat used to produce steam. The water must be at least 302°F for such systems to run efficiently. HDR, also known as engineered geothermal systems (EGS), extracts heat from dry, hot formations, first by fracturing those formations and then by circulating water through those fractures and extracting heat.

A comprehensive study by the Massachusetts Institute of Technology (MIT) concluded that geothermal energy has an average capacity factor of 90 percent and a relatively small environmental footprint (MIT 2006). Geothermal resources can be used for baseload power generation where sufficient geothermal resources are available, but the MIT study concluded that a $300 to $400 million investment over 15 years would be needed to make early-generation

EGS power plant installations competitive in the evolving U.S. electricity supply markets (MIT 2006). However, geothermal technology is not widely used as baseload power generation because of the limited geographical availability of the resource and immature status of the technology (NRC 1996). Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent (DOE 2010). No geothermal energy generation currently occurs in Michigan (DOE/EIA 2009b). A map of geothermal resources in Michigan developed by the DOE shows geothermal resources at nominal depths of 3.7 mi to exist at temperatures between 212 and 302°F, marginally adequate for efficient production of baseload amounts of power. HDR geothermal resources do not exist in Michigan. Given the low quality of geothermal resources and the current stage of geothermal technology development, the review team has concluded that extant geothermal resources in Michigan cannot support utility-scale electricity generation and would therefore be an infeasible alternative to the proposed Fermi 3 reactor.

9.2.3.6 Wood Waste

In the GEIS, the staff determined that a wood-burning facility could provide baseload power and operate with an average annual capacity factor of about 70 to 80 percent and with 20 to 25 percent thermal efficiency (NRC 1996). The fuels required are variable and site-specific. Wood-to-energy technologies include direct combustion in boilers and combustion of fuels derived through gasification and pyrolysis of cellulosic materials. A significant impediment to the use of wood waste to generate electricity is the high cost of fuel delivery and high construction cost per megawatt of generating capacity. The fuel delivery impediment is being addressed by technologies that convert wood residue into high-density pellets. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impacts per megawatt of installed capacity would be approximately the same as for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Similar to coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment (plants have been constructed that simultaneously burn coal and pelletized wood wastes in the same boiler). The greatest commercial success for wood-to-energy plants has been in distributed energy production geographically close to the source of the wood residue sources. In 2008, net generation from renewable energy technologies (excluding large hydroelectric) increased 19.9 percent, following a 9.0 percent increase in 2007. In 2008, for the first time, wind surpassed biomass (including wood) in representing the largest share of renewable generation. Wood and wood-derived fuels represented 0.9 percent of net renewable generation, accounting for 37 million MWh, down 4.4 percent from 2007 (DOE/EIA 2010d).

A study completed in 2006 by the Michigan Biomass Energy Program (Michigan Department of Labor and Economic Growth 2006) concluded that Michigan has ample wood residue resources to support wood-to-energy facilities, but determined that the most significant wood resources are located in the northern portions of the State, far removed from the Detroit Edison load centers. As of 2006, there were six combustion-based wood-to-energy utilities operating in Michigan with a combined capacity of 173,100 kW. Of the six wood-to-energy utilities located in the Lower Peninsula, only the Genesee Power Station in Flint, Michigan, with a rated capacity of 39,500 kW, is located close to major Detroit Edison load centers. EIA reported that in 2008, the net summer capacity for wood and wood-derived power plants in Michigan was 231 MW, accounting for the generation of 1,682,504 MWh of power, approximately 44 percent of the 3,793,896 MWh of power from all renewable sources in Michigan in 2008 (DOE/EIA 2009a).

Because of uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload power plant, the location of the majority of high-value wood resources in the State (relative to Detroit Edison's major load centers of Detroit and Ann Arbor), the typical capacities of wood-to-electricity facilities, and the ecological impacts of large-scale timber cutting (e.g., soil erosion and loss of wildlife habitat), the review team determined that wood waste would not be a reasonable alternative to the proposed Fermi 3 reactor.

9.2.3.7 Municipal Solid Waste

In 2008, municipal solid waste (MSW) generation in the United States totaled 249.6 million tons. Of that amount, 31.6 million tons (12.7 percent) was combusted for energy recovery. The percentage of solid wastes burned for energy recovery has remained generally constant since 1990 (EPA 2009b). MSW combustors incinerate the waste and use the resulting heat to produce steam, hot water, or electricity. The combustion process reduces the volume of waste and subsequently the need for new solid waste landfills. MSW combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (RDF). Approximately one-fifth of the facilities burning MSW burn RDF (EPA 2008b). Mass burning technologies are most commonly used in the United States. This group of technologies processes raw MSW "as is," with little or no sizing, shredding, or separation before combustion. In the GEIS for license renewal, the staff determined that the initial capital cost for municipal solid-waste plants is greater than that for comparable steam-turbine technology at wood-waste facilities because of the need for specialized waste-separation and -handling equipment for MSW (NRC 1996).

EPA estimates that, on average, air impacts from MSW-fired power plants are 3685 lb/MWh of CO_2, 1.2 lb/MWh of SO_2, and 6.7 lb/MWh of NO_x[(a)]. However, depending on the composition of the municipal waste stream, air emissions can vary greatly (EPA 2010c). MSW combustors generate an ash residue that is buried in landfills. Similar to coal combustion, both bottom ash and fly ash are formed. Pollution control equipment similar to that used in coal-fired boilers (fabric filters and/or scrubbers) is used to capture fly ash from the boiler exhaust gases, but with

(a) Assumes 0.535 MWh/ton of MSW feed combusted, based on EPA emission factors contained in "Compilation of Air Pollutant Emission Factors (AP-42)" (EPA 1998).

unsorted MSW fuel, the ash produced may exhibit hazardous characteristics and require special treatment and handling (EPA 2010c).

Estimates in the GEIS suggest that the overall level of impact from construction of a waste-fired plant would be approximately the same as that for a coal-fired power plant. Additionally, waste-fired plants have the same or greater operational impacts as coal-fired technologies (including impacts on the aquatic environment, air, and waste disposal).

The decision to burn MSW to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term as energy prices increase (and especially since landfills of sufficient size and maturity can be sources of easily recoverable methane fuel); however, it is possible that MSW combustion facilities may become attractive again.

Regulatory structures that once supported MSW incineration no longer exist. For example, the Tax Reform Act of 1986 made capital-intensive projects such as MSW combustion facilities more expensive relative to less-capital-intensive waste disposal alternatives such as landfills. Also, the 1994 Supreme Court decision *C&A Carbone, Inc. v. Town of Clarkstown, New York* struck down local flow-control ordinances that required waste to be delivered to specific MSW combustion facilities rather than to landfills that may have had lower fees. In addition, environmental regulations have increased the capital cost necessary to construct and maintain MSW combustion facilities.

Currently, approximately 86 waste-to-energy (WTE) plants operate in 24 States, processing 97,000 tons of MSW per day. Latest estimates are that 26 million tons of trash was processed in 2008 by WTE facilities. With a reliable supply of waste fuel, WTE plants have an aggregate capacity of 2572 MW and can operate at capacity factors greater than 90 percent (ERC 2010). Three MSW plants are operational in Michigan: the 68-MW Greater Detroit Resource Recovery Facility in Detroit, Michigan; the 3.7-MW Jackson County Resource Recovery Facility in Jackson, Michigan; and the 18-MW Kent County Waste-to-Energy Facility in Grand Rapids, Michigan (ERC 2010).

Given the level of WTE facility penetration into the commercial electric utility market, the small average installed size of MSW plants, and the unfavorable regulatory environment, the review team does not consider MSW combustion to be a feasible alternative to the proposed Fermi 3 reactor.

9.2.3.8 Other Biomass-Derived Fuels

In addition to wood and MSW fuel, several other biomass-derived fuels are available for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). The NRC staff determined that none of these technologies have progressed to the point of being competitive on a large scale or of being reliable enough to replace a large baseload generating plant (NRC 1996). In 2008, 353 facilities were operational nationwide that burned wood and wood-derived fuels for electricity production, representing a collective nameplate capacity of 7730 MW, while 1412 facilities burned other biomass energy sources (MSW, landfill gas, sludge waste, agricultural byproducts, other biomass solids, other biomass liquids, and other biomass gases [including digester gases, methane, and other biomass gases]) for electricity production with a collective nameplate capacity of 4854 MW, an average of 3.4 MW per facility (DOE/EIA 2010e). Co-firing with coal is the most economic option for the near future to introduce new biomass power generation (presuming the infrastructure necessary to deliver biomass fuel sources to coal-fired facilities already exists). These projects require small capital investments per unit of power generation capacity. Co-firing systems can produce from 3 to 20 percent of their heat from combustion of biomass, with biomass representing from 3 to 15 MW of the facility's nameplate capacity (DOE/EERE 2004).

The review team concludes that given the relatively small capacity of biomass generation facilities and the lack of a well-developed biomass infrastructure, biomass-derived fuels (besides wood, wood-derived fuels, and MSW discussed separately above) do not offer a reasonable alternative to the proposed Fermi 3 reactor.

9.2.3.9 Fuel Cells

Fuel cells oxidize fuels without combustion and its environmental side effects. Power is produced electrochemically by passing a hydrogen-rich gas over an anode and air (or oxygen) over a cathode and separating the two by an electrolyte. The only byproducts (depending on fuel characteristics) are heat, water, and CO_2. Hydrogen can be produced from a variety of hydrocarbon resources by subjecting them to steam under pressure. Steam reforming of natural gas is the most likely source of hydrogen for fuel cells. However, steam reforming of CH_4 results in the formation of significant quantities of CO_2; the amount of CO_2 produced from steam reforming of pipeline specification natural gas would be 2.51 times the amount of hydrogen produced (NYSERDA 2010).

At the present time, fuel cells are not economically or technologically competitive with other alternatives for electricity generation. EIA projects that electricity from a 10-MW central station fuel cell power plant whose construction was begun in 2009 and that is scheduled to come on-line in 2012 will have an total overnight cost (in 2008 dollars) of $5478/kWh, compared to $3820/kWh for new nuclear, $1749/kWh for geothermal, $1966/kWh for wind (onshore), $5132/kWh for solar thermal, and $6171/kWh for solar photovoltaic (DOE/EIA 2010a). While it may be possible to use a distributed array of fuel cells to provide an alternative to the proposed Fermi 3 reactor, it would be extremely costly to do so and would require many units and wholesale modifications to the existing transmission system. Accordingly, the review team does not consider fuel cells to be a feasible alternative to the proposed Fermi 3 reactor.

9.2.4 Combination of Alternatives

The coal-fired power plant alternative and the natural gas-fired power plant alternative discussed above are the only alternatives that individually could be reasonably expected to produce the amount of baseload power represented by the proposed Fermi 3 reactor. As discussed in Section 9.2.3, other alternatives individually would not be a reasonable alternative to the Fermi 3 plant. Nevertheless, it is conceivable that a combination of alternatives might be both technically feasible and environmentally preferable to the proposed action. There are many possible combinations of alternatives. As part of the license renewal process and pursuant to 10 CFR Part 54, NRC has already determined that comprehensive consideration of all possible combinations would be too unwieldy, given the purposes of the alternative analysis. However, the analysis of combinations of alternatives should be sufficiently complete to aid the Commission in its analysis of alternative sources of energy pursuant to NEPA. Examining every possible combination of energy alternatives in an EIS would also be counter to the CEQ's direction that an EIS be analytically (rather than encyclopedically) concise and no longer than absolutely necessary to comply with NEPA and CEQ's regulations (40 CFR 1502.2(a)(b)).

As a basis for developing the combination alternative, the review team considered the availability and technical feasibility of all alternatives evaluated in previous sections. Of the renewable technologies considered, facilities utilizing wood-derived fuel would have the greatest potential to provide a baseload replacement power source to Fermi 3. However, the locations of the highest valued wood residues are far removed from the major load centers served by Detroit Edison. Transportation costs associated with delivering wood residues to generating facilities closer to those load centers would be significant. Likewise, the existing transmission system in the areas of highest value wood resources would make long-distance transfer of power from wood-burning facilities operating close to those high-value resources to Detroit Edison load centers inefficient and costly. In addition, the EIA is not projecting any growth in electricity production from wood waste in Michigan through 2035 (DOE/EIA 2009b). Thus, the review team did not include the power generation from wood in the combination alternative.

Of the remaining renewable energy alternatives, wind would have the highest power generation capacity, but because of its intermittent nature, it would have to be coupled with an energy storage technology or quick-response natural-gas-fired plants to be a viable baseload generation alternative. The highest value wind resources in Michigan are in the Thumb and offshore of Lake Michigan. Although the Thumb is within the Detroit Edison service area, the transmission infrastructure in that area is operated at only 120 kV, and substantial costs and inefficiencies would be associated with upgrading that system and linking it to major Detroit Edison load centers. While there is currently considerable enthusiasm within the Great Lakes States to develop offshore wind power, that initiative is in its infancy and the review team does not have evidence on which to base a conclusion that significant amounts of wind power will be available in the near term. Further, delivering the power from any such offshore wind resources would introduce added costs and complexity and would argue against what the review team believes is a reasonable Detroit Edison preference that any alternative be located within the Detroit Edison service area.

In addition to new generation, an energy conservation and demand side management alternative would have limited capability to singly offset the power that would be produced by the proposed Fermi 3 reactor, but nevertheless would avoid the adverse impacts associated with energy-generating options and would allow reduced reliance on those energy-generating sources, resulting in the avoidance of some environmental impacts.

As discussed in detail in Section 8.2.2, a national assessment of demand response potential published by the Federal Energy Regulatory Commission (FERC) in June 2009 (FERC 2009) determined that under the most aggressive scenario of DSM program implementation possible, Michigan could realize a maximum reduction in demand of 4409 MW[(a)]. The net generating capacity of all the State's electric utilities is 21,894 MW. Of the total 94,503,953 MWh of power generated by electric utilities in Michigan in 2008, Detroit Edison was responsible for 47,499,119 MWh, or approximately 50.3 percent of the total (DOE/EIA 2010b). Based on the assumption that Detroit Edison's energy conservation programs account for 50 percent of the DSM reductions projected in FERC's maximum-reduction scenario, Detroit Edison would be able to reduce its systemwide generating capacity by 2205 MW. However, in its February 20, 2008, testimony to the MPSC for Docket U-15244 (Detroit Edison 2008), Detroit Edison estimated an increase in systemwide savings from interruptible load programs to total 156 MW by 2018. In addition, in its application to the MPSC for Docket U-16358, Detroit Edison included as Exhibit A-5 its Energy Optimization Annual Report for 2009 (Detroit Edison 2010b) in which it estimated additional savings from energy efficiency programs to total about 500 GWh per year by 2015, equivalent to a reduction of 62 MW of demand. Based on the assumption that all the estimated capacity savings of 218 MW from conservation and demand side management were attributable to Fermi 3, the new reactor would need to produce only 1317 MW of power to meet anticipated demand (with all other parameters influencing supply and demand remaining unchanged).

Detroit Edison is also working to increase the power available from renewable resources. In its March 4, 2009, testimony to the MPSC under Docket U-15806 (Detroit Edison 2009d), Detroit Edison projected that by 2029 it could have installed 565 MW of wind energy capacity and

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(a) In its report, FERC states, "It is important to note that the results of the four scenarios are in fact estimates of potential, rather than projections of what is likely to occur. The numbers reported in this study should be interpreted as the amount of demand response that could potentially be achieved under a variety of assumptions about the types of programs pursued, market acceptance of the programs, and the overall cost-effectiveness of the programs. This report does not advocate what programs/measures should be adopted/implemented by regulators; it only sets forth estimates should certain things occur. As such, the estimates of potential in this report should not be interpreted as targets, goals, or requirements for individual states or utilities."

15 MW of solar energy capacity. Using capacity factors of 31 percent for wind and 13 percent for solar (Detroit Edison 2009d), these capacities would equate to 190 MW from wind and 2 MW from solar (baseload equivalent, considering the nuclear plant capacity factor of 92 percent). Including these in addition to the conservation and DSM contributions, the nuclear plant would need to generate 1125 MW. Considering the capacity factors for nuclear and NGCC, this would equate to an NGCC plant with a capacity of 1218 MW.

The review team notes that, in order to be considered as baseload power, the wind and solar installations would have to be coupled with some energy storage mechanism such as CAES. The CAES facility would have a capacity of about 192 MW.

Given the above, the review team concludes that a reasonable combination alternative would consist of the NGCC option, energy conservation and DSM, and wind and solar power coupled with energy storage. Specifically, a combination alternative could involve operation of a NGCC facility with the capacity of 1218 MW, together with aggressive conservation and DSM programs that would reduce demand by 218 MW and installation of 565 MW of wind and 15 MW of solar. A new 10-mi natural gas pipeline would still need to be constructed connecting the NGCC plant at the Fermi site with existing infrastructure. The wind and solar facilities would have impacts on the resources at the locations in which they were built.

Section 9.2.2.2 identifies the impacts of a 1661-MW NGCC facility. Disregarding any different dividends from economies of scale, the projected operational impacts of a 1218-MW NGCC facility, configured the same as the 1661-MW facility assessed in Section 9.2.2 and operating at a capacity factor of 85 percent, would be either essentially the same or less by simple ratio. The NGCC portion of the combination alternative would consume 54,190 million ft^3 of natural gas per year to produce 9,070 GWh of power. The CTs are presumed to operate at a thermal efficiency of 42 percent and at load factors always greater than 80 percent, while the overall thermal efficiency of the NGCC facility would be 60 percent. Table 9-5 provides a summary of the impacts associated with the combination of alternatives.

9.2.5 Summary Comparison of Alternatives

Table 9-6 contains a summary of the review team's environmental impact characterizations for constructing and operating new nuclear (Fermi 3), coal-fired, and NGCC generating units at the Fermi site, and a combination of alternatives. For the combination of alternatives, the review team assumes the siting of the NGCC units at the Fermi site and siting of other generating facilities elsewhere within Detroit Edison's ROI.

The review team reviewed the available information on the environmental impacts of power generation alternatives compared to building a new nuclear unit at the Fermi site. Based on this review, the review team concludes that, from an environmental perspective, none of the viable

Table 9-5. Summary of Environmental Impacts of a Combination Alternative

Impact Category	Impact	Comment
Land Use	MODERATE	A natural gas-fired plant would have land use impacts for a power block, new transmission line corridor, cooling towers and support systems, and connection to a natural gas pipeline. The footprint of the NGCC facility in the combination would be somewhat smaller than the discrete NGCC facility evaluated in Section 9.2.2.2 but would still have onsite land demands not substantially different from the proposed Fermi 3. Some expansion of gas well fields and modifications to the existing pipeline infrastructure may be necessary. No land use impacts would result from implementation and/or expansions of DSM programs. The wind power portion of this alternative has the potential to affect substantial areas of land, although most of that land could still be used for purposes such as farming. The small solar component would also have land use impacts.
Air Quality	SMALL to MODERATE	Emissions from the natural gas-fired plant would be approximately: SO_2, 93.9 tons/yr NO_x, 359 tons/yr Particulate, 183 tons/yr (all as $PM_{10)}$ CO, 829 tons/yr N_2O, 82.9 tons/yr VOC, 58 tons/yr CO_2, 3.04 million tons/yr (without CCS) No air impacts are projected from any of the energy conservation and DSM programs or from the wind and solar power generation.
Water Use and Quality	SMALL	Impacts would be less than those of the proposed Fermi 3 nuclear plant located at the proposed site.
Ecology	SMALL (aquatic) to MODERATE (terrestrial)	Impacts on terrestrial ecology and wetlands at the Fermi site would be generally similar to Fermi 3. In addition, the wind farms and solar facilities could have noticeable impacts on terrestrial ecology. Offsite parcels may also be affected by construction of a 10-mi natural gas pipeline. Impacts on aquatic ecology from operation of the cooling system would be smaller than those anticipated from Fermi 3. Impacts on terrestrial ecology from cooling tower drift would be smaller than those anticipated from Fermi 3. Additional impacts are associated with natural gas extractions, which are expected to occur on gas fields.

Table 9-5. (contd)

Impact Category	Impact	Comment
Waste Management	SMALL	The only significant waste would be from spent SCR catalyst used for control of NO_x emissions.
Socioeconomics (economy and taxes)	SMALL to MODERATE (beneficial)	Increased economic activity from new jobs and spending in the region would stimulate economic growth and tax revenues. Local property tax base would benefit Monroe County during construction and operations, but to a lower level than the impacts characterized for Fermi 3 because of the lower property values associated with the combination of technologies alternative. All beneficial tax-related impacts elsewhere in the 50-mi region would also be less than for the Fermi 3 plant because of the smaller workforce needed to operate the combination of technologies alternative. This stimulus would be SMALL beneficial for all areas except for property tax impacts in Monroe County, which would be MODERATE beneficial.
Socioeconomics (all other categories)	SMALL to MODERATE	Construction-related impacts would be limited and temporary (4 years for the NGCC plant). Construction workforce for the NGCC plant projected to be less than the 2500 required for the coal-fired alternative and the 2900 required for the Fermi 3 reactor. Operating workforce for the NGCC plant projected to be approximately 150, less than that expected for the coal-fired alternative and substantially less than would be required for Fermi 3 operation. Construction workforce likely to originate primarily from the Detroit and Toledo MSAs. Impacts on local communities with regard to housing and services would be expected to be small and temporary for construction and small for operation. The NGCC plant and new transmission line would have aesthetic impacts comparable to those anticipated for Fermi 3. Wind turbines [565 MW(e)] would have noticeable aesthetic impacts. Overall increase in adverse impact on aesthetics is MODERATE.
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and Cultural Resources	MODERATE	Construction activities would involve removal of some portions of the NRHP-eligible Fermi1 and would thus have a MODERATE impact on historic and cultural resources. Any other potential impacts could likely be managed effectively. The NGCC power block and ancillary facilities would likely be built on previously disturbed ground on the Fermi site. Newly disturbed ground would result from construction of the necessary natural gas pipeline, transmission lines, wind turbines, and solar facilities. Surveys prior to construction and archiving of any identified resources would preempt adverse impacts.

Table 9-5. (contd)

Impact Category	Impact	Comment
Environmental Justice	SMALL	Population density around the site is low, and the closest Census Block Group to the Fermi site that qualifies as a minority or low-income population of interest is about 8 mi from the site, which is beyond the distance the review team expects for physical pathways to environmental justice impacts. Emission limits imposed by operating permits would ensure that those populations would not receive adverse air quality and noise impacts from the operation of the NGCC alternative. In Section 4.4.3 the review team concludes that there are no disproportionately large adverse impacts on minority or low-income populations from the construction and operation of Fermi 3, which serves as a bounding case for establishing environmental justice impacts for the NGCC alternative.

energy alternatives are clearly preferable to building a new baseload nuclear power generation plant at the Fermi site.

It is appropriate to specifically discuss the differences among the alternative energy sources regarding CO_2 emissions. The CO_2 emissions for the proposed action and energy generation alternatives are discussed in Sections 5.7.2, 9.2.2.1, 9.2.2.2, and 9.2.4. Table 9-7 summarizes the CO_2 emissions estimates for a 40-year period for the alternatives considered by the review team to be viable for baseload power generation. These estimates are limited to the emissions from power generation and do not include CO_2 emissions for workforce transportation, building, fuel cycle, or decommissioning. Among the viable energy generation alternatives, the CO_2 emissions for nuclear power are a small fraction of the emissions of the other viable energy generation alternatives.

On June 3, 2010, EPA issued a rule tailoring the applicability criteria that determine which stationary sources and modifications to existing projects become subject to permitting requirements for GHG emissions under the PSD and Title V programs of the Clean Air Act (75 FR 31514). According to the source permitting program, if the source (1) is otherwise subject to PSD (for another regulated NSR pollutant) and (2) has a GHG PTE equal to or greater than 75,000 tons/yr of CO_2-e (adjusting for different global warming potentials for different GHGs). Such sources would be subject to BACT. The use of BACT has the potential to reduce the amount of GHGs emitted from stationary source facilities. The implementation of this rule could reduce the amount of GHGs from the values indicated in Table 9-7 for coal and natural gas, as well as from other alternative energy sources that would otherwise have appreciable uncontrolled GHG emissions. The emission of GHGs from the production of electrical energy from a nuclear power source is orders of magnitude less than those of the reasonable alternative energy sources. Accordingly, the comparative relationship between the energy sources listed in Table 9-7 would not change meaningfully because GHG emissions

Table 9-6. Summary of Environmental Impacts of Construction and Operation of Nuclear (Fermi 3), Coal-Fired Alternative, Natural Gas-Fired Alternative, and a Combination Alternative

Impact Category	Nuclear (Fermi 3) (proposed action)	Coal	Natural Gas	Combination of Alternatives
Land Use	SMALL	MODERATE	SMALL	MODERATE
Air Quality	SMALL	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL
Ecology	SMALL (aquatic) to MODERATE (terrestrial)	SMALL (aquatic) to MODERATE (terrestrial)	SMALL (aquatic) to MODERATE (terrestrial)	SMALL (aquatic) to MODERATE (terrestrial)
Waste Management	SMALL	MODERATE	SMALL	SMALL
Socioeconomics (economy and taxes)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to MODERATE (beneficial)	SMALL to MODERATE (beneficial)
Socioeconomics (all other categories)	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL to MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE
Environmental Justice	SMALL	SMALL	SMALL	SMALL

from the other energy source alternatives would not be sufficiently reduced to make them environmentally preferable to the proposed project.

Considering the addition of life-cycle greenhouse gas emissions from the production of electricity from a nuclear power source, i.e., those from the fuel cycle and transportation of workers, total emissions for plant operation over a 40-year period would increase to about 25.7 MMT. This amount is still significantly lower than the emissions from any of the other alternatives; such emissions could be reduced further if the electricity from the assumed fossil fuel source powering the fuel cycle is subject to BACT controls.

Table 9-7. Comparison of CO_2 Emissions from the Proposed Action and Energy Alternatives

Generation Type	Years	CO_2 Emission[(a)]
Nuclear power[(b)]	40	0.29 MMT
Coal-fired generation[(c)]	40	440 MMT
Natural-gas-fired generation[(d)]	40	166 MMT
Combination of alternatives[(e)]	40	122 MMT

(a) All values without CCS; CO_2 directly related to electricity production only.
(b) From Appendix L, using a scaling factor of 1.79 as discussed in Section 5.7.2.
(c) From Section 9.2.2.1 (12.4 MMT/yr).
(d) From Section 9.2.2.2 (4.15 MMT/yr).
(e) From Section 9.2.4 (3.04 MMT/yr) (assuming only natural gas generation has significant CO_2 emissions).

The CO_2 emissions associated with generation alternatives such as wind power, solar power, and hydropower would be associated with workforce transportation, construction, and decommissioning of the facilities. Because these generation alternatives do not involve combustion, the review team considers the GHG emissions to be minor and concludes that the GHG emissions would have a minimal cumulative impact. Other energy-generation alternatives involving combustion of oil, wood waste, municipal solid waste, or biomass-derived fuels would have CO_2 emissions from combustion as well as from workforce transportation, plant construction, and plant decommissioning. It is likely that the CO_2 emissions from the combustion process for these alternatives would dominate the other CO_2 emissions associated with the generation alternative. It is also likely that the CO_2 emissions from these alternatives would be the same order of magnitude as the emissions for the fossil fuel alternatives considered in Sections 9.2.2.1, 9.2.2.2, and 9.2.4. However, because the review team determined that these alternatives do not meet the need for baseload power generation, the review team has not evaluated the CO_2 emissions quantitatively.

As discussed in Chapter 8, the review team concludes that the need for additional baseload power generation has been demonstrated. Also, as discussed earlier in this chapter, the review team concludes that the viable alternatives to the proposed action all would involve the use of fossil fuels (coal or natural gas). Consequently, the review team concludes that the proposed action results in the lowest level of emissions of GHGs among the viable alternatives.

9.3 Alternative Sites

NRC EISs prepared in response to an application for a COL must analyze alternatives to the proposed action [10 CFR 51.71(d)]. NRC guidance in the ESRP (NRC 2000) states that the ER submitted in conjunction with an application for a COL should include an evaluation of alternative sites. In Section 9.3 of the ESRP, NRC's site selection process guidance calls for identification of an ROI, followed by successive screening of candidate areas, potential sites, candidate sites, and the proposed site. This section presents a discussion of Detroit Edison's ROI for possible siting of a new nuclear power plant and describes its alternative site selection process. This is followed by the review team's evaluation of Detroit Edison's process, a description of the alternative sites selected, and the review team's evaluation of the environmental impacts of locating a new nuclear generating unit at each alternative site. And finally, the impacts at the proposed and alternative sites are compared to determine whether any alternative sites are environmentally preferable or obviously superior to the proposed site.

The specific resources and components that could be affected by the incremental effects of the proposed action and other actions in the same geographic area are assessed. For the purposes of this alternative sites evaluation, impacts evaluated include NRC-authorized construction and operation and other cumulative impacts including preconstruction activities. Sections 9.3.3 through 9.3.6 provide a site-specific description of the environmental impacts at each alternative site, based on issues such as land use, air quality, water resources, terrestrial and aquatic ecology, socioeconomics and environmental justice, and historic and cultural resources. Section 9.3.7 contains a table with the staff's characterization of the impacts at the alternative sites and comparison to the proposed site to determine whether there are any alternative sites that are environmentally preferable or obviously superior to the proposed Fermi site.

The review of alternative sites consists of a two-part sequential test (NRC 2000). The first part of the test determines whether any environmentally preferred sites are among the candidate sites. The staff considers whether the applicant has (1) reasonably identified candidate sites, (2) evaluated the likely environmental impacts of construction and operation at these sites, and (3) used a logical means of comparing sites that led to the applicant's selection of the proposed site. Based on its own independent review, the review team then determines whether any of the alternative sites are environmentally preferable to the applicant's proposed site. If the review team determines that one or more alternative sites are environmentally preferable, then it would proceed with the second part of the test. The second part of the test determines whether an alternative site is obviously superior to the proposed site. The review team must determine that (1) one or more important aspects, either singly or in combination, of an acceptable and available alternative site are obviously superior to the corresponding aspects of the applicant's proposed site, and (2) the alternative site does not have offsetting deficiencies in other important areas. Included in this part of the test is the consideration of estimated costs (i.e., environmental, economic, and time of building the proposed plant) at the proposed site and at the environmentally preferable site or sites (NRC 2000). A staff conclusion that an alternative site is obviously superior to the applicant's proposed site would normally lead to a recommendation that the application for the COL(s) be denied.

9.3.1 Alternative Site Selection Process

The review team's evaluation of Detroit Edison's alternative site selection process began with an evaluation of Detroit Edison's stated ROI. Within that ROI, the review team evaluated the results of the application of screening criteria applied sequentially to establish candidate areas, potential sites, and finally candidate sites, leading to the selection of alternative sites. The process Detroit Edison used to select its alternative sites is described in the following sections.

9.3.1.1 Detroit Edison's Region of Interest

In general, the ROI is the geographic area considered in searching for candidate sites (NRC 2000). The ROI is typically the State in which the proposed site is located or the relevant service area for the proposed plant (NRC 2000).

Detroit Edison selected its traditional service area as its ROI (see Figure 8-1). The ROI consists of approximately 7600 mi^2 in 11 counties within southeastern Michigan, including the City of Detroit. Major water features within the ROI that could provide cooling water include Lake Erie, Lake Huron, and the interconnecting St. Clair River. In addition to numerous State routes, major transportation routes within the ROI include Interstates 96, 275, 94, and 75. Rail and water transportation infrastructures also exist throughout the ROI.

9.3.1.2 Detroit Edison's Site Selection Process

Candidate Areas

As the initial step of its alternative site selection process, Detroit Edison identified candidate areas within the ROI. Detroit Edison referred to these as "greenfield areas" (Detroit Edison 2011a, b). Detroit Edison identified these candidate (greenfield) areas based on proximity to transmission lines, rail, transportation corridors, and water supply. A commercial database provided by EnergyVelocity was consulted by Detroit Edison to identify the candidate areas.

Potential Sites

Detroit Edison next searched the candidate areas for locations for potential sites. The search involved a review of publicly available sources of data such as 7.5-min U.S. Geological Survey (USGS) quadrangle maps, aerial photographs, atlases, and road maps, review of Google Earth images, and searches of the Internet. The general criteria used to identify potential sites within the ROI included the following:

- proximity to transmission lines and rail and road and water transportation infrastructures
- adequate supplies of water for cooling and industrial applications

- no obvious environmental concerns such as large expanses of wetlands and the absence of sensitive areas such as natural resource conservation areas
- the absence of complex terrain that would require substantial modification before facility construction could begin
- few residences/sensitive receptors (Detroit Edison 2011a).

Detroit Edison also identified potential “brownfield” sites (i.e., sites with prior or current industrial or commercial development) using two methods. One method involved a review of the MDEQ database of formerly utilized industrial sites. The MDEQ database is comprehensive and includes brownfield sites of all sizes and conditions. The brownfield sites in the database were evaluated by using the same general criteria used to identify greenfield sites (e.g., proximity to transmission, rail, roads, and water). Detroit Edison also considered its existing sites for inclusion in the list of potential sites. Of its existing sites, nine were retained as potential sites: Belle River-St. Clair, River Rouge, Trenton Channel, Fermi, Greenwood, Monroe, Harbor Beach, Conners Creek, and Marysville.

In all, Detroit Edison identified 24 potential sites. A variety of existing land uses was represented in the potential sites selected: sites currently in use for industrial purposes (including power generation), greenfield sites, and brownfield sites (i.e., formerly used industrial sites).

Candidate Sites

The 24 potential sites were subjected to additional research as well as high-level site reconnaissance visits by Detroit Edison staff and its contractors. During this stage, Detroit Edison eliminated 16 sites (Detroit Edison 2011a, b). Of these, 13 sites were eliminated based on a failure to meet criteria for minimum property size (500 ac) and/or minimum cooling water supply (40,000 gpm). Detroit Edison eliminated the other three potential sites because of proximity to major resort areas (two of the sites) and because a new power plant would significantly change the character of the area (all three sites).

Proposed and Alternative Sites

To identify the proposed and alternative sites, Detroit Edison evaluated each candidate site against more specific criteria from both technical and environmental perspectives. For each criterion, each site was given a score of 1, 3, or 5, reflecting a decreasing potential for adverse impact, with a score of 5 representing the most favorable score for each criterion evaluated (Detroit Edison 2011a). Environmental criteria and subcriteria included the following:

- ecology and natural resources: threatened and endangered species; wetlands/waters of the United States; impacts on designated scenic, natural, recreational, or wildlife areas; disruption of natural habitat; impacts on water quality
- land use: existing land ownership, existing land use within one mile (industrial, agricultural, open space/parks, residential areas), nearby airports, extent of buffer zones for potential offsite receptors
- socioeconomics: impacts on resources such as traffic, demographics, employment and housing, noise levels, cultural resources and viewshed
- potential for hazardous material contamination
- associated linear facilities: for transmission line and water line routes
- community perception/receptivity to new facilities; based on Detroit Edison's judgment of probable resistance to new nuclear facilities by residents of the site area.

Technical review criteria included the following:

- site development issues: topography; subsurface conditions that affect foundations, earthwork, and pipe installation; construction impacts on groundwater; flood potential; geological/seismic activity; need for extensive relocation of existing utilities; cogeneration potential
- transmission system development: distance to adequate transmission; transmission system reliability/available current-carrying capacity
- transportation development: proximity to highway network; extent of required road displacement/replacement
- water resources development: adequacy of water source for baseload plant needs; distance to adequate water resources; groundwater static head (as it affects construction dewatering); quality of makeup water (affecting the life of plant components); groundwater quality and accessibility
- security conditions: logistics associated with making the site secure against intrusion
- economics of the site: development costs, including major actions such as cut-and-fill to alter grade; delivered fuel costs; costs of linear facilities such as pipelines and transmission lines
- waste disposal: dry spent fuel storage capacity.

All eight candidate sites were evaluated by using all the criteria itemized above and given relative scores, with the highest score representing the most desirable site. Based on the individual weights of the criteria, environmental factors carried a total weight of 41 percent and technical criteria, 59 percent. After an initial score for each candidate site from both environmental and technical perspectives was established, Detroit Edison conducted a sensitivity analysis to identify any biases that may have been inadvertently introduced during the scoring process. Weightings of both 30 percent and 70 percent were applied to the scores of each site for both environmental factors and technical factors, and the sum of the weighted environmental and technical scores was used to ultimately rank the sites (Detroit Edison 2011a).

Scores assigned to each of the eight candidate sites for each of the evaluation criteria discussed above were provided in tabular form in Chapter 9 of the ER, as was the basis for elimination of some of those sites (Detroit Edison 2011a). Table 9-8 shows the overall results of the evaluation exercise for the eight candidate sites.

Table 9-8. Scores and Relative Rankings of Detroit Edison's Candidate Sites

Candidate Site	County	Existing Use	Weighted Environmental Score	Weighted Technical Score	Weighted Total (Overall Rank)
Site M: Fermi nuclear site	Monroe	Detroit Edison power plant	1.75	2.11	3.86 (1)
Site N: Belle River-St. Clair Energy Facility	St. Clair	Detroit Edison power plant	1.63	2.07	3.70 (2)
Site F: Greenwood Energy Center	St. Clair	Detroit Edison power plant	1.39	2.17	3.56 (3)
Site A: Petersburg	Monroe	Greenfield site	1.13	2.31	3.44 (4)
Site C: South Britton	Lenawee	Greenfield site	1.15	2.19	3.34 (5)
Site W3	Huron	Greenfield site	1.09	2.03	3.12(6)
Site W2	Huron	Greenfield site	1.09	1.81	2.90 (7)
Site W1	Huron	Greenfield site	0.87	1.85	2.72 (8)

Source: Detroit Edison 2011a

Based on the scores from its site selection process, Detroit Edison proposed construction of the Fermi 3 reactor on the existing Fermi site in Monroe County, Michigan, and also considered two alternative sites.

9.3.1.3 Conclusions about Detroit Edison's Site Selection Process

The review team evaluated Detroit Edison's methodology for selecting its ROI, identifying candidate areas, and evaluating potential sites, candidate sites, and alternative sites. The results of the review team's evaluation follow.

For its ROI, Detroit Edison chose its traditional service territory. The designated ROI is consistent with the guidance in NRC's ESRP for review of ERs for nuclear power stations (NRC 2000). The review team concludes that the ROI used in Detroit Edison's COL application is reasonable for consideration and analysis of potential sites. The review team also finds that Detroit Edison's basis for defining its ROI did not arbitrarily exclude desirable candidate locations.

Detroit Edison next identified candidate areas (which it referred to as greenfield areas). Detroit Edison employed criteria based on proximity to transmission lines, rail, transportation corridors, and water supply (i.e., inclusionary criteria). This is the inverse of the approach described in the ESRP, but it would be expected to yield the same results. Therefore the review team concludes that the method used to identify candidate areas is reasonable.

In order to identify potential sites, Detroit Edison used a process in which it avoided areas of potential concern (e.g., natural resource conservation areas, areas with complex terrain). After eliminating those areas, it identified parcels of land that could be developed for a new nuclear plant. Detroit Edison also looked for brownfield sites and considered its own existing sites in this step. In all, Detroit Edison identified 24 potential sites. Here again, the Detroit Edison process is rather like an inverse of that described in the ESRP (i.e., Detroit Edison used exclusionary criteria, while the ESRP envisioned inclusionary criteria). But, again, the Detroit Edison approach would be expected to yield similar results. The review team notes that the 24 sites cover a wide geographic area and range of environmental conditions. The process used by Detroit Edison did identify sites that would be too small for a new nuclear plant. However, these would be eliminated in the next step (Candidate Sites), leading to the same result. The review team concludes that the Detroit Edison process for identifying potential sites is reasonable.

Detroit Edison reviewed the potential sites in more detail to narrow the list to a group of candidate sites. This portion of its review included visits to all 24 potential sites. In this step Detroit Edison eliminated 16 of the potential sites, with most of these (13) eliminated because of lack of adequate site size (500 ac) or adequate water supply (40,000 gpm) (Detroit Edison 2011b). Detroit Edison eliminated the other three sites because it determined that a new nuclear plant at these locations would significantly change the character of the area. Detroit Edison also considered a number of other attributes in this step, as mentioned in the notes in Table 9.3-2 of the ER (Detroit Edison 2011a). One consideration noted in the table (i.e., private ownership as a disadvantage) would not be considered under the guidance in the ESRP. But this consideration appears not to have been the deciding factor and so would not affect the results. The process used by Detroit Edison at this stage does not appear to be as detailed as the process described in the ESRP. However, the review team concludes that this lack of depth would lead Detroit Edison to identify more candidate sites than the ESRP process. Because the process used by Detroit Edison would not improperly eliminate sites from consideration, the review team concludes that it is reasonable.

Detroit Edison then evaluated the remaining eight candidate sites using 40 criteria. Each criterion was given its own weighting factor, and each site was scored for each criterion. Detroit Edison took the total scores for each site and determined that the Fermi site was the most suitable. It also identified the Belle River-St. Clair and Greenwood sites as alternatives.

The ESRP guidance indicates that the identification of three to five alternative sites could, in general, be viewed as adequate. Because Detroit Edison identified only two alternative sites in its ER (Detroit Edison 2011a), the review team requested additional information (NRC 2009) for Site A (Petersburg) and Site C (South Britton), which were ranked fourth and fifth by Detroit Edison, with similar overall scores. Detroit Edison provided its response on August 25, 2009 (Detroit Edison 2009c). The review team considered all four alternative sites in its evaluation. The locations of the four alternative sites are shown in Figure 9-1.

Detroit Edison considered both environmental criteria and technical criteria in its scoring of the sites. But the ESRP guidance considers only environmental factors in the comparison of the sites to determine if any is environmentally preferable. Technical and cost factors would be considered only if an alternative site was determined to be environmentally preferable (NRC 2000). However, even if only environmental criteria are considered, the top five sites remain unchanged and Fermi remains the highest ranked site.

In the Detroit Edison analysis, the criterion “Public Receptivity” was given a high weight of 10 percent of the total. Because of the relatively high uncertainty involved in measuring public acceptance, the review team requested Detroit Edison to perform a sensitivity analysis regarding the weight of this criterion (NRC 2011b). Detroit Edison’s response to that request (Detroit Edison 2011b) provides the site scores for various weights for Public Receptivity, from 0 percent to 10 percent. At a weight of 2 percent (approximately the average weight for all criteria), the top five sites remain unchanged and the top three sites (Fermi, Belle River-St. Clair, and Greenwood) are essentially tied. The review team concludes that the high weight of this criterion did not skew the outcome of the analysis.

Overall, the review team determines that Detroit Edison used a logical approach that adequately satisfied applicable NRC guidance for the identification of sites that are among the best in the ROI. Consequently, in addition to Fermi, the review team has chosen the top four alternative sites identified by Detroit Edison for its independent analysis.

9.3.2 Review Team Alternative Site Evaluation

In accordance with Section 9.3 of the ESRP (NRC 2000), the review team performed an independent comparison of the proposed and alternative sites. The four alternative sites (Belle

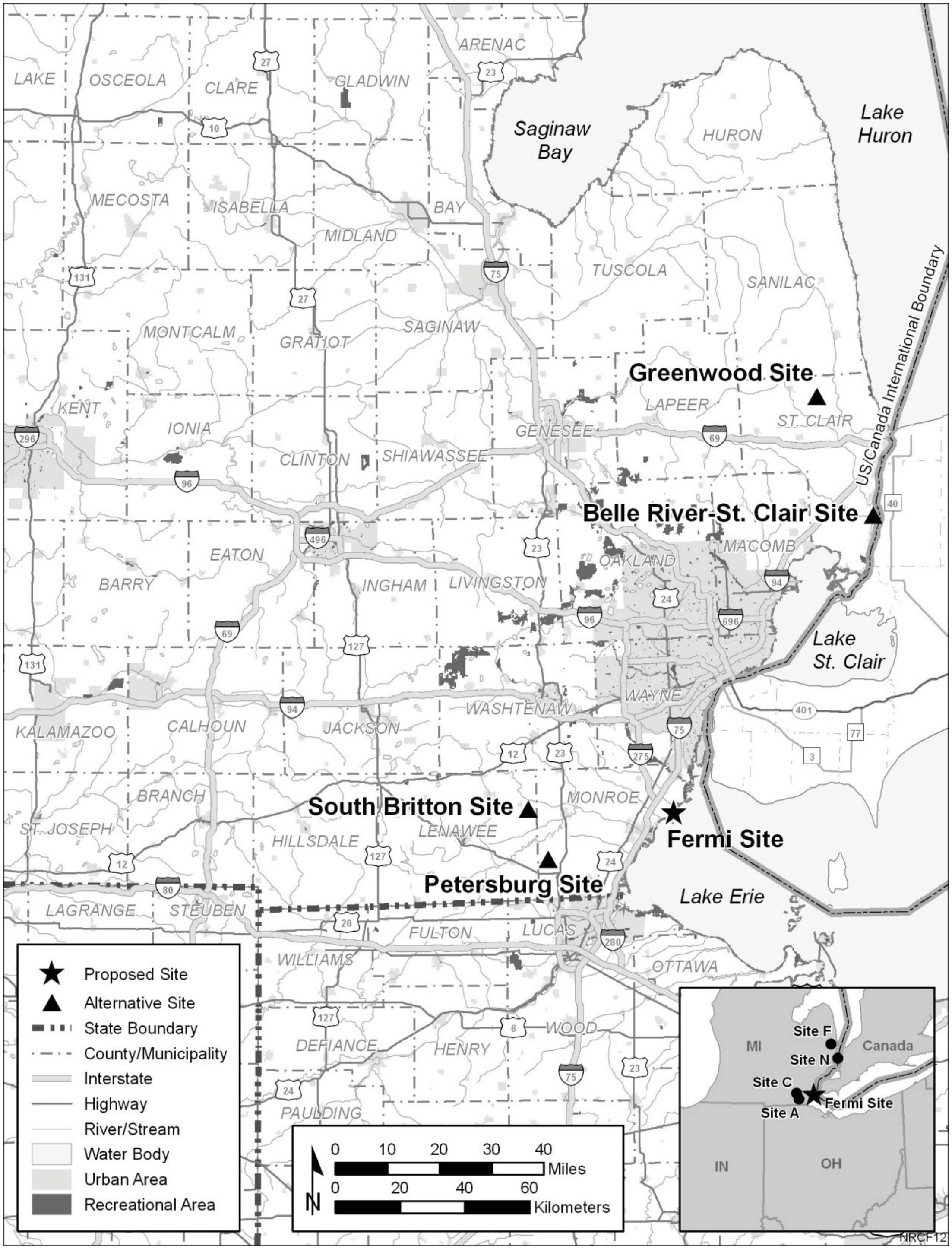

Figure 9-1. Locations of the Proposed Site and Alternative Sites for Fermi 3

River-St. Clair, Greenwood, Petersburg, and South Britton) are examined in detail in Sections 9.3.3 through 9.3.6 in the following subject areas: land use, water resources, terrestrial and aquatic ecology, socioeconomics and environmental justice, historic and cultural resources, air quality, nonradiological health, radiological health, and postulated accidents. The review team visited each alternative site as well as the proposed site in January 2009. Section 9.3.7 contains a table with the review team's characterization of the cumulative impacts of the proposed action at the proposed and alternative sites.

Following the guidance promulgated in Section 9.3 of the ESRP, the review team collected and analyzed reconnaissance-level information for each site. The review team then used the information provided in the ER (Detroit Edison 2011a), a request for additional information (RAI) response (Detroit Edison 2009c), information from other Federal and State agencies, and information gathered during the visits to each alternative site to evaluate the cumulative impacts of building and operating a new nuclear power plant at those sites. The analysis therefore included the impacts of NRC-authorized construction and operation as well as potential impacts associated with other actions affecting the same resources. Cumulative impacts occur when the effects of an action are added to or interact with other effects in a particular place and within a particular time; as a result, the cumulative impact assessment entails a more extensive and broader review of possible effects of the action beyond the site boundary.

The cumulative analysis for the impacts at the alternative sites was performed in the same manner as discussed in Chapter 7 for the proposed site, except, as specified in Section 9.3 of the ESRP (NRC 2000), a reconnaissance-level analysis was conducted for the alternative sites. To inform the cumulative impacts analysis, the review team researched EPA databases for recent EISs within the State, used an EPA database for permits for water discharges in the geographic area to identify water-use projects, and used www.recovery.gov to identify projects in the geographic area funded by the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). The review team developed tables of the major projects near each alternative site that were considered relevant in the cumulative analysis. The review team used the information to perform an independent evaluation of the direct and cumulative impacts of the proposed action at the alternative sites to determine whether one or more of the alternative sites were environmentally preferable to the proposed site.

Included are past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts together with the proposed action. For the purposes of this analysis, the past is defined as the time period prior to receipt of the COL application. The present is defined as the time period from the receipt of the COL application until the beginning of activities associated with building Fermi 3. The future is defined as the beginning of building activities (construction and preconstruction activities) associated with Fermi 3 through operation and eventual decommissioning.

The specific resources and components that could be affected by the incremental effects of the proposed action and other actions in the same geographic area were identified. The affected environment that serves as the baseline for the cumulative impacts analysis is described for each alternative site, and a qualitative discussion of the general effects of past actions is included. The geographic area over which past, present, and future actions could reasonably contribute to cumulative impacts is defined and is described in later sections for each resource area. The analysis for each resource area at each alternative site concludes with a cumulative impact finding (SMALL, MODERATE, or LARGE). For those cases in which the impact level on a resource was greater than SMALL, the review team also discussed whether building and operating a nuclear unit would be a significant contributor to the cumulative impact. In the context of this evaluation, “significant” is defined as a contribution that is important in reaching that impact-level determination.

Cumulative impacts are summarized for each resource area in the sections that follow. The level of detail is commensurate with the significance of the impact for each resource area. The findings for each resource area at the Fermi site and each alternative site are then compared in Table 9-44. The results of this comparison are used to determine whether any of the alternative sites is environmentally preferable to the proposed site. If any alternative site is determined to be environmentally preferable, the review team would evaluate whether that alternative site was obviously superior.

The impacts described in Chapter 6 of this EIS (e.g., nuclear fuel cycle; decommissioning) would not vary significantly from one site to another. This is true because all the alternative sites and the proposed site are in low population areas and because the review team assumes the same reactor design (therefore, the same fuel cycle technology, transportation methods, and decommissioning methods) for all the sites. As such, these impacts would not differentiate between the sites and would not be useful in the determination of whether an alternative site is environmentally preferable to the proposed site. For this reason, these impacts are not discussed in the evaluation of the alternative sites.

Similarly, the nonradiological waste impacts described in Sections 4.10 and 5.10 would not vary significantly from one site to another. The types and quantities of nonradiological and mixed waste would be approximately the same as those for the construction and operation of an Economic Simplied Boiling Water Reactor (ESBWR) at any of the alternative sites. For each alternative, all wastes destined for land-based treatment or disposal would be transported offsite by licensed contractors to existing, licensed disposal facilities operating in compliance with all applicable Federal, State, and local requirements, and all nonradioactive liquid discharges would be discharged in compliance with the provisions of an applicable NPDES permit. Also, the amount of nonradioactive, nonhazardous municipal solid waste generated annually at the Fermi site would be roughly equivalent to the small percentage of total solid waste generated in the geographic area of influence of the alternative sites. Finally, as stated in Section 7.9, the

Fermi site would generate a very small percentage of hazardous waste produced in Michigan, and no known capacity constraints exist for the treatment or disposal of hazardous wastes either within Michigan or for the nation as a whole. For these reasons, these impacts are not discussed separately in the evaluation of each alternative site.

9.3.3 Belle River-St. Clair Site

This section presents the review team's evaluation of the potential environmental impacts of siting a nuclear reactor at the Belle River-St. Clair site. The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the Belle River-St. Clair site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment are other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action, if implemented at the Belle River-St. Clair site. Other actions and projects considered in this cumulative analysis are described in Table 9-9. The location and vicinity of the Belle River-St. Clair alternative site are shown in Figure 9-2.

Referred to by Detroit Edison in its site selection process as Site N, the Belle River-St. Clair property contains two Detroit Edison-owned power plants on contiguous parcels of 1860 ac and 226 ac. The site is approximately 1 mi west of the United States–Canada border, 4 mi north of Marine City, 4 mi south of St. Clair, and 8 mi south of Port Huron, the largest population center in the area. The site occupies Sections 13, 18, 19, 30, and 31 of Township 4 North and Ranges 18 East and 17 East in the China and East China Townships. Other than the industrial footprints of the power plants, the site is composed of agricultural land and some wooded areas.

Small portions of the site may be inside the Belle River floodplain. Five residences are within 2 mi of the site. The East China Fractional District No. 2 School is located about 1.5 mi southeast of the site.

Access to the site is provided by State Route 29, which runs through the site; by barge via the St. Clair River; and by rail via the CSX rail line that runs along the eastern border of the site.

The nearest sensitive environmental area is East China Township Park to the south of the site. Other small parks are also located in the area.

While the industrial areas of the site are generally free of vegetation, the wooded areas are composed of cottonwoods (*Populus deltoides*) and green ash (*Fraxinus pennsylvanica*). Diversity in understory areas and open areas is low, with the plant communities composed largely of weedy, nonnative plants. There is also limited wildlife habitat diversity on the site.

Table 9-9. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Belle River-St. Clair Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
Belle River Power Plant	1664-MW coal-fired plant	On Belle River-St. Clair site	Operational
St. Clair Power Plant	1929-MW coal-fired plant	On Belle River-St. Clair site	Operational
Fermi Unit 2	1098-MW nuclear power plant, including proposed ISFSI and decommissioned Fermi 1 colocated on site	68 mi southwest of Belle River St. Clair site on Lake Erie	Operational
Davis-Besse Nuclear Plant Unit 1	925-MW nuclear power plant	86 mi southwest of Belle River St. Clair site on Lake Erie	Operational
Greenfield Energy Centre LP	1005-MW natural-gas-fired combined-cycle electricity-generating facility	1 mi east of Belle River-St. Clair site across the St. Clair River	Operational
Lambton Generating Station	1920-MW coal-fired power plant	1 mi northeast of Belle River-St. Clair site across the St. Clair River	Operational
Dawn Gateway Pipeline	Operation of 30-km, 610-mm international natural gas transmission pipeline system (construction of 1-km new pipeline)	4 mi east of Belle River-St. Clair site in Lambton County, Ontario	Proposed
Marysville Power Plant	200-MW coal-fired plant	10 mi north of Belle River-St. Clair site on St. Clair River	Operational
Greenwood Energy Center	Oil-fired peaking unit and three natural gas CTs with 1071 MW of combined capacity	24 mi northwest of Belle River-St. Clair site	Operational
Suncor Ethanol Plant Phase II Project	Expansion of existing St. Clair Ethanol Plant to increase the supply of ethanol for blending with gasoline. The expansion will increase the plant's production capacity from 200 million to 400 million L/yr.	11 mi north of Belle River-St. Clair site in St. Clair Township, Ontario, Canada	Recently completed
Suncor Ethanol Production Project	Ethanol production facility with production capacity of 200 million L/yr	16 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Recently completed

Table 9-9. (contd)

Project Name	Summary of Project	Location	Status
Northern Ethanol (Sarnia) Inc. Ethanol Facility	Ethanol facility with a maximum capacity of 454.3 million L/yr of ethanol at an industrial brownfield site in the city of Sarnia	16 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Proposed
Diesel Fuel and Hydrogen Pipelines	3.3 km of one 10-in. hydrogen pipeline and two 8-in. diesel fuel pipelines from the Shell Canada Refinery in Corunna to the Suncor Refinery in Sarnia	16 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Recently completed
St. Clair Liquid Petroleum Gas Terminal	Liquid petroleum gas terminal	2.4 mi north of Belle River-St. Clair site located near confluence of Pine and St. Clair Rivers	Operational
Dome Petroleum Corporation	Petroleum bulk station and terminal with discharge to Jordan Creek	2.4 mi north of Belle River-St. Clair site	Operational
Mining Projects			
Cross Sand and Gravel Inc.	Construction sand and gravel mine	17 mi northwest of Belle River-St. Clair site	Operational
Transportation Projects			
I-94 Black River Bridge Replacement in Port Huron	First phase of the Blue Water Bridge plaza expansion, a project to modernize and improve capacity at the nation's second-busiest U.S.-Canadian truck border crossing	15 mi north of Belle River-St. Clair site in Port Huron	Proposed; schedule undetermined
Parks and Recreation Facilities			
St. Clair County Trail System	Proposed upgrades and extensions of an existing offroad and onroad bike route network	Throughout St. Clair County	Proposed construction through 2024
Other Actions/Projects			
Algonac Water Filtration Plant	Water filtration plant that discharges to the St. Clair River	9.6 mi. south of Belle River-St. Clair site on St. Clair River	Operational
Marine City Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair and Black Rivers	4 mi south of Belle River-St. Clair site on St. Clair River	Operational

Table 9-9. (contd)

Project Name	Summary of Project	Location	Status
City of St. Clair Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair River	2.4 mi north of Belle River-St. Clair site on St. Clair River	Operational
City of Port Huron Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair and Black Rivers	17 mi north of Belle River-St. Clair site on St. Clair River	Operational
St. Clair County-Algonac Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair River	10 mi south of Belle River-St. Clair site on St. Clair River	Operational
Detroit Water and Sewerage District Lake Huron Water Treatment Plant	Water treatment plant	22 mi north of Belle River-St. Clair site on Lake Huron	Operational
Indian Trail North Mobile Home Park Wastewater Sewage Lagoon	Wastewater sewage lagoon located on Lake Huron	22 mi north of Belle River-St. Clair site on Lake Huron	Operational
Cargill Salt	Manufactures salt as food additive	2.4 mi north of Belle River-St. Clair site	Operational
Courtright Sewage Treatment Plant Upgrades	Upgrade and expansion of the Sewage Treatment Plant	3 mi north of Belle River-St. Clair site on St. Clair River in Ontario, Canada	Recently completed
Marysville Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair River	10 mi north of Belle River-St. Clair site on St. Clair River	Operational
Dunn Paper Company	Paper mill discharging to St. Clair River	17 mi north of Belle River-St. Clair site	Operational
E B Eddy Paper, Inc.	Paper mill discharging to St. Clair and Black Rivers	17 mi north of Belle River-St. Clair site	Operational
Sarnia Combined Sanitary/Storm Sewer Separation	The combined sewer separation project proposed will halt the Combined Sewer Overflow to the St. Clair River	25 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Recently completed
Sarnia Wastewater System Improvements	Trunk sanitary sewer expected to reduce the number of combined sewer overflows to the St. Clair River	25 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Recently completed

Table 9-9. (contd)

Project Name	Summary of Project	Location	Status
Dry Hydrant Installation, North Slip, Sarnia Harbor	Construction, installation, and maintenance of a dry hydrant and protection bollards along the North Slip embankment in Sarnia Harbor	25 mi north of Belle River-St. Clair site in Sarnia, Ontario, Canada	Recently completed
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents. No specific data found concerning development/ expansion of the towns within 20 mi of site.	Throughout region	Construction would occur in the future, as described in State and local land use planning documents
Great Lakes Restoration Initiative	Restoration activities to address toxic substances, invasive species, nearshore health and nonpoint source pollution, and habitat and wildlife protection	Great Lakes watershed	Start in FY2011
Global Climate Change/Natural Environmental Stressors	Short- or long-term changes in precipitation or temperature	Throughout region	Impacts would occur in the future

Source: Modified from NRC 2010a, b

The site is located approximately 50 mi from Detroit. St. Clair County has a population of approximately 164,200 (2000 data) and the nearest towns, St. Clair and Marine City, have populations of 5800 and 4650, respectively (2000 data).

9.3.3.1 Land Use

The following impact analysis includes impacts on land use from building and operating the proposed nuclear project at the Belle River-St. Clair site. The analysis also considers past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects, and those projects listed in Table 9-9 within the geographic area of interest.

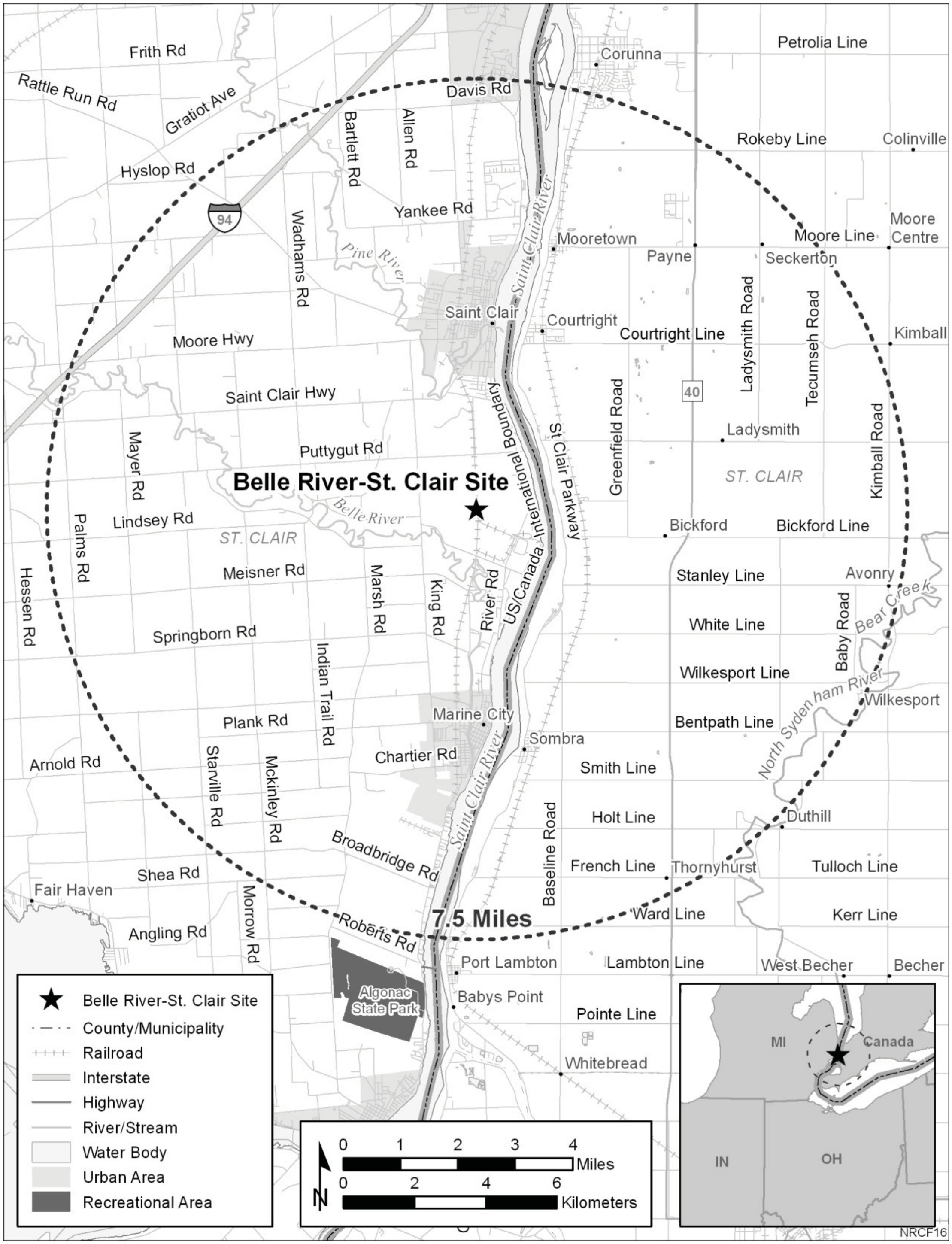

Figure 9-2. The Belle River-St. Clair Alternative Site and Vicinity

The site is owned by Detroit Edison, is zoned industrial, and hosts the existing Belle River and St. Clair power plants (Detroit Edison 2011a). There are a number of buildings onsite associated with the power plants. The proposed location for the new facility is approximately 1200 ac, located in the northwestern part of the existing site (Detroit Edison 2009b). Within the 1200 ac, the conceptual plant layout suggests that permanent land disturbance would be as much as 95 ac, and temporary land disturbance would be as much as 200 ac. There are no residential areas on the site, although there are a few residences within 2 mi (Detroit Edison 2011a). Topography is flat with very little variation, and outside of the developed areas around the existing coal plants, the site is primarily agricultural land (including possibly some prime farmland), grassland, and young mixed deciduous forest. There are 37 wetlands on the site, and several former utility ponds may have been abandoned for a sufficient period to be considered waters of the United States (see Section 9.3.3.3). Some parts of the site are within the Belle River floodplain (Detroit Edison 2011a).

National Wetland Inventory (NWI) maps suggest that a substantial area of wetlands, perhaps several hundred acres of mostly forested and scrub-shrub wetlands, lies within the 1200 ac. Drainage connections between the site and the St. Clair River could also be disturbed. The river is an adequate water source for the proposed plant and already supplies the existing Belle River and St. Clair power plants. No new offsite roadway would likely be needed during development or operation of the proposed facility (Detroit Edison 2011a).

The nearest recreational area to the site is East China Township Park, south of the site near the intersection of Recor Road and River Road (Detroit Edison 2011a). A number of smaller parks are present in the surrounding area, while Algonac State Park is approximately 8 mi south of the site. These recreational resources may be affected by increased user demand, by views of the proposed 600-ft cooling tower and condensate plume, or by access delays associated with increased traffic.

One or more new transmission line corridors would likely be needed to connect a new power plant at the Belle River-St. Clair site to the grid (Detroit Edison 2011a). Although a 345-kV transmission line already crosses the site, it is fairly congested, partly because of the recent loss of a critical double-circuit tower. Although transmission capacity and reliability in the area are considered to be fair, a load flow study of the transmission line is recommended (Detroit Edison 2011a). Environmental conditions along the transmission line corridor are similar to those of the site, with a mixture of cropland, wooded areas, and some wetlands. Because the transmission interconnection would be on the site, the review team concludes that the land use impacts of building and operating transmission lines for a new nuclear plant at the Belle River-St. Clair site would be minor.

For cumulative land use analysis, the geographic area of interest is the 15-mi region surrounding the Belle River-St. Clair site. This geographic area of interest includes the primary communities (China Charter Township and East China Charter Township) that would be affected by the proposed project if it were located at the Belle River-St. Clair site.

A number of offsite projects identified in Table 9-9 would likely affect land use in the geographic area of interest around the Belle River-St. Clair site. The two Suncor Ethanol projects in St. Clair Township, the Northern Ethanol project in Sarnia, and the I-94 Black River bridge replacement project in Port Huron are all more than 10 mi from the proposed site but along with other projects identified in Table 9-9, have contributed or would contribute to some decreases in open lands, wetlands, and forested areas and generally result in increased urbanization and industrialization. However, existing parks, reserves, and managed areas would help preserve open lands, wetlands, and forested areas. The projects within the geographic area of interest identified in Table 9-9 appear to be generally consistent with applicable land use plans and control policies.

As discussed in Section 7.1 for the Fermi site, climate change could increase precipitation and flooding, while increased lake evaporation and reduced lake ice accumulation could reduce lake levels and thereby increase the extent of low-lying lakeshore areas (USGCRP 2009). Forest growth may increase as a result of more carbon dioxide in the atmosphere (USGCRP 2009). In addition, climate change could reduce crop yields and livestock productivity (USGCRP 2009), which might change portions of agricultural land uses in the area of interest.

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the cumulative land use impacts associated with siting a reactor on the Belle River-St. Clair site would be SMALL, and further mitigation would not be warranted.

9.3.3.2 Water Use and Quality

The predominant surface water feature near the Belle River-St. Clair site is the St. Clair River, which is 2 mi east of the site, connects Lake Huron with Lake Erie, and has an average daily flow of 188,000 ft^3/sec (approximately 121 billion gpd) (Neff and Nichols 2005). The river supports multiple uses from industry to commerce to recreational boating. Surface water quality is moderate to poor. The two existing power plants at the site currently use the St. Clair River as a source of cooling water and for industrial purposes. There are 37 wetlands on the site, and several utility ponds may have been abandoned for a sufficient period to be considered waters of the United States (see Section 9.3.3.3). During a site visit in January 2009, terrain at the proposed site was observed to be flat with forested wetlands in undeveloped areas.

Water for a reactor at the Belle River-St. Clair Power Plant site would most likely be obtained from the St. Clair River, which is used for once-through cooling by the two existing power plants and is also used for cooling by the Canadian power industry. The flow of the St. Clair River is large enough to support the closed cycle cooling system of the proposed plant. New intake and discharge structures would be necessary (constructed under USACE and MDEQ permits), because the current power plants do not have enough additional capacity. Discharge would include cooling tower blowdown at an elevated temperature relative to the river, treated process wastewater, and liquid radwaste. Discharges would be controlled by an NPDES permit issued by MDEQ.

Water wells locally support domestic use of groundwater, but low yields and moderate quality limit the potential usefulness of this resource for the proposed facility. Groundwater could possibly be used during the building phase. Groundwater resources in the area are described as marginal. Most wells access the surficial aquifer, which is between 200 and 400 ft thick, with well yields in the 10 to 15 gpm range.

Building activities, including site grading and dewatering, would have the potential to affect water quality through increased erosion by stormwater, increased turbidity in surface water, and possible spills or leaks of fuel and other liquids. These changes would be expected to be limited by following appropriate BMPs. Surface water quality may be affected by discharges, but the discharges should be controlled by NPDES and stormwater permits.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Belle River-St. Clair site is the St. Clair River (which connects Lake Huron with Lake Erie) and downstream Lake Erie itself, because these are the areas potentially affected by the proposed project. Key actions that have current and reasonably foreseeable potential impacts on water supply and water quality in this area of interest include coal- and natural-gas-fired power plants, proposed and recently completed ethanol plants, proposed and recently completed pipeline construction projects, wastewater treatment plants, paper mills, and other industries. For the cumulative analysis of impacts on groundwater, the geographic area of interest is the thick surficial aquifer in the vicinity of the site.

Water Use

Operational cooling water requirements would be the major demand of a new nuclear power plant on surface water resources. As described above, the water availability of the St. Clair River would be sufficient to support the makeup water needs of a new reactor in addition to the cooling water needed by existing U.S. and Canadian power plants and other projects listed in Table 9-9. The maximum consumptive loss anticipated from Fermi 3 is 24.7 MGD, or approximately 0.02 percent of the river's average flow rate of over 121,000 MGD. The cumulative consumptive use of surface water is anticipated to have a small effect on the resource.

As described in Section 7.2.1, the greatest potential future impact on the Great Lakes water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario discussed in the USGCRP report (2009) and by Hayhoe et al. (2010) would not be detectable or would be so minor that it would not noticeably alter the availability of water from the Great Lakes. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario, the effect of climate change could noticeably increase air and water temperatures and decrease the availability of water in surface water resources in the Great Lakes region. As a result, the review team concludes that the potential impacts of use and climate change on surface water quantity would be SMALL to MODERATE. Based on its evaluation, the review team concludes that building and operating a nuclear plant at the Belle River-St. Clair site would not be a significant contributor to the cumulative impact on surface water use.

Groundwater withdrawals associated with site dewatering during construction or preconstruction of a new nuclear power plant would be temporary and localized. As noted above, groundwater usage in the Belle River-St. Clair vicinity is generally limited to withdrawals by domestic wells. The review team concludes that cumulative groundwater impacts associated with withdrawals while building a new nuclear power plant at this site and with projects identified in Table 9-9 would be SMALL.

Water Quality

An NPDES permit from the MDEQ would be required for discharges from a new nuclear power plant at the Belle River-St. Clair site as well as for discharges to surface waters from the other projects identified in Table 9-9. Such permits would limit both chemical and thermal discharges. Construction activities associated with the proposed facilities in Table 9-9 and urbanization in the vicinity have the potential to degrade surface water quality, but adhering to BMPs would limit this impact.

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative, a consortium of 11 Federal agencies that developed an action plan to address environmental issues. These issues fall into five areas: cleaning up toxics and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted runoff, restoring wetlands and other habitats, and tracking progress and working with strategic partners. The results of this long-term initiative would presumably address water quality concerns of Lake Erie.

Climate change, as described in Section 7.2.1, has the potential to affect water quality within the Great Lakes, including Lake Huron, which discharges via the St. Clair River, leading to a MODERATE cumulative impact on surface water quality. Reduced lake levels and reduced flow in the river could increase the impact of permitted discharges. However, the high flow rate of the St. Clair River and associated mixing would limit the influence of chemical and thermal discharges on downstream surface water bodies (e.g., Lake St. Clair, the Detroit River, and Lake Erie). The review team concludes that building and operating a nuclear plant at the Belle

River-St. Clair site would not be a significant contributor to the MODERATE cumulative impact on surface water quality.

Groundwater in the region, which is generally of moderate chemical quality, could be affected by a new nuclear power plant at the Belle River-St. Clair site and the other past, present, and reasonably foreseeable actions in the region identified in Table 9-9. These impacts would be expected to be localized in extent and may be avoided or minimized through adherence to BMPs. The review team concludes that cumulative groundwater quality impacts would be SMALL.

9.3.3.3 Terrestrial and Wetland Resources

The parts of the site that would be developed are a mix of agriculture used for row crops and hay, old field, and young forest stands composed of green ash and early successional species such as cottonwood. The forested areas had been disturbed historically by farming or other land management activities. Species diversity in the understory and more open areas is low and composed largely of weedy nonnative plants (Detroit Edison 2011a).

The species of wildlife in the project vicinity is typical of partially urbanized areas in the region: whitetail deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginiana*), and various rodents. Various songbirds, raptors such as the red-tailed hawk (*Buteo jamaicensis*), and game birds such as ring-necked pheasant (*Phasianus colchicus*) use the site (Detroit Edison 2011a). Some amphibians and reptiles are probably present, but unusual species would not be expected due to the disturbed character of the area. Wildlife in the project area is limited by habitat diversity and the proximity of the site to industrial development.

The NWI identifies 37 wetlands on the site (Detroit Edison 2009b). NWI maps suggest a substantial area of wetlands, perhaps several hundred acres of mostly forested and scrub-shrub wetland. Several utility ponds onsite may have been abandoned for a sufficient period to be considered waters of the United States (Detroit Edison 2011a). The ponds are dominated by cattail (*Typha* sp.) and common reed (*Phragmites australis*) and could meet the criteria for regulation as waters of the United States if they have been abandoned for more than 5 years. If there are drainage ditch connections to the St. Clair River (a navigable water body under Section 10 of the Rivers and Harbors Act) that would be disturbed, the ditches also could be regulated. It is possible, but uncertain at this time, that other areas on this site contain wetlands, since most soils on the site are mapped as hydric soils (USDA 2010). A more definitive evaluation of possible wetland resources on the site would require a wetland delineation.

Two terrestrial species listed as threatened or endangered under the Endangered Species Act (ESA) are known to occur or could occur in St. Clair County. The eastern prairie fringed orchid

(*Platanthera leucophaea*) is Federally listed as endangered and is known mostly from lakeplain prairies around Saginaw Bay and western Lake Erie (MNFI 2007a). No lakeplain prairie habitat occurs on the site or in the surrounding area, but fallow agricultural fields with hydric soil are present and the orchid could occur there (MNFI 2007a). The Indiana bat (*Myotis sodalis*) is Federally listed as endangered. It occurs in southern Michigan when it is not hibernating (wintering) in caves and other hibernacula (wintering sites) located in southern Michigan and other states (MNFI 2007b). The bats generally require large trees (greater than 9-in. diameter) with exfoliating bark for summer roosting. According to the FWS (2009), however, trees as small as 5 in. in diameter should be considered as potential habitat. The emerald ash borer (*Agrilus planipennis*) is active in the project area (MDA 2009). Ash (*Fraxinus* spp.) trees onsite have died from the borer, creating the potential for dead trees with loose bark and resulting in potential roosting habitat for the Indiana bat.

The bald eagle (*Haliaeetus leucocephalus*) is no longer on the Federal endangered species list, although it is protected under the Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) (MNFI 2007c). The bald eagle was also recently removed from the State list of threatened and endangered species but is still considered a species of concern. Although bald eagles are known to occur in the region, they usually nest and roost closer to fish-bearing waters. The potential for any impacts on protected species appears to be minimal due to the type of habitat present.

More than 50 State-listed species occur in St. Clair County (see Table 9-10). Among the State-listed species is the eastern fox snake. Four other species formerly present in the county are presumed extirpated (locally extinct). Detroit Edison has not consulted with the MDNR on potential impacts on State-listed species that could result from siting the power plant at the Belle River-St. Clair site.

Building Impacts

Agricultural land, old field, and forest land would have to be cleared and converted to industrial use in order to build a new reactor and associated facilities at the Belle River-St. Clair site. According to Detroit Edison, the total area of the site would be approximately 1200 ac (Detroit Edison 2011a). Detroit Edison did not provide detailed data on the size of the areas or specific locations that would be used to build the power plant. Its conceptual plan layout (Detroit Edison 2009b), however, suggests that the permanently disturbed area could be as much as 95 ac, and the temporarily disturbed area could be as much as 200 ac. Conversion of agricultural land would have minimal impact on wildlife and habitat. Conversion of forested areas would have some impact on most of the common species present onsite by removing habitat used for shelter or other functions. Furthermore, NWI maps suggest that many of the forested areas on the site are wetlands. With the possible exception of the Indiana bat, adverse impacts on Federally listed species are not anticipated. The forested areas of the site have the potential to provide roosting, foraging, and breeding habitat for the Indiana bat in the form of

Table 9-10. Federally and State-Listed Terrestrial Species that Occur in St. Clair County and May Occur on the Belle River-St. Clair Site or in the Immediate Vicinity

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Amphibians			
Blanchard's cricket frog	*Acris crepitans blanchardi*	NL	T
Birds			
Cerulean warbler	*Dendroica cerulea*	NL	T
Common moorhen	*Gallinula chloropus*	NL	T
Common tern	*Sterna hirundo*	NL	T
Forster's tern	*Sterna forsteri*	NL	T
Henslow's sparrow	*Ammodramus henslowii*	NL	E
King rail	*Rallus elegans*	NL	E
Least bittern	*Ixobrychus exilis*	NL	T
Louisiana waterthrush	*Seiurus motacilla*	NL	T
Peregrine falcon	*Falco peregrinus*	NL	E
Red-shouldered hawk	*Buteo lineatus*	NL	T
Mammals			
Indiana bat	*Myotis sodalis*	E	E
Plants			
American chestnut	*Castanea dentata*	NL	E
Beak grass	*Diarrhena obovata*	NL	T
Beard tongue	*Penstemon calycosus*	NL	T
Bog bluegrass	*Poa paludigena*	NL	T
Broad-leaved sedge	*Carex platyphylla*	NL	E
Carey's smartweed	*Polygonum careyi*	NL	T
Chestnut sedge	*Fimbristylis puberula*	NL	PE
Creeping whitlow grass	*Draba reptans*	NL	T
Eastern prairie fringed orchid	*Platanthera leucophaea*	T	E
Few-flowered nut rush	*Scleria pauciflora*	NL	E
Frost grape	*Vitis vulpina*	NL	T
Gattinger's gerardia	*Agalinis gattingeri*	NL	E
Ginseng	*Panax quinquefolius*	NL	T
Goldenseal	*Hydrastis canadensis*	NL	T
Heart-leaved plantain	*Plantago cordata*	NL	E
Large toothwort	*Dentaria maxima*	NL	T
Large water starwort	*Callitriche heterophylla*	NL	T
Leiberg's panic grass	*Dichanthelium leibergii*	NL	T
Limestone oak fern	*Gymnocarpium robertianum*	NL	T
Narrow-leaved puccoon	*Lithospermum incisum*	NL	PE
Northern prostrate clubmoss	*Lycopodiella margueritae*	NL	T
Orange- or yellow-fringed orchid	*Platanthera ciliaris*	NL	E

Table 9-10. (contd)

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Painted trillium	*Trillium undulatum*	NL	E
Pine-drops	*Pterospora andromedea*	NL	T
Pink milkwort	*Polygala incarnata*	NL	PE
Prairie buttercup	*Ranunculus rhomboideus*	NL	T
Purple milkweed	*Asclepias purpurascens*	NL	T
Purple prairie clover	*Dalea purpurea*	NL	PE
Scirpus-like rush	*Juncus scirpoides*	NL	T
Short-fruited rush	*Juncus brachycarpus*	NL	T
Showy orchis	*Galearis spectabilis*	NL	T
Skinner's gerardia	*Agalinis skinneriana*	NL	E
Slough grass	*Beckmannia syzigachne*	NL	T
Spearwort	*Ranunculus ambigens*	NL	T
Stiff gentian	*Gentianella quinquefolia*	NL	T
Sullivant's milkweed	*Asclepias sullivantii*	NL	T
Three-awned grass	*Aristida longespica*	NL	T
White gentian	*Gentiana flavida*	NL	E
White goldenrod	*Solidago bicolor*	NL	E
White lady slipper	*Cypripedium candidum*	NL	T
Wild rice	*Zizania aquatica* var. *aquatica*	NL	T
Reptiles			
Eastern fox snake	*Pantherophis gloydi*	NL	T
Spotted turtle	*Clemmys guttata*	NL	T

Source: MNFI 2010a
(a) E = listed as endangered, NL = not listed, PE = presumed extirpated, T = listed as threatened.

dead ash trees. If the bat uses the areas that would be disturbed, impacts could be kept to minimal levels by limiting tree clearing to the times of year when the bats are not in the region.

The agricultural land is not likely to provide habitat for State-listed species. An additional study would be necessary to adequately assess potential impacts on State-listed species, including the eastern fox snake.

Detroit Edison's plan layout for the new reactor avoids disturbing any known wetlands on the site (Detroit Edison 2009b), although considering the prevalence of hydric soils on the site, the layout likely affects unmapped wetlands.

Detroit Edison's ER states that studies would be needed to determine whether more transmission capacity would have to be to be built for a new power plant at this site. It is likely, however, that a new transmission line would be necessary for a number of reasons. A reactor built on the Belle River-St. Clair site would still be expected to serve the same load centers as if it were at the Fermi site, and the existing non-nuclear power plants on the site would continue operating, resulting in a low likelihood that sufficient uncommitted carrying capacity remains on the existing lines.

No information was provided on where a possible transmission line would be routed, how long it would be, or what terrestrial ecological resources might be affected by development or operation of such a transmission line. It may be possible, however, that new transmission lines could share or adjoin an existing transmission line corridor for some of its length and might use existing substations, thereby resulting in less ecological impact than completely new corridors and substations. The vicinity of the Belle River-St. Clair site is largely agricultural, with some forested areas. A complete assessment would require defining a route and obtaining site-specific information about wildlife and habitat. It is likely that building a new transmission line on any route would require clearing trees from substantial areas of forested wetlands.

Operational Impacts

During plant operation, wildlife, including the eastern fox snake, would be subjected to increased mortality from traffic, but it is not expected that such effects would destabilize the local or regional populations of the common species of the site (Forman and Alexander 1998). Information about the local occurrence of important species and habitats would be needed to conduct a more complete assessment of potential project effects on those resources at the Belle River-St. Clair site.

Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of bird impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in bird mortality. Weather, such as low cloud ceilings, advancing fronts, and fog, also contribute to this phenomenon (NRC 1996).

There would be a potential for bird mortality from collisions with the nuclear power plant structures at this site. Typically, the cooling tower and the meteorological tower are the structures likely to pose the greatest risk. The potential for bird collisions increases as structure heights and widths increase. MDCTs are of little concern because of their relatively low height compared with existing and proposed structures onsite. An NDCT, however, would be on the order of 600 ft high. Nonetheless, the NRC concluded that effects of bird collisions with existing cooling towers “involve sufficiently small numbers for any species that it is unlikely that the losses would threaten the stability of local populations or would result in a noticeable impairment of the function of a species within local ecosystems” (NRC 1996). Thus, the impacts on bird populations from collisions with the cooling tower are expected to be minimal.

Impacts of the transmission system on wildlife (e.g., bird collisions and habitat loss) resulting from the addition of new lines and towers cannot be fully evaluated without additional information on the length and location of any new transmission facilities. Nonetheless, Section 4.5.6.2 of the GEIS for license renewal (NRC 1996) provides a thorough discussion of the topic and concludes that bird collisions associated with the operation of transmission lines would not cause long-term reductions in bird populations. The same document also concludes that once a transmission corridor has been established, the impacts on wildlife populations from continued transmission line corridor maintenance are not significant (NRC 1996).

Other potential impacts associated with transmission line operation would consist of habitat loss due to corridor maintenance, noise, and electromagnetic field (EMF) effects on flora and fauna.

ITC*Transmission* operates in accordance with industry standards for vegetation management (NERC 2010), including seasonal restriction on activities that could adversely affect important wildlife (Detroit Edison 2010a). According to ITC*Transmission*'s vegetation management policy, wetland areas within the corridor would be manually cleared of woody vegetation periodically for line safety, thereby keeping them in a scrub/shrub or emergent wetland state (ITC*Transmission* 2010). Other forested areas would be managed similarly to prevent tree regrowth that could present safety or transmission reliability problems. Access to these areas for maintenance would likely be on foot or by the use of matting for vehicles so as not to disturb the soil. Pesticides or herbicides would be used only occasionally in specific areas where needed. It is expected that the use of such chemicals in the transmission line corridor would be minimized to the greatest extent possible in wetland areas to protect these important resources (Detroit Edison 2010a). The impacts associated with corridor maintenance activities are loss of habitat, especially forested habitat, from cutting and herbicide application. The maintenance of transmission line corridors could be beneficial for some species, including those that inhabit early successional habitat or use edge environments. Detroit Edison provided no data on noise for the possible new reactor on the Belle River-St. Clair site, but it is likely that impacts would be minimal and similar to those of the Fermi 3 project.

EMFs are unlike other agents that have adverse biological impacts (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NIEHS 2002). A review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NIEHS 2002). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes (NIEHS 2002). Thus, impacts of EMFs from transmission systems with variable numbers of power lines on terrestrial flora and fauna are of small significance at operating nuclear power plants (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2007). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2007). A review of the literature on health effects of electric and magnetic fields conducted for the Oregon Department of Energy looked at the effects of strong electric and magnetic fields on various bird species. While some studies concluded that some species of birds exhibited changes in activity levels and some physiological metrics, no studies demonstrated adverse effects on health or breeding success (Golder Associates, Inc. 2009).

Cumulative Impacts

Several past, present, and reasonably foreseeable projects could affect terrestrial resources in ways similar to siting a new reactor at the Belle River-St. Clair site (see Table 9-9). The geographic area of interest for the following analysis is defined by a 25-mi radius extending out from the site

Past projects include, among others, the Belle River and St. Clair Power Plants, which are major coal-fired generating facilities belonging to Detroit Edison that occupy hundreds of acres on the east side of the site bordering the St. Clair River. Future activities in the region that could noticeably contribute to wildlife and habitat impacts in the geographic area of interest include the proposed Suncor Ethanol Projects in Sarnia and St. Clair Townships, Ontario, Canada; the proposed Northern Ethanol, Inc. facility in Sarnia, Ontario; and future urbanization in the region. Although information on the area of land that would be converted to industrial and urban use is lacking, it is reasonable to conclude that such area would be substantial.

Urbanization would likely result in conversion of agricultural land, forest land, wetlands, and other habitat to urban uses. Urbanization would involve some of the same activities as building a new reactor, including land clearing and grading (temporary and permanent), increased human presence, heavy equipment operation, traffic (including resulting wildlife mortality), noise from construction equipment, and fugitive dust. Some of the effects of these activities, such as noise and dust, are short term and localized. The cumulative impacts of noise and dust from building a new reactor would be brief and negligible. Other effects, such as clearing wildlife habitat that will not be restored, would be permanent. The effects of urbanization of land clearing and grading, filling of wetlands, increased human presence, and increased traffic would occur over a period of several years and in several locations.

Development of new energy facilities could result in increased employment and population within the geographic area of concern, which, in turn, could indirectly result in additional urbanization. Given the current populations of St. Clair County, Michigan, and Lambton County, Ontario, approximately 164,000 and 127,000, respectively, the additional impacts on ecological resources from urbanization indirectly resulting from a new nuclear power plant at the Belle River-St. Clair site and reasonably foreseeable projects are expected to be minor.

Summary of Impacts on Terrestrial and Wetland Resources at the Belle River-St. Clair Site

Impacts on terrestrial ecological resources and wetlands were estimated based on the information provided by Detroit Edison and the review team's independent review. Impacts at this site combined with past, present, and reasonably foreseeable future activities in the geographic area of interest are expected to be noticeable. Based on the conceptual layout (Detroit Edison 2009b), the permanently disturbed area could be as much as 95 ac and the temporarily disturbed area could be as much as 200 ac. Most of the project area is currently used for row crops and hay and provides relatively low wildlife habitat value. After construction and preconstruction at the site, habitat in temporarily disturbed areas would be expected to naturally regenerate. Wildlife would also recover but might not use the regenerated habitat to the same degree. Permanently disturbed areas would be converted to industrial use for the indefinite future. However, the presence of hydric soils on the site suggests that substantial impacts to wetlands might be unavoidable. Because the review team has no definitive information on the routing and length of a new transmission corridor, it cannot definitively evaluate impacts.

The review team concludes that the cumulative impacts on terrestrial ecological resources would be MODERATE for a new reactor at the Belle River-St. Clair site. Building and operating a new nuclear unit at the Belle River-St. Clair site would be a significant contributor to the MODERATE impact.

9.3.3.4 Aquatic Resources

Aquatic habitats associated with the Belle River-St. Clair site include 37 onsite wetlands, several small utility ponds, the St. Clair River, and the Belle River (Section 9.3.3.2). No information was available regarding the aquatic organisms in the onsite wetlands and utility ponds, and surveys would be needed to characterize the aquatic communities present. However, a variety of aquatic macroinvertebrates such as mayflies, stoneflies, caddisflies, isopods, and chironomids are likely to be present, along with fish common to Great Lakes coastal habitats such as sunfishes (Family Centrarchidae), shiners (Family Cyprinidae), suckers (Family Catostomidae), and catfish (Family Ictaluridae) (Bolsenga and Herdendorf 1993).

The St. Clair River, which connects Lake Huron with Lake St. Clair, would likely serve as the source of cooling water intake and discharge for a new reactor on the Belle River-St. Clair site. The St. Clair River is 44 mi long and 833 ft to 3000 ft wide and is east of the site. Surface water quality in the St. Clair River is currently considered moderate to poor (see Section 9.3.3.2). The two existing power plants on the site (Belle River Power Plant and St. Clair Power Plant) employ once-through cooling systems, use the St. Clair River as a source of cooling water, and also discharge heated effluent into the river (Section 9.3.3.2).

Other aquatic habitats in the vicinity of the Belle River-St. Clair site include the Belle River, a tributary of the St. Clair River that drains approximately 2525 mi^2 of land. Impacts on the Belle River from preconstruction, construction, and operations of a new reactor are expected to be minimal because the land area that would be affected by reactor construction would be located approximately 1 mi northeast of the Belle River and no water would be withdrawn from or discharged into the Belle River.

Approximately 18 mi downstream of the Belle River-St. Clair site, the St. Clair River terminates in the St. Clair River delta on the northern shore of Lake St. Clair. The St. Clair River delta is one of the most diverse and productive wetlands in the Midwest (Wildlife Habitat Council 2002). Aquatic habitats located within the St. Clair River and its tributaries include coastal marsh, bogs, fens, and swamps. Submerged macrophytes are the dominant primary producers within the St. Clair River, and they provide critical food and habitat for higher trophic levels. Beds of aquatic vegetation are particularly extensive at the St. Clair River delta. Mussels, crayfish, leeches, and aquatic insect larvae are common benthic invertebrates. Historically there was a high diversity of freshwater mussels within the St. Clair River drainage (Wildlife Habitat Council 2002).

There are 116 species of fish known to occur in the St. Clair River and its tributaries (Wildlife Habitat Council 2002). Common forage species include gizzard shad (*Dorosoma cepedianum*), killifish (*Fundulus* spp.), sticklebacks, rainbow smelt (*Osmerus mordax*), and alewife (*Alosa pseudoharengus*). Centrachids, catfish, yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), pike and muskellunge (*Esox* spp.) and freshwater drum (*Aplodinotus grunniens*) are commercial or recreationally important species. The river also serves as an important corridor for migratory fishes such as lake sturgeon (*Acipenser fulvescens*) and several species belonging to the families Salmonidae and Clupeidae (Wildlife Habitat Council 2002). Some of the primary introduced aquatic nuisance fish species include the common carp (*Cyprinus carpio*) and round goby (*Neogobius melanostomus*) (Wildlife Habitat Council 2002).

Federally and State-Listed Threatened and Endangered Species

No Federally listed threatened or endangered aquatic species is known to occur in St. Clair County (FWS 2010). However, the rayed bean (*Villosa fabalis*) and snuffbox mussel (*Epioblasma triquetra*), which are present in St. Clair County in the Belle River, are proposed for Federal listing as endangered (FWS 2010; 75 FR 67552) and are listed as endangered by the State of Michigan (Carman 2001b). There are no designated critical habitats for any listed species in the vicinity of the Belle River-St. Clair site. In the St. Clair River and Belle River within St. Clair County, there are seven State-listed species of fish and six State-listed mussel species (Table 9-11). The St. Clair River provides suitable habitat for all seven fish species, and all seven are known to occur in the St. Clair or Belle River (Carman and Goforth 2000a; Carman 2001a; Derosier 2004a, b, c, d; Goforth 2000). The St. Clair River contains significant spawning grounds for lake sturgeon (Goforth 2000) and is the only river in Michigan for which

Table 9-11. Federally and State-Listed Threatened and Endangered Aquatic Species That Are Known to Occur in St. Clair County and That May Occur on the Belle River-St. Clair Site or in the St. Clair River and Belle River

Common Name	Scientific Name	Federal Status[a]	State Status[b]
Fish			
Channel darter	*Percina copelandi*	NL	E
Eastern sand darter	*Ammocrypta pellucida*	NL	T
Lake sturgeon	*Acipenser fulvescens*	NL	T
Mooneye	*Hiodon tergisus*	NL	T
Northern madtom	*Noturus stigmosus*	NL	E
Pugnose shiner	*Notropis anogenus*	NL	E
Sauger	*Sander canadensis*	NL	T
Invertebrates			
Eastern pondmussel	*Ligumia nasuta*	NL	E
Pink papershell	*Potamilus ohiensis*	NL	T
Rayed bean	*Villosa fabalis*	PE	E
Slippershell	*Alasmidonta viridis*	NL	T
Snuffbox mussel	*Epioblasma triquetra*	PE	E
Wavyrayed lampmussel	*Lampsilis fasciola*	NL	T

(a) Federal status rankings determined by the FWS under the Endangered Species Act; NL = not listed, PE = proposed endangered. Source: FWS 2010.

(b) State species information provided by MNFI (2010b); E = endangered, T = threatened.

there are recent records of mooneye (*Hiodon tergisus*) and sauger (*Sander canadensis*) (Derosier 2004a, b). Historical or recent records indicate that the wavyrayed lampmussel (*Lampsilis fasciola*), rayed bean, slippershell (*Alasmidonta viridis*), and snuffbox mussel are present or potentially present in the Belle River (Carman and Goforth 2000b; Carman 2001b; Stagliano 2001a; Carman 2002b; 75 FR 67552). Rayed bean, snuffbox mussel, and slippershell are potentially present in large rivers like the St. Clair. The eastern pondmussel (*Ligumia nasuta*) can be found in ponds, lakes, and streams (Mulcrone 2006a). The pink papershell (*Potamilus ohiensis*) is usually found in rivers and large streams (Mulcrone 2006b). Therefore, suitable habitat for both species may exist in the St. Clair River and Belle River.

Building Impacts

Impacts on aquatic habitats and biota on the Belle River-St. Clair site and on the St. Clair River could result from building the new reactor, associated transmission lines, and the cooling water intake pipeline. As identified in Section 9.3.3.1, the area of the site that would be developed if the site was chosen for a new reactor facility consists primarily of agricultural land and woodland. The expected building location is adjacent to wetland areas, but there are no streams or ponds located directly within the construction footprint. Building a new cooling water intake and discharge pipeline would have the potential to affect aquatic habitat present along the pipeline corridor and could require dredging, pile driving, and other alterations to the shoreline and benthic habitat of the St. Clair River, potentially resulting in sedimentation, noise, turbidity, sediment removal, and accidental releases of contaminants. See Section 4.3.2 for a detailed description of potential impacts of construction activities on aquatic habitat and biota. The impacts on aquatic organisms would likely be temporary and largely mitigable through the use of BMPs. Preconstruction activities within the St. Clair River would require Section 10 and 404 permits from the USACE, as well as a separate permit from the MDEQ, and these permits would likely contain stipulations that would further reduce impacts. Overall, the impact of building the cooling water intake and discharge structures on aquatic resources would be minor.

As described in Section 4.3.2, building activities at the location of the new reactor, including an increase in impervious surface, vegetation removal, site grading, and dewatering, would have the potential to affect water quality and hydrology, and therefore aquatic biota in wetlands and ponds located in the vicinity. Stormwater runoff could carry soil as well as contaminants (e.g., spilled fuel and oil) from construction equipment into wetlands and ponds located onsite. Construction of the new reactor would not occur adjacent to the Belle River or the St. Clair River, making it unlikely that there would be effects of reactor facility construction on aquatic resources in these areas.

It is possible that the transmission line for a new reactor at the Belle River-St. Clair site could use existing substations and share or adjoin an existing transmission line corridor for some of its length. If so, building-related impacts on aquatic resources would be minimal. If a new transmission line is needed to service a new reactor at this site, there is the potential for the construction-related impacts described above to affect aquatic habitat and aquatic biota if the new transmission line passed near or crossed a surface water feature. Expansion of existing corridors would be expected to result in minor environmental impacts, while establishing new corridors could result in greater impacts. However, assuming required construction permits would be obtained from MDEQ and/or USACE and appropriate BMPs were implemented during building activities, the impacts on aquatic resources from development of additional transmission facilities would be temporary, easily mitigated, and minor.

NPDES and stormwater construction permits would stipulate the application of BMPs and other mitigation to reduce impacts on the St. Clair River and onsite wetlands and ponds resulting from the construction of a new reactor facility and cooling water intake structures. Adhering to appropriate BMPs would reduce the potential for sediments to enter surface water. Detroit Edison's suggested layout for a new reactor at the alternative Belle River-St. Clair site avoids disturbing any wetlands or water bodies on the site (Detroit Edison 2009b) and is located approximately 1 mi or more from the Belle River and St. Clair River, further reducing the potential for impacts on aquatic biota.

New reactor and transmission line construction is not expected to result in impacts on Federally or State-listed species, given the lack of suitable habitat at the reactor location and the use of BMPs to minimize potential construction-related impacts. However, threatened and endangered fish and mussels found in the St. Clair River may be affected by benthic disturbance associated with the building of cooling water intake and discharge structures. Threatened and endangered mussels potentially present in the St. Clair River include the eastern pondmussel, pink papershell, slippershell, and snuffbox mussel. As discussed above, the rayed bean is not likely to be present. Additional information would need to be collected and surveys may need to be conducted to evaluate the potential for threatened and endangered mussel species to be present in areas of the St. Clair River that would be disturbed by building activities. If threatened or endangered mussels were found, it is likely that mitigation measures would need to be developed to limit potential impacts. Habitat for State-listed fish species could be disturbed by shoreline and in-water construction activities. However, fish are highly mobile and would likely avoid the affected areas during construction. On the basis of this information and because construction and preconstruction activities would be temporary and largely mitigable, the review team concludes that impacts on threatened and endangered aquatic species would be minor.

Operational Impacts

Operational impacts on aquatic resources could result from water withdrawal from the St. Clair River, impingement and entrainment of aquatic biota by the cooling water system, transmission line and cooling water system maintenance, and alteration of water quality due to cooling water discharge.

Operational cooling water requirements would be the major water demand of a new reactor on the St. Clair River. Detroit Edison has indicated a closed cycle recirculating cooling system would be used, which could reduce water use by 96 to 98 percent of the amount that the facility would use if it employed a once-through cooling system (66 FR 65256). Assuming that cooling water needs would be similar to those identified for the proposed Fermi 3 Unit, approximately 34,000 gpm, or 49 MGD, would be needed (Detroit Edison 2011a). The daily flow in the St. Clair River is adequate to support the closed cycle cooling system and meet the EPA CWA Section 316(b) Phase I proportional flow requirements for withdrawal of water from a river. Therefore the incremental impact from operating a new power plant at the Belle River-St. Clair site would be minor (see Section 9.3.3.2, Water Use and Quality). Consequently, the hydrologic impacts on aquatic habitat in the St. Clair River from water withdrawal should be minimal.

Maintenance dredging of the water intake is necessary to maintain appropriate operating conditions for cooling water intake. Such dredging would likely be managed under permits from USACE and MDEQ and result in temporary localized increase in turbidity in the vicinity of the intake bay. Dredged material is expected to be disposed of in a spoil disposal pond, where sedimentation would occur prior to discharge of the water back into the St. Clair River. The periodic dredging of the intake bay, which would likely be similar to existing maintenance dredging activities for the existing power plants on the site, would result in minor impacts on aquatic biota and habitats in the St. Clair River.

Impingement and entrainment of organisms from the St. Clair River would be the most likely way in which populations of aquatic biota could be affected by operations of a new reactor at the Belle River-St. Clair site. Particularly vulnerable are early life stages (eggs and larvae), which lack the ability to overcome intake suction and which are small enough to pass through the mesh of the intake screens. As discussed above, the St. Clair River contains a diverse aquatic biota and provides spawning habitat for several important aquatic species, particularly in the St. Clair River delta. However, the St. Clair River delta is approximately 18 mi downstream of the site, which would greatly reduce the potential for fish eggs, larvae, and juveniles to be entrained by the water intake system. A study of larval fish entrainment from the St. Clair River power station found that during spring and summer rainbow smelt, fourhorn sculpin (*Myoxocephalus quadricornis*), silver chub (*Macrohybopsis storeriana*), yellow perch, common white sucker (*Catostomus commersonii*), logperch (*Percina caprodes*), trout-perch (*Percopsis omiscomaycus*), burbot (*Lota lota*), and goldfish (*Carassius auratus*) were entrained, with rainbow smelt accounting for approximately 96 percent of the individuals; fourhorn sculpin and silver chub each accounted for less than 2 percent of individuals (Leslie et al. 1979). Historically, larval walleye have also been entrained in great numbers by the St. Clair River Power Plant (Wapora, Inc. 1978). The closed cycle recirculating cooling system proposed by Detroit Edison would reduce water withdrawal, thereby decreasing the impingement and entrainment of organisms (Section 5.3.2). Assuming a closed cycle cooling system that meets the EPA's CWA Section 316(b) Phase I regulations for new facilities (66 FR 65256), the anticipated impacts on aquatic populations from entrainment and impingement are expected to be minimal.

Discharge would include warm cooling tower blowdown, treated process wastewater, and processed radwaste wastewater, all of which could affect aquatic biota through mortality or sublethal physiological, behavioral, and reproductive impairment (see Section 5.3.2). In addition, aquatic organisms could be affected by cold shock and the scour of benthic habitat in the vicinity of the discharge ports (see Section 5.3.2). Mixing and the high flow rate of the St. Clair River would likely limit impacts on downstream surface waters from the cooling water discharge. Proposed design features such as the presence of riprap around the submerged discharge port and orientation of the discharge ports in an upward direction are intended to reduce scouring (Detroit Edison 2011a). As identified in Section 9.3.3.2, a NPDES permit from the MDEQ would be required for discharges from a new nuclear power plant at the Belle River-St. Clair site. Such a permit would specify limits for chemical and thermal discharges in order to protect water quality, thereby limiting the potential for impacts on aquatic organisms. As identified in Section 9.3.3.2, the high flow rate of the St. Clair River and associated mixing would limit the influence of chemical and thermal discharges on downstream surface water bodies.

Assuming that NPDES permitting requirements are met, the impacts of discharges on aquatic habitats and biota would be minor.

At the Belle River-St. Clair site, impacts on aquatic resources from operation of a new reactor may include those associated with maintenance of new and existing transmission line corridors. ITC*Transmission* would be expected to construct and operate any new transmission line needed for a new reactor at the Belle River-St. Clair site, and it is assumed that it would follow existing maintenance practices designed to minimize impacts on wetlands, such as minimizing disturbance to riparian habitat and minimizing the application of pesticides and herbicides, which can enter aquatic habitat and adversely affect aquatic biota (Detroit Edison 2010a). As a result, impacts on aquatic habitats and biota from maintenance of transmission lines would likely be minor.

There is no suitable habitat for threatened and endangered mussels near the location of the reactor, but several of the species, including the rayed bean and the snuffbox mussel (both proposed for Federal listing as endangered) and the State-listed eastern pondmussel, the pink papershell, and the slippershell, are potentially found in the St. Clair River, and may therefore be vulnerable to cooling water intake and discharge operational impacts. As eggs, mussels are not likely to be affected by system operation, because they are not free-floating but rather develop into larvae within the female. The glochidial stage, during which juvenile mussels attach to a suitable fish host, is vulnerable indirectly through host impingement and entrainment. Hosts for the slippershell (johnny darter [*Etheostom anigrum*], mottled sculpin [*Cottus bairdii*]), snuffbox mussel (logperch), and rayed bean (largemouth bass [*Micropterus salmoides*]) are present in the St. Clair River and could be impinged during reactor operations. Post-glochidial and adult stages of mussels are not likely to be susceptible to entrainment or impingement because they bury themselves in sediment.

The channel darter (*Percina copelandi*) and eastern sand darter (*Ammocrypta pellucida)* are unlikely to be entrained because they bury themselves in sediment and remain near the bottom. Lake sturgeon are known to spawn in the St. Clair River near the opening into Lake St. Clair approximately 18 mi downstream of the site, and eggs or young of the State-listed mooneye and sauger could be present in the St. Clair River. A closed cycle cooling system for a new reactor on the Belle River-St. Clair site would withdraw river water at a maximum rate of 34,264 gpm, as discussed in Section 3.2.2.2. Compared to the average river flow of 121,000 MGD, this represents only 0.04 percent of the flow of the St. Clair River, and therefore early life stages of these species are not likely to be entrained or impinged in sufficient numbers to cause population-level effects.

Cumulative Impacts

For the cumulative analysis of impacts on aquatic resources, the geographic areas of interest for the Belle River-St. Clair reactor are the St. Clair River (which connects Lake Huron with Lake

St. Clair) and Lake St. Clair, because these are the areas potentially affected by a new reactor. Past, present, and reasonably foreseeable projects, facilities, and other environmental changes that contribute to cumulative impacts on aquatic resources in this area of interest are existing power plants on the St. Clair River (including the Belle River Power Plant and the St. Clair Power Plant on the Belle River-St. Clair site); ethanol production facilities in Ontario, Canada; and future urbanization in the region. In addition, aquatic resources in the region have been greatly affected by ecosystem changes from introduced dreissenid mussels (*Dreissena* spp.) and recreational and commercial fishing.

As discussed above, potential building-related impacts on aquatic habitat and biota could result from altered hydrology, erosion, and stormwater runoff of soil and contaminants and disturbance or loss of benthic habitat from construction of the reactor, associated transmission lines, and water intake and discharge system. The additional impacts on aquatic resources from building new ethanol plants would be minimal due to the small areas that would be developed and the distance to the Ontario sites. Urbanization can affect aquatic resources by increasing the impervious surface, non-point-source pollution and water use, and by altering riparian and in-stream habitat and existing hydrology patterns. Development of a new reactor on the Belle River-St. Clair site and the other projects in the region could result in some increased population and additional urbanization with subsequent impacts on aquatic resources.

The primary operational impacts on aquatic habitat and biota could result from impingement and entrainment of aquatic biota during cooling water intake, makeup water needs, transmission line maintenance, and alteration in water quality from cooling water discharge. Impingement and entrainment of aquatic biota from the St. Clair River due to a new reactor must be considered along with mortality resulting from existing power plants that already withdraw water from the St. Clair River, commercial and recreational fishing, and introduced zebra mussels (*Dreissena polymorpha*) and quagga mussels (*D. rostriformis*), which have dramatically reduced plankton abundance in the region.

The St. Clair River would be sufficient to support the makeup water needs of a new reactor in addition to the cooling water needed by existing U.S. and Canadian power plants and other projects listed in Table 9-9. However, as described in Section 7.2.1, the effect of climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. If such a reduction in surface water were to occur, some aquatic habitat on the reactor site and in the St. Clair River may be altered with potentially adverse consequences for aquatic habitat and biota.

Discharges into the St. Clair River from a new nuclear power plant at the Bell River-St. Clair site must be considered along with discharges into the St. Clair River from the other projects identified in Table 9-9. NPDES permits would limit both chemical and thermal discharges into the St. Clair River. However, if climate change results in reduced water levels and increased water temperatures, impacts associated with contaminant concentrations and thermal stress from cooling water discharge into the St. Clair River could also increase. As identified in Section 9.3.3.2, the overall, cumulative surface water quality impacts associated with a new nuclear power plant at the Belle River-St. Clair site together with predicted climate change and other past, present, and reasonably foreseeable actions in the region are expected to be moderate. However, the construction and operation of a new nuclear power plant at the Belle River-St. Clair site is not expected to contribute significantly to the overall cumulative impacts on water quality in downstream surface water bodies (Section 9.3.3.2). Consequently, the incremental contribution of a new reactor at the Belle River-St. Clair site to cumulative impacts on aquatic biota from water quality changes due to operational discharges would be minor.

Based on its evaluation, the review team concludes that the cumulative impacts on aquatic resources, including threatened and endangered species, could be substantial due to the continued inadvertent introduction of invasive species, overfishing, and increased urbanization resulting in further degradation of water quality, and global climate change. The incremental impact from building and operating a new power plant at the Belle River-St. Clair site would not contribute significantly to the overall cumulative impacts in the geographic area of interest.

Summary of Impacts on Aquatic Resources at the Belle River-St. Clair Site

Impacts on aquatic habitats and associated biota within onsite ponds and wetlands and the St. Clair River could result from reactor, transmission line, and cooling water intake preconstruction and construction activities. However, the impacts on aquatic organisms would be temporary and could be largely mitigated by avoiding aquatic habitats during siting of facilities and activity areas and through the use of BMPs during preconstruction and construction.

Operational impacts on aquatic resources could result from cooling water withdrawal from the St. Clair River, impingement and entrainment of aquatic biota by the cooling water system, transmission line and cooling water system maintenance, and alteration of water quality by cooling water discharge. Impingement and entrainment would add to existing mortality sources for aquatic biota such as invasive species, commercial and recreational fishing, and the operation of other power plants using water from or discharging to the St. Clair River.

Impingement and entrainment of aquatic organisms in the St. Clair River would be minimized by complying with EPA's CWA Section 316(b) Phase I regulations. The St. Clair River could support the makeup water needs of a new reactor. However, climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. Similarly, while a NPDES permit would limit both chemical and thermal discharges from the Belle River-St. Clair reactor, climate change has the potential to increase impacts of the discharges on aquatic communities. Transmission line and cooling water pipeline maintenance impacts on aquatic habitat and biota could be minimized by implementing BMPs.

Although there is no suitable habitat that is likely to be present near the reactor location, State-listed fish and mussels may be present in the St. Clair River and could be vulnerable to benthic disturbance associated with the building of the cooling water intake and discharge system. State-listed mussels could be surveyed and translocated prior to construction of the intake and discharge structures. The State-listed darters are unlikely to be entrained because they occupy benthic habitats. Although lake sturgeon, mooneye, and sauger could be more vulnerable to entrainment and impingement, the use of closed cycle cooling and a properly designed intake structure would significantly reduce potential losses and population-level effects would be minor.

The review team's conclusion, based on information provided by Detroit Edison and the review team's independent evaluation, is that the impacts on aquatic resources, including threatened or endangered species, from the Belle River-St. Clair reactor considered with cumulative impacts from other activities and climate change would be MODERATE. Building and operating a new nuclear unit at the Belle River-St. Clair alternative site would not be a significant contributor to the overall cumulative impact.

9.3.3.5 Socioeconomics

The economic impact area for the Belle River-St. Clair site is St. Clair County. The site is located in St. Clair County, approximately 8 mi south of Port Huron and approximately 1 mi west of the international border crossing at Port Huron/Sarnia, Canada. St. Clair County is also part of the Detroit-Warren-Livonia MSA, which encompasses nine principal cities over a six-county area, the core of which is the City of Detroit, which is approximately 35 mi southwest of the site.

Because of the geographical location of the plant, members of the workforce that would be drawn from the region may live in Canada or elsewhere within the Detroit-Warren-Livonia MSA. However, the review team expects that most of the in-migrating construction and operations workers would likely relocate in or near the City of Port Huron, which is near the plant, has the highest population base, and would have the most housing and other amenities relative to the rest of the primarily rural region. Impacts beyond St. Clair County are not likely to be significant in any single jurisdiction, because the number of in-migrating workers within any single jurisdiction outside of St. Clair County would be minor. Therefore, this analysis focuses on St. Clair County.

Physical Impacts

Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics. Because the physical impacts of building and operating a nuclear power plant are very similar between the proposed site and the alternative sites, the review team determined that, as assessed for the Fermi 3 site, all physical impacts related to the Belle River-St. Clair site would be minor. See Sections 4.4.1 and 5.4.1 for a detailed discussion of physical impacts for Fermi 3.

Demography

The Belle River-St. Clair site is partially within the China Charter Township and partially within East China Charter Township. Port Huron, approximately 8 mi north of the Belle River-St. Clair site, is the largest population center in the county. Other large population areas are those immediately surrounding Port Huron, including the City of Marysville and the Townships of Fort Gratiot, Port Huron, and Kimball. Historically, St. Clair County's population has been concentrated along the coast, including within Port Huron, Marysville, St. Clair, and Marine City. Table 9-12 provides the 2000 Census population, the U.S. Census Bureau's (USCB's) 2008 population estimate, and the projected 2020 population for the largest population areas in St. Clair County.[(a)]

Table 9-12. Demographics for St. Clair County and Local Jurisdictions

	Population		
County/City/Township	**2000 Actual**	**2008 Estimate**	**2020 Projected**
St. Clair County	164,235	168,894	180,294
City of Port Huron	32,338	30,869	31,402
City of Marysville	9684	9943	10,820
Fort Gratiot Township	10,691	10,998	12,743
Port Huron Township	8615	10,691	11,995
Kimball Township	8628	9410	10,066

Source: The 2020 projections are provided by SEMCOG (2008). The 2000 data for all areas are from the 2000 Census of Population and Housing. The 2008 estimates are from the USCB Population Estimates Program (USCB 2009a), which also includes the 2000 data from the 2000 Census of Population and Housing.

Between 2000 and 2008, the population in St. Clair County grew by approximately 3 percent. Most of the growth occurred in the City of Marysville and townships surrounding the City of Port Huron, while the population of Port Huron declined. These jurisdictions are also where future growth in the county is expected (LSL Planning Inc. undated).

Detroit Edison estimates that the size of the construction workforce needed for the nuclear power plant over a 10-year construction period would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, and that the average size of the onsite workforce

(a) During the preparation of this draft EIS, the results of the mandated U.S. decadal census for 2010 were being released in topical and regional data sets. While the U.S. Census Bureau has not issued all the data sets in final form, some of the preliminary information was considered by the review team. While some of the final data sets were released for national scale information, most of the fine-scale information is still under review by the Department of Commerce and other Federal agencies. The review team is not aware of information that appears to be inconsistent with the earlier information sets and those sets projected from the earlier census.

during the 10-year construction period would be approximately 1000 workers (Detroit Edison 2011a).

The review team's assumptions for in-migrating and local workers are similar to those for the Fermi 3 plant site. Although the plant is located in a primarily rural county, it is also within commuting distance of highly urbanized areas (i.e., within a 50-mi radius of the plant). St. Clair County is within the Detroit-Warren-Livonia MSA, and the City of Detroit is approximately 35 mi southwest of the plant. The City of Flint, Michigan, is slightly beyond the 50-mi radius of the site, but is still within a reasonable commuting distance to the plant, approximately 60 mi. Therefore, for comparative purposes between analyses of site alternatives, the review team based this analysis upon the assumptions presented in Section 4.4.2 of this EIS, with approximately 85 percent of the construction workforce drawn from within a 50-mi region or more of the plant, and 15 percent of the construction workforce (approximately 435 workers during the peak construction and 150 workers on an average annual basis) expected to relocate within the 50-mi radius of the project site.

If the facility were to be built at the Belle River-St. Clair site and operations commenced, Detroit Edison expects an operations workforce of 900 workers in 2020 (Detroit Edison 2011a). For reasons similar to those presented for the Fermi 3 site in Section 2.5 of this EIS, the review team determined that based on the analysis of impacts presented in Section 5.4.2, approximately 70 percent of the operations workforce would be drawn from the region within 50 mi of the plant, and 30 percent of the operations workforce (approximately 270 workers) would relocate within a 50-mi radius of the project site.

Using an average household size of 2.6 persons, based on the national average household size in the USCB's 2008 population estimate, the total in-migrating population during the peak construction period is estimated to be approximately 1131 persons, and less during periods of non-peak construction. The projected population increase associated with the in-migrating operations workers is estimated to be 702 persons.

If all the in-migrating construction workers and their families settled in St. Clair County for the 2-year peak construction period, the projected increase would be less than 1 percent of the projected 2020 population for the county. Demographic impacts during periods of non-peak employment construction would be smaller. The in-migrating construction workers and their families would likely settle in various cities and townships throughout the county, and the population effects are expected to be minimal. The projected population increase for the operations workforce would be smaller than that projected for the peak construction employment period and would also be less than 1 percent of the projected 2020 population for the county.

Given the small number of in-migrating workers compared to the projected 2020 population for St. Clair County, the review team concludes that the demographic impact during peak construction and operation would be minor.

Economic Impacts on the Community

Economy

There were 73,888 employed workers in St. Clair County in 2008 (USBLS 2009) (see Table 9-13). Its unemployment rate increased from 4.2 percent in 2000 to 10.5 percent in 2008. Unemployment has continued to increase, with an annual unemployment rate of 17.5 percent in 2009 (USBLS 2010). Approximately 22 percent of the workforce is employed in manufacturing, and 21 percent is employed in educational services, health care, and social assistance (USCB 2009b). Approximately 14 percent is employed in retail trade, and 9 percent is employed in construction. Tourism and manufacturing are large components of St. Clair's economy (St. Clair County Metropolitan Planning Commission 2009). The Blue Water Bridge international crossing at Port Huron/Sarnia is the third-busiest border crossing in the country. St. Clair's manufacturing base consists primarily of suppliers of plastics and rubber to the automotive industry, although other manufacturing establishments, including paper, fabricated metal and metal parts, and machinery, are also located in St. Clair County (St. Clair County Metropolitan Planning Commission 2009). In 2000, approximately 36 percent of St. Clair County's workers lived in the county and commuted to work outside of the county. The four largest employers in St. Clair County in 2008 were Port Huron School District, with approximately 1462 employees; Port Huron Hospital, with approximately 1057 employees; Detroit Edison, with approximately 1044 employees; and the K-Mart Corporation, with approximately 850 employees (St. Clair Administrator/Controller's Office 2009).

Table 9-13. Labor Force Statistics for St. Clair County (2000 and 2008)

	St. Clair County	
	2000	**2008**
Total labor force	87,071	82,548
Employed workers	83,383	73,888
Unemployed workers	3688	8660
Unemployment rate	4.2	10.5

Source: USBLS 2009

The economy of St. Clair County would benefit over the estimated 10-year construction period through direct purchase of materials and supplies and direct employment of the construction workforce. Detroit Edison estimates the size of the construction workforce would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, with an average annual onsite construction workforce of 1000 workers. The review team estimates that based on an average salary of $50,500, approximately $50.5 million would be expended directly in payroll annually during the construction period.

When the plant becomes operational, Detroit Edison expects direct employment to be 900 full-time and contract employees. In addition, Detroit Edison estimates 1200 to 1500 workers would be employed during scheduled maintenance outages, which would occur every 24 months and require workers for a period of about 30 days. Based on an average salary estimate of $63,625, approximately $57.3 million would be expended directly in payroll annually during the 40-year operating license of the plant. In addition, every 24 months, an additional $6.3 to $7.9 million in payroll would be expended for the outage workforce for the plant.

New workers (i.e., in-migrating workers and those previously unemployed) would have an additional indirect effect on the local economy, because these new workers would stimulate the regional economy with their spending on goods and services in other industries.

The review team concludes that the impact of building activities on the economy would be noticeable and beneficial in St. Clair County and minimal and beneficial elsewhere.

Taxes

Construction and operation of a plant at the Belle River-St. Clair site would result in increased tax revenues to State and local governments. State income tax revenue would accrue through income taxes on salaries of the new workers (i.e., in-migrating workers and those previously unemployed). As discussed in Section 4.4.3, based on an estimated annual average of 362 new workers (i.e., 150 in-migrating and 212 previously unemployed) during the 10-year construction period, and an average salary of $50,500, the State of Michigan would receive an estimated $0.7 million in income tax revenue annually during the construction period. As discussed in Section 5.4.3, based on an estimated annual average of 327 new workers (i.e., 270 in-migrating and 57 previously unemployed) for operation of the plant and an average salary of $63,625, the State of Michigan would receive an estimated $0.8 million in income tax revenue annually during the period of the 40-year operating license. The State of Michigan would also receive tax revenue through increased sales expenditures by workers and for the plant construction, operation and maintenance, and business taxes during operation.

Property tax revenue would be the primary tax benefit to the local jurisdictions. The plant would be assessed during the construction period and be at its highest assessed value when the plant becomes operational. For purposes of analysis, the review team recognizes that the full estimated construction cost of $6.4 billion for a nuclear power plant of 1605 MW(e), as discussed in Section 4.4.3.1, may not be the actual assessed value for property tax purposes. However, for comparative purposes in the alternative sites analysis, the review team based its conclusions upon this construction cost estimate. In 2008, the taxable value of real and personal property at Detroit Edison's existing Belle River-St. Clair Power Plants and the Greenwood Energy Center was $731 million, approximately 11 percent of the total county taxable assessed property value ($8.5 billion) (St. Clair Administrator/Controller's Office 2009). Consequently, with completion of the construction of a new nuclear plant at the Belle River site, the total assessed property value in the county would be increased by about 75 percent. The review team recognizes that this would be an upper bound to the assessed value of the property and that a fee in lieu of agreement or other considerations may significantly reduce that assessed value. However, the review team believes that the property tax impact to St. Clair County would be substantial and beneficial.

Summary of Economic Impacts and Taxes

Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the impact of building activities on the economy would be noticeable and beneficial in St. Clair County and minimal and beneficial elsewhere. The impact of tax revenues would be substantial and beneficial in St. Clair County and minimal and beneficial elsewhere. An annual average of 150 new construction workers would relocate into the area, and 212 workers who are currently unemployed would be employed for building activities over the 10-year construction period. A portion of the estimated $6.4 billion construction cost of the nuclear power plant would be spent on materials and supplies in the local area or would be transported into the area through the international border crossing at Port Huron/Sarnia; tax revenue to the State and local jurisdictions would accrue through personal income, sales, and property taxes and would have the largest benefit on the local jurisdictions within St. Clair County.

During operations at the Belle River plant, an estimated 270 new operations workers would relocate into the area, and 57 workers who are currently unemployed would be employed in operating the plant. Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the economic impact of operating the Belle River plant, including tax revenues, would be substantial and beneficial in St. Clair County and minimal and beneficial elsewhere.

Infrastructure and Community Services

Traffic

State Route 29 (M-29) separates the St. Clair plant site from the Belle River plant site and would provide direct access to the new plant site. M-29 would also be the principal route for workers commuting from communities along the shoreline and the City of Port Huron. It extends along the St. Clair River north to Marysville and south to Lake St. Clair at the southern end of St. Clair County.

Two major interstates cross the county, merging at Port Huron. Interstate 69 provides east–west access extending from the Canadian border crossing at Port Huron/Sarnia to Flint, Lansing, and Chicago. Interstate 94 extends southwest from Port Huron to the Detroit metropolitan area, approximately 35 mi southwest of Port Huron. The Blue Water Bridge crossing at Port Huron/Sarnia is a major international bridge crossing, with 4.9 million crossings in 2008 (MDOT 2009). The St. Clair River is part of the Great Lakes St. Lawrence Seaway System; the nearest port to the site is in the City of Sarnia, Canada.

Canadian National (CN) and CSX Transportation (CSX) rail systems cross St. Clair County. The CN railroad crosses the St. Clair River through an underground tunnel between Port Huron and Sarnia. A rail spur for CSX provides direct access to the plant site. The Belle River-St. Clair site can also be accessed from the St. Clair River via barge.

Most of the traffic-related concern would be related to the commutes of the workforce. Detroit Edison's Belle River and St. Clair Power Plants already employ a large portion of the 1044 Detroit Energy employees in the county at this site, and the projected construction and operations workforces would more than double the number of employees at the site, especially during the peak construction employment period and during outages. M-29 appears to provide the most direct route for commuting between the Belle River-St Clair site and places of residence and is already a high-volume road. However, Detroit Edison, in coordination with the MDOT and St. Clair County Road Commission, would need to conduct a traffic study that would identify strategies that would mitigate the traffic to an acceptable level.

The review team expects traffic impacts from building activities and operations, including both construction workers, operations workers, and deliveries, would be noticeable but not destablizing and would warrant mitigation in coordination with the MDOT, the Blue River Bridge Authority, and the St. Clair County Road Commission, as well as Canadian transportation agencies (i.e., Transport Canada, Ontario Ministry of Transportation, and Canadian Blue River Bridge Authority), depending on the extent of truck traffic crossing the Blue River Bridge with materials and supplies.

<u>Recreation</u>

St. Clair County Parks and Recreation Commission operates three parks in the county: Goodells County Park (327 ac), Fort Gratiot County Park (30 ac), and the Wadhams to Avoca Trail (12 mi). A fourth park, the Columbus County Park, is in development and will include 384 ac along the Belle River when complete. The State of Michigan owns 22,178 ac of park and conservation land in St. Clair County, including Algonac State Park (1450 ac in Cottrellville and Clay Townships), Lakeport State Park (1215 ac in Burtchville Township), Port Huron State Game Area (6627 ac in Grant, Clyde, and Kimball Townships), St. Clair Flats State Wildlife Area (10,300 ac in Clay Township), St. Johns March Recreation Area (2477 ac in Clay and Ira Townships), and Mini Game Area (109 ac in St. Clair Township) (St. Clair County Parks and

Recreation Commission 2007). In addition, numerous township parks are located throughout St. Clair County, and various beaches, marinas, and boat access points are located along the St. Clair River and Lake Huron shoreline (St. Clair County Parks and Recreation Commission 2007).

The recreational areas nearest to the Belle River-St. Clair site are East China Township Park, just south of the site; Algonac State Park, approximately 8 mi south of the site; and a portion of the 54-mi Bridge to Bay Trail, which extends along the St. Clair River shoreline and passes through East China Township Park.

Recreational resources in St. Clair County may be affected by construction and operation of a plant at the Belle River-St. Clair site. Impacts may include increased user demand associated with the projected increase in population from the in-migrating workforce and their families; an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and steam plume; or access delays associated with increased traffic from the construction and operations workforce on local roadways.

Several small communities and recreational facilities are located along the St. Clair River near the Belle River-St. Clair site. Users of recreational resources in the vicinity of the site may be affected by the views of the 600-ft cooling tower and condensate plume that would occur during operation of the plant. A new nuclear power plant and 600-ft cooling tower and condensate plume would be visible in a wide area, because the topography in the vicinity of the site is flat and the plant would be located near the St. Clair River. Existing coal-fired power plant stacks and MDCTs, which are also capable of producing condensate plumes, are located at the site but are smaller than the proposed 600-ft cooling tower.

Because the construction of a nuclear plant adjacent to the coal plants would result in substantial increases in power capacity, it is likely that new or upgraded transmission lines would also be required, which could result in additional offsite construction and visual impacts.

Impacts associated with the increased use of the recreational resources in the vicinity and region would be minor. The projected increase in population in St. Clair County associated with in-migrating workers and their families for construction and operation is less than 1 percent of the projected 2020 population and would not affect the availability and use of recreational resources in the area.

People using recreational facilities near the site may experience traffic congestion on the roads during the construction period, during morning and afternoon commutes of the operations workforce, and during the scheduled maintenance and forced outage periods. Measures to mitigate traffic impacts, particularly along M-29, would be needed and would alleviate some of the impacts on users of recreational facilities as well as members of the general public.

However, even with mitigations, recreational users may be affected during the morning and afternoon commutes to and from the plant site.

Based upon the above information, the review team determined that the recreation-related impacts of building and operating at the alternative site would be minor.

Housing

As shown in Table 9-14, an estimated 73,299 housing units are located in St. Clair County, based on the USCB 2008 estimate of housing, of which 9097 are vacant. In the 2000 census of housing, an estimated 38 percent of the vacant housing units were used for seasonal, recreational, or occasional use. The number of vacant units increased from 5035 to 9097 between 2000 and 2008. If the proportion of vacant housing units used for seasonal, recreational, or occasional use remains consistent, an estimated 5640 would be available for rent or sale.

Table 9-14. Housing Units in St. Clair County (2008 Estimate)

Type of Housing Unit	St. Clair County
Total Housing Units	73,299
Occupied	64,202
Owner-occupied (units)	51,264
Owner-occupied (percent)	80
Renter-occupied (units)	12,938
Renter-occupied (percent)	20
Vacant	9097
Vacancy Rate	
Homeowner (percent)	3.0
Rental (percent)	12.3

Source: USCB 2009d

Demand for short-term housing is expected to be highest during the peak construction period, and demand for long-term housing is expected to be highest when operations commence.

Based on the analysis of impacts presented in Section 4.4.2, most of the construction and operations workforces would already reside in the area and would be accommodated in existing housing. Approximately 15 percent of the construction workforce (approximately 435 workers during the peak construction) and approximately 30 percent (approximately 270 workers) of the operations workforce would be expected to relocate within a 50-mi radius of the project site. Considering that the construction workforce may choose short-term accommodations such as campsites or hotels, the review team expects that the existing housing supply is sufficient to accommodate the construction workforce of 435 workers during the peak building-related employment period and the operations workforce of 270 workers in-migrating to the area without affecting the housing supply or prices in the local area or stimulating new housing construction. Therefore, the impacts on housing would be minor.

Public Services

In-migrating construction workforce and operations workforce would increase the demand for water supply and wastewater treatment services within the communities where they choose to reside. The size of the total construction and operations workforce also would increase the demand for water supply and wastewater treatment services at the Belle River-St. Clair site. Much of the county obtains water supplies through private wells (St. Clair County Metropolitan Planning Commission 2009). Communities with water supply and wastewater treatment services in St. Clair County are shown in Table 9-15, which indicates that most areas have excess capacity and the water supply and wastewater treatment systems should be able to accommodate the in-migrating construction and operations workforces and their families.

Increased demand for police, fire response, and health care services from the in-migrating construction and operations workforces and their families are also expected to be accommodated within the existing systems.

Therefore, the review team expects the impacts on public services to be minor.

Education

St. Clair County has seven school districts (Algonac, Anchor Bay, Capac, East China, Marysville, Port Huron, and Yale) with a combined enrollment of 32,047 for the 2007–2008 school year (U.S. Department of Education 2010). As stated in Section 4.4.4.5, approximately 202 school-age children are expected to in-migrate into the 50-mi region during building activities, and 124 school-age children are expected to in-migrate for operations. Although they could in-migrate anywhere within the 50-mi region, if they were all to go into St. Clair County schools, it would raise the county’s student population by less than 1 percent. Given the number of schools in St. Clair County and the large student enrollment, it is likely that new students from building and operating a new nuclear unit at the Belle River-St. Clair site would be absorbed easily, and education impacts would be minimal for St. Clair County and the larger 50-mi region.

Summary of Impacts on Infrastructure and Community Services at the Belle River-St. Clair Site

The review team concludes from the information provided by Detroit Edison, review of existing reconnaissance level documentation, and its own independent evaluation that the impact of

Table 9-15. Water Supply and Wastewater Treatment Capacity and Demand (2005)

	Water (MGD)		Wastewater (MGD)	
Community	**Capacity**	**Demand[(a)]**	**Capacity**	**Demand[(a)]**
Algonac City	2.75	1.3	–[(b)]	–
Algonac	1.0	0.46	–	–
Clay Township	1.75	0.84	–	–
St. Clair County	–	–	2.7	1.9
Algonac	–	–	0.82	0.63
Clay Township	–	–	0.94	0.63
Ira Township	–	–	0.94	0.63
Burtchville	1.0	0.22	None	None
Capac	0.4	0.2	0.24	0.21
East China	2.7	0.6	3.35	0.85
China Township	0.27	0.06	0.34	0.08
East China Township	2.43	0.54	3.01	0.77
Ira	2.25	0.7	–	–
Marine City	2.0	0.80	7.0	0.80
Cottrellville	0.05	0.02	0.175	0.02
Marine City	1.95	0.78	6.825	0.78
Marysville	7.5	2.2	6.1	2.22
Memphis	0.39	0.09	None	None
Port Huron[(c)]	30.0	7.7	20.0	11.3
Clyde Township	0.69	0.2	None	None
Ft. Gratiot Township	5.7	1.5	3.8	1.28
Kimball Township	2.01	0.4	1.4	0.34
Port Huron City	15.9	4.1	10.8	5.74
Port Huron Township	5.7	1.5	4.0	2.1
St. Clair	3.0	1.4	1.6	1.4
St. Clair County	2.42	1.15	1.28	1.12
St. Clair Township	0.58	0.25	0.32	0.28
Yale	1.65	0.23	1.8	0.35

Source: LSL Planning, Inc. undated
(a) Average daily demand is provided for all utility systems and jurisdictions except for Port Huron. Port Huron reported peak demand.
(b) A dash indicates information was not reported for these jurisdictions.
(c) Peak demand.

building and operations activities on regional infrastructure and community services – including recreation, housing, water and wastewater facilities, police, fire, and medical facilities, and education – would be minor. The estimated peak workforce of 2900 would have a noticeable adverse impact on traffic on local roadways near the Belle River site. These traffic-related impacts could be reduced but not eliminated with proper planning and mitigation measures.

Cumulative Impacts

The geographic area of interest for analysis of cumulative socioeconomic impacts of the Belle River-St. Clair site is St. Clair County, where most of the socioeconomic impacts of construction and operation of the Belle River-St. Clair site are expected to occur.

The impact analyses presented for the Belle River-St. Clair site are cumulative. Past and current economic impacts associated with activities listed in Table 9-9 have already been considered as part of the socioeconomic baseline or in the analyses discussed above for the Belle River-St. Clair site. Construction and operation of the Belle River-St. Clair plant could result in cumulative impacts on the demographics, economy, and community infrastructure of St. Clair County, in conjunction with those reasonably foreseeable future actions shown in Table 9-9, and generally result in increased urbanization and industrialization. However, many impacts, such as those on housing or public services, are able to adjust over time, particularly with increased tax revenues. Furthermore, State and county plans, along with modeled demographic projections, include forecasts of future development and population increases. Because the projects within the geographic area of interest identified in Table 9-9 would be consistent with applicable land use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be manageable. Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics.

Based on the above considerations, Detroit Edison's ER, and the review team's independent evaluation, the review team concludes that under some circumstances, building a nuclear reactor at the Belle River-St. Clair alternative site could make a temporary small adverse contribution to the cumulative effects associated with some socioeconomic issues. Those impacts would include physical impacts (workers and the general public, noise, air quality, buildings, roads, and aesthetics), demography, and local infrastructures and community services (traffic; recreation; housing; water and wastewater facilities; police, fire, and health care services; and education), and would depend on the particular jurisdictions affected.

The cumulative effects on regional economies and tax revenues would be beneficial and SMALL, with the exception of St. Clair County, which would receive a MODERATE and beneficial cumulative effect on the economy and a LARGE and beneficial cumulative effect from property taxes. The cumulative effects on physical impacts, demography, and infrastructure and community services would be SMALL within the 50-mi region, except for a MODERATE and adverse cumulative effect on local traffic near the Belle River-St. Clair site. Building and operating a new nuclear unit at the Belle River-St. Clair alternative site would be a significant contributor to the cumulative impacts.

9.3.3.6 Environmental Justice

The economic impact area for the Belle River-St. Clair alternative site is St. Clair County, Michigan. To evaluate the distribution of minority and low-income populations near the Belle River-St. Clair site, the review team conducted a demographic analysis of populations within the 50-mi region surrounding the proposed site in accordance with the methodology discussed in Section 2.6.1 of this EIS. The results of this analysis are displayed in Tables 9-16 and 9-17 and Figures 9-3, 9-4, 9-5, and 9-6.

In general, the review team found the population within the 50-mi region surrounding the Belle River plant to be similar in demographic distribution to the 50-mi region surrounding the proposed Fermi 3 site: rural, with few representative minority or low-income populations of interest outside the urban areas (for the Belle River site, these urban areas are near the southwestern boundary of the 50-mi region). Because the review team identified St. Clair County as the economic impact area for the Belle Rive-St. Clair alternative site, the review team focused its analysis upon the minority and low-income populations within St. Clair County. The economic impact area of St. Clair County was representative of that characterization, with only one minority population of interest (a Black or African American population between 10 and

Table 9-16. Results of the Census Block Group Analysis for Minority Populations of Interest within the Region Surrounding the Belle River-St. Clair Alternative Site (50-mi radius)

County	Total Number of Census Block Groups in the 50-mi Region	Number of Census Block Groups with Minority Populations of Interest					
		Black	American Indian	Asian	Pacific Islander	Hispanic	Aggregate
Genesee	1	0	0	0	0	0	0
Lapeer	67	0	0	0	0	1	0
Macomb	626	8	0	0	0	0	9
Oakland	742	110	0	5	0	8	118
Sanilac	32	0	0	0	0	0	0
St. Clair[(a)]	145	1	0	0	0	0	1
Tuscola	1	0	0	0	0	0	0
Wayne	1392	1008	0	6	0	61	1023
Total	**3006**	**1127**	**0**	**11**	**0**	**70**	**1151**

Source: USCB 2011a
(a) Shaded row indicates the economic impact area.

Table 9-17. Results of the Census Block Group Analysis for Low-Income Populations of Interest within the 50-mi Region of the Belle River-St. Clair Alternative Site

County	Total Number of Census Block Groups in the 50-mi Region	Number of Census Block Groups with Low-Income Populations of Interest	Percentage of Census Block Groups with Low-Income Populations of Interest
Genesee	1	0	0
Lapeer	67	0	0
Macomb	626	5	<1
Oakland	742	20	2.6
Sanilac	32	0	0
St. Clair[(a)]	145	4	2.7
Tuscola	1	0	0
Wayne	1392	420	30.2
Total	**3006**	**449**	**14.9**

Source: USCB 2011b
(a) Shaded row indicates the economic impact area.

15 mi north of the plant near the Canadian border). This was the closest population of interest to the Belle River alternative site. The four identified low-income populations of interest included that same minority Census block group, as well as three others slightly farther north of the alternative site.

Based on this analysis the review team determines that there do not appear to be any identified minority or low-income populations of interest in St. Clair County that would be likely to experience disproportionate and adverse human health, environmental, physical, or socioeconomic effects as a result of construction or operation of a plant at the Belle River-St. Clair site. The review team did not identify any subsistence activities in St. Clair County. For the other physical and environmental pathways described in Section 2.6.1, the review team determined that impacts at the Belle River-St. Clair site would be similar to those at the Fermi 3 site. Therefore, the review team determines the environmental justice impacts of building and operating a nuclear reactor at the Belle River-St. Clair site would be SMALL

9.3.3.7 Historic and Cultural Resources

This section presents the review team's evaluation of the potential impacts of siting a new ESBWR at the Belle River-St. Clair site on historic and cultural resources. For the analysis of impacts on historic and cultural resources, the geographic area of interest is considered to be the area of potential effects (APE) that would be defined for a new nuclear power facility at the site. This includes the physical APE, defined as the area directly affected by building and

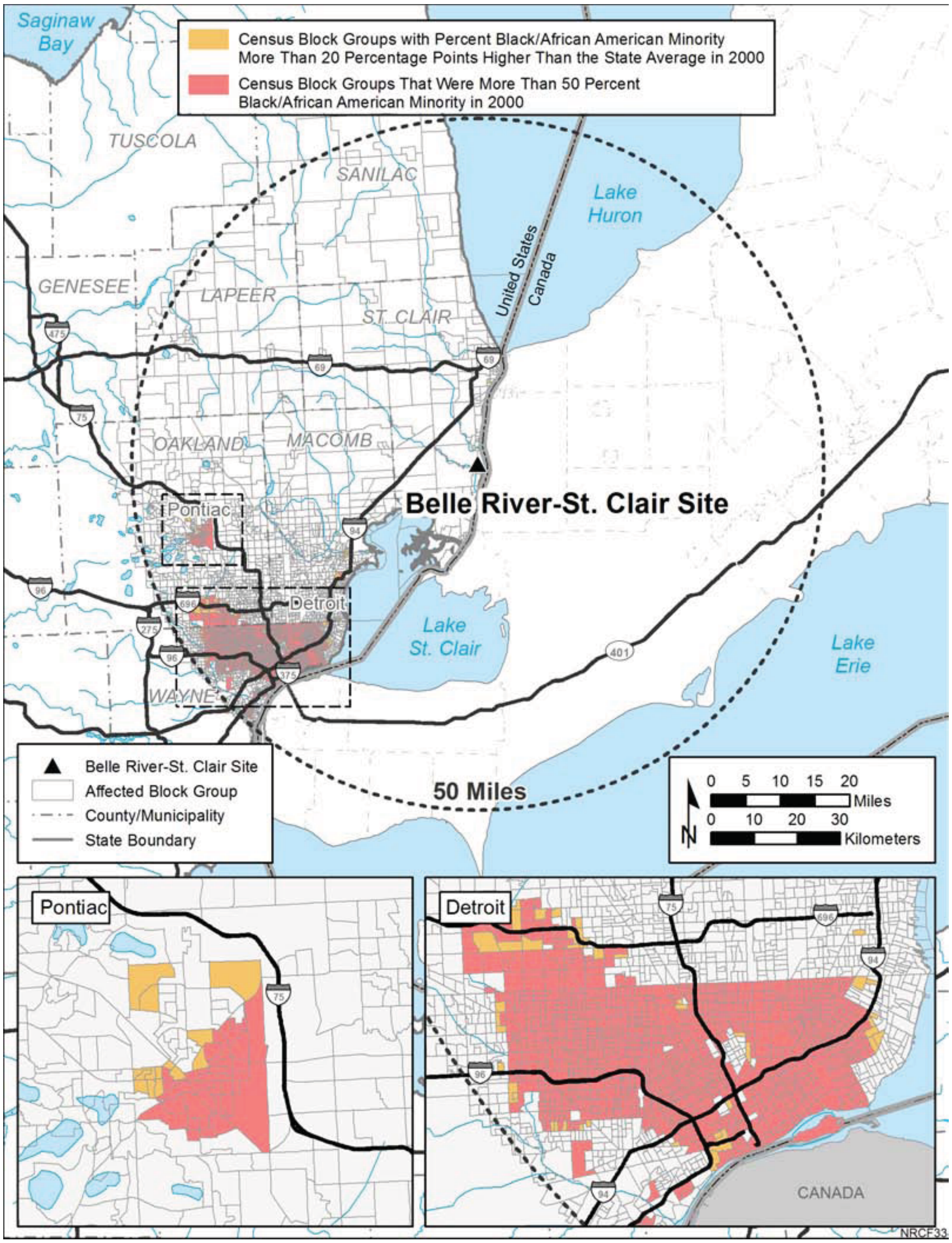

Figure 9-3. Black and African-American Minority Census Block Group Populations of Interest within a 50-mi Radius of the Belle River-St. Clair Site (USCB 2011a)

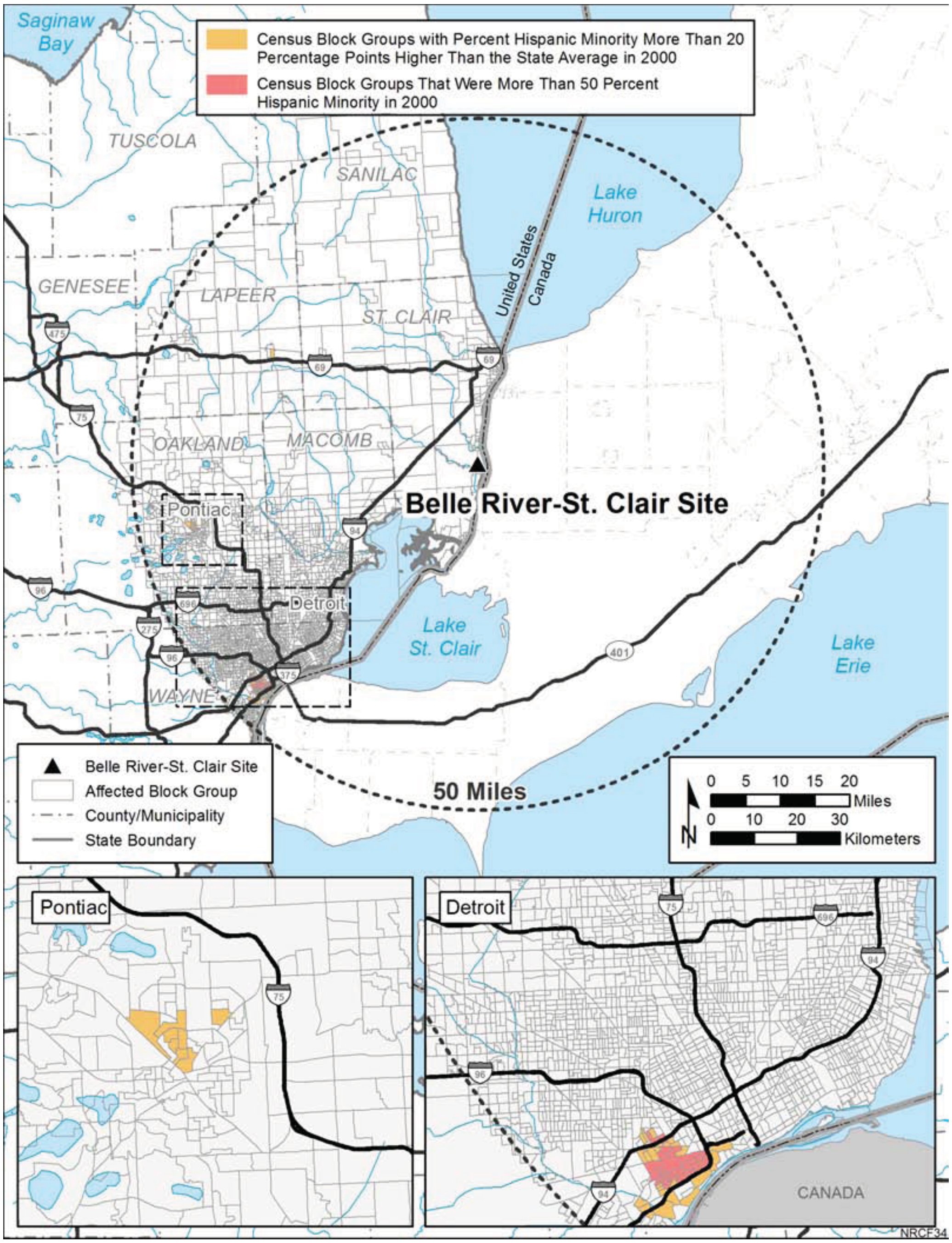

Figure 9-4. Hispanic Minority Census Block Group Populations of Interest within a 50-mi Radius of the Belle River-St. Clair Site (USCB 2011a)

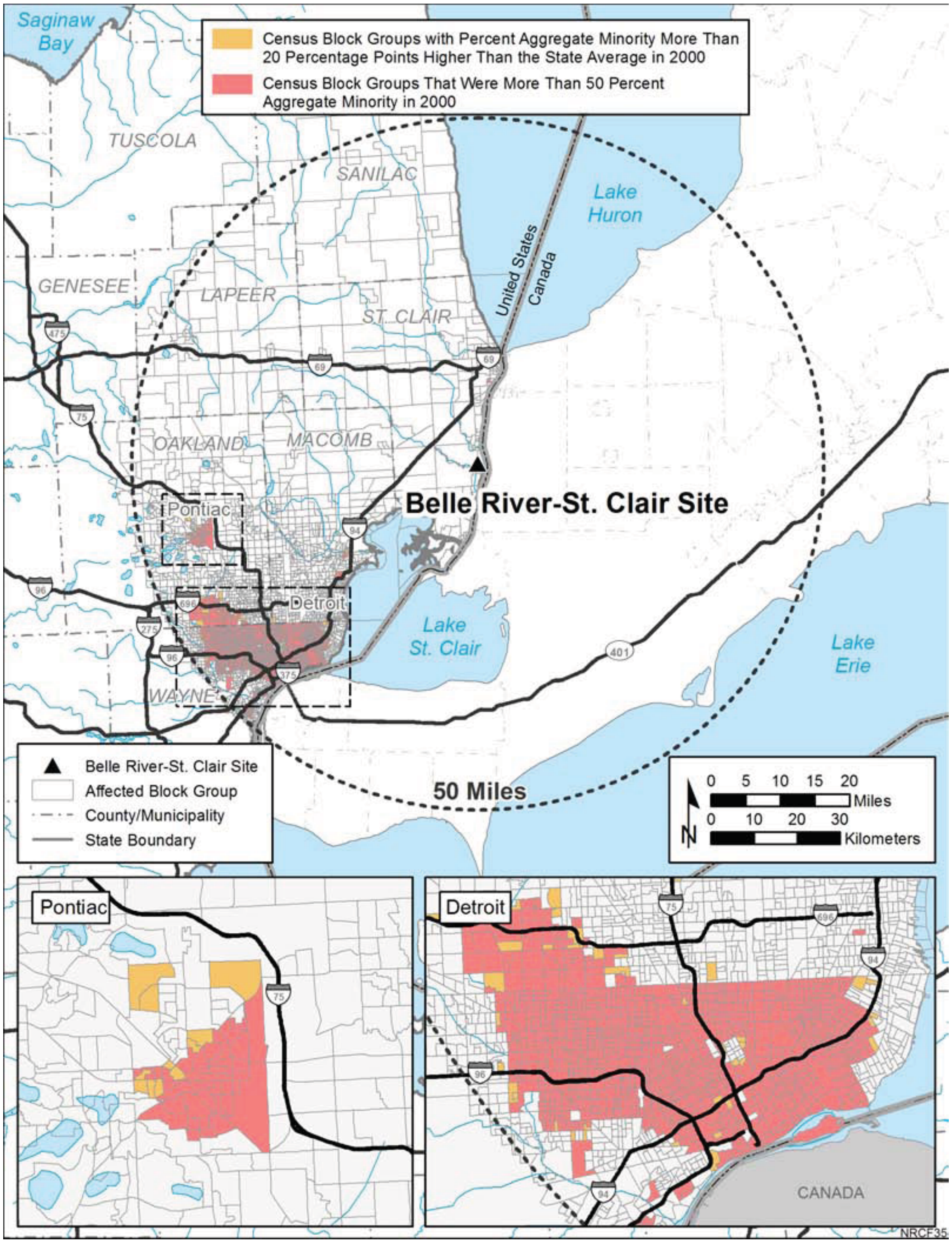

Figure 9-5. Aggregate Minority Census Block Group Populations of Interest within a 50-mi Radius of the Belle River-St. Clair Site (USCB 2011a)

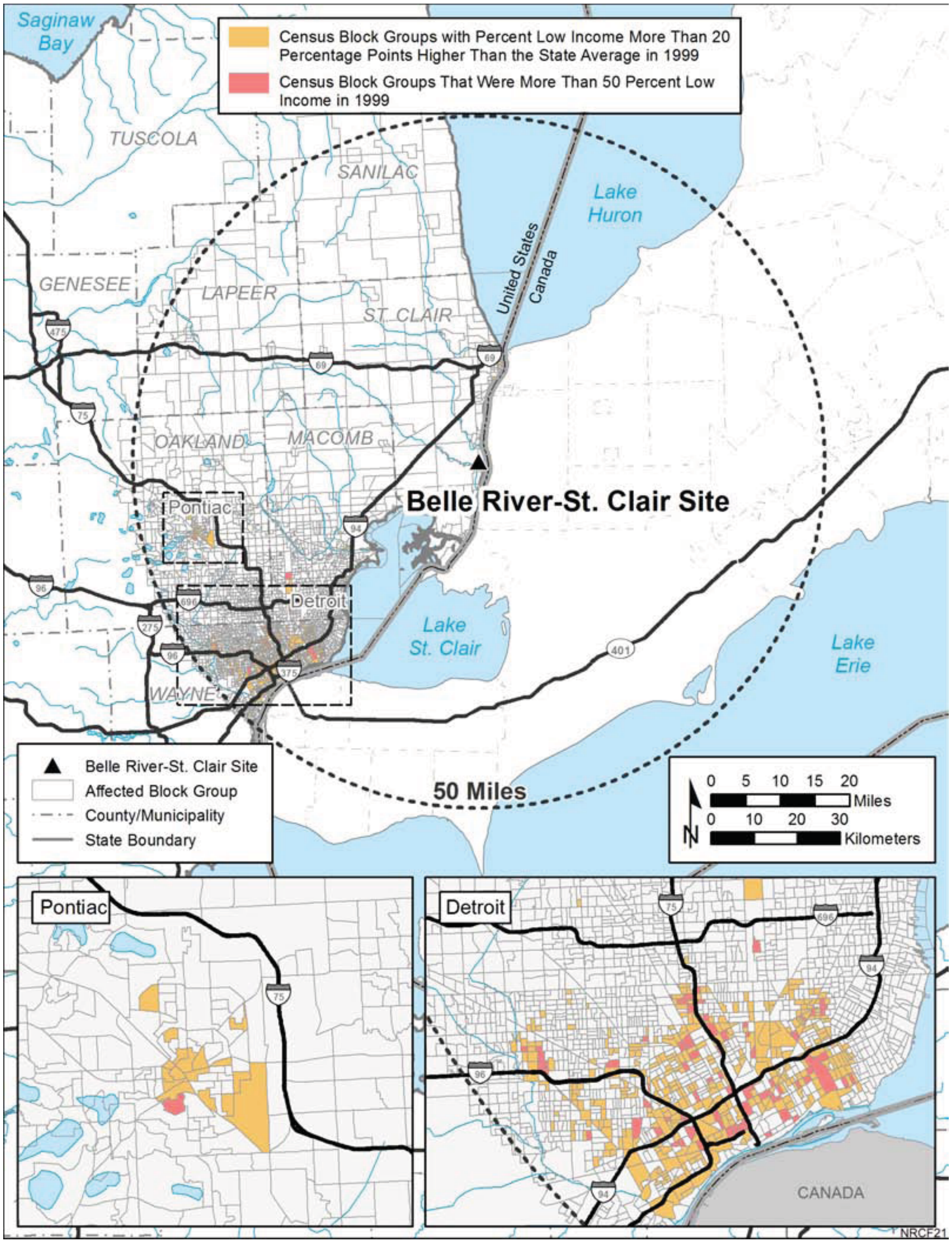

Figure 9-6. Low-Income Census Block Group Populations of Interest within a 50-mi Radius of the Belle River-St. Clair Site (USCB 2011b)

operating a new nuclear power plant and transmission lines, and the visual APE (i.e., the area from which the structures can be seen). The visual APE includes the physical APE and the area within 1 mi of the physical APE.

The review team relied upon reconnaissance-level information to perform the alternative site evaluation. Reconnaissance-level activities in a cultural resources review have particular meaning. For example, these activities may include site file searches, background research for environmental and cultural contexts, and preliminary field investigations to confirm the presence or absence of cultural resources in an APE or the sensitivity of an APE for cultural resources. For the purposes of preparing this alternatives analysis, reconnaissance-level information is considered to be data that are readily available from Federal and State agencies and other public sources. The following sources were used to identify reconnaissance-level information on historic and cultural resources in the APE at the Belle River-St. Clair site:

- National Park Service's (NPS's) National Historic Landmarks Program database for designated National Historic Landmarks (NPS 2010a).
- NPS's NRHP database for properties listed in the NRHP (NPS 2010b).
- NationalRegisterofHistoricPlaces.com database for properties listed in the NRHP (NRHP 2010).
- Michigan's Historic Sites Online database for cultural resources significant to the State of Michigan (MSHDA 2010a).
- Parks Canada's Federal Historic Buildings Review Office Register for designated Federal Heritage Buildings (Parks Canada 2010a).
- Parks Canada's Historic Sites and Monuments Board of Canada databases for designated National Historic Sites and Monuments (Parks Canada 2010b).
- Parks Canada's Canadian Register of Historic Places for recognized historic places of local, provincial, territorial, and national significance (Parks Canada 2010c).
- Parks Canada's list of National Historic Sites of Canada administered by Parks Canada (Parks Canada 2010d).
- Ontario Ministry of Culture's Ontario Heritage Properties Database for heritage properties designated by municipal bylaw under Parts IV or V of the Ontario Heritage Act of 1975, as amended; protected by a municipal heritage easement; owned by the Ontario Heritage Trust; protected by an Ontario Heritage Trust conservation easement; listed on the Ontario Heritage Bridge List; protected by the Federal Heritage Railway Stations Protection Act of 1985, as amended; designated as a National Historic Site; or listed in the Canadian Register of Heritage Properties (Ontario Ministry of Culture 2008).
- Ontario Ministry of Culture's list of community museums (Ontario Ministry of Culture 2009).

- The Architectural Conservancy of Ontario (The Architectural Conservancy of Ontario 2010).
- Ontario Heritage Trust's Online Plaque Guide (Ontario Heritage Trust 2010).
- Detroit Edison's ER (Detroit Edison 2011a).
- *Cultural Resources Site File Review of Seven Alternative Sites in Monroe, Lenawee, St. Clair, and Huron Counties, Michigan, Fermi Nuclear Power Plant Unit 3 (Fermi 3) Project, Frenchtown and Berlin Townships, Monroe County, Michigan* (Lillis-Warwick et al. 2009).

Within the portion of the APE in Michigan, no National Historic Landmarks or other historic properties listed in the NRHP were identified (NPS 2010a, b; NRHP 2010). Three previously recorded cultural resources have been identified within the APE in Michigan (MSHDA 2010a). Two are archaeological resources (Sites 20SC153 and 20SC71); one is an architectural resource (the East China Fractional District School No. 2, Site ID#P24687). None of these previously recorded cultural resources have been included in, or determined eligible for inclusion in, the NRHP. Therefore, none of these three previously recorded cultural resources are considered a historic property, pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

Archaeological Site 20SC153 is a late-nineteenth to early-twentieth century farmstead and is located entirely within the physical APE for the Belle River-St. Clair site. It was determined not eligible for inclusion in the NRHP in 1999. Archaeological Site 20SC71 is a prehistoric archaeological site of unknown cultural affiliation and unknown function, which is located partially within the physical APE for the Belle River-St. Clair site. It has not been evaluated for NRHP eligibility (Lillis-Warwick et al. 2009).

The East China Fractional District School No. 2 (Site ID #P24687) property is a late-nineteenth century brick schoolhouse approximately 0.5 mi outside of the physical APE, within the visual APE for the Belle River-St. Clair site. It is the remaining example of only three nineteenth-century schoolhouses constructed in East China Township in St. Clair County. It is the second schoolhouse on the property, replacing an earlier frame schoolhouse, and was constructed circa 1873. The last classes were held there in 1954, and it was restored for use as a local museum between 1988 and 1991. It was listed on the *Michigan State Register of Historic Places* (SRHP) in 1991, and the State of Michigan erected a historical marker in front of it in 1993. However, it has not been evaluated for NRHP eligibility (Lillis-Warwick et al. 2009; East China Township 2010; MSHDA 2010b). Additional properties that are listed in the NRHP are located approximately 4 mi to the north in Marine City and approximately 4 mi to the south in St. Clair (Detroit Edison 2011a). These additional NRHP-listed properties are outside of the visual APE for the Belle River-St. Clair site.

No archaeological or architectural surveys have been conducted at the alternative site to identify additional cultural resources in the portion of the APE in Michigan and/or to determine or confirm the significance (NRHP-eligibility) of the previously identified cultural resources in the APE in Michigan. As currently designed, a new nuclear power plant at the Belle River-St. Clair site has the potential to affect two of the previously identified resources. The proposed layout for the Belle River-St. Clair site is proximate to archaeological sites 20SC153 and 20SC71 and may result in disturbance or destruction during preconstruction and construction activities. Site 20SC153 was previously determined not eligible for listing in the NRHP by the Michigan SHPO in 1999 (Lillis-Warwick et al. 2009). Because this archaeological resource is not considered a historic property, a new nuclear power facility at the Belle River-St. Clair site would have no effect on this resource pursuant to 36 CFR Part 800. Site 20SC71 would have to be evaluated for NRHP eligibility to determine the effect of a new nuclear power facility at the Belle River-St. Clair site on this resource, pursuant to 36 CFR Part 800. The proposed layout for the Belle River-St. Clair site includes structures (buildings and cooling towers) and operational activities (condensation plumes) that would be new landscape elements in viewsheds from East China Fractional District No. 2 School and would result in indirect (visual) impacts on this architectural resource. This architectural resource would have to be evaluated for NRHP eligibility to determine the effect of a new nuclear power facility at the Belle River-St. Clair site on this resource pursuant to 36 CFR Part 800.

Consultation with the Michigan SHPO would be necessary to determine the need for cultural resources investigations (including archaeological and architectural surveys) to identify cultural resources within the portion of the APE in Michigan and prior to any onsite ground-disturbing activities, to determine whether any identified cultural resources are eligible for inclusion in the NRHP, to evaluate the potential impacts on cultural resources and historic properties, and to determine the effect of a new nuclear power facility at the Belle River-St. Clair site pursuant to Section 106 of the NHPA. As part of this consultation, Detroit Edison would be expected to put protective measures in place to protect discoveries in the event that cultural resources were found during building or operation of a new plant. If an unanticipated discovery was made during building activities, site personnel would have to notify the Michigan SHPO and consult with it in conducting an assessment of the discovery to determine whether additional work is needed.

The incremental impacts from installation and operation of offsite transmission lines would be minimal if there were no significant alterations (either physical alteration or visual intrusion) to the cultural environment. If these activities resulted in significant alterations to the cultural environment, then the impact could be greater. Construction and operation of the offsite transmission lines would be the responsibility of a transmission company. For impacts greater than small, mitigation might be developed by the transmission company in consultation with the appropriate Federal and State regulatory authorities. Only Federal undertakings would require a Section 106 review.

A portion of the visual impact APE extends east across the St. Clair River into St. Clair Township, which is in Lambton County, in Ontario, Canada. No previously identified Federal, provincial, or municipal heritage properties, historic sites, or other cultural resources were identified within the Ontario portion of the visual APE for the Belle River-St. Clair site (Parks Canada 2010a, b, c; Ontario Ministry of Culture 2008, 2009; The Architectural Conservancy of Ontario 2010; Ontario Heritage Trust 2010; The Corporation of the County of Lambton 2010). The NRC would consider the need to consult with Parks Canada, the Ontario Ministry of Culture, and local municipalities regarding indirect impacts on potential heritage properties, historic sites, or other cultural resources within the Ontario portion of the APE.

The portion of the APE in Michigan does not contain any Indian reservation land, and no Federally recognized Indian Tribes have indicated an interest in St. Clair County (BIA undated; NPS 2010c). However, consultation with Federally recognized Indian Tribes in the State of Michigan would be necessary in accordance with Section 106 of the NHPA. As part of this consultation, the NRC would consult with all 12 Federally recognized Indian Tribes that are located within the State of Michigan, as identified for the Fermi site (Michigan Department of Human Services 2001–2009). The portion of the APE in Ontario does not contain any First Nation Reserve land. However, prior to Euro-American settlement, the APE in both Michigan and Ontario may have been settled and/or used by groups now located within Canada.[(a)] In Canada, these groups are often called First Nations.[(b)] Two First Nation reserves are located outside, but in the general vicinity of, the portion of the APE in Ontario, Canada: Sarnia Reserve 45 and Walpole Island Reserve 46 (INAC 2010). Sarnia Reserve 45 is located approximately 15 mi north of the Belle River-St. Clair site, on the eastern side of the St. Clair River near Sarnia, Ontario. The Aamjiwnaang First Nation is associated with Sarnia Reserve 45. Walpole Island Reserve 46 is located approximately 15 mi south of the Belle River-St. Clair site, on the eastern side of the St. Clair River near Wallaceburg, Ontario. The Walpole Island First Nation is associated with Walpole Island Reserve 46. Additional First Nation reserves are located farther to the north and east in southern Ontario (see Table 9-18)

(a) The Canadian government recognizes the original inhabitants of North America as Aboriginal peoples. There are three formally recognized Aboriginal groups: Indians, Métis, and Inuits. Indians comprise three legally defined groups: Status Indians (people who are registered as Indians under the Indian Act of 1876, as amended [Indian Act], which specifies the requirements for determining who is an Indian for the purposes of the Indian Act); non-Status Indians (people who are Indians but are not registered as Indians under the Indian Act); and Treaty Indians (Status Indians who belong to a First Nation that signed a Treaty with the Crown). Métis comprise people of “mixed First Nation and European ancestry who identify themselves as Métis, as distinct from First Nations people, Inuit, or non-Aboriginal people.” Inuit comprise “Aboriginal people in Northern Canada, who live in Nunavut, Northwest Territories, Northern Quebec and Northern Labrador” (INAC 2009).

(b) First Nations is a term that came into common usage in the 1970s to replace the word “Indian,” which some people found offensive. Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term “First Nations peoples” refers to the Indian peoples in Canada, both Status and non-Status. Some Indian peoples have also adopted the term “First Nation” to replace the word “band” in the name of their community (INAC 2009).

Table 9-18. First Nations and First Nation Reserves in Southwestern Ontario

First Nation	Reserve	Approximate Distance and Direction from the Belle River/ St. Clair Site	Approximate Distance and Direction from the Greenwood Site	Closest Town or City
Aamjiwnaang First Nation	Sarnia Reserve 45	15 mi north	15 mi southeast	Sarnia, Ontario
Walpole Island First Nation	Walpole Island Reserve 46	15 mi south	30 mi southeast	Wallaceburg, Ontario
Moravian of the Thames	Moravian Indian Reserve 47	30 mi southeast	50 mi southeast	Thamesville, Ontario
Chippewas of Kettle and Stony Point	Kettle Point Reserve 44	40 mi northeast	30 mi east	Forest, Ontario
Caldwell	None	55 mi southeast	65 mi southeast	Blenheim, Ontario
Chippewas of the Thames First Nation	Chippewas of Thames First Nation Reserve 42	50 mi east	70 mi east	Muncey, Ontario
Munsee-Delaware Nation	Munsee-Delaware Nation 1	50 mi east	70 mi east	Muncey, Ontario
Oneida Nation of the Thames	Oneida Indian Reserve 41	45 mi east	70 mi east	Southwold, Ontario

Source: INAC 2010

(INAC 2010). The review team would consider the need to consult with INAC and First Nations to determine any concerns regarding physical (direct) or visual (indirect) impacts on cultural resources within the APE.

The following cumulative impact analysis for historic and cultural resources includes building and operating a new nuclear power facility at the Belle River-St. Clair site. This analysis also considers other past, present, and reasonably foreseeable future actions that could affect historic and cultural resources, as identified in Table 9-9. The APE for the cumulative impact analysis for historic and cultural resources for the Belle River-St. Clair site consists of the alternative site area and any new transmission line corridors, and a 1-mi buffer area around the site and the corridors.

The Belle River-St. Clair site includes areas of agricultural land, some young forest, and previous development (e.g., power plants, aboveground transmission lines, pipelines, roads, and railroads). Agricultural activities such as plowing, disking, and harvesting (whether historic or modern [mid-nineteenth to mid-twentieth century]) and logging or clearing of original forests (prior to the reestablishment of the existing young forested areas) are likely to have resulted in minimal subsurface disturbance, suggesting that at least some areas at the Belle River-St. Clair site, which are currently used for agricultural purposes or as woodland, may have sustained minimal prior ground disturbance. Other areas at the site are likely to have undergone significant prior disturbance during previous development. Past actions at the Belle River-St. Clair site that may have destroyed, disturbed, or otherwise affected onsite historic and cultural resources in the APE may have included construction and operation of the existing Belle River and St. Clair Power Plants, River Road, State Route 29, CSX rail lines, and an existing 345-kV transmission line.

Additional past actions onsite or in the general vicinity of the Belle River-St. Clair site, as identified in Table 9-9, may have also indirectly (visually) affected cultural resources within the visual APE. These past actions would have included construction and operation of the Greenfield Energy Center, and the Lambton Generating Station, located approximately 1 mi east and northeast, across the St. Clair River, respectively. Additional past actions, such as construction and operation of the Marysville Power Plant, approximately 10 mi north on the St. Clair River, and recently completed or proposed projects, such as the Suncor Ethanol Production Project, the Suncor Ethanol Plant Phase II Project, and the Northern Ethanol (Sarnia) Inc. Ethanol Facility, more than 20 mi north of the Belle River-St. Clair site, in Ontario, Canada, would likely be too far to incur cumulative indirect (visual) impacts on historic or cultural resources within the APE at the Belle River-St. Clair site. Because a new nuclear power facility at the Belle River-St. Clair site would be located on property that already contains the existing Belle River and St. Clair power plants, it is likely that the proposed project would not result in new significant indirect (visual) impacts on cultural resources within the visual APE.

Based on reconnaissance-level information provided by Detroit Edison and identified by the review team and on the review team's independent evaluation of this information, the review team concludes that the cumulative impacts on historic and cultural resources from building and operating a new nuclear power facility at the Belle River-St. Clair site would be SMALL. A SMALL impact determination is based on available reconnaissance information, which indicates that no known historic properties would be affected (one previously identified cultural resource within the APE has been determined not to be NRHP eligible; the other two previously identified cultural resources within the APE have not been evaluated for NRHP eligibility) and that the five existing and operating power plants or generating facilities onsite or within 1 to 10 mi of the Belle River-St. Clair site are already landscape elements of the existing visual setting for the Belle River-St. Clair site. However, if a new nuclear power facility were to be developed at the Belle River-St. Clair site, then cultural resources investigations within the APE and for any proposed transmission lines may reveal important historic or cultural resources that could result in greater cumulative impacts.

9.3.3.8 Air Quality

Criteria Pollutants

For a plant with the same capacity as the proposed Fermi 3 plant, the emissions from building and operating a nuclear power plant at the Belle River-St. Clair site are assumed to be comparable to those from Fermi 3, as described in Chapters 4 and 5. The alternative site is located in St. Clair County, about 1 mi west of the United States-Canada border. St. Clair County is in the Metropolitan Detroit-Port Huron Intrastate Air Quality Control Region (AQCR) (40 CFR 81.37). Currently St. Clair County is designated as a nonattainment area for $PM_{2.5}$ NAAQS and as a maintenance area for 8-hr ozone NAAQS (EPA 2010b). In July 2011, the MDEQ submitted a request asking the EPA to redesignate Southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011). This request is based, in part, on air quality monitoring data collected in the 2007–2010 period showing all seven counties in Southeast Michigan in attainment for the $PM_{2.5}$ NAAQS.

In Sections 4.7 and 5.7, the review team concludes that air quality impacts of building and operating a plant at Fermi 3, including those associated with transmission lines and cooling towers, would be SMALL, as long as appropriate measures are taken to mitigate dust during building activities. During operation, cooling towers would be the primary source of $PM_{2.5}$, which accounts for most of the total $PM_{2.5}$ emissions of 9.51 tons/yr at Fermi 3. However, these emissions would be relatively small, and thus are not anticipated to elevate $PM_{2.5}$ concentrations in a designated nonattainment area. With dust mitigation, the impacts of building and operating a plant at the Belle River-St. Clair site would also be SMALL. Any new industrial projects would either be small or subject to permitting by the MDEQ. State permits are issued under regulations approved by the EPA and deemed sufficient to attain and maintain the NAAQS and comply with other Federal requirements under the CAA. Thus, the cumulative air quality impacts of building and operating a plant at the Belle River-St. Clair site would be SMALL.

Greenhouse Gases

The extent and nature of climate change is not sensitive to where GHGs are emitted because the long atmospheric lifetimes of GHGs result in extensive transport and mixing of these gases. Since the emissions of a plant at the Belle River-St. Clair site would be comparable to those of a similar plant at the Fermi 3 site, the discussions of Sections 4.7 and 5.7 for Fermi 3 also apply to building and operating a similar plant at the Belle River-St. Clair site. Thus, the impacts of the plant's GHG emissions on climate change would be SMALL, but the cumulative impacts considering global emissions would be MODERATE. Building and operating a new nuclear unit at the Belle River site would not be a significant contributor to these impacts.

9.3.3.9 Nonradiological Health

The following impact analysis considers nonradiological health impacts from building activities and operations on the public and workers from a new nuclear facility at the Belle River-St. Clair alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including other Federal and non-Federal projects and those projects listed in Table 9-9 within the geographic area of interest. The building-related activities with the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operation-related activities with the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and the transport of workers to and from the site.

Most of the nonradiological impacts of building and operation (e.g., noise, etiological agents, and occupational injuries) would be localized and would not have significant impact at offsite locations. However, activities such as vehicle emissions from transport of personnel to and from the site would encompass a larger area. Therefore, for nonradiological health impacts, the geographic area of interest for cumulative impacts analysis includes projects within a 50-mi radius of the Belle River-St. Clair site based on the influence of vehicle and other air emissions sources because the site is in a nonattainment area (Section 9.3.3.8). For cumulative impacts associated with transmission lines, the geographical area of interest is the transmission line corridor. These geographical areas are expected to encompass areas where public and worker health could be influenced by the proposed project and associated transmission lines, in combination with any past, present, or reasonably foreseeable future actions.

Building Impacts

Nonradiological health impacts on the construction workers from building a new nuclear unit at the Belle River-St. Clair site would be similar to those for building Fermi 3 at the Fermi site as evaluated in Section 4.8. They include occupational injuries, noise, odor, vehicle exhaust, and dust. Applicable Federal, State, and local regulations on air quality and noise would be complied with during the plant construction phase. The Belle River-St. Clair site does not have any characteristics that would be expected to lead to fewer or more construction accidents than would be expected for the Fermi site. The site is in a predominantly rural area, and construction impacts would likely be minimal on the surrounding populations, which are classified as medium- and low-population areas. Access routes to the site for construction workers would include State Route 29, which is already a high-volume road. Mitigation may be necessary to ease congestion, thereby improving traffic flow and reducing nonradiological health impacts (i.e., traffic accidents, injuries, and fatalities) during the building period.

Operational Impacts

Nonradiological health impacts on occupational health of workers and members of the public from operation of a new nuclear unit at the Belle River-St. Clair site would be similar to those evaluated in Section 5.8 for the Fermi site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Belle River-St. Clair site would likely be the same as those evaluated for workers at the new unit at the Fermi site. The average flow rate of St. Clair River is 188,000 ft^3/sec, which is large enough to support closed cycle NDCTs. Discharges to the river would be controlled by NPDES permits issued by MDEQ (Section 9.3.3.2). The growth of etiological agents would not be significantly encouraged at the Belle River-St. Clair site because of the large flow rate of the St. Clair River (i.e., >100,000 ft^3/sec, see NRC [2000]). Noise and EMF exposure would be monitored and controlled in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations. Effects of EMFs on human health would be controlled and minimized by conformance with National Electrical Safety Code (NESC) criteria. Nonradiological impacts of traffic during operations would be less than the impacts during building. Mitigation measures taken during building to improve traffic flow would also minimize impacts during operation of a new unit.

Cumulative Impacts

Past and present actions within the geographic area of interest that could contribute to cumulative nonradiological health impacts include the energy and mining projects in Table 9-9, as well as vehicle emissions and existing urbanization. Reasonably foreseeable future projects in the geographical area of interest that could contribute to cumulative nonradiological health impacts include construction of the proposed I-94 Black River Bridge Replacement in Port Huron and the two proposed energy projects, future transmission line development, and future urbanization.

The review team is also aware of the potential climate changes that could affect human health. A recent compilation of the state of the knowledge in this area (USGCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature, increased likelihood of drought in summer, more heavy downpours, and an increase in precipitation, especially in the winter and spring, which may alter the presence of microorganisms and parasites. In view of the water source characteristics, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases.

Summary of Nonradiological Health Impacts at the Belle River-St. Clair Site

Based on the information provided by Detroit Edison and the review team’s independent evaluation, the review team expects that the impacts on nonradiological health from building and operation of a new nuclear unit at the Belle River-St. Clair site would be similar to the impacts evaluated for the Fermi site. Although there are past, present, and future activities in the geographical area of interest that could affect nonradiological health in ways similar to the building and operation of a new unit at the Belle River-St. Clair site, those impacts would be localized and managed through adherence to existing regulatory requirements. Similarly, impacts of a new nuclear unit operating at the Belle River-St. Clair site on public health would be expected to be minimal. The review team concludes, therefore, that the cumulative impacts of building and operation of a nuclear unit at Belle River-St. Clair on nonradiological health would be SMALL.

9.3.3.10 Radiological Health

The following impact analysis considers radiological impacts on the public and workers from building activities and operations for one nuclear unit at the Belle River-St. Clair alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects and those projects listed in Table 9-9 within the geographic area of interest. The geographic area of interest is the area within a 50-mi radius of the Belle River-St. Clair site. As described in Section 9.3.3, the Belle River-St. Clair property contains two Detroit Edison-owned non-nuclear power plants. There are currently no nuclear facilities on the site or within a 50-mi radius. In addition, there are likely to be medical, industrial, and research facilities within 50 mi of the Belle River-St. Clair site that use radioactive materials.

The radiological impacts of building and operating the proposed ESBWR unit at the Belle River-St. Clair site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those at the proposed Fermi site.

The NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive materials would be an insignificant contribution to the cumulative impact around the Belle River-St. Clair site. This conclusion is based on data from radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Detroit Edison and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the proposed ESBWR advanced reactor and other existing projects and actions in the geographic area of interest around the Belle River-St. Clair site would be SMALL.

9.3.3.11 Postulated Accidents

The following impact analysis considers radiological impacts from postulated accidents during operation of a nuclear unit at the Belle River-St. Clair alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that impact radiological health from postulated accidents, including other Federal and non-Federal projects and those projects listed in Table 9-9 within the geographic area of interest. As described in Section 9.3.3, the Belle River-St. Clair site is an active power generation site; however, there are currently no nuclear facilities on the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Belle River-St. Clair site. Existing facilities potentially affecting radiological accident risk within this geographic area of interest are Fermi 2 and Davis-Besse, because the 50-mi radii for Fermi 2 and Davis-Besse overlap part of the 50-mi radius for the Belle River-St. Clair site. No other reactors have been proposed within the geographic area of interest.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of design-basis accidents (DBAs) at the proposed Fermi site would be minimal for an ESBWR. DBAs are addressed specifically to demonstrate that a reactor design is sufficiently robust to meet NRC safety criteria. The ESBWR design is independent of site conditions, and the meteorology of the alternative and the proposed Fermi sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the site would be SMALL.

Because the meteorology, population distribution, and land use for the Belle River-St. Clair site are expected to be similar to the proposed Fermi site, risks from a severe accident for an ESBWR located at the Belle River-St. Clair site are expected to be similar to those analyzed for the proposed Fermi site. These risks for the proposed Fermi site are presented in Tables 5-33 and 5-34 of this EIS and are well below the mean and median values for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (i.e., Fermi 2 and Davis-Besse), the Commission has determined the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Because of the NRC's safety review criteria, it is expected that risks for any new reactors at any other locations within geographic area of interest for the Belle River-St. Clair site would be well below risks for current-generation reactors and would meet the Commission's safety goals. The severe accident risk due to any particular nuclear power plant becomes smaller as the distance from that plant increases. However, the combined risk at any location within 50 mi of the Belle River-St. Clair site would be bounded by the sum of risks for all these operating nuclear power plants and would still be low.

On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Belle River-St. Clair site would be SMALL.

9.3.4 Greenwood Site

This section presents the review team's evaluation of the potential environmental impacts of siting a nuclear reactor at the Greenwood Energy Center. The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action, if it were implemented at the Greenwood site, and by other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment were other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action, if implemented at the Greenwood site. Other actions and projects considered in this cumulative analysis are described in Table 9-19. The location and vicinity of the Greenwood alternative site are shown in Figure 9-7.

Referred to by Detroit Edison in its site-selection process as "Site F," the Detroit Edison-owned Greenwood Energy Center is approximately 3 mi west of Port Huron State Game Area in St. Clair County, Michigan. The site encompasses 1280 ac on Sections 21, 22, 27, and portions of Section 28 of Township 8 North, Range 14 East. The site is currently used by Detroit Edison to generate electricity through the operation of an 800-MW oil-fired unit and three gas combustion turbines. The closest human receptors are approximately 2 mi from the site in the town of Avoca.

Access to the site is provided by State Route 136, approximately 1 mi south of the site. A spur of the CSX rail line provides rail access. The power generated at the Greenwood Energy Center is delivered to the grid via a 345-kV transmission line entering the site from the south.

Outside the industrial footprint, land on the site is a mixture of cropland, wooded areas, and two large wetland areas. In addition to the wetlands on the site, the nearest sensitive environmental areas are wetlands to the south and southeast of the industrial areas of the site. Other sensitive areas include the Port Huron Game Area and the Black River, both approximately 3 mi east of the site. The Lake Huron shore contains recreational beaches, as does Lakeport State Park and Beach, both about 7 mi east of the site. State parks and wildlife areas also exist about 27 mi south near Anchor Bay in Lake St. Clair. Ecology on the site and in the immediate vicinity is a mixture of grassland, shrub, and woodland communities.

The nearest towns are Yale, with a population of 2000, and the city of Port Huron, located approximately 11 mi to the southeast, with a 2000 population of approximately 32,300. The population of St. Clair County is approximately 164,200 (2000 data).

Table 9-19. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Greenwood Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
Greenwood Energy Center	Oil-fired peaking unit and three natural gas combustion turbines with 1071 MW combined capacity	On Greenwood site	Operational
Fermi Unit 2	1098-MW nuclear power plant, including proposed ISFSI and decommissioned Fermi 1 collocated on site	83 mi southwest of Greenwood site on Lake Erie	Operational
Marysville Power Plant	200-MW coal-fired plant	17 mi southeast of Greenwood site on St. Clair River	Operational
Suncor Ethanol Plant Phase II Project	Expansion of existing St. Clair Ethanol Plant to increase the supply of ethanol for blending with gasoline. The expansion will increase the plant's production capacity from 200 million L/yr to 400 million L/yr	17 mi southeast of Greenwood site in St. Clair Township, Ontario, Canada	Recently completed
Suncor Ethanol Production Project	Ethanol production facility with production capacity of 200 million L/yr	17 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Recently completed
Northern Ethanol (Sarnia) Inc. Ethanol Facility	Ethanol facility with a maximum capacity of 454.3 million L/yr of ethanol at an industrial brownfield site in the city of Sarnia	17 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Proposed
Diesel Fuel and Hydrogen Pipelines	3.3 km of one 10-in. hydrogen pipeline and two 8-in. diesel fuel pipelines from the Shell Canada Refinery in Corunna to the Suncor Refinery in Sarnia	17 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Recently completed
Belle River Power Plant	1664-MW coal-fired plant	24 mi south-southeast of Greenwood site	Operational
St. Clair Power Plant	1929-MW coal-fired plant	25 mi south-southeast of Greenwood site	Operational

Table 9-19. (contd)

Project Name	Summary of Project	Location	Status
Greenfield Energy Centre LP	1005-MW natural-gas-fired combined cycle electricity generating facility	25 mi south-southeast of Greenwood site in Ontario, Canada	Operational
Lambton Generating Station	1920-MW coal-fired power plant	24 mi south-southeast of Greenwood site in Ontario, Canada	Operational
St. Clair Liquid Petroleum Gas Terminal	Liquid petroleum gas terminal	23 mi southeast of Greenwood site located near confluence of Pine and St. Clair Rivers	Operational
Dawn Gateway Pipeline	Operation of 30-km, 610-mm international natural gas transmission pipeline system (construction of 17-km new pipeline)	24 mi south-southeast of Greenwood site	Proposed
Mining Projects			
Clicks Sand and Gravel and RGE Aggregates, Inc.	Construction sand and gravel mine	5.8 mi south of Greenwood site	Operational
Mid Michigan Materials, Inc., Shipley Pit	Construction sand and gravel mine	5.4 mi northeast of Greenwood site	Operational
Cross Sand and Gravel Inc.	Construction sand and gravel mine	11 mi southwest of Greenwood site	Operational
Transportation Projects			
I-94 Black River Bridge replacement in Port Huron	First phase of the Blue Water Bridge plaza expansion, a project to modernize and improve capacity at the nation's second-busiest U.S.–Canadian truck border crossing	17 mi southeast of Greenwood site in Port Huron	Proposed; schedule undetermined
Parks and Recreation Facilities			
Fort Gratiot State Park	Planned infrastructure improvements for 30-ac State Park.	11 mi southeast of Greenwood site on Lake Huron	Ongoing infrastructure improvements.

Table 9-19. (contd)

Project Name	Summary of Project	Location	Status
St. Clair County Trail System	Proposed upgrades and extensions of an existing offroad and onroad bike route network	Throughout St. Clair County	Proposed construction through 2024
Other Actions/Projects			
Dunn Paper Company	Paper mill discharging to St. Clair River	16 mi southeast of Greenwood site	Operational
E. B. Eddy Paper, Inc.	Paper mill discharging to St. Clair and Black Rivers	15 mi southeast of Greenwood site	Operational
Indian Trail North Mobile Home Park Wastewater Sewage Lagoon	Wastewater sewage lagoon located on Lake Huron	10 mi southeast of Greenwood site on Lake Huron	Operational
Sarnia Combined Sanitary/Storm Sewer Separation	The combined sewer separation project proposed will halt the combined sewer overflow to the St. Clair River	16 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Recently completed
Sarnia Wastewater System Improvements	Trunk sanitary sewer expected to reduce the number of combined sewer overflows to the St. Clair River	16 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Recently completed
Dry Hydrant Installation, North Slip, Sarnia Harbor	Construction, installation, and maintenance of a dry hydrant and protection bollards along the North Slip embankment in Sarnia Harbor	16 mi southeast of Greenwood site in Sarnia, Ontario, Canada	Recently completed
Marysville Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair River	18 mi southeast of Greenwood site on St. Clair River	Operational
City of St. Clair Wastewater Treatment Plant	Wastewater treatment plant that discharges to St. Clair River	23 mi southeast of Greenwood site on St. Clair River	Operational
Detroit Water and Sewerage District Lake Huron Water Treatment Plant	Water treatment plant	11 mi east of Greenwood site on Lake Huron	Operational
Cargill Salt	Manufactures salt as food additive	23 mi southeast of Greenwood site	Operational

Table 9-19. (contd)

Project Name	Summary of Project	Location	Status
Courtright Sewage Treatment Plant Upgrades	Upgrade and expansion of the Sewage Treatment Plant	22 mi southeast of Greenwood site on St. Clair River in Ontario, Canada	Recently completed
Metal Fabrication Company	Metal fabrication for automobile industry	14 mi east of Greenwood site on Lake Huron	
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents. No specific data found concerning development/expansion of the towns within 20 mi of site.	Throughout region	Construction would occur in the future, as described in State and local land use planning documents
Global Climate Change/ Natural Environmental Stressors	Short- or long-term changes in precipitation or temperature.	Throughout region	Impacts would occur in the future

Source: Modified from NRC 2010a, b, c

9.3.4.1 Land Use

The following impact analysis includes impacts on land use from building activities and operations at the Greenwood site and within the geographic area of interest, which is the 15-mi region surrounding the site. The analysis also considers past, present, and reasonably foreseeable future actions that impact land use, including other Federal and non-Federal projects and those projects listed in Table 9-19 within the geographic area of interest.

The site is owned by Detroit Edison; most of the site is zoned industrial and hosts the existing Greenwood Energy Center power plants (Detroit Edison 2011a). The proposed location for the new facility includes approximately 60 ac of permanent use and 200 to 300 ac of temporary use, located in the southern part of the existing 1280-ac site (Detroit Edison 2009b). There are a number of buildings onsite associated with the power plants. There are no residential areas on the site, although there are a few residences more than 2 mi from the site (Detroit Edison 2011a). Site topography is flat with very little variation and is primarily agricultural land,

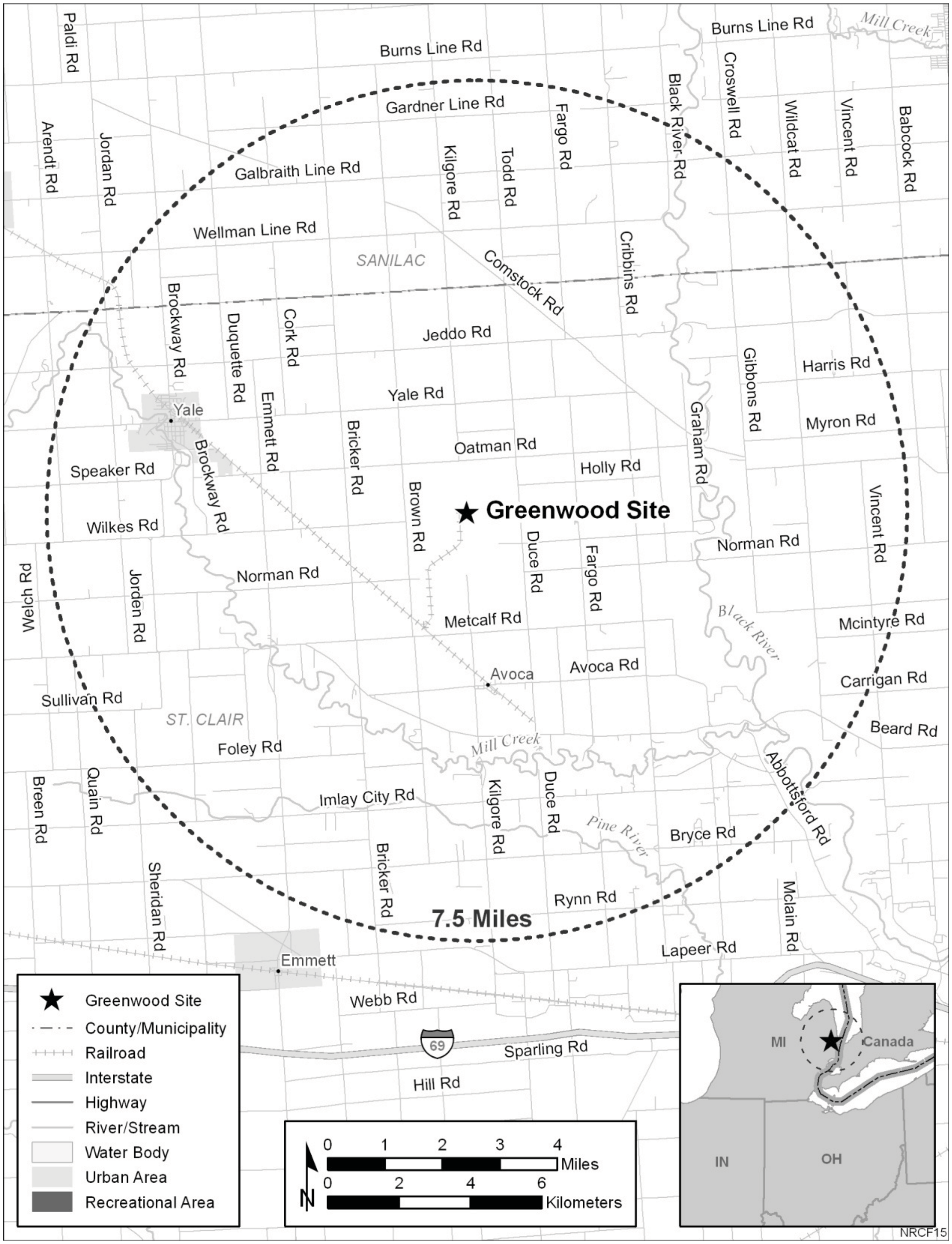

Figure 9-7. The Greenwood Alternative Site and Vicinity

with some young mixed deciduous woodland (Detroit Edison 2011a). Seven wetland areas have been identified on the site (see Section 9.3.4.3). Although FEMA has not mapped the site for flood hazard, it is likely that the site is outside the Black River floodplain (Detroit Edison 2011a).

If a new nuclear power plant were constructed on the Greenwood site, about 360 ac of the 1280-ac tract would be disturbed, and some of the agricultural land (possibly including some prime farmland) and woodland areas on the tract would be disturbed. Drainage connections between the site and the Black River 3 mi east could also be disturbed. To supply cooling water, Detroit Edison would have to build a 10-mi water pipeline from Lake Huron, and although the amount of land required for a pipeline corridor is not known, some offsite land would be affected. The pipeline would likely disturb agricultural land, forest land and wetlands, and cross several railroad tracks and local roads. No new offsite roadway would likely be needed during construction or operation of the proposed facility (Detroit Edison 2011a).

The recreational areas nearest to the site are the Port Huron State Game Area and the Black River, about 3 mi east of the site. Lake Huron, as well as Lakeport State Park and Beach, are approximately 7 mi east. Several parks and beaches are located along the coast of Lake Huron. A number of State game areas are about 25 mi to the west of the site and a group of State parks and wildlife areas about 27 mi south of the site, near Anchor Bay in Lake St. Clair (Detroit Edison 2011a). Those recreational resources closest to the site may be affected by development and operation of a plant at the Greenwood site, including increased user demand associated with the projected increase in population with the in-migrating workforce and their families, an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and condensate plume, or access delays associated with increased traffic from the construction and operations workforce on local roadways.

Although an existing 345-kV transmission line serves the site, it may need to be upgraded to serve a new nuclear facility (Detroit Edison 2011a). Upgrading the line might require expanding the corridor width and hence clearing forests and possibly interfering with some agricultural activities. Land uses along the transmission line corridor are generally similar to those on undeveloped portions of the site and lands adjoining the site, with a mixture of cropland, wooded areas, and some wetlands. Because of the short distances to the transmission interconnections, the review team concludes that the land use impacts of building and operating transmission lines for a new nuclear plant at the Greenwood site would be minor.

For cumulative land use analysis, the geographic area of interest is the 15-mi region surrounding the Greenwood site. This geographic area of interest includes the primary communities (Greenwood Township and Avoca Township) that would be affected by the proposed project if it were located at the Greenwood site.

A number of projects identified in Table 9-19 are likely to affect land use in the geographic area of interest around the Greenwood site. Upgrades and new construction of facilities at Fort Gratiot County Park on the lakeshore and the St. Clair County bike trail system are all proposed for locations within 10 mi of the proposed site, and all would require slight changes in land use around the Greenwood Energy Center. Other projects identified in Table 9-19 have contributed to or would contribute to some decreases in open lands, wetlands, and forested areas and generally result in increased urbanization and industrialization. However, several existing parks, reserves, and managed areas have been established to help preserve open lands, wetlands, and forested areas. Continued operation of existing facilities at the site is not likely to produce additional land use impacts. The review team concludes that the cumulative land use impacts of building and operating a new nuclear generating unit and associated transmission lines at the Greenwood site would be minimal because the projects within the geographic area of interest identified in Table 9-19 would be consistent with applicable land use plans, undeveloped land at the existing energy center is readily available, and the distance to transmission interconnections are relatively short.

As described for the Fermi site in Section 7.1, climate change could increase precipitation and flooding around the Greenwood site, while increased lake evaporation and reduced lake ice accumulation could reduce lake levels, thus changing land use through an increase in low-lying lakeshore areas (USGCRP 2009). Forest growth may increase as a result of more carbon dioxide in the atmosphere, while existing parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by the same factors (USGCRP 2009). In addition, climate change could reduce crop yields and livestock productivity (USGCRP 2009), which might change portions of agricultural land uses in the geographical area of interest.

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the cumulative land use impacts associated with siting a reactor at the Greenwood site would be SMALL and mitigation would not be warranted.

9.3.4.2 Water Use and Quality

Surface water features in the vicinity of the Greenwood Energy Center site include small creeks and ditches and an onsite cooling pond system for the existing power plants. Because the surface water resources near the site are poor, water for a reactor at the Greenwood site would most likely be obtained from Lake Huron, which is approximately 10 mi to the east. The site's existing power plants are supplied with lake water via a 10-mi-long pipeline system that has excess capacity of 40 MGD (Detroit Edison 2011a). However, the proposed Fermi 3's makeup water requirement is 34,000 gpm, or 49 MGD (Detroit Edison 2011a). It is unclear from this information as to how the proposed plant's water requirements would be satisfied. One possibility is that a second pipeline would be constructed to provide the additional cooling water. The review team assumed that any new pipeline would be built next to the existing pipeline.

Discharge from an operating new nuclear power plant at the Greenwood site would include relatively warm cooling tower blowdown, treated process wastewater, and liquid radwaste. The receiving body of water for these discharges is not described by Detroit Edison (2011a), but it is assumed that a second pipeline would convey discharges back to Lake Huron. Such discharges would be controlled by an NPDES permit issued by MDEQ. Given the length of pipeline that would be required for a discharge system, at least partial temperature attenuation might take place prior to discharge in the lake.

Groundwater resources in the area are present in a surficial aquifer with thickness ranging from 200 to 400 ft and well yields in the 50 to 100 gpm range. Both domestic and industrial uses are currently supported by groundwater. Groundwater in the thick surficial aquifer is of moderate chemical quality. Detroit Edison (2011a) considers that the feasibility of using wells to provide water is moderate to poor.

Building activities, including site grading and dewatering and building of new intake and discharge pipelines, would have the potential to affect water quality through increased erosion by stormwater, increased turbidity in surface water, and possible spills or leaks of fuel and other liquids. Pipeline construction between the Greenwood site and Lake Huron would create the potential for impacts of erosion and turbidity, especially at stream crossings. These changes would be expected to be limited by following appropriate BMPs. Surface water quality may be affected by discharges, but the discharges should be controlled by NPDES permits for cooling water discharge to Lake Huron or for local stormwater management.

For the cumulative analysis of impacts on surface water, the geographic areas of interest for the Greenwood site are the local creeks and ditches and Lake Huron, because these are the areas potentially affected by the proposed project. Key actions that have current and reasonably foreseeable potential impacts on water supply and water quality in this area of interest include active fossil fuel power plants, a sand and gravel pit, and wastewater treatment plants. For the cumulative analysis of impacts on groundwater, the geographic area of interest is the thick surficial aquifer in the vicinity of the site.

Water Use

Operational cooling water requirements would be the major demand on surface water resources from a new nuclear power plant. As described above, the water available from Lake Huron would be sufficient to support the makeup water needs of a new reactor, in addition to the cooling water needed by existing power plants and other projects listed in Table 9-19. The cumulative consumptive use of surface water is anticipated to have a small effect on the resource.

As described in Section 7.2.1, the greatest potential future impact on the Great Lakes water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario discussed in the USGCRP report (2009) and by Hayhoe et al. (2010) would not be detectable or would be so minor that it would not noticeably alter the availability of water from the Great Lakes. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario, the effect of climate change could noticeably increase air and water temperatures and decrease the availability of water in surface water resources in the Great Lakes region. As a result, the review team concludes that the potential impacts of use and climate change on surface water quantity would be SMALL to MODERATE. Based on its evaluation, the review team concludes that building and operating a nuclear plant at the Greenwood site would not be a significant contributor to the cumulative impact on surface water use.

Groundwater withdrawals associated with site dewatering during construction or preconstruction of a new nuclear power plant would be temporary and localized. As noted above, groundwater usage in the Greenwood vicinity supports both domestic and industrial wells. The review team concludes that cumulative groundwater impacts associated with withdrawals while building a new nuclear power plant at this site and with projects identified in Table 9-19 would be SMALL.

Water Quality

An NPDES permit from the MDEQ would be required for discharges from a new nuclear power plant at the Greenwood site, as well as for discharges from the other projects identified in Table 9-19. Such permits would limit both chemical and thermal discharges. Construction activities associated with the proposed facilities in Table 9-19 and urbanization in the vicinity have the potential to degrade surface water quality; adhering to BMPs would limit this impact.

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative, a consortium of 11 Federal agencies that developed an action plan to address environmental issues. These issues fall into five areas: cleaning up toxics and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted runoff, restoring wetlands and other habitats, and tracking progress and working with strategic partners. The results of this long-term initiative would presumably address water quality concerns of Lake Huron, which is assumed to be the receiving body of water.

Climate change, as described in Section 7.2.1, has the potential to affect the water quality of the Great Lakes, including Lake Huron and Lake Erie. Reduced lake levels could increase the impact of discharges. The review team concludes that cumulative surface water quality impacts associated with a new nuclear power plant at the Greenwood site and other past, present, and reasonably foreseeable actions in the region could result in a MODERATE impact; however, building and operating a nuclear plant at the Greenwood site would not be a significant contributor to the MODERATE cumulative impact on surface water.

Groundwater quality in the region, which is generally moderate in the surficial aquifer, could be affected by a new nuclear power plant at the Greenwood site and the other past, present, and reasonably foreseeable actions in the region identified in Table 9-19. These impacts would be expected to be localized in extent and may be avoided or minimized through adherence to BMPs. The review team concludes that cumulative groundwater quality impacts would be SMALL.

9.3.4.3 Terrestrial and Wetland Resources

Grassland, shrub, and woodland communities are present on the site and in the immediate vicinity. Historic aerial photography shows that nearly the entire site was cleared and graded in the past. No undisturbed natural communities remain in the area. The grassland is dominated by tall fescue (*Festuca arundinacea*) and orchard grass (*Dactylis glomerata*), and many native and introduced weedy or early succession species of forbs are present. A portion of these areas may be wetlands. Shrubs present include rose (*Rosa* sp.), willow (*Salix* sp.), sumac (*Rhus* sp.), and blackberry (*Rubus* sp.). The wooded areas are mostly dominated by cottonwood and green ash (Detroit Edison 2011a).

With the site and surrounding vicinity being a mosaic of fields, woods, and cropland, the area can support a variety of wildlife. Whitetail deer are the largest mammals in the vicinity. Coyote (*Canis latrans)* are probably in the area, along with a variety of smaller mammals such as eastern cottontail (*Sylvilagus floridanus***)**, opossum, striped skunk (*Mephitis mephitis)*, and mice (*Peromyscus* sp.). Diverse amphibians and reptiles should also be expected, especially with the presence of local wetlands. The habitat variety also suggests a diversity of birds, from waterfowl and songbirds to raptors (Detroit Edison 2011a).

The NWI does not identify wetlands on the site, but offsite review by Detroit Edison (Detroit Edison 2009b) determined that there are seven wetlands within the site, some of high quality. It is possible that one or more additional areas contain wetlands because many of the soils on the site are mapped as having areas of hydric soils (USDA 2010).

Two terrestrial species listed as threatened or endangered under the ESA are known to occur or could occur in St. Clair County. The eastern prairie fringed orchid is Federally listed as endangered and is known mostly from lakeplain prairies around Saginaw Bay and western Lake Erie (MNFI 2007a). No lakeplain prairie habitat occurs on or in the immediate vicinity of the project site, but hydric soils in fallow agricultural fields are possible and the orchid could occur there (MNFI 2007a). The Indiana bat, Federally listed as endangered, occurs in southern Michigan when it is not hibernating in hibernacula located in southern Michigan and other States (MNFI 2007b). It generally requires large trees (greater than 9-in. diameter) with exfoliating bark for summer roosting. According to the FWS (2009), however, trees as small as 5 in. in diameter should be considered as potential habitat. Moreover, the emerald ash borer is active in the project area (MDA 2009), and ash trees onsite have died from the borer, creating a potential for dead trees with loose bark and resulting in potential roosting habitat for the Indiana bat. The bald eagle is no longer on the Federal endangered species list, although it remains protected under the BGEPA and MBTA (MNFI 2007c). The bald eagle was also recently removed from the State list of threatened and endangered species and is now considered a species of concern. Although bald eagles are known to occur in the region, the species usually nests and roosts closer to fish-bearing waters. The potential for any impacts on protected species appears to be minimal due to the type of habitat present.

More than 50 State-listed species occur in St. Clair County (see Table 9-20). Among the State-listed species is the eastern fox snake. Four other species formerly present in the county are presumed extirpated. Detroit Edison has not consulted with MDNR about impacts on State-listed species that could result from construction of the power plant at the Greenwood Energy Center site.

Building Impacts

Agricultural land, old field, and forest land would have to be cleared and converted to industrial use in order to build a new reactor and associated facilities at the Greenwood Energy Center site. According to Detroit Edison, the total area of the Greenwood Energy Center site is approximately 1280 ac; the new reactor facilities would occupy about 60 ac of the southwestern part of the Greenwood site (Detroit Edison 2011a). Although Detroit Edison's conceptual plan layout (Detroit Edison 2009b) does not differentiate temporarily disturbed areas from the facility footprint, information about the proposed Fermi site location indicates that temporary disturbance could be as much as 200 to 300 ac. Conversion of agricultural land would have minimal impact on wildlife and habitat. Conversion of forested areas would have some impact on most of the common species present onsite by removing habitat used for shelter or other functions. With the possible exception of the Indiana bat, adverse impacts on Federally listed species would not be anticipated. The forested areas of the site have the potential to provide nesting and roosting habitat for the Indiana bat, primarily in the form of dead ash trees. If the bat uses the areas that would be disturbed, impacts could be kept to minimal levels by limiting tree clearing to the times of year when the bats are not in the region.

The agricultural land and the relatively young forest on this site are not likely to provide habitat for State-listed species, but additional study would be needed to adequately assess potential impacts on terrestrial ecological resources on the site and in the vicinity, including the eastern fox snake.

Information about the Greenwood Energy Center alternative provided by Detroit Edison did not indicate whether any part or all of the seven wetland areas on the site would be affected by building the new reactor facilities (Detroit Edison 2009b, 2011a). Detroit Edison did state that a conceptual facility layout could affect approximately 1313 ft of Engles Drain (Detroit Edison 2009b), raising the possibility of affecting any wetlands that may be associated with

Table 9-20. Federally and State-Listed Terrestrial Species That Occur in St. Clair County and That May Occur on the Greenwood Energy Center Site or in the Immediate Vicinity

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Amphibians			
Blanchard's cricket frog	*Acris crepitans blanchardi*	NL	T
Birds			
Cerulean warbler	*Dendroica cerulea*	NL	T
Common moorhen	*Gallinula chloropus*	NL	T
Common tern	*Sterna hirundo*	NL	T
Forster's tern	*Sterna forsteri*	NL	T
Henslow's sparrow	*Ammodramus henslowii*	NL	E
King rail	*Rallus elegans*	NL	E
Least bittern	*Ixobrychus exilis*	NL	T
Louisiana waterthrush	*Seiurus motacilla*	NL	T
Peregrine falcon	*Falco peregrinus*	NL	E
Red-shouldered hawk	*Buteo lineatus*	NL	T
Mammals			
Indiana bat	*Myotis sodalis*	E	E
Plants			
American chestnut	*Castanea dentata*	NL	E
Beak grass	*Diarrhena obovata*	NL	T
Beard tongue	*Penstemon calycosus*	NL	T
Bog bluegrass	*Poa paludigena*	NL	T
Broad-leaved sedge	*Carex platyphylla*	NL	E
Carey's smartweed	*Polygonum careyi*	NL	T
Chestnut sedge	*Fimbristylis puberula*	NL	Presumed Extirpated
Creeping whitlow grass	*Draba reptans*	NL	T
Eastern prairie fringed orchid	*Platanthera leucophaea*	T	E
Few-flowered nut rush	*Scleria pauciflora*	NL	E
Frost grape	*Vitis vulpina*	NL	T
Gattinger's gerardia	*Agalinis gattingeri*	NL	E
Ginseng	*Panax quinquefolius*	NL	T
Goldenseal	*Hydrastis canadensis*	NL	T
Heart-leaved plantain	*Plantago cordata*	NL	E
Large toothwort	*Dentaria maxima*	NL	T
Large water starwort	*Callitriche heterophylla*	NL	T
Leiberg's panic grass	*Dichanthelium leibergii*	NL	T
Limestone oak fern	*Gymnocarpium robertianum*	NL	T
Narrow-leaved puccoon	*Lithospermum incisum*	NL	Presumed Extirpated
Northern prostrate clubmoss	*Lycopodiella margueritae*	NL	T
Orange- or yellow-fringed orchid	*Platanthera ciliaris*	NL	E
Painted trillium	*Trillium undulatum*	NL	E

Table 9-20. (contd)

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Pine-drops	*Pterospora andromedea*	NL	T
Pink milkwort	*Polygala incarnata*	NL	Presumed Extirpated
Prairie buttercup	*Ranunculus rhomboideus*	NL	T
Purple milkweed	*Asclepias purpurascens*	NL	T
Purple prairie clover	*Dalea purpurea*	NL	Presumed Extirpated
Scirpus-like rush	*Juncus scirpoides*	NL	T
Short-fruited rush	*Juncus brachycarpus*	NL	T
Showy orchis	*Galearis spectabilis*	NL	T
Skinner's gerardia	*Agalinis skinneriana*	NL	E
Slough grass	*Beckmannia syzigachne*	NL	T
Spearwort	*Ranunculus ambigens*	NL	T
Stiff gentian	*Gentianella quinquefolia*	NL	T
Sullivant's milkweed	*Asclepias sullivantii*	NL	T
Three-awned grass	*Aristida longespica*	NL	T
White gentian	*Gentiana flavida*	NL	E
White goldenrod	*Solidago bicolor*	NL	E
White lady slipper	*Cypripedium candidum*	NL	T
Wild rice	*Zizania aquatica* var. *aquatica*	NL	T
Reptiles			
Eastern fox snake	*Pantherophis gloydi*	NL	T
Spotted turtle	*Clemmys guttata*	NL	T

Source: MNFI 2010a
(a) E = listed as endangered, NL = not listed, T = listed as threatened.

Engles Drain. Considering the prevalence of hydric soils on the site, the layout likely affects unmapped wetlands

Detroit Edison's ER states that although there appears to be an open circuit on a 345-kV transmission line that enters the site, capacity and reliability are not likely to be adequate for a new nuclear power plant. It is likely, therefore, that a new transmission line would be necessary for a number of reasons. A reactor built on the Greenwood site rather than at the proposed Fermi site would still be expected to serve the same load centers as if it were at the Fermi site, and the existing power plants on the site would continue operating, resulting in little likelihood that there is sufficient uncommitted current-carrying capacity left on the existing lines. No information was provided on where a possible transmission line would be built, how long it would be, or what terrestrial ecological resources might be affected. It might be possible, however, that a new transmission line could share or adjoin an existing transmission line corridor for some of its length and use existing substations, thereby resulting in less ecological impact than completely new corridors and substations would cause. The vicinity of the

Greenwood Energy Center site is largely agricultural, with some forested areas. Although it appears possible to avoid most, if not all, important habitat with a new transmission line, a complete assessment would require a corridor location and site-specific information about the wildlife and habitat within the corridor.

Operational Impacts

During plant operation, wildlife, including the eastern fox snake, could be subjected to increased mortality from traffic, but it is not expected that such effects would destabilize the local or regional populations of the common species of the site (Forman and Alexander 1998). Information about the local occurrence of important species and habitats would be needed to conduct a more complete assessment of potential project effects on those resources at the Greenwood Energy Center site. Potential impacts associated with transmission line operation would consist of bird collisions with transmission lines, habitat loss due to corridor maintenance, noise, and EMF effects on flora and fauna.

Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of bird collisions with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in bird mortality. Weather, such as low cloud ceilings, advancing fronts, and fog, also contribute to this phenomenon.

There would be a potential for bird mortality from collisions with the nuclear power plant structures at this site. Typically, the cooling tower and the meteorological tower are the structures likely to pose the greatest risk. The potential for bird collisions increases as structure heights and widths increase. MDCTs are of little concern, because of their relatively low height compared to existing and proposed structures onsite. An NDCT, however, would be on the order of 600 ft high. Nonetheless, the NRC concluded that bird collisions with existing cooling towers “involve sufficiently small numbers for any species that it is unlikely that the losses would threaten the stability of local populations or would result in a noticeable impairment of the function of a species within local ecosystems” (NRC 1996). Thus, the impacts on bird populations from collisions with the cooling tower are expected to be minimal.

Because the transmission line that runs through the site is fairly congested (Detroit Edison 2011a), the review team assumes that either an upgrade of existing transmission facilities or the addition of one or more new transmission lines would likely be constructed to serve a new reactor. The vicinity of this alternative site is primarily agricultural. Impacts on terrestrial ecological resources from constructing a new transmission line in agricultural land would likely be minimal. Actual impacts, however, would depend on the exact route and length of new transmission lines.

Impacts of the transmission system on wildlife (e.g., bird collisions and habitat loss) resulting from the addition of new lines and towers cannot be fully evaluated without additional information on the length and location of any new transmission facilities. Nonetheless, Section 4.5.6.2 of the GEIS for license renewal (NRC 1996) provides a thorough discussion of the topic and concludes that bird collisions associated with the operation of transmission lines would not cause long-term reductions in bird populations. The same document also concludes that once a transmission corridor has been established, the impacts on wildlife populations are from continued transmission line corridors maintenance and are not significant (NRC 1996).

ITC*Transmission* would construct and operate any new transmission line needed for a new reactor at the Greenwood Energy Center site. ITC*Transmission* operates in accordance with industry standards for vegetation management (NERC 2010) including seasonal restrictions on activities that could adversely affect important wildlife (Detroit Edison 2010a). According to ITC*Transmission*'s vegetation management policy, wetland areas within the corridor that have the potential to regenerate in forest vegetation would be periodically manually cleared of woody vegetation for line safety, thereby keeping them in a scrub-shrub or emergent wetland state (ITC*Transmission* 2010). Other forested areas would similarly be managed to prevent tree regrowth that could present safety or transmission reliability problems. Access to these areas for maintenance would likely be on foot or by the use of matting for vehicles so as not to disturb the soil. Pesticides or herbicides would be used only occasionally in specific areas in the corridor where needed. It is expected that the use of such chemicals in the transmission line corridor would be minimized to the greatest extent possible in wetland areas to protect these important resources (Detroit Edison 2010a). The impacts associated with corridor maintenance activities are loss of habitat, especially forested habitat, from cutting and herbicide application. The maintenance of transmission line corridors could be beneficial for some species, including those that inhabit early successional habitat or use edge environments. Impacts of transmission line corridor maintenance would depend on the types and extents of habitat crossed. Detroit Edison has not provided sufficient details to make a complete assessment of transmission line corridor maintenance impacts. In general, however, if a new transmission line is needed, the impacts from operation and maintenance of the line would likely be minimal.

Detroit Edison provided no data on noise for the possible new reactor on the Greenwood Energy Center site, but it is likely that impacts would be minimal and similar to those of the Fermi 3 project.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NIEHS 2002). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NIEHS 2002). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes (NIEHS 2002). Thus, impacts of EMFs from transmission systems with variable numbers of power lines on terrestrial flora and fauna are of small significance at operating nuclear power plants (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals exposed to EMFs for all or most of their lives (Moulder 2007). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2007). A review of the literature on health effects of electric and magnetic fields conducted for the Oregon Department of Energy looked at the effects of strong electric and magnetic fields on various bird species. While some studies concluded that some species of birds exhibited changes in activity levels and some physiological metrics, no studies demonstrated adverse effects on health or breeding success (Golder Associates, Inc. 2009).

Cumulative Impacts

Several past, present, and reasonably foreseeable projects could affect terrestrial resources in ways similar to siting a new reactor at the Greenwood Energy Center site (see Table 9-19). The geographic area of interest for the following analysis is defined by a 25-mi radius extending out from the site.

Past projects include two generation facilities belonging to Detroit Edison: the Greenwood Energy Center, a major oil-fired and natural gas generating facility, and the Belle River Power Plant, a major coal-fired power plant. Just beyond the 25-mi radius is the St. Clair Power Plant, a major coal- and oil-fired facility. The Greenwood facility belonging to Detroit Edison occupies hundreds of acres on the east side of the site. Future urbanization in the region could also noticeably affect wildlife and habitat in or near the geographic area of interest. Development of the site could result in increased employment and population within the geographic area of concern which, in turn, could indirectly result in additional urbanization. However, given the current populations of Lapeer, Sanilac, and St. Clair Counties, Michigan, and Lambton County, Ontario, approximately 90,000, 42,000, 164,000, and 127,000, respectively, the additional impact on ecological resources from urbanization resulting from development of the Greenwood site cumulative to past projects would be minor.

Urbanization would likely result in conversion of agricultural land, forest land, wetlands, and other habitat to urban uses. Urbanization would involve some of the same activities as building a new reactor, including land clearing and grading (temporary and permanent), increased human presence, heavy equipment operation, traffic (including resulting wildlife mortality), noise from construction equipment, and fugitive dust. The cumulative impacts of noise and dust from building a new reactor would be negligible. Some of the effects of these activities, such as noise and dust, are short term and localized. Other effects, such as clearing wildlife habitat that would not be restored, would be permanent. The effects of urbanization of land clearing and grading, filling of wetlands, increased human presence, and increased traffic would occur over a period of several years and in several locations.

Considering the presence of known wetlands and hydric soils on the site, it is likely that wetland habitat would be disturbed by building a new reactor at the Greenwood Energy Center site. Impacts from potential transmission line development cannot be assessed without more specific routing information. Because of the largely agricultural landscape of the Greenwood Energy Center site vicinity, it is likely that a transmission line corridor could be routed to minimize impacts on wildlife and habitat.

Summary of Impacts on Terrestrial and Wetland Resources at the Greenwood Energy Center Site

Impacts on terrestrial ecological resources and wetland resources were estimated based on the information provided by Detroit Edison and the review team's independent review of that and other relevant data. Based on the conceptual layout (Detroit Edison 2009b), the permanently disturbed area could be as much as 60 ac and the temporarily disturbed area could be as much as 200 ac. Much of the area that would be affected is currently used for row crops and hay and provides relatively low wildlife habitat value. After construction and preconstruction at the Greenwood Energy Center site, habitat resources in temporarily disturbed areas would be expected to naturally regenerate. Wildlife would also recover but might not use the regenerated habitat to the same degree. Permanently disturbed areas would be converted to industrial use for the indefinite future. However, because of the likelihood of wetland impacts at the site, impacts are expected to be noticeable. Because the review team has no definitive information on the routing and length of a new transmission corridor, it cannot estimate the extent of affected habitats.

The review team concludes that the cumulative impacts on terrestrial wildlife and habitat would be MODERATE for a new reactor at the Greenwood Energy Center site. Building and operating a new nuclear unit at the Greenwood site would be a significant contributor to the MODERATE impact.

9.3.4.4 Aquatic Resources

Surface water features associated with the Greenwood site include a small creek (Plum Creek), agricultural drains (e.g., Engles Drain), and an onsite cooling pond system for the existing power plants (Section 9.3.4.2). The Black River is 3 mi east of the Greenwood site, but the cooling water intake and discharge pipelines for a new reactor may cross the Black River in route to Lake Huron. The NWI does not identify wetlands on the site, but Detroit Edison determined that there are seven wetlands within the site, some of high quality (Detroit Edison 2011a). No information exists regarding the aquatic organisms in the onsite wetlands and utility ponds, and surveys would be needed to characterize the aquatic communities present. However, a variety of aquatic macroinvertebrates, such as mayflies, stoneflies, caddisflies, isopods, and chironomids, are likely to be present, along with fish common to Great Lakes coastal habitats such as sunfishes, shiners, suckers, and catfish (Bolsenga and Herdendorf 1993).

The site's existing power plant (Greenwood Energy Center) is supplied with water from Lake Huron via a 10-mi-long pipeline system (Section 9.3.4.2), and cooling water for a new reactor at the Greenwood site would also likely be obtained from Lake Huron. Lake Huron is the second largest of the Great Lakes and supports an important commercial and recreational fishery. Common nearshore forage species include shiners (*Notropis* spp.), sticklebacks, and rainbow smelt. Alewife, an introduced species that also provides forage for commercially and recreationally important species in the Great Lakes, were once abundant in Lake Huron but have declined significantly in recent years (Schaeffer et al. 2009). Lake herring (*Coregonus artedii*), yellow perch, common carp, channel catfish (*Ictalurus punctatus*), walleye, pike, and freshwater drum are commercially or recreationally important species found near the shoreline (USGS 2010). Some of the primary aquatic nuisance species are the fishhook waterflea (*Bythotrephes cederstroemi*), zebra mussels, sea lamprey (*Petromyzon marinus*), common carp, and round goby. Zebra mussels in particular have substantially changed the ecosystem characteristics of Lake Huron by increasing benthic productivity, reducing plankton and planktivorous fish abundance, and altering the substrate available to demersal organisms (EPA 2008c).

Federally and State-Listed Threatened and Endangered Species

No Federally listed threatened or endangered aquatic species is known to occur in St. Clair County (FWS 2010). However, the rayed bean and snuffbox mussel, which are present in St. Clair County in the Belle River, are proposed for Federal listing as endangered (FWS 2010; 75 FR 67552) and are listed as endangered by the State of Michigan (Carman 2001b). There are no designated critical habitats for any listed species in the vicinity of the Greenwood site. Within St. Clair County, seven State-listed species of fish may exist in the Black River drainage or Lake Huron (Table 9-21). Lake Huron contains lake sturgeon and their spawning grounds (Goforth 2000). Channel darters are also present in Lake Huron (Carman and Goforth 2000a). Northern madtoms (*Noturus stigmosus*), mooneye, and sauger are not historically abundant in Lake Huron, and these species have not been collected in Lake Huron in the last 20 years (Carman 2001a; Derosier 2004a, b). Eastern sand darters and pugnose shiners (*Notropis anogenus*) are found in the Black River drainage (Derosier 2004c, d).

Six State-listed mussel species potentially present within St. Clair County may occur on the Greenwood Site, in the Black River, or in Lake Huron (Table 9-21). Of the threatened or endangered species, slippershell mussels are present in St. Clair County in Lake Huron drainages including large rivers and lakes (Carman 2002b). Eastern pondmussel and pink papershell are historically present in St. Clair County. The eastern pondmussel can be found in ponds, lakes, and streams (Mulcrone 2006a), while the pink papershell is usually found in rivers and large streams (Mulcrone 2006b). Therefore, suitable habitat for both species may exist in the Black River or Lake Huron. The rayed bean is not known to currently exist in Lake Huron

Table 9-21. Federally and State-Listed Threatened and Endangered Aquatic Species That Are Known to Occur in St. Clair County and That May Occur on the Greenwood Site, the Black River, or Lake Huron

Common Name	Scientific Name	Federal Status[(a)]	State Status[(b)]
Fish			
Channel darter	*Percina copelandi*	NL	E
Eastern sand darter	*Ammocrypta pellucida*	NL	T
Lake sturgeon	*Acipenser fulvescens*	NL	T
Mooneye	*Hiodon tergisus*	NL	T
Northern madtom	*Noturus stigmosus*	NL	E
Pugnose shiner	*Notropis anogenus*	NL	E
Sauger	*Sander canadensis*	NL	T
Invertebrates			
Eastern pondmussel	*Ligumia nasuta*	NL	E
Pink papershell	*Potamilus ohiensis*	NL	T
Rainbow	*Villosa iris*	NL	SC
Rayed bean	*Villosa fabalis*	PE	E
Round pigtoe	*Pleurobema sintoxia*	NL	SC
Slippershell	*Alasmidonta viridis*	NL	T
Snuffbox mussel	*Epioblasma triquetra*	PE	E

(a) Federal status rankings determined by the FWS under the Endangered Species Act. NL = not listed, PE = proposed endangered. Source: FWS 2010.
(b) State species information provided by MNFI (2010b): E = endangered, T = threatened, SC = species of concern.

(Carman 2001b). A single live rayed bean was found in the Black River in 2001, but additional specimens were not found in subsequent surveys (75 FR 67552).

Building Impacts

Impacts on aquatic habitats and biota could result from building the primary facilities, associated transmission lines, and the cooling water intake and discharge pipelines for a new reactor at the Greenwood site. As identified in Section 9.3.4.1, the area of the site that would be developed if the site was chosen for a new reactor facility consists primarily of agricultural land and woodland. The site's existing pipeline system may not be adequate to provide the needed cooling water for a new reactor. If the existing pipeline capacity is considered insufficient, construction of a 10-mi pipeline from the site to Lake Huron could result in building-related impacts near aquatic habitats located along the pipeline corridor including the likely crossing of the Black River. Building a new cooling water intake and discharge structure at Lake Huron would require dredging, pile driving, and other alterations to the shoreline and benthic habitat, potentially resulting in the temporary and permanent loss or alteration of aquatic habitat as well as injury, mortality, or temporary displacement of aquatic biota (see Section 4.3.2 for a detailed description of potential impacts of construction activities on aquatic habitat and biota). The impacts on aquatic organisms would be temporary and could be largely mitigated through the use of BMPs. Pipelines crossing streams would likely span the streams rather than being placed along the bottom, reducing impacts on aquatic communities. Preconstruction and construction activities within Lake Huron and the Black River would require Section 10 and Section 404 permits from USACE, as well as a regulatory permit from MDEQ, and these permits would likely contain stipulations that would further reduce impacts. Overall, the impact of building cooling water intake and discharge structures on the aquatic ecology of Lake Huron and the Black River would be minor.

As described in Section 4.3.2, building activities at the location of the new reactor, including an increase in impervious land surface, vegetation removal, site grading, and dewatering, would have the potential to affect water quality and hydrology and therefore aquatic biota in ditches, streams, and wetlands located within and downstream of the proposed site. Stormwater runoff could carry soil as well as contaminants (e.g., spilled fuel and oil) from construction equipment into onsite streams and drains. Drainage connections between the site and the Black River 3 mi to the east could also be disturbed. Information about the Greenwood site provided by Detroit Edison did not indicate whether any part or all of the seven wetland areas on the site would be affected by building the new reactor facilities (Detroit Edison 2011a). Additional project design details as well as surveys of aquatic habitat and biota would be needed to fully evaluate the potential for impacts on onsite aquatic resources. Although surface water quality may be affected by construction site discharges, the discharges would be regulated by NPDES and stormwater permits. Implementing appropriate BMPs would further reduce the potential for sediments to enter surface water.

It is possible that the transmission line for a new reactor at the Greenwood site could use existing substations and share or adjoin the existing 345-kV transmission line corridor for some of its length. If so, building-related impacts on aquatic resources would be minimal. If a new transmission line is needed to service a new reactor, there is the potential for the construction-related impacts described above to affect aquatic habitat and aquatic biota if the new transmission line passes near or crosses a surface water feature. Expansion of existing corridors would be expected to result in minor environmental impacts, while establishing new corridors could result in greater impacts. However, based on the assumptions that required construction permits are obtained from MDEQ and/or USACE and appropriate BMPs are implemented during building activities, the impacts on aquatic resources from development of additional transmission facilities would likely be temporary, easily mitigated, and minor.

Building a new reactor at the Greenwood site is not expected to result in impacts on threatened and endangered aquatic species, given the lack of suitable habitat at the reactor location and the use of BMPs to minimize potential construction impacts on aquatic habitats. However, any threatened or endangered fish and mussels found in Lake Huron and the Black River could be affected because the cooling water intake and discharge structures may cross the Black River and would entail building activity in Lake Huron. Threatened or endangered mussels potentially present in the Black River and Lake Huron include the eastern pondmussel, pink papershell, and slippershell. As discussed above, the rayed bean is potentially, but not likely, present in Lake Huron, but the species has been found in the Black River as recently as 2001. Additional information would need to be collected and surveys may need to be conducted to evaluate the potential for Federally and State-listed mussel species to be present in areas of the Black River and Lake Huron that would be disturbed by building activities. If threatened or endangered mussels were found, it is likely that mitigation measures would need to be developed to limit potential impacts. Habitat for State-listed fish species could be disturbed by shoreline and in-water building activities. However, fish are highly mobile and would likely avoid the affected areas during construction. On the basis of this information and because construction and preconstruction activities would be temporary and mitigable, the review team concludes that impacts on threatened and endangered aquatic species would be minor.

Operational Impacts

Operational impacts on aquatic habitat and biota could result from cooling water consumption, transmission line maintenance, cooling water system maintenance, cooling water discharge, and impingement and entrainment of aquatic biota in Lake Huron by the cooling water intake system.

Withdrawal of cooling water by a new nuclear power reactor at the Greenwood site could affect the aquatic environment. Detroit Edison has proposed a closed cycle recirculating cooling system, which could reduce water use by 96 to 98 percent of the amount that the facility would use if it employed a once-through cooling system (66 FR 65256). Assuming that cooling water needs would be similar to those identified for the proposed Fermi 3, approximately 34,000 gpm, or 49 MGD, would be needed (Detroit Edison 2011a). The withdrawal of water would not disrupt natural thermal stratification or the turnover pattern for Lake Huron and would comply with EPA's CWA Section 316(b) Phase I regulations. The water available from Lake Huron would be sufficient to support the makeup water needs of a new reactor, and therefore the incremental impact on water availability from operating a new power plant at the Greenwood site would be minor (see Section 9.3.4.2). Consequently, the hydrologic impacts on aquatic habitat in Lake Huron from water withdrawal should be minimal.

Maintenance dredging of the area around the cooling water intake in Lake Huron would periodically be necessary to maintain appropriate operating conditions. Such dredging would be managed under permits from the USACE and MDEQ and result in a temporary localized increase in turbidity in the vicinity of the intake bay. Dredged material is expected to be disposed of in a spoil disposal pond, where sedimentation would occur prior to discharge of the water back into Lake Huron. The periodic dredging of the intake bay, which would likely be similar to maintenance dredging activities for other existing power plants in the region, would result in minimal impacts on aquatic biota and habitats in Lake Huron.

The effect of impingement and entrainment of aquatic organisms from Lake Huron was evaluated by the staff. Entrainment could result in mortality to zooplankton and phytoplankton. Particularly vulnerable are invertebrates and early life stages of fish (eggs and larvae), which lack the ability to overcome intake suction and which are small enough to pass through the mesh of the intake screens. Juvenile fish may still be vulnerable, while adults of larger fish species are likely less vulnerable. The fish screens and the closed cycle recirculating cooling system proposed by Detroit Edison would reduce water intake and physical damage to aquatic organisms (Section 5.3.2). Based on the assumption of a closed cycle cooling system that meets the EPA's CWA Section 316(b) Phase I regulations for new facilities the Greenwood Energy Center, the anticipated impacts on aquatic populations from entrainment and impingement are expected to be minimal.

Discharge would include warm cooling tower blowdown, treated process wastewater, and processed radwaste wastewater, all of which could affect aquatic biota through mortality or sublethal physiological, behavioral, and reproductive impairment (see Section 5.3.2). In addition, aquatic organisms could be affected by cold shock and the scour of benthic habitat near the discharge pipe (see Section 5.3.2). However, proposed design features such as the presence of riprap around the submerged discharge ports and orientation of the discharge ports in an upward direction are intended to reduce scouring (Detroit Edison 2011a). As identified in Section 9.3.4.2, a NPDES permit from MDEQ would be required for discharges from a new nuclear power plant at the Greenwood site. Such a permit would likely specify limits for chemical and thermal discharges in order to protect water quality, thereby limiting the potential for impacts on aquatic organisms. Also, given the length of pipeline that would be required for a discharge system that extends to Lake Huron, at least partial temperature attenuation might take place prior to discharge in the lake. Assuming that NPDES permitting requirements are met, the impacts of discharges on aquatic habitats and biota would be minor.

Impacts on aquatic resources from operation of a new reactor at the Greenwood site may include those associated with maintenance of transmission line corridors located near surface water features. ITC*Transmission* would be expected to construct and operate any new transmission lines needed for a new reactor at the Greenwood site, and it is assumed that it would follow current maintenance practices designed to minimize impacts on drains, creeks, rivers, and wetlands, such as minimizing disturbance to riparian habitat and minimizing the application of pesticides and herbicides, which can enter aquatic habitat and adversely affect aquatic biota (Detroit Edison 2011a). Although impacts of transmission line corridor maintenance would depend, in part, on the types and extent of aquatic habitat located near the transmission line, impacts on aquatic habitats and biota from maintenance of transmission lines would likely be minor as long as maintenance practices currently followed by ITC*Transmission* are implemented.

There is no suitable habitat for threatened and endangered mussels near the proposed location for a reactor, but Federally and State-listed threatened and endangered species potentially found in surface waters located along the transmission line and cooling water intake and discharge pipelines, including the Black River, may be adversely affected by maintenance activities. The potential for impacts on threatened and endangered species could be minimized by avoiding streams and mitigated by following BMPs and surveying for the presence of mussel species before maintenance activities begin. Threatened and endangered mussels potentially present in Lake Huron include the rayed bean (proposed for Federal listing), and the State-listed eastern pondmussel, and pink papershell. These species may be vulnerable to cooling water intake operational impacts if present in the immediately affected areas. As eggs, mussels are not likely to be affected by system operation because they typically develop into larvae within the female. The glochidial stage during which juvenile mussels attach to a suitable fish host are vulnerable indirectly through host impingement or entrainment. The presumed host for the rayed bean (largemouth bass) is present in Lake Huron and could be impinged during reactor operations. Post-glochidial and adult stages of mussels are not likely to be susceptible to entrainment or impingement because they bury themselves in sediment.

No recent records of State-listed northern madtoms, mooneye, and sauger exist for Lake Huron, and these species are not likely to be affected by reactor operations. Channel darters are closely associated with the sediment and may be less likely to be entrained. Early life stages of lake sturgeon could be vulnerable to impingement and entrainment, but mortality significant enough to affect lake sturgeon populations is not anticipated. Overall, impacts on threatened and endangered aquatic species from reactor operations are expected to be minor.

Cumulative Impacts

Past, present, and reasonably foreseeable projects, facilities, and other environmental changes that may contribute to cumulative impacts on aquatic resources in the area include activities and projects shown in Table 9-19 and current and future ecosystem changes from climate change, introduced dreissenid mussels, and recreational and commercial fishing. Environmental conditions in Lake Huron may be improved in the future by the Great Lakes Restoration Initiative, which is a multi-agency effort to reduce pollution and restore habitat in the Great Lakes region. Among the many projects are the City of Port Huron-Restoring Fish Habitat project, which seeks to restore rocky bottom fish habitat in the St. Clair River near Port Huron, and the Upper Great Lakes Stream Connectivity and Habitat Initiative, which seeks to improve Great Lakes tributaries by restoring fish passage and in-stream habitat (see http://greatlakesrestoration.us/).

As discussed above, potential building-related impacts on aquatic habitat and biota could result from altered hydrology, erosion, and stormwater runoff of soil and contaminants and disturbance or loss of benthic habitat from construction of the reactor, associated transmission lines, and cooling water system. Future urbanization in the region can affect aquatic resources in similar ways by increasing impervious surface, non-point-source pollution and water use, and by altering existing hydrology patterns, potentially resulting in changes in the structure and function of aquatic communities. Development of a new reactor at the Greenwood site could result in increased population and additional urbanization with subsequent impacts on aquatic resources.

The primary operational impacts on aquatic habitat and biota at the Greenwood site could result from makeup water needs, transmission line maintenance, alteration in water quality from cooling water discharge, and impingement and entrainment of aquatic biota during cooling water intake. Impingement and entrainment of aquatic biota from Lake Huron resulting from operations of a new reactor must be considered along with mortality resulting from existing power plants that already withdraw water from Lake Huron, from commercial and recreational fishing, and from introduced zebra mussels and quagga mussels, which have dramatically reduced plankton abundance in the region. Species currently in decline in Lake Huron are primarily deepwater or pelagic species such as lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), and chinook salmon (*Oncorhynchus tshawytscha*) (Schaeffer et al. 2009). However, these species may also occupy nearshore areas at various life stages and could be vulnerable to cooling water intake.

As described above, the water available from Lake Huron would be sufficient to support the makeup water needs of a new reactor in addition to the cooling water needed by existing power plants and other projects listed in Table 9-19. The cumulative consumptive use of surface water is anticipated to have a small effect on aquatic resources (Section 9.3.4.2). However, as described in Section 7.2.1, climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. If such a reduction in surface water were to occur, aquatic habitat on the reactor site and in Lake Huron may be altered or eliminated, with potentially adverse consequences for aquatic habitat and biota.

Discharges into Lake Huron from a new nuclear power plant at the Greenwood site must be considered along with discharges into Lake Huron from the other projects identified in Table 9-19. NPDES permits would limit both chemical and thermal discharges into Lake Huron. However, if climate change results in reduced water levels and increased water temperature, the impacts associated with contaminant concentrations and thermal stress from cooling water discharge into Lake Huron could also increase. As identified in Section 9.3.4.2, the overall cumulative surface water quality impacts associated with a new nuclear power plant at the Greenwood site together with other past, present, and reasonably foreseeable actions in the region are expected to be minor because of the expected localized extent of the project impacts and the adherence to BMPs and permitting requirements designed to avoid or minimize impacts. Similarly, the incremental contribution of a new reactor at the Greenwood site to cumulative impacts on aquatic biota from water quality changes due to operational discharges would also be minor.

Based on its evaluation, the review team concludes that the cumulative impacts on aquatic resources, including threatened or endangered species, could be substantial due to the continued inadvertent introduction of invasive species, overfishing, and increased urbanization resulting in degradation of water quality and global climate change. The incremental impact from building and operating a new power plant at the Greenwood site would not contribute significantly to the overall cumulative impacts in the geographic area of interest.

Summary of Impacts on Aquatic Resources at the Greenwood Site

Impacts on aquatic habitats and associated biota within onsite ponds and wetlands at the Greenwood site, the Black River, and Lake Huron could result from reactor, transmission line, and cooling water intake and discharge system preconstruction and construction activities. However, the impacts on populations of aquatic organisms would be temporary and could be largely mitigated by avoiding aquatic habitats during siting of facilities and activity areas and through the use of BMPs during preconstruction and construction activities.

Operational impacts on aquatic resources could result from cooling water consumption, transmission line and cooling water system maintenance, alteration of water quality by cooling water discharge, and impingement and entrainment of aquatic biota by the cooling water system. Impingement and entrainment of aquatic organisms from the nearshore environment of Lake Huron would add to the existing mortality of aquatic biota due to invasive species, commercial and recreational fishing, and the operation of other power plants that use water from or discharge into Lake Huron.

Impingement and entrainment of aquatic organisms in Lake Huron would be minimized by complying with EPA's CWA Section 316(b) Phase I regulations and using appropriately designed fish screens. Lake Huron could support the makeup water needs of a new reactor. However, climate change could noticeably decrease the availability of surface water resources in the Great Lakes. Similarly, while a NPDES permit would limit both chemical and thermal discharges from a new reactor, climate change has the potential to increase ecological impacts from the discharge on aquatic communities. Transmission line and cooling water pipeline maintenance impacts on aquatic habitat and biota could be minimized by implementing BMPs.

Although suitable habitat for threatened and endangered species is not likely to be present near the reactor, threatened and endangered fish and mussels may be found in the Black River drainage and in Lake Huron, and these species may be vulnerable to benthic disturbance associated with the building, operation, and maintenance of the cooling water intake and discharge system. If required, mussels could be surveyed, and observed individuals could be relocated before building activities as a mitigation action. The potential for entrainment and impingement of threatened and endangered species in Lake Huron is possible but is not likely to be significant. Overall, minor impacts on threatened and endangered aquatic species are expected from building and operations.

The review team's conclusion, based on the information provided by Detroit Edison and the review team's independent evaluation, is that the impacts on aquatic resources, including threatened or endangered species, from a new reactor at the Greenwood site, considered with cumulative impacts from other activities and climate change, would be MODERATE. Building and operating a new nuclear unit at the Greenwood site would not be a significant contributor to the overall cumulative impact.

9.3.4.5 Socioeconomics

The economic impact area for the Greenwood Energy Center alternative site is St. Clair County. The site is located in St. Clair County, approximately 10 mi northwest of Port Huron and approximately 10 mi west of the international border crossing at Port Huron and Sarnia. The Greenwood Energy Center site is approximately 24 mi northwest of the Belle River site, such that the baseline information for the Greenwood Energy Center site will be similar to the baseline data for the Belle River site, discussed in Section 9.3.3.5. As discussed in Section 9.3.3.5, St. Clair County is part of the Detroit-Warren-Livonia MSA, which encompasses nine principal cities over a six-county area, the core of which is the City of Detroit, approximately 50 mi southwest of the site.

Because of the geographical location of the plant, members of the workforce who would be drawn from the region may live in Canada or elsewhere within the Detroit-Warren-Livonia MSA. However, the review team expects that most of the in-migrating construction and operations workers would likely relocate in or near the City of Port Huron, which is near the plant, has the highest population base, and would have the most housing and other amenities relative to the rest of the region, which is rural. The review team determined that any impacts in any other jurisdiction beyond St. Clair County (e.g., Port Huron) would be minimal because the number of in-migrating workers within any other jurisdiction would be small. Therefore, this analysis focuses on St. Clair County.

Physical Impacts

Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics. Because the physical impacts of building and operating a nuclear power plant are very similar between the proposed site and alternative sites, the review team determined that, as assessed for the Fermi 3 site, all physical impacts related to the Greenwood site would be minor. See Sections 4.4.1 and 5.4.1 for a detailed discussion of physical impacts for Fermi 3.

Demography

The Greenwood site is located within Greenwood Township, near the Town of Avoca, in St. Clair County. Port Huron, approximately 10 mi southeast of the Greenwood site, is the largest population center in the county. Other large population areas are those immediately surrounding Port Huron, including the City of Marysville and the Townships of Fort Gratiot, Port Huron, and Kimball. Historically, St. Clair County's population has been concentrated along the coast, including within Port Huron, Marysville, St. Clair, and Marine City. Table 9-22 provides the 2000 Census population, the USCB's 2008 population estimate, and the projected 2020 population for the largest population areas in St. Clair County.

Table 9-22. Demographics for St. Clair County and Local Jurisdictions

	Population		
County/City/Township	**2000 Actual**	**2008 Estimate**	**2020 Projected**
St. Clair County	164,235	168,894	180,294
City of Port Huron	32,338	30,869	31,402
City of Marysville	9684	9943	10,820
Fort Gratiot Township	10,691	10,998	12,743
Port Huron Township	8615	10,691	11,995
Kimball Township	8628	9410	10,066

Source: The 2020 projections are provided by SEMCOG (2008). The 2000 data for all areas are from the 2000 Census of Population and Housing. The 2008 estimates are from the USCB Population Estimates Program (USCB 2009a), which also includes the 2000 data from the 2000 Census of Population and Housing.

Between 2000 and 2008, the population in St. Clair County grew by approximately 3 percent. Most of the growth occurred in the City of Marysville and townships surrounding the City of Port Huron, while the population of Port Huron declined. These jurisdictions are also where future growth in the county is expected (LSL Planning Inc. undated).

Detroit Edison estimates that the size of the construction workforce needed for the nuclear power plant over a 10-year construction period would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, and that the average size of the onsite workforce during the 10-year construction period would be approximately 1000 workers (Detroit Edison 2011a).

The review team's assumptions for in-migrating and local workers are similar to those for the Fermi 3 plant site. Although the plant is located in a rural area, it is also within commuting distance of highly urbanized areas (i.e., within a 50-mi radius of the plant). St. Clair County is within the Detroit-Warren-Livonia MSA, and the City of Detroit is approximately 50 mi southwest of the plant. The City of Flint, Michigan, is slightly beyond the 50-mi radius of the site, but is still within a reasonable commute distance to the plant, approximately 70 mi from the plant.

Therefore, for comparative purposes between analyses for site alternatives, the review team based the analysis for this site upon the assumptions presented in Section 4.4.2 of this EIS, with approximately 15 percent of the construction workforce (approximately 435 workers during the peak construction and 150 workers on an average annual basis) expected to relocate within a 50-mi radius of the project site.

If the facility were to be built at the Greenwood site and operations commenced, Detroit Edison expects an operations workforce of 900 workers in 2020 (Detroit Edison 2011a). For reasons similar to those addressed in the analysis of impacts presented in Section 5.4.2, the review team determined that approximately 30 percent of the operations workforce (approximately 270 workers) would relocate within a 50-mi radius of the project site.

Using an average household size of 2.6 persons, based on the national average household size in the USCB's 2008 population estimate, the total in-migrating population during the peak construction period is estimated to be approximately 1131 persons, and less during periods of non-peak construction. The projected population increase associated with the in-migrating operations workers is estimated to be 702 persons.

If all of the in-migrating construction workers and their families settled in St. Clair County for the 2-year peak construction period, the projected increase would be less than 1 percent of the projected 2020 population for the county. Demographic impacts during periods of non-peak construction would be smaller. The in-migrating construction workers and their families would likely settle in various cities and townships throughout the county, and the population effects are expected to be minimal. The projected population increase for the operations workforce would be smaller than that projected for the peak construction period and would also be less than 1 percent of the projected 2020 population for the county.

Given the small number of in-migrating workers compared to the projected 2020 population for St. Clair County, the review team concludes that the demographic impact during peak construction and operation would be minor.

Economic Impacts on the Community

<u>Economy</u>

There were 73,888 employed workers in St. Clair County in 2008 (USBLS 2009) (see Table 9-23). Its unemployment rate increased from 4.2 percent in 2000 to 10.5 percent in 2008. Unemployment has continued to increase, with an annual unemployment rate of 17.5 percent in 2009 (USBLS 2010). Approximately 22 percent of the workforce is employed in manufacturing, and 21 percent in educational services, health care, and social assistance (USCB 2009b). Approximately 14 percent is employed in retail trade, and 9 percent is employed in construction. Tourism and manufacturing are large components of St. Clair's economy (St. Clair County

Table 9-23. Labor Force Statistics for St. Clair County (2000 and 2008)

	St. Clair County	
	2000	**2008**
Total labor force	87,071	82,548
Employed workers	83,383	73,888
Unemployed workers	3688	8660
Unemployment rate	4.2	10.5

Source: USBLS 2009

Metropolitan Planning Commission 2009). The Blue Water Bridge international crossing at Port Huron/Sarnia is the third-busiest border crossing in the country. St. Clair's manufacturing base consists primarily of suppliers of plastics and rubber to the automotive industry, although other manufacturing establishments including paper, fabricated metal and metal parts, and machinery are also located in St. Clair County (St. Clair County Metropolitan Planning Commission 2009). In 2000, approximately 36 percent of St. Clair County's workers lived in the county and commuted to work outside of the county. The four largest employers in St. Clair County in 2008 were Port Huron School District, with approximately 1462 employees; Port Huron Hospital, with approximately 1057 employees; Detroit Edison, with approximately 1044 employees; and the K-Mart Corporation, with approximately 850 employees (St. Clair Administrator/Controller's Office 2009).

The economy of St. Clair County would benefit over the estimated 10-year construction period through direct purchase of materials and supplies and direct employment of the construction workforce. Detroit Edison estimates that the size of the construction workforce would range from an estimated minimum of 35 workers to a peak construction workforce of 2900 workers, with an average annual onsite construction workforce of 1000 workers. Based on an average salary estimate of $50,500, approximately $50.5 million would be expended directly in payroll annually during the construction period.

When the plant becomes operational, Detroit Edison estimates direct employment will be 900 full-time and contract employees. In addition, Detroit Edison estimates 1200 to 1500 workers would be employed during scheduled maintenance outages, which would occur every 24 months and require workers for a period of about 30 days. Based on an average salary estimate of $63,625, approximately $57.3 million would be expended directly in payroll annually during the 40-year operating license of the plant. In addition, every 24 months, an additional $6.3 to $7.9 million in payroll would be expended for the outage workforce for the plant.

New workers (i.e., in-migrating workers and those previously unemployed) would have an additional indirect effect on the local economy, because these new workers would stimulate the regional economy with their spending on goods and services in other industries.

Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the impact of building activities on the economy would be noticeable and beneficial in St. Clair County and minimal and beneficial elsewhere.

Taxes

Construction and operation of a plant at the Greenwood site would result in increased tax revenues to State and local governments. State income tax revenue would accrue primarily through income taxes on salaries of the new workers (i.e., in-migrating workers and those previously unemployed). Based on an estimated annual average of 362 new workers (i.e., 150 in-migrating and 212 previously unemployed) during the 10-year construction period and an average salary of $50,500, the State of Michigan would receive an estimated $0.7 million in income tax revenue annually during the construction period. Based on an estimated annual average of 327 new workers (i.e., 270 in-migrating and 57 previously unemployed) for operation of the plant and an average salary of $63,625, the State of Michigan would receive an estimated $0.8 million in income tax revenue annually during the period of the 40-year operating license. The State of Michigan would also receive tax revenue through increased sales expenditures by workers and for the plant construction, operation and maintenance, and business taxes during operation.

Property tax revenue would be the primary tax benefit to the local jurisdictions. The plant would be assessed during the construction period and be at its highest assessed value when the plant becomes operational. For purposes of analysis, the review team recognizes that the full estimated construction cost of $6.4 billion for a nuclear power plant of 1605 MW(e), as discussed in Section 4.4.3.1, may not be the actual assessed value for property tax purposes. However, for comparative purposes in the alternative sites analysis, the review team based its conclusions upon this construction cost estimate. In 2008, the taxable value of real and personal property at Detroit Edison's existing Belle River-St. Clair Power Plants and the Greenwood Energy Center was $731 million, approximately 11 percent of the total county taxable assessed property value ($8.5 billion) (St. Clair Administrator/Controller's Office 2009). Consequently, with completion of the construction of the plant, the total assessed property value in the county would be increased by about 75 percent. The review team recognizes that this would be an upper bound to the assessed value of the property and that a fee in lieu of agreement or other considerations may significantly reduce that assessed value. However, the review team believes that the property tax impact on St. Clair County would be substantial and beneficial.

Summary of Economic Impacts and Taxes

Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the impact of building activities on the economy would be noticeable and beneficial in St. Clair County and minimal and beneficial elsewhere. The impact of tax revenues would be substantial and beneficial in St. Clair County and minimal and beneficial elsewhere. An annual average of 150 new construction workers would relocate into the area, and 212 workers who are currently unemployed would be employed for building activities over the 10-year construction period. A portion of the estimated $6.4 billion construction cost of the nuclear power plant would be spent on materials and supplies in the local area or would be transported into the area through the international border crossing at Port Huron/Sarnia; tax revenue to the State and local jurisdictions would accrue through personal income, sales, and property taxes and would have the largest benefit on the local jurisdictions within St. Clair County.

During operations at the Greenwood site, an estimated 270 new operations workers would relocate into the area, and 57 workers who are currently unemployed would be employed in operating the plant. Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the economic impact of operating the Greenwood plant, including tax revenues, would be substantial and beneficial in St. Clair County and minimal and beneficial elsewhere.

Infrastructure and Community Services

Traffic

Access to the Greenwood site would be from State Route 136. State Route 136 extends east to Port Huron and west to State Route 19, which traverses the interior of St. Clair County from north to south. State Route 19 also provides access to Interstate 69 at an interchange approximately 7 mi south of the site. The Blue Water Bridge crossing at Port Huron/Sarnia is a major international bridge crossing, with 4.9 million crossings in 2008 (MDOT 2009). The St. Clair River is part of the Great Lakes St. Lawrence Seaway System; the nearest port to the site is in the City of Sarnia, Canada.

CN and CSX rail systems cross St. Clair County. The CN railroad crosses the St. Clair River through an underground tunnel between Port Huron and Sarnia. A CSX rail line is located approximately 0.5 mi southwest of the site. The site is not accessible by barge.

The review team expects that traffic impacts from building activities and operations, including construction workers, operations workers, and deliveries, would be noticeable but not destabilizing and would warrant mitigation in coordination with MDOT and the St. Clair County Road Commission. Detroit Edison's Greenwood Energy Center employs approximately

49 employees at the site (MDEQ 2009); therefore, the roads would likely need to be upgraded to accommodate the projected construction and operations workforces. Detroit Edison, in coordination with the MDOT and St. Clair County Road Commission, would need to conduct a traffic study that would identify strategies that would mitigate the traffic to an acceptable level.

Recreation

St. Clair County Parks and Recreation Commission operates three parks in the county: Goodells County Park (327 ac), Fort Gratiot County Park (30 ac), and the Wadhams to Avoca Trail (12 mi). A fourth park, the Columbus County Park, is in development and will include 384 ac along the Belle River when complete. The State of Michigan owns 22,178 ac of park and conservation land in St. Clair County, including Algonac State Park (1450 ac in Cottrellville and Clay Townships), Lakeport State Park (1215 ac in Burtchville Township), Port Huron State Game Area (6627 ac in Grant, Clyde, and Kimball Townships), St. Clair Flats State Wildlife Area (10,300 ac in Clay Township), St. Johns March Recreation Area (2477 ac in Clay and Ira Townships), and Mini Game Area (109 ac in St. Clair Township) (St. Clair County Parks and Recreation Commission 2007). In addition, numerous township parks are located throughout St. Clair County, and various beaches, marinas, and boat access points are located along the St. Clair River and Lake Huron shoreline (St. Clair County Parks and Recreation Commission 2007). The recreational area nearest to the Greenwood site is the Port Huron State Gameland, approximately 3 mi east of the site.

Recreational resources in St. Clair County may be affected by construction and operation of a plant at the Greenwood site. Impacts may include increased user demand associated with the projected increase in population from the in-migrating workforce and their families; an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and steam plume; or access delays associated with increased traffic from the construction and operations workforce on local roadways. A new nuclear power plant and 600-ft cooling tower and condensate plume would be visible in a wide area, because the topography in the vicinity of the site is flat and would extend above surrounding forest. The existing oil- and natural gas-fired power plant stack is located at the site but is shorter and narrower than the proposed cooling tower.

Because the construction of a nuclear plant adjacent to the oil- and natural gas-fired power plant stack would result in substantial increases in power capacity, it is likely that new or upgraded transmission lines would also be required, which could result in additional offsite construction and visual impacts.

People using recreational facilities near the site may experience traffic congestion on the roads during the construction period, during morning and afternoon commutes of the operations workforce, and during the scheduled maintenance and forced outage periods. Measures to upgrade roads to accommodate the increased traffic would alleviate impacts on users of recreational facilities as well as members of the general public.

Impacts associated with the increased use of the recreational resources in the vicinity and region would be minor. The projected increase in population in St. Clair County associated with in-migrating workers and their families for construction and operation is less than 1 percent of the projected 2020 population and would not affect the availability and use of recreational resources in the area. Based upon the above information, the review team determined that the recreation-related impacts of building and operating at the alternative site would be minor.

Housing

As shown in Table 9-24, an estimated 73,299 housing units are located in St. Clair County, based on the USCB 2008 estimate of housing, of which 9097 are vacant. In the 2000 census of housing, an estimated 38 percent of the vacant housing units were used for seasonal, recreational, or occasional purposes. The number of vacant units has increased from 5035 to 9097 between 2000 and 2008. If the proportion of vacant housing units used for seasonal, recreational, or occasional use remains consistent, an estimated 5640 would be available for rent or sale.

Table 9-24. Housing Units in St. Clair County (2008 Estimate)

Type of Housing Unit	St. Clair County
Total Housing Units	73,299
Occupied	64,202
Owner-occupied (units)	51,264
Owner-occupied (percent)	80
Renter-occupied (units)	12,938
Renter-occupied (percent)	20
Vacant	9097
Vacancy Rate	
Homeowner (percent)	3.0
Rental (percent)	12.3

Source: USCB 2009d

Demand for short-term housing is expected to be highest during the peak building employment period, and demand for long-term housing is expected to be highest when operations commence. Based on the analysis of impacts presented in Section 4.4.2, most of the construction and operations workforces would already reside in the area and would be accommodated in existing housing. Approximately 15 percent of the construction workforce (approximately 435 workers during the peak construction) and approximately 30 percent (approximately 270 workers) of the operations workforce would be expected to relocate within a 50-mi radius of the project site. Considering that the construction workforce may choose short-term accommodations such as campsites or hotels, the review team expects that the existing housing supply is sufficient to accommodate the construction workforce of 435 workers during the peak building-related employment period and the operations workforce of 270 workers in-migrating to the area without affecting the housing supply or prices in the local area or stimulating new housing construction. Therefore, the impacts on housing would be minor.

Public Services

In-migrating construction workforce and operations workforce would increase the demand for water supply and wastewater treatment services within the communities where they choose to reside; the size of the total construction and operations workforce also would increase the demand for water supply and wastewater treatment services at the Greenwood site. Much of the county obtains water supplies through private wells (St. Clair County Metropolitan Planning Commission 2009). Communities with water supply and wastewater treatment services in St. Clair County are shown in Table 9-25, which indicates that most areas have excess capacity and the water supply and wastewater treatment systems should be able to accommodate the in-migrating construction and operations workforces and their families.

Increased demand for police, fire response, and health care services from the in-migrating construction and operations workforces and their families is also expected to be accommodated within the existing systems.

Therefore, the review team expects the impacts on public services to be minor.

Education

St. Clair County has seven school districts (Algonac, Anchor Bay, Capac, East China, Marysville, Port Huron, and Yale) with a combined enrollment of 32,047 for the 2007–2008 school year (U.S. Department of Education 2010). As stated in Section 4.4.4.5, approximately 202 school-age children are expected to in-migrate into the 50-mi region during the peak building employment period, and 124 school-age children are expected to in-migrate for operations. Although they could in-migrate anywhere within the 50-mi region, if they were all to go into St. Clair County schools, the county's student population would be increased by less than 1 percent. Given the number of schools in St. Clair County and the large student enrollment, it is likely that new students from building and operating a new nuclear unit at the Greenwood site would be absorbed easily, and education impacts would be minimal for St. Clair County and the larger 50-mi region.

Table 9-25. Water Supply and Wastewater Treatment Capacity and Demand (2005)

Community	Water (MGD)		Wastewater (MGD)	
	Capacity	Demand[a]	Capacity	Demand[a]
Algonac City	2.75	1.3	–[b]	–
Algonac	1.0	0.46	–	–
Clay Township	1.75	0.84	–	–
St. Clair County	–	–	2.7	1.9
Algonac	–	–	0.82	0.63
Clay Township	–	–	0.94	0.63
Ira Township	–	–	0.94	0.63
Burtchville	1.0	0.22	None	None
Capac	0.4	0.2	0.24	0.21
East China	2.7	0.6	3.35	0.85
China Township	0.27	0.06	0.34	0.08
East China Township	2.43	0.54	3.01	0.77
Ira	2.25	0.7	–	–
Marine City	2.0	0.80	7.0	0.80
Cottrellville	0.05	0.02	0.175	0.02
Marine City	1.95	0.78	6.825	0.78
Marysville	7.5	2.2	6.1	2.22
Memphis	0.39	0.09	None	None
Port Huron[c]	30.0	7.7	20.0	11.3
Clyde Township	0.69	0.2	None	None
Ft. Gratiot Township	5.7	1.5	3.8	1.28
Kimball Township	2.01	0.4	1.4	0.34
Port Huron City	15.9	4.1	10.8	5.74
Port Huron Township	5.7	1.5	4.0	2.1
St. Clair	3.0	1.4	1.6	1.4
St. Clair County	2.42	1.15	1.28	1.12
St. Clair Township	0.58	0.25	0.32	0.28
Yale	1.65	0.23	1.8	0.35

Source: LSL Planning, Inc. undated

(a) Average daily demand is provided for all utility systems and jurisdictions except for Port Huron. Port Huron reported peak demand.

(b) A dash indicates information was not reported for these jurisdictions.

(c) Peak demand.

Summary of Impacts on Infrastructure and Community Services at the Greenwood Site

From the information provided by Detroit Edison, review of existing reconnaissance level documentation, and its own independent evaluation, the review team concludes that the impact of building and operations activities on regional infrastructure and community services – including recreation, housing, water and wastewater facilities, police, fire, and medical facilities, and education – would be minor. The estimated peak workforce of 2900 would have a noticeable but not destabilizing adverse impact on traffic on local roadways near the Greenwood site. These traffic-related impacts could be reduced but not eliminated with proper planning and mitigation measures.

Cumulative Impacts

The geographic area of interest for analysis of cumulative socioeconomic impacts of the Greenwood site is St. Clair County, where most of the socioeconomic impacts of construction and operation of the nuclear power plant are expected to occur.

The impact analyses presented for the Greenwood Energy Center site are cumulative. Past and current economic impacts associated with activities listed in Table 9-19 already have been considered as part of the socioeconomic baseline or in the analyses discussed above for the Greenwood site. Construction and operation of a new nuclear unit at the Greenwood site could result in cumulative impacts on the demographics, economy, and community infrastructure of St. Clair County, in conjunction with those reasonably foreseeable future actions shown in Table 9-19, and generally result in increased urbanization and industrialization. However, many impacts, such as those on housing or public services, are able to adjust over time, particularly with increased tax revenues. Furthermore, State and county plans, along with modeled demographic projections, include forecasts of future development and population increases. Because the projects within the geographic area of interest identified in Table 9-19 would be consistent with applicable land use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be manageable. Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics.

Based on the above considerations, Detroit Edison's ER, and the review team's independent evaluation, the review team concludes that under some circumstances, building the nuclear power plant at the Greenwood site could make a temporary small adverse contribution to the cumulative effects associated with some socioeconomic issues. Those issues would include physical impacts (workers and the general public, noise, air quality, buildings, roads, and aesthetics), demography, and local infrastructure and community services (traffic, recreation, housing, water and wastewater facilities, police, fire, and health care services, and education), and would be dependent on the particular jurisdictions affected.

The cumulative effects on regional economies and tax revenues would be beneficial and SMALL, with the exception of St. Clair County, which would receive a MODERATE and beneficial cumulative effect on the economy and a LARGE and beneficial cumulative effect from property taxes. The cumulative effects on physical impacts, demography, infrastructure, and community services would be SMALL within the 50-mi region, except for a MODERATE and adverse cumulative effect on local traffic near the Greenwood Energy Center site during peak building-related activities. Building and operating a new nuclear unit at the Greenwood alternative site would be a significant contributor to the cumulative impacts.

9.3.4.6 Environmental Justice

The economic impact area for the Greenwood alternative site is St. Clair County, Michigan. To evaluate the distribution of minority and low-income populations near the Greenwood site, the review team conducted a demographic analysis of populations within the 50-mi region surrounding the proposed site in accordance with the methodology discussed in Section 2.6.1 of this EIS. The results of this analysis are displayed below in Table 9-26 and 9-27 and Figures 9-8, 9-9, 9-10, and 9-11.

In general, the review team found the population within the 50-mi region surrounding the Greenwood site to be similar in demographic distribution to the 50-mi region surrounding the proposed Fermi 3 site: rural, with few representative minority or low-income populations of interest outside the urban areas (for the Greenwood site, these urban areas are near the boundary of the 50-mi region to the west and south). Because the review team identified St. Clair County as the economic impact area for the Greenwood alternative site, the review team focused its analysis upon the minority and low-income populations within St. Clair County. The economic impact area of St. Clair County was representative of that characterization, with only one minority population of interest (a Black or African American population about 15 mi east of the plant near the Canadian border). This was the closest population of interest to the Greenwood site. The four identified low-income populations of interest included that same minority Census block group, as well as three others slightly farther away from the alternative site.

Based on this analysis, the review team determined that there do not appear to be any identified minority or low-income populations of interest in St. Clair County that would be likely to experience disproportionate and adverse human health, environmental, physical, or socioeconomic effects as a result of construction or operation of a plant at the Greenwood alternative site. The review team did not identify any subsistence activities in St. Clair. For the other physical and environmental pathways described in Section 2.6.1, the review team determined that impacts at the Greenwood site would be similar to those at the Fermi 3 site. Therefore, the review team determined the environmental justice impacts of building and operating a nuclear reactor at the Greenwood site would be SMALL.

Table 9-26. Results of the Census Block Group Analysis for Minority Populations of Interest within the Region Surrounding the Greenwood Alternative Site (50-mi radius)

County	Total Census Block Groups in the 50-mi Region	Number of Census Block Groups with Minority Populations of Interest					
		Black	American Indian	Asian	Pacific Islander	Hispanic	Aggregate
Genesee	157	22	0	0	0	0	23
Huron	14	0	0	0	0	0	0
Lapeer	78	0	0	0	0	1	0
Macomb	626	8	0	0	0	0	9
Oakland	609	57	0	4	0	8	61
Sanilac	41	0	0	0	0	0	0
St. Clair[(a)]	145	1	0	0	0	0	1
Tuscola	43	0	0	0	0	0	0
Wayne	217	168	0	2	0	0	16
Total	**1930**	**256**	**0**	**6**	**0**	**9**	**261**

Source: USCB 2011a
(a) Shaded row indicates the economic impact area.

Table 9-27. Results of the Census Block Group Analysis for Low-Income Populations of Interest within the 50-mi Region of the Greenwood Alternative Site

County	Total Census Block Groups in the 50-mi Region	Number of Census Block Groups with Low-Income Populations of Interest	Percentage of Census Block Groups with Low-Income Populations of Interest
Genesee	157	22	14.0
Huron	14	0	0
Lapeer	78	0	0
Macomb	626	5	0.8
Oakland	609	20	3.3
Sanilac	41	0	0
St. Clair[(a)]	145	4	2.8
Tuscola	43	0	0
Wayne	217	50	23.0
Total	**1930**	**101**	**5.2**

Source: USCB 2011b
(a) Shaded row indicates the economic impact area.

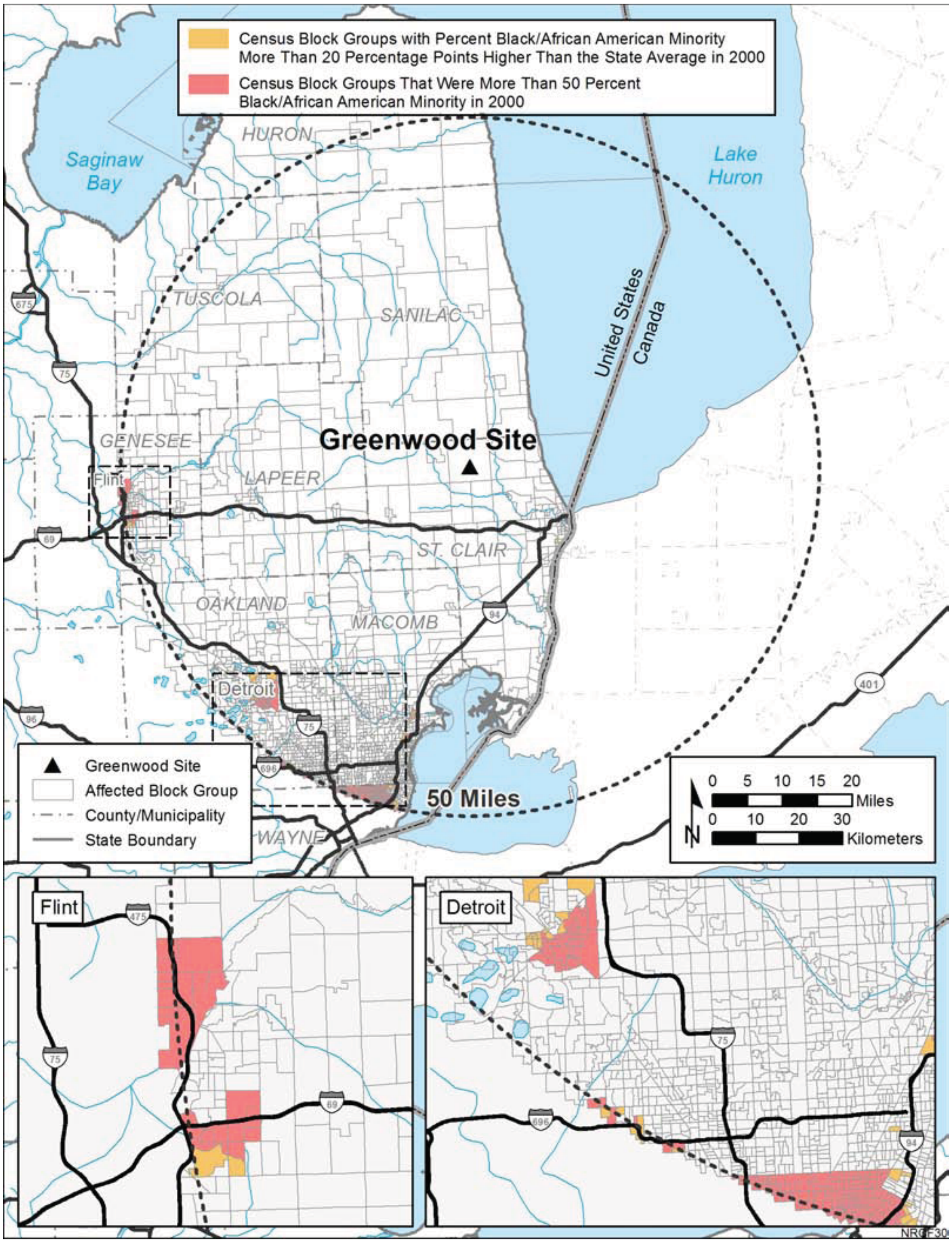

Figure 9-8. Black and African-American Minority Census Block Group Populations of Interest within a 50-mi Radius of the Greenwood Alternative Site (USCB 2011a)

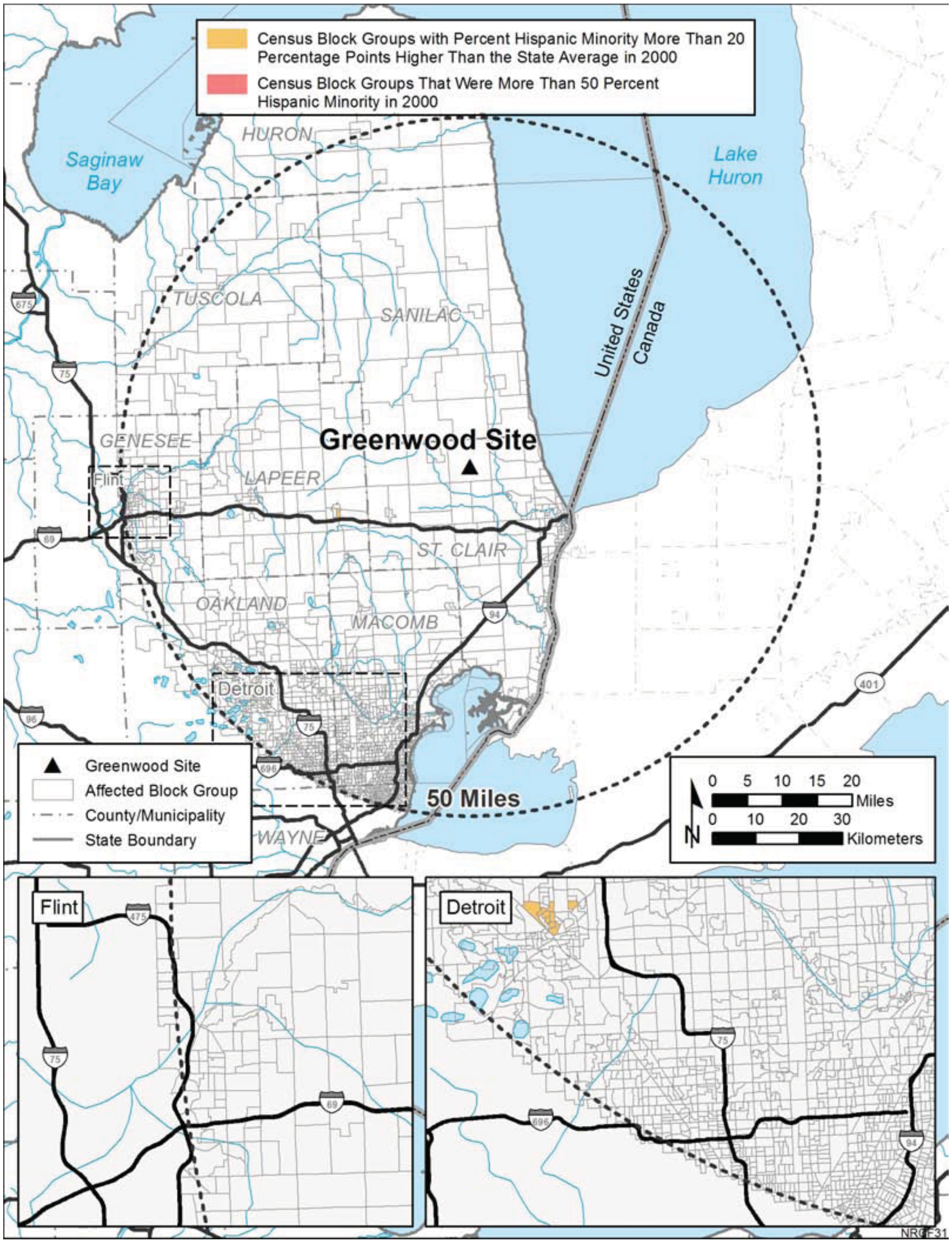

Figure 9-9. Hispanic Minority Census Block Group Populations of Interest within a 50-mi Radius of the Greenwood Alternative Site (USCB 2011a)

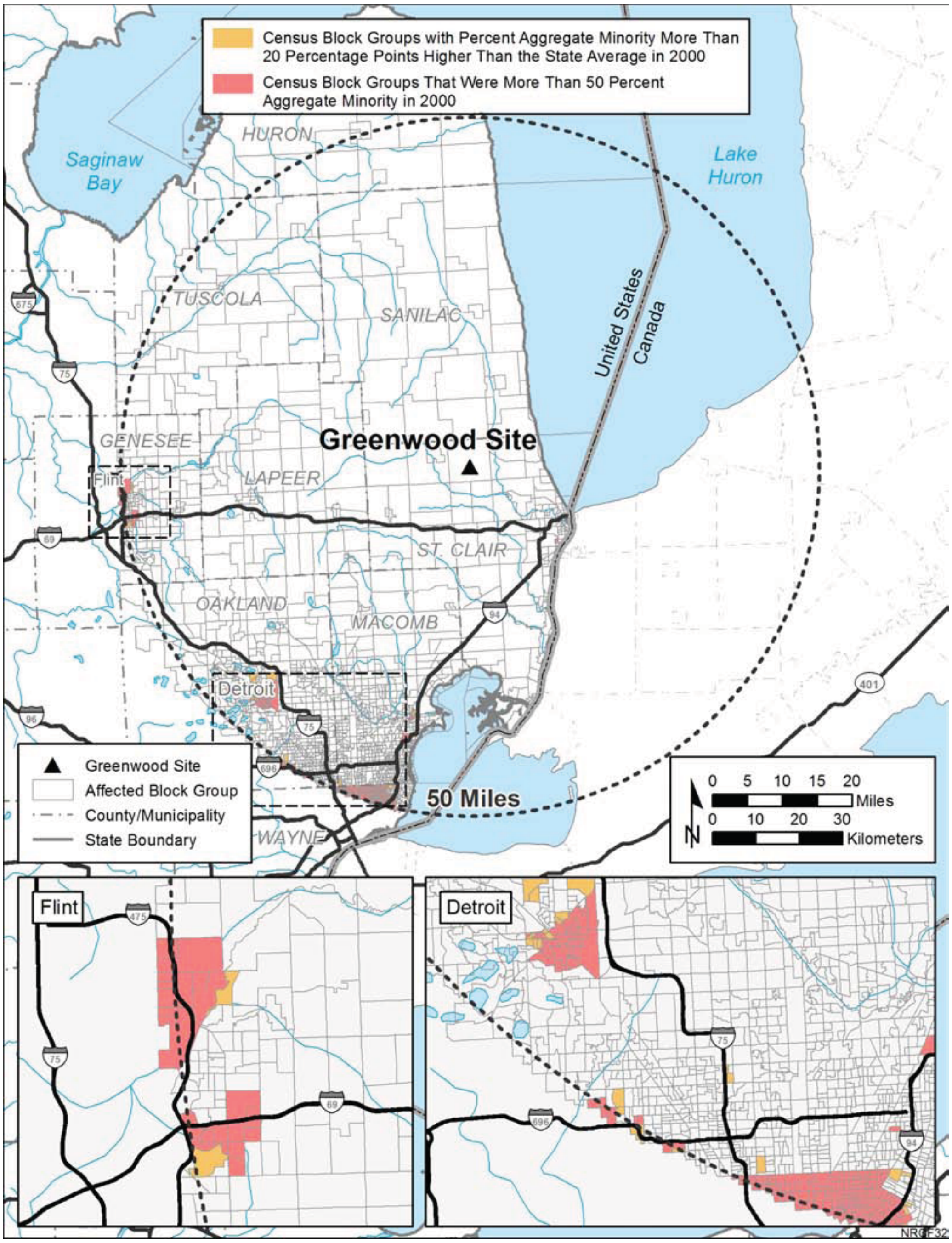

Figure 9-10. Aggregate Minority Census Block Group Populations of Interest within a 50-mi Radius of the Greenwood Alternative Site (USCB 2011a)

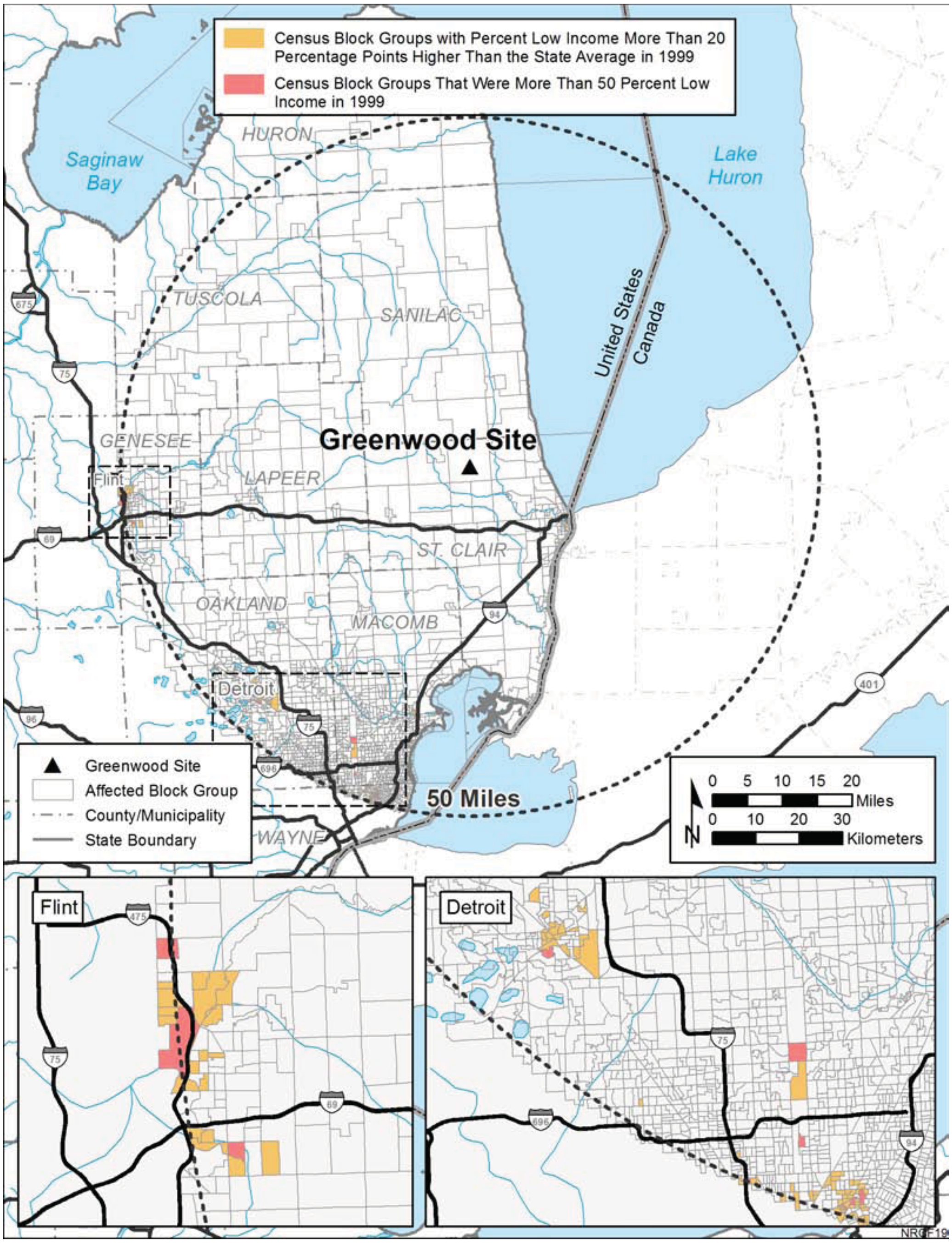

Figure 9-11. Low-Income Census Block Group Populations of Interest within a 50-mi Radius of the Greenwood Alternative Site (USCB 2011b)

9.3.4.7 Historic and Cultural Resources

This section presents the review team's evaluation of the potential impacts of siting a new ESBWR at the Greenwood site on historic and cultural resources. For the analysis of impacts on historic and cultural resources, the geographic area of interest is considered to be the APE that would be defined for a new nuclear power facility at the site. This includes the physical APE, defined as the area directly affected by building and operating a new nuclear power plant and transmission lines, and the visual APE (i.e., the area from which the structures can be seen). The visual APE includes the physical APE and the area within 1 mi of the physical APE.

In developing the EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation. Reconnaissance-level activities in a cultural resources review have particular meaning. For example, these activities may include site file searches, background research for environmental and cultural contexts, and preliminary field investigations to confirm the presence or absence of cultural resources in an APE or the sensitivity of an APE for cultural resources. For the purposes of preparing this alternatives analysis, reconnaissance-level information is considered data readily available from Federal and State agencies and other public sources. The following sources were used to identify reconnaissance-level information on historic and cultural resources in the APE at the Greenwood site:

- NPS's National Historic Landmarks Program database for designated National Historic Landmarks (NPS 2010a).
- NPS's NRHP database for properties listed in the NRHP (NPS 2010b).
- NationalRegisterofHistoricPlaces.com database for properties listed in the NRHP (NRHP 2010).
- Michigan's Historic Sites Online database for cultural resources significant to the State of Michigan (MSHDA 2010a).
- Detroit Edison's ER (Detroit Edison 2011a).
- *Cultural Resources Site File Review of Seven Alternative Sites in Monroe, Lenawee, St. Clair, and Huron Counties, Michigan, Fermi Nuclear Power Plant Unit 3 (Fermi 3) Project, Frenchtown and Berlin Townships, Monroe County, Michigan* (Lillis-Warwick et al. 2009).

No National Historic Landmarks, historic properties listed in the NRHP, or other cultural resources were identified within the APE (NPS 2010a, b; NRHP 2010; MSHDA 2010a; Lillis-Warwick et al. 2009). The closest cultural resources and/or historic properties identified within the general vicinity of the APE consist of two architectural resources (Detroit Edison 2011a). The first is the James McColl Residence (Site ID#P26144, also known as the James Godo Residence), a late-nineteenth century house, which is approximately 4 mi northwest of the APE in the town of Yale, St. Clair County. It was listed in the NRHP in 1985 (MSHDA 2010c) and is considered a historic property, pursuant to Section 106 of the NHPA. The second is the Ruby United Methodist Church, a late-nineteenth century church that was originally a store and was converted into a church in 1864. It was moved from its original location to its current location in 1928; the current location is approximately 7 mi south of the APE in Clyde Township, St. Clair County. It was listed in the Michigan SRHP in 1990 (MSHDA 2010d). It has not been included in, or determined to be eligible for inclusion in, the NRHP. Therefore, it is not considered a historic property pursuant to Section 106 of the NHPA. No archaeological and/or architectural surveys have been conducted at the alternative site to identify additional previously unrecorded cultural resources in the APE.

Consultation with the Michigan SHPO would be necessary to determine the need for cultural resources investigations (including archaeological and architectural surveys) to identify cultural resources within the APE prior to any onsite ground-disturbing activities; to determine whether any identified cultural resources are eligible for inclusion in the NRHP; to evaluate the potential impacts on cultural resources and/or historic properties; and to determine the effect of a new nuclear power facility at the Greenwood site pursuant to Section 106 of the NHPA. As part of this consultation, Detroit Edison would be expected to put measures in place to protect discoveries in the event that cultural resources are found during building or operation of a new plant. If an unanticipated discovery was made during building activities, site personnel would have to notify the Michigan SHPO and consult with them in conducting an assessment of the discovery to determine if additional work is needed.

The incremental impacts from installation and operation of offsite transmission lines and potential water intake and discharge pipelines to Lake Erie would be minimal, if there were no significant alterations (either physical alteration or visual intrusion) to the cultural environment. If these activities resulted in significant alterations to the cultural environment, then the impact could be greater. Although building and operating potential water intake and discharge pipelines would be the responsibility of Detroit Edison, building and operating the offsite transmission lines would be the responsibility of a transmission company. For impacts greater than small, mitigation may be developed in consultation with the appropriate Federal and State regulatory authorities. Only Federal undertakings would require a Section 106 review.

The APE does not contain any Indian Reservation land, and no Federally recognized Indian Tribes have indicated an interest in St. Clair County (BIA undated; NPS 2010c). However, consultation with Federally recognized Indian Tribes in the State of Michigan would be necessary in accordance with Section 106 of the NHPA. As part of this consultation, the NRC would consult with all 12 Federally recognized Indian Tribes that are located within the State of Michigan, as identified for the Fermi site (Michigan Department of Human Services 2001–2009). Additionally, because of the APE's proximity to Canada, it is possible that prior to Euro-American settlement, the APE may have been settled and/or used by groups (First Nations) that are now located within Canada, as described in Section 9.3.3.7. One First Nation reserve is located outside, but in the general vicinity, of the APE in Ontario, Canada: Sarnia Reserve 45 (INAC 2010). Sarnia Reserve 45 is located approximately 15 mi southeast of the Greenwood site, on the eastern side of the St. Clair River south of Sarnia, Ontario. The Aamjiwnaang First Nation is associated with Sarnia Reserve 45. Additional First Nation reserves, which are more than 30 mi further to the south and east of the Greenwood site, in southern Ontario, would be the same as those identified for the Belle River-St. Clair site (see Table 9-18) (INAC 2010). The review team would consider the need to consult with INAC and First Nations to identify any concerns regarding physical (direct) or visual (indirect) impacts on cultural resources within the APE.

The following cumulative impact analysis for historic and cultural resources includes building and operating a new nuclear power facility at the Greenwood site. This analysis also considers other past, present, and reasonably foreseeable future actions that could affect historic and cultural resources, as identified in Table 9-19. The APE for the cumulative impact analysis for historic and cultural resources at the Greenwood site consists of the alternative site area and any new transmission line corridors, and a 1-mi buffer area around the site and the corridors.

The Greenwood site includes areas of agricultural land, woodland, wetland, and previous development (e.g., power plant, aboveground transmission lines, pipelines, roads, and railroads). Agricultural activities such as plowing, disking, and harvesting (whether historic or modern [mid-nineteenth to mid-twentieth century]) and logging or clearing of original forests (prior to the reestablishment of the existing woodland areas) are likely to have resulted in minimal subsurface disturbance, suggesting that at least some areas at the Greenwood site, which are currently used for agricultural purposes or as woodland, may have sustained minimal prior ground disturbance. However, historic aerial photography indicates that nearly the entire Greenwood site was cleared and graded in the past (Detroit Edison 2011a), suggesting that the site is likely to have undergone significant prior disturbance during previous development. Past actions at the Greenwood site that may have destroyed, disturbed, or otherwise affected onsite historic and cultural resources in the APE may have included construction and operation of the existing Greenwood Energy Center, Wilkes and Kilgore roads, a spur track of the CSX Transportation mainline rail line, and an existing 345-kV transmission line.

Construction and operation of the existing Greenwood Energy Center may have also indirectly (visually) affected cultural resources within the visual APE. Additional past actions, as identified from Table 9-19, such as construction and operation of the Belle River Power Plant, and the St. Clair Power Plant, approximately 24–25 mi southeast on the St. Clair River, would likely be too far away to incur cumulative indirect (visual) impacts on historic or cultural resources within the APE at the Greenwood site. Because a new nuclear power facility at the Greenwood site would be located on property that already contains the existing Greenwood Energy Center, it is likely that the proposed project would not result in new significant indirect (visual impacts) on cultural resources within the visual APE.

Based on reconnaissance-level information provided by Detroit Edison and identified by the review team and the review team's independent evaluation of this information, the review team concludes that the cumulative impacts on historic and cultural resources from building and operating a new nuclear power facility at the Greenwood site would be SMALL. This impact determination is based on available information, which indicates that nearly the entire Greenwood site was cleared and graded in the past, suggesting that the site has undergone prior subsurface ground disturbance; that no known historic properties are located within the APE; and that the existing and operating Greenwood Energy Center is already a landscape element within the existing visual setting for the site. However, cultural resources investigations within undisturbed portions of the APE and for any proposed transmission lines and water pipelines might reveal important historic properties that could result in greater cumulative impacts.

9.3.4.8 Air Quality

Criteria Pollutants

For a plant with the same capacity as the proposed Fermi 3 plant, the emissions from building and operating a nuclear power plant at the Greenwood site are assumed to be comparable to those from Fermi 3, as described in Chapters 4 and 5. The alternative site would be located in St. Clair County, about 10 mi west of Lake Huron. St. Clair County is in the Metropolitan Detroit-Port Huron Intrastate AQCR (40 CFR 81.37). Currently, St. Clair County is designated as a nonattainment area for $PM_{2.5}$ NAAQS and as a maintenance area for 8-hr ozone NAAQS (EPA 2010b). In July 2011, MDEQ submitted a request asking the EPA to redesignate Southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011). This request is based, in part, on air quality monitoring data collected in the 2007–-2010 period showing all seven counties in Southeast Michigan in attainment for the $PM_{2.5}$ NAAQS.

In Sections 4.7 and 5.7, the review team concludes that air quality impacts of building and operating a plant at Fermi 3, including those associated with transmission lines and cooling towers, would be SMALL, as long as appropriate measures are taken to mitigate dust during building activities. During operation, cooling towers would be the primary source of $PM_{2.5}$, which accounts for most of total $PM_{2.5}$ emissions of 9.51 tons/yr at Fermi 3. However, these emissions would be relatively small and thus are not anticipated to elevate $PM_{2.5}$ concentrations in a designated nonattainment area. With dust mitigation, the impacts of building and operating a plant at the Greenwood site would also be SMALL. Any new industrial projects would either be small or subject to permitting by MDEQ. State permits are issued under regulations approved by the EPA and deemed sufficient to attain and maintain the NAAQS and comply with other

Federal requirements under the CAA. Thus, the cumulative air quality impacts of building and operating a plant at the Greenwood site would be SMALL.

Greenhouse Gases

The extent and nature of climate change is not sensitive to where GHGs are emitted because the long atmospheric lifetimes of GHGs result in extensive transport and mixing of these gases. Because the emissions of a plant at the Greenwood site would be comparable to those of a similar plant at the Fermi site, the discussions of Sections 4.7 and 5.7 for Fermi 3 also apply to building and operating a similar plant at the Greenwood site. Thus, the impacts of the plant's GHG emissions on climate change would be SMALL, but the cumulative impacts considering global emissions could be MODERATE. Building and operating a new nuclear unit at the Greenwood site would not be a significant contributor to the MODERATE impacts.

9.3.4.9 Nonradiological Health

The following impact analysis considers nonradiological health impacts from building activities and operations on the public and workers from a new nuclear facility at the Greenwood Energy Center. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including other Federal and non-Federal projects and those projects listed in Table 9-19 within the geographic area of interest. The building-related activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and transport of workers to and from the site.

Most of the nonradiological impacts of building and operation (e.g., noise, etiological agents, occupational injuries) would be localized and would not have significant impact at offsite locations. However, activities such as vehicle emissions from transport of personnel to and from the site would encompass a larger area. Therefore, for nonradiological health impacts, the geographic area of interest for cumulative impacts analysis includes projects within a 50-mi radius of the Greenwood site based on the influence of vehicle and other air emissions sources because the site is in a nonattainment area (Section 9.3.4.8). For cumulative impacts associated with transmission lines, the geographical area of interest is the transmission line corridor. These geographical areas are expected to encompass areas where public and worker health could be influenced by the proposed project and associated transmission lines, in combination with any past, present, or reasonably foreseeable future actions.

Building Impacts

Nonradiological health impacts on the construction workers from building a new nuclear unit at the Greenwood site would be similar to those from building Fermi 3 at the Fermi site, as evaluated in Section 4.8. They include occupational injuries, noise, odor, vehicle exhaust, and dust. Applicable Federal, State, and local regulations on air quality and noise would be complied with during the plant construction phase. The Greenwood site does not have any characteristics that would be expected to lead to fewer or more construction accidents than would be expected for the Fermi site. The site is in a predominantly rural area, and construction impacts would likely be minimal on the surrounding populations that are classified as medium- and low-population areas. Access routes to the site for construction workers would include State Route 136, approximately 1 mi south of the site, and Duce Road. Mitigation may be necessary to ease congestion, thereby improving traffic flow and reducing nonradiological health impacts (i.e., traffic accidents, injuries, and fatalities) during the building period.

Operational Impacts

Nonradiological health impacts on occupational health of workers and members of the public from operation of a new nuclear unit at the Greenwood site would be similar to those evaluated in Section 5.8 for the Fermi site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Greenwood Energy Center site would likely be the same as those evaluated for workers at the new Fermi site unit. Discharges to Lake Huron would be controlled by NPDES permits issued by MDEQ (Section 9.3.4.2). The growth of etiological agents would not be significantly encouraged at the Greenwood site because of the temperature attenuation in the length of the pipe required for a discharge system. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Effects of EMFs on human health would be controlled and minimized by conformance with NESC criteria. Nonradiological impacts of traffic during operations would be less than the impacts during building. Mitigation measures employed during building to improve traffic flow would also minimize impacts during operation of a new unit.

Cumulative Impacts

Past and present actions within the geographic area of interest that could contribute to cumulative nonradiological health impacts include the energy and mining projects in Table 9-19, as well as vehicle emissions and existing urbanization. Reasonably foreseeable future projects in the geographical area of interest that could contribute to cumulative nonradiological health impacts include construction of the proposed Northern Ethanol (Sarnia) Inc. Ethanol Facility, the Dawn Gateway Pipeline, and the I-94 Black River Bridge replacement in Port Huron, future transmission line development, and future urbanization.

The review team is also aware of the potential climate changes that could affect human health. A recent compilation of the state of the knowledge in this area (USGCRP 2009) has been considered in the preparation of this EIS. Projected changes in climate for the region include an increase in average temperature, increased likelihood of drought in summer, more heavy downpours, and an increase in precipitation, especially in the winter and spring, which may alter the presence of microorganisms and parasites. In view of the water source characteristics, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases.

Summary of Nonradiological Health Impacts at the Greenwood Site

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team expects that the impacts on nonradiological health from building and operating a new nuclear unit at the Greenwood site would be similar to the impacts evaluated for the Fermi site. While there are past, present, and future activities in the geographical area of interest that could affect nonradiological health in ways similar to the building and operation of a new unit at the Greenwood Energy Center site, those impacts would be localized and managed through adherence to existing regulatory requirements. Similarly, impacts on public health of a new nuclear unit operating at the Greenwood Energy Center site would be expected to be minimal. The review team concludes, therefore, that the cumulative impacts of building and operation of a nuclear unit at Greenwood site on nonradiological health would be SMALL.

9.3.4.10 Radiological Health

The following impact analysis considers radiological impacts on the public and workers from building activities and operations for one nuclear unit at the Greenwood Energy Center alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects and those projects listed in Table 9-19 within the geographic area of interest. The geographic area of interest is the area within a 50-mi radius of the Greenwood site. As described in Section 9.3.4, the Greenwood site contains one 800-MW oil-fired unit and three gas CTs. There are currently no nuclear facilities on the site or within a 50-mi radius. There are likely to be medical, industrial, and research facilities within 50 mi of the Greenwood site that use radioactive materials.

The radiological impacts of building and operating the proposed ESBWR unit at the Greenwood site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those at the proposed Fermi site.

The NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive materials would be an insignificant contribution to the cumulative impacts around the Greenwood site. This conclusion is based on data from radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Detroit Edison and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the proposed ESBWR and other existing projects and actions in the geographic area of interest around the Greenwood site would be SMALL.

9.3.4.11 Postulated Accidents

The following impact analysis considers radiological impacts from postulated operations accidents for one nuclear unit at the Greenwood Energy Center alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and those projects listed in Table 9-19 within the geographic area of interest. As described in Section 9.3.4, the Greenwood site is an active power generation site; however, there are currently no nuclear facilities on the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Greenwood site. The only existing facility potentially affecting radiological accident risk within this geographic area of interest is Fermi 2, because the 50-mi radius for Fermi 2 overlaps part of the 50-mi radius for the Greenwood site. No other reactors have been proposed within the geographic area of interest.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the proposed Fermi site would be minimal for an ESBWR. DBAs are addressed specifically to demonstrate that a reactor design is sufficiently robust to meet NRC safety criteria. The ESBWR design is independent of site conditions, and the meteorologies of the alternative and the proposed Fermi sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the site would be SMALL.

Because the meteorology, population distribution, and land use for the Greenwood site are expected to be similar to those for the proposed Fermi site, risks from a severe accident for an ESBWR located at the Greenwood site would be expected to be similar to those analyzed for the proposed Fermi site. These risks for the proposed Fermi site are presented in Tables 5-33 and 5-34 of this EIS and are well below the mean and median values for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plant within the geographic area of interest (i.e., Fermi 2), the Commission has determined the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Because of the NRC's safety review criteria, it is expected that risks for any new reactors at any other locations within the geographic area of interest for the Greenwood site would be well below risks for current-generation reactors and would meet the Commission's safety goals. The severe accident risk due to any particular nuclear power plant becomes smaller as the distance from that plant increases. However, the combined risk at any location within 50 mi of the Greenwood site would be bounded by the sum of risks for all these operating nuclear power plants and would still be low.

On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Greenwood site would be SMALL.

9.3.5 Petersburg Site

This section presents the review team's evaluation of the potential environmental impacts of building and operating a nuclear reactor at the Petersburg site. The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the Petersburg site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment were other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Petersburg site. Other actions and projects considered in this cumulative analysis are described in Table 9-28. The location and vicinity of the Petersburg alternative site are shown in Figure 9-12.

Referred to by Detroit Edison in its site selection process as Site A, the Petersburg site is approximately 7 mi north of the Michigan–Ohio border in Monroe County. This greenfield site occupies approximately 1900 ac in Sections 28, 29, 32, and 33 of Township 7 South, Range 6 East in Summerfield Township. The site is currently in agricultural use. Approximately 25 individuals currently reside on the site. Other than onsite residents, the next closest receptors are in the town of Deerfield, approximately 4 mi northwest.

Access to the site is provided by local roads, via U.S. Route 223. Rail access is provided via the CN North American line that runs along the northern border of the site.

Both 345-kV and 120-kV transmission lines are present approximately 1 mi north of the site, both with uncommitted capacity.

The closest surface water resource is the River Raisin, approximately 4 mi north of the site. However, water quality is poor. Lake Erie, the more likely source of water for operations of a nuclear plant at this site, is about 17 mi east of the site. Drainage from the site is provided by engineered ditches. No portion of the site is believed to be in the River Raison floodplain;

Table 9-28. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Petersburg Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
J.R. Whiting Power Plant	328-MW coal-fired plant	13 mi east-southeast of Petersburg site	Operational
Bay Shore Power Plant	499-MW coal-fired plant	16 mi southeast of Petersburg site in Maumee Bay, Ohio	Operational
Detroit Edison Monroe Power Plant	3280-MW coal-fired plant	19 mi east-northeast of Petersburg site	Operational
Fermi Unit 2	1098-MW nuclear power plant	25 mi east-northeast of Petersburg site	Operational
Davis Besse Nuclear Plant Unit 1	925-MW nuclear power plant	36 mi southeast of Petersburg site on Lake Erie	Operational
Mining Projects			
STONECO-Ottawa Lake Site	Limestone and landscape material (i.e., boulders, gravel, topsoil, and sand).	6 mi south-southeast of Petersburg site	Operational
STONECO-Meanwell Road Site	Commercial fill sand and topsoil.	7 mi northeast of Petersburg site	Operational
Transportation Projects			
Cleveland-Toledo-Detroit Passenger Rail Line	Addition to regional transportation hub with rail lines connecting Cleveland, Buffalo, Toronto, Pittsburgh, Cincinnati, and Detroit.	Rail line would pass through Monroe County on its way to Detroit	Proposed; schedule undetermined
Other Actions/Projects			
Petersburg WWTP	WWTP that discharges to River Raisin.	4 mi north of Petersburg site on River Raisin	Operational
Deerfield WWTP	WWTP that discharges to River Raisin.	4 mi north-northwest of Petersburg site on River Raisin	Operational
Midwest Grain Processing – Blissfield	Manufactures industrial organic chemicals with discharge to River Raisin.	5 mi west of Petersburg site	Operational
Global Ethanol Services	Manufactures industrial organic chemicals with discharge to Golf County Drain.	5 mi west of Petersburg site	Operational
Blissfield WWTP	WWTP that discharges to River Raisin.	6 mi west of Petersburg site on River Raisin	Operational

Table 9-28. (contd)

Project Name	Summary of Project	Location	Status
Blissfield Manufacturing Company	Fabricated metal products	6 mi west of Petersburg site on River Raisin	Operational
Holcim (US) Inc. – Dundee	Portland cement plant	9 mi north-northeast of Petersburg site	Operational
Dundee WWTP	WWTP that discharges to River Raisin	9 mi north-northeast of Petersburg site on River Raisin	Operational
Central Lenawee WWTP and landfill	WWTP and landfill that discharges to River Raisin.	13 mi west-northwest of Petersburg site	Operational
Adrian WWTP	WWTP that discharges to South Branch of River Raisin.	15 mi west-northwest of Petersburg site	Operational
Dairy Farmers of America	Milk processing facility with discharge to South Branch of River Raisin.	15 mi west-northwest of Petersburg site	Operational
Tecumseh WWTP	WWTP that discharges to River Raisin.	15 mi northwest of Petersburg site	Operational
Fairfield Township Wastewater Stabilization Lagoon	Wastewater stabilization lagoon that discharges to River Raisin.	15 mi northwest of Petersburg site	Operational
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents. No specific data found concerning development/ expansion of the towns within 20 mi of site.	Throughout region	Construction would occur in the future, as described in State and local land use planning documents.
Global Climate Change/Natural Environmental Stressors	Short- or long-term changes in precipitation or temperature.	Throughout region	Impacts would occur in the future

Source: Modified from NRC 2010a, d

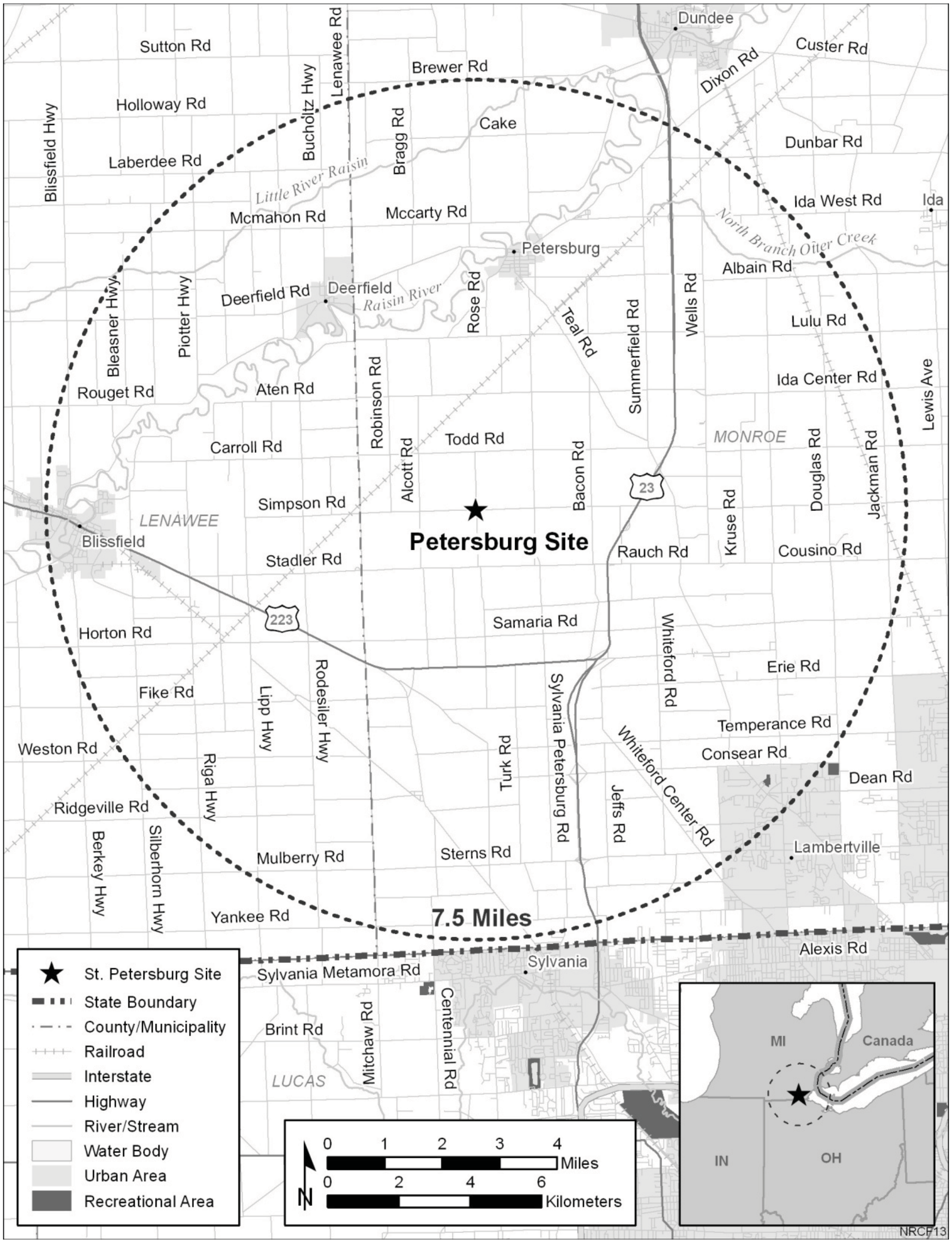

Figure 9-12. The Petersburg Alternative Site and Vicinity

however, a small portion of Section 30 in the forested portion of the site appears on the FWS Wetland Inventory Map for the area. Groundwater resources in the area are present in the Silurian and Devonian bedrock aquifer, which is approximately 100 to 200 ft thick.

Ecology on the site is composed primarily of cropland (i.e., wheat, corn, soybeans). A 50-ac forest parcel contains second-growth ash, oak (*Quercus* spp.), cottonwood, and maple (*Acer* spp.), with some portion of the forested area permanently wet.

The closest population center is Toledo, Ohio, 8 mi southeast of the site, with a 2000 population of approximately 305,000. The nearest towns, Petersburg, Deerfield, and Dundee, have 2000 populations of 1157, 1005, and 3522, respectively.

9.3.5.1 Land Use

The following impact analysis considers impacts on land use from building activities and operations at the Petersburg site and within the geographic area of interest, which is the 15-mi region surrounding the Petersburg site. The analysis also considers past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects and those projects listed in Table 9-28 within the geographic area of interest.

The Petersburg site is owned by a number of private individuals and is zoned as agricultural (Detroit Edison 2011a). The proposed location for the new facility is in the southern part of the approximately 1900-ac site. There are approximately 25 buildings on the site, including existing residences, new dwellings, and abandoned barns (Detroit Edison 2011a). Site topography is generally flat with very little variation and is mainly prime agricultural land with some young mixed deciduous woodland. At least one forested wetland occurs on the site (see Section 9.3.5.3), and the site is outside of mapped floodplains (Detroit Edison 2011a).

If a new nuclear power plant were located on the Petersburg site, portions of the 1900-ac tract would be disturbed and some of the farmland and woodland areas on the tract would likely be lost possibly including some prime farmland). Based on Detroit Edison's conceptual plant layout (Detroit Edison 2009b), the review team estimates that the project would permanently occupy as much as 80 ac and temporarily disturb as much as 200 ac. Intake and discharge pipelines built to transfer water to and from Lake Erie could result in some offsite land use impacts, and the pipelines would likely cross railroad tracks and local roads. No new offsite roadways are expected to be needed during development or operation of the proposed facility (Detroit Edison 2011a).

The recreational area nearest to the site is the Petersburg State Game Management Area, approximately 1.5 mi northeast. There are several small local parks in Lambertville, about 6 mi southeast of the site (Detroit Edison 2011a). Recreational resources in Monroe County may be affected by development and operation of a plant at the Petersburg site, including increased user demand associated with the projected increase in population with the in-migrating workforce and their families; an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and condensate plume; or access delays associated with increased traffic from the construction and operations workforce on local roadways.

An existing 120-kV and a 345-kV transmission line runs approximately 1.2 mi north of the site (Detroit Edison 2011a). Environmental conditions along the likely transmission line corridor are similar to those of the site, with a mixture of cropland, wooded areas, and some wetlands (Detroit Edison 2011a). Because of the short distance from the proposed site to the transmission interconnections, the review team concludes that the land use impacts of building and operating transmission lines for a new nuclear plant at the Petersburg site would be minor.

For cumulative land use analysis, the geographic area of interest is the 15-mi region surrounding the Petersburg site. This geographic area of interest includes the primary community (Summerfield Township) that would be affected by the proposed project if it were located at the Petersburg site.

There are a number of projects identified in Table 9-28 likely to affect land use in the geographic area of interest around the Petersburg site. The proposed Cleveland-Toledo-Detroit rail line project, which would be within 10 mi of the proposed site, would require slight changes in land use around the Petersburg site. Other projects identified in Table 9-28 have contributed or would contribute to some decreases in open lands, wetlands, and forested areas and generally result in increased urbanization and industrialization. However, the continued presence of existing parks, reserves, and managed areas would help preserve a substantial area of open lands, wetlands, and forested areas. The projects within the geographic area of interest identified in Table 9-28 would generally be consistent with applicable land use plans. The distance to transmission interconnections would be approximately 1.2 mi (Detroit Edison 2011a). Even with the new reactor facilities and other reasonably foreseeable development projects anticipated for the geographic area of interest, the currently rural character of the area would not likely be noticeably altered.

As described for the Fermi site in Section 7.1, climate change could increase precipitation and flooding in the area around the Petersburg site, while increased lake evaporation and reduced lake ice accumulation could reduce lake levels, thus changing land use through an increase in low-lying lakeshore areas (USGCRP 2009). Forest growth may increase as a result of more CO_2 in the atmosphere, while existing parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by the same factors (USGCRP 2009). In addition, climate change could reduce crop yields and livestock productivity (USGCRP 2009), which might affect land use in some agricultural areas.

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the cumulative land use impacts associated with siting a reactor at the Petersburg site would be SMALL, and no mitigation would be warranted.

9.3.5.2 Water Use and Quality

Surface water features in the vicinity of the Petersburg site include engineered ditches and a small wetland area in the forested portion of the property. Because the surface water resources near the site are poor, water for a reactor at the Petersburg site was originally proposed to come from the River Raisin, which is about 4 mi north of the site. During the review team's visit in January 2009, the River Raisin was observed to be of moderate size with modest flow, and concern was expressed by the review team regarding the adequacy of the river as a source of cooling water for the proposed power plant and the river's ability to accept discharges of heated and chemically treated cooling tower blowdown discharges. Detroit Edison (Detroit Edison 2009c) has since indicated that a pipeline to Lake Erie would be a possible method of providing a dependable water source for power plant operations. A representative route along State highways and county roads was provided by Detroit Edison, with a total pipeline length of more than 15 mi. A new intake structure would be necessary at the lake (constructed under the USACE and MDEQ permits). Discharge would include relatively warm cooling tower blowdown, treated process wastewater, and liquid radwaste. The receiving body of water for these discharges is not described by Detroit Edison (2011a), but it is assumed that a second pipeline would convey discharges back to Lake Erie. Such discharges would be controlled by an NPDES permit issued by MDEQ. Given the length of pipeline that would be required for a discharge system, at least partial temperature attenuation may take place prior to discharge in the lake.

Groundwater in the site vicinity is used for irrigation and domestic purposes. Well yields are in the 100- to 280-gpm range; however, groundwater static levels have been dropping throughout Monroe County. Groundwater quality is moderate to poor, and in combination with dropping water levels, Detroit Edison considers groundwater to have moderate to low feasibility as a water source for supporting building or operating a new nuclear facility at the Petersburg site.

Building activities, including site grading and dewatering and building of new intake and discharge pipelines, would have the potential to affect water quality through increased erosion by stormwater, increased turbidity of surface water, and possible spills or leaks of fuel and other liquids. Pipeline construction would create the potential for impacts of erosion and turbidity, especially at stream crossings. These changes would be expected to be limited by following appropriate BMPs. Surface water quality may be affected by discharges, but the discharges should be controlled by NPDES permits for cooling water discharge to Lake Erie or for local stormwater management.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Petersburg site is the local ditches and creeks and Lake Erie, because these are the areas potentially affected by the proposed project. Key actions that have current and reasonably foreseeable potential impacts on water supply and water quality in this area of interest include active fossil fuel and nuclear power plants, several sand and/or rock quarries, wastewater treatment plants (WWTPs), and industries (i.e., metal fabrication, organic chemicals, cement). For the cumulative analysis of impacts on groundwater, the geographic area of interest is the bedrock aquifer in the vicinity of the site.

Water Use

Operational cooling water requirements would be the major demand of a new nuclear power plant on surface water resources. As discussed in Section 5.2, water available from Lake Erie would be sufficient to support the makeup water needs of a new reactor, in addition to the cooling water needed by existing regional power plants and other projects listed in Table 9-28. The cumulative consumptive use of surface water is anticipated to have a small effect on the resource.

As described in Section 7.2.1, the greatest potential future impact on the Great Lakes water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario discussed in the USGCRP report (2009) and by Hayhoe et al. (2010) would not be detectable or would be so minor that it would not noticeably alter the availability of water from the Great Lakes. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario, the effect of climate change could noticeably increase air and water temperatures and decrease the availability of water in surface water resources in the Great Lakes region. As a result, the review team concludes that the potential impacts of use and climate change on surface water quantity would be SMALL to MODERATE. Based on its evaluation, the review team concludes that building and operating a nuclear plant at the Petersburg site would not be a significant contributor to the cumulative impact on surface water use.

Groundwater withdrawals associated with site dewatering during construction or preconstruction of a new nuclear power plant would be temporary and localized. As described above, though well yields are reasonably high in the Petersburg vicinity, the feasibility of using groundwater as a cooling water source is low. The review team concludes that cumulative groundwater impacts associated with withdrawals during the construction of a new nuclear power plant at the Petersburg site and with projects identified in Table 9-28 would be SMALL.

Water Quality

An NPDES permit from MDEQ would be required for discharges from a new nuclear power plant at the Petersburg site, as well as for discharges from the other projects identified in

Table 9-28 Such permits would limit both chemical and thermal discharges. Construction activities associated with the proposed facilities in Table 9-28, urbanization in the vicinity, and pipeline crossings have the potential to degrade surface water quality; adhering to BMPs would limit this impact.

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative, a consortium of 11 Federal agencies that developed an action plan to address environmental issues. These issues fall into five areas: cleaning up toxics and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted runoff, restoring wetlands and other habitats, and tracking progress and working with strategic partners. The results of this long-term initiative would presumably address water quality concerns of Lake Erie.

Climate change, as described in Section 7.2.1, has the potential to affect water quality within Lake Erie, leading to a MODERATE cumulative impact on surface water quality. Reduced lake levels could increase the impacts of discharges. The review team concludes that cumulative surface water quality impacts associated with a new nuclear power plant at the Petersburg site and other past, present, and reasonably foreseeable actions in the region would be MODERATE, however, building and operating a nuclear plant at the Petersburg Site would not be a significant contributor to the MODERATE cumulative impact on surface water.

Groundwater quality in the region, which is generally moderate to poor, could be affected by a new nuclear power plant at the Petersburg site and the other past, present, and reasonably foreseeable actions in the region identified in Table 9-28. These impacts would be expected to be localized in extent and may be avoided or minimized through adherence to BMPs. The review team concludes that cumulative groundwater quality impacts would be SMALL.

9.3.5.3 Terrestrial and Wetland Resources

The site is composed primarily of cropland planted with crops such as wheat, corn, and soybeans. A few areas of second-growth forest are scattered about the site. Ash, oak, cottonwood, and maple appear to be the prevalent species in these woodlands. Other non-cropland areas are limited to disturbed roadside ROWs dominated by tall fescue or ditches (drains) where cattail or orchard grass dominate, depending on the amount of moisture available.

The small forested areas provide daytime shelter for large mammals such as whitetail deer, nesting areas for birds, and other habitat needs for smaller mammals. Small mammals present in the area likely include opossum, raccoon, striped skunk, and a variety of rodents. Waterfowl (geese and ducks) and game birds likely feed in the fields after crops are harvested, taking advantage of the grain and other seeds that remain. Small amphibians and reptiles can be found in the local ditches (Detroit Edison 2011a).

The NWI identifies an area of forested wetland in a portion of the site. It is possible, but uncertain at this time, that one or more additional areas contain wetlands because most soils on the site are mapped as hydric soils (USDA 2010).

Three terrestrial species listed as threatened or endangered under the ESA are known to occur or could occur in Monroe County. The eastern prairie fringed orchid is Federally listed as threatened and is known mostly from lakeplain prairies around Saginaw Bay and western Lake Erie (MNFI 2007a). The Indiana bat is Federally listed as endangered. It occurs in southern Michigan when not hibernating (wintering) in hibernacula (caves and other wintering locations) located in southern Michigan and other States (MNFI 2007b). The bats generally require large trees (greater than 9-in. diameter) with exfoliating bark for summer roosting. According to the FWS (2009), however, trees with diameters as small as 5 in. should be considered as potential habitat. The emerald ash borer is active in the project area (MDA 2009). It is likely that ash trees onsite have been killed by the borer, creating dead trees with loose bark and resulting in potential roosting habitat for the Indiana bat. The Karner blue butterfly (*Lycaeides melissa samuelis*) is Federally listed as endangered. The species was recorded in Monroe County in 1986 but is otherwise known from the west-central portion of lower Michigan. Suitable habitat does not appear to exist at the project site or in the immediate vicinity. According to the MDNR Endangered Species Coordinator, Karner blue butterflies were introduced to Monroe County in the Petersburg State Game Area within the last decade (Hoving 2010). Because the maximum movement of the butterflies from their point of introduction is about 0.6 mi and the Game Area is approximately 8 mi southeast, there is no likelihood that any butterflies introduced in the Game Area would occur on the site. Furthermore, suitable habitat does not appear to exist at the site or in the immediate vicinity. The bald eagle is no longer on the Federal endangered species list, although it is protected under the BGEPA and MBTA (MNFI 2007c). The bald eagle was also recently removed from the State list of threatened and endangered species but is still considered a species of concern. Although bald eagles are known to occur in the region, the species usually nests and roosts closer to fish-bearing waters. The potential for any impacts on protected species appears to be minimal because of the type of habitat present.

Nearly 50 State-listed species occur in Monroe County (see Table 9-29). Among the State-listed species is the eastern fox snake. Three other species formerly present in the county are presumed extirpated. Detroit Edison has not consulted with MDNR on potential impacts on State-listed species that could result from construction of the power plant at the Petersburg site.

Building Impacts

Agricultural land, possibly along with some forest and residential land, would have to be cleared and converted to industrial use in order to build a new reactor and associated facilities at the Petersburg site. According to Detroit Edison, the total area of the Petersburg site is approximately 1900 ac (Detroit Edison 2011a). Detroit Edison's conceptual plan layout shows the new reactor facilities would occupy as much as 80 ac in the central part of the Petersburg

Table 9-29. Federally and State-Listed Terrestrial Species That Occur in Monroe County and That May Occur on the Petersburg Site or in the Immediate Vicinity

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Amphibians			
Blanchard's cricket frog	*Acris crepitans blanchardi*	NL	T
Smallmouth salamander	*Ambystoma texanum*	NL	E
Birds			
Barn owl	*Tyto alba*	NL	E
Common moorhen	*Gallinula chloropus*	NL	T
Common tern	*Sterna hirundo*	NL	T
Cup plant	*Silphium perfoliatum*	NL	T
King rail	*Rallus elegans*	NL	E
Least bittern	*Ixobrychus exilis*	NL	T
Peregrine falcon	*Falco peregrinus*	NL	E
Invertebrates			
Dukes' skipper	*Euphyes dukesi*	NL	T
Frosted elfin	*Incisalia irus*	NL	T
Karner blue butterfly	*Lycaeides melissa samuelis*	E	T
Proud globe	*Mesodon elevatus*	NL	T
Silphium borer moth	*Papaipema silphii*	NL	T
Mammals			
Indiana bat	*Myotis sodalis*	E	E
Plants			
American chestnut	*Castanea dentata*	NL	E
American lotus	*Nelumbo lutea*	NL	T
Arrowhead	*Sagittaria montevidensis*	NL	T
Beak grass	*Diarrhena obovata*	NL	T
Corn salad	*Valerianella umbilicata*	NL	T
Downy sunflower	*Helianthus mollis*	NL	T
Gattinger's gerardia	*Agalinis gattingeri*	NL	E
Ginseng	*Panax quinquefolius*	NL	T
Goldenseal	*Hydrastis canadensis*	NL	T
Hairy mountain mint	*Pycnanthemum pilosum*	NL	T
Least pinweed	*Lechea minor*	NL	Presumed extirpated
Leggett's pinweed	*Lechea pulchella*	NL	T
Leiberg's panic grass	*Dichanthelium leibergii*	NL	T
Orange- or yellow-fringed orchid	*Platanthera ciliaris*	NL	E
Eastern prairie fringed orchid	*Platanthera leucophaea*	NL	E

Table 9-29. (contd)

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Purple milkweed	*Asclepias purpurascens*	NL	T
Raven's-foot sedge	*Carex crus-corvi*	NL	E
Red mulberry	*Morus rubra*	NL	T
Round-fruited St. John's-wort	*Hypericum sphaerocarpum*	NL	E
Sand cinquefoil	*Potentilla paradoxa*	NL	T
Short-fruited rush	*Juncus brachycarpus*	NL	T
Smooth rose-mallow	*Hibiscus laevis*	NL	Presumed extirpated
Stiff gentian	*Gentianella quinquefolia*	NL	T
Sullivant's milkweed	*Asclepias sullivantii*	NL	T
Tall green milkweed	*Asclepias hirtella*	NL	T
Three-awned grass	*Aristida longespica*	NL	T
Violet wood sorrel	*Oxalis violacea*	NL	Presumed extirpated
Water willow	*Justicia americana*	NL	T
Wild hyacinth	*Camassia scilloides*	NL	T
Wild rice	*Zizania aquatica* var. *aquatica*	NL	T
Woodland lettuce	*Lactuca floridana*	NL	T
Reptiles			
Eastern fox snake	*Pantherophis gloydi*	NL	T

Source: MNFI 2010a
(a) E = listed as endangered, NL = not listed, T = listed as threatened.

site (Detroit Edison 2011a). Although Detroit Edison's conceptual plan layout (Detroit Edison 2009b) does not differentiate temporarily disturbed areas from the facility footprint, the review team estimates that temporary disturbance could be as much as 200 ac. Conversion of agricultural land would have minimal impact on wildlife and habitat. Conversion of forested areas would have some impact on most of the common species present onsite by removing habitat used for shelter or other functions. With the possible exception of the Indiana bat, adverse impacts on Federally listed species are not anticipated. The forested areas of the site have the potential to provide habitat for the Indiana bat in the form of dead ash trees. If the bat uses the areas that would be disturbed, impacts could be kept to minimal levels by limiting tree clearing to the times of year when the bats are not in the region.

The agricultural land and the small areas of forest on this site are not likely to provide habitat for State-listed species, but additional study would be called for to adequately assess potential impacts on terrestrial ecological resources, including the eastern fox snake, on the site and its vicinity if this alternative location for the power plant were to be selected. However, considering the prevalence of hydric soils on the site, the layout likely affects unmapped wetlands.

Information about the Petersburg alternative provided by Detroit Edison indicated that there are wetlands on the Petersburg site, but no wetland areas would be affected by building the new reactor facilities (Detroit Edison 2009b, 2011a). The conceptual plan layout appears to site the facilities entirely on agricultural land.

Detroit Edison's ER states that 345-kV and 120-kV transmission lines pass about 1.2 mi north of the Petersburg site. The ER also states that capacity and reliability in the area are good and that there is an open circuit on the 345-kV line. Nonetheless, it is possible that a new transmission line would be necessary for a number of reasons. A reactor built on the Petersburg site rather than at the proposed Fermi site would still be expected to serve the same load centers as if it were at the Fermi site. Detroit Edison did not state whether there is sufficient uncommitted current transmission capacity left on the existing lines. No information was provided on where a possible transmission line would be built, how long it would be, or what terrestrial ecological resources might be affected by such a transmission line. It may be possible, however, that a new transmission line could share or adjoin an existing transmission line corridor for some of its length and use existing substations, thereby resulting in less ecological impact than would occur with completely new corridors and substations. The vicinity of the Petersburg site is largely agricultural, with some forested areas. Although it appears possible to avoid most, if not all, important habitat with a new transmission line, a complete assessment would require a corridor location and site-specific information about the wildlife and habitat within the corridor.

Operational Impacts

During plant operation, wildlife, including the eastern fox snake, would be subjected to increased mortality from traffic, but it is not expected that such effects would destabilize the local or regional populations of the common species of the site (Forman and Alexander 1998). Information about the local occurrence of important species and habitats would be needed to conduct a more complete assessment of potential project effects on those resources at the Petersburg site. Potential impacts associated with transmission line operation would consist of bird collisions with transmission lines, habitat loss due to corridor maintenance, noise, and EMF effects on flora and fauna.

Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of bird collisions with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in bird mortality. Weather, such as low cloud ceilings, advancing fronts, and fog, also contribute to this phenomenon.

There would be a potential for bird mortality from colliding with the nuclear power plant structures at this site. Typically, the cooling tower and the meteorological tower are the structures likely to pose the greatest risk. The potential for bird collisions increases as structure heights and widths increase. MDCTs are of little concern, because of their relatively low height compared with existing and proposed structures onsite. An NDCT, however, would be on the order of 600 ft high. Nonetheless, the NRC concluded that effects of bird collisions with existing cooling towers "involve sufficiently small numbers for any species that it is unlikely that the losses would threaten the stability of local populations or would result in a noticeable impairment of the function of a species within local ecosystems" (NRC 1996). Thus, the impacts on bird populations from collisions with the cooling tower are expected to be minimal.

Operational impacts of the transmission system on wildlife (e.g., bird collisions and habitat loss) resulting from the addition of new lines and towers cannot be fully evaluated without additional information on the length and location of any new transmission facilities. Nonetheless, Section 4.5.6.2 of the GEIS for license renewal (NRC 1996) provided a thorough discussion of the topic and concluded that bird collisions associated with the operation of transmission lines would not cause long-term reductions in bird populations. The same document also concluded that once a transmission corridor has been established, the impacts on wildlife populations would be from continued maintenance of transmission line corridors and are not significant (NRC 1996).

ITC*Transmission* would build and operate any new transmission line needed for a new reactor at the Petersburg site. ITC*Transmission* operates in accordance with industry standards for vegetation management (NERC 2010), including seasonal restriction on activities that could adversely affect important wildlife (Detroit Edison 2010a). According to ITC*Transmission*'s vegetation management policy, wetland areas within the corridor that have the potential to regenerate in forest vegetation would be manually cleared of woody vegetation periodically for line safety, thereby keeping them in a scrub/shrub or emergent wetland state (ITC*Transmission* 2010). Other forested areas would be managed similarly to prevent tree regrowth that could present safety or transmission reliability problems. Access to these areas for maintenance would likely be on foot or by using matting for vehicles so as not to disturb the soil. Pesticides or herbicides would be used only occasionally in specific areas where needed in the corridor. It is expected that the use of such chemicals in the transmission line corridor would be minimized to the greatest extent possible in wetlands areas to protect these important resources (Detroit Edison 2010a). The impact associated with corridor maintenance activities is loss of habitat, especially forested habitat, from cutting and herbicide application. The maintenance of transmission line corridors could be beneficial for some species, including those that inhabit early successional habitat or use edge environments. Impacts of transmission line corridor maintenance would depend on the types and extents of habitat crossed. Detroit Edison has not provided sufficient details to make a complete assessment of transmission line corridor maintenance impacts. In general, however, if a new transmission line is needed, the impacts would likely be minimal.

Detroit Edison provided no data on noise for the possible new reactor on the Petersburg site, but it is likely that impacts would be minimal and similar to those associated with the Fermi 3 project.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NIEHS 2002). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NIEHS 2002). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes (NIEHS 2002). Thus, impacts of EMFs from transmission systems with variable numbers of power lines on terrestrial flora and fauna are of small significance at operating nuclear power plants (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2007). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2007). A review of the literature on health effects of electric and magnetic fields conducted for the Oregon Department of Energy looked at the effects of strong electric and magnetic fields on various bird species. While some studies concluded that some species of birds exhibited changes in activity levels and some physiological metrics, no studies demonstrated adverse effects on health or breeding success (Golder Associates, Inc. 2009).

Cumulative Impacts

Several past, present, and reasonably foreseeable projects could affect terrestrial resources in ways similar to siting a new reactor exist at the Petersburg site (see Table 9-28). The geographic area of interest for the following analysis is defined by a 25-mi radius extending out from the site

Past projects include three coal-fired generation facilities: the Detroit Edison Monroe power plant in Monroe, Michigan; the Bay Shore power plant in Oregon, Ohio; and the J.R. Whiting power plant in Luna Pier, Michigan. The Fermi 2 power plant is just inside the geographic area of interest, at a distance of approximately 25 mi. The three coal-fired plants are between 12 and 19 mi from the Petersburg site. All four power plants were constructed at least two decades ago. Any short-term impacts of plant construction ended years ago. The long-term effects on terrestrial ecological resources from operating a new reactor at the Petersburg site combined with the other power plants in the geographic area of interest would be minimal because of the low level of impacts of a new power plant and the distances to the other existing power plants.

Reasonably foreseeable projects within the geographic area of interest that could affect terrestrial resources include continued regional commercial and residential development and construction of a proposed Cleveland-Toledo-Detroit passenger rail line.

Urbanization would likely result in conversion of agricultural land, forest land, wetlands, and other habitat to urban uses. Urbanization would involve some of the same activities as building a new reactor, including land clearing and grading (temporary and permanent), increased human presence, heavy equipment operation, traffic (with resulting wildlife mortality), noise from construction equipment, and fugitive dust. Some of the effects of these activities, such as noise and dust, are short term and localized. The impacts of noise and dust from building a new reactor would be negligible. Other effects, such as clearing wildlife habitat that would not be restored, would be permanent. The effects of urbanization, land clearing and grading, filling of wetlands, increased human presence, and increased traffic would occur over a period of several years and in several locations away from the Petersburg site.

The current status of the proposed passenger rail line from Cleveland through Toledo to Detroit is not known. As part of this project, a railway station could be built in the City of Monroe. The project would have some potential to encourage local economic development, including urbanization.

Development of the site could result in increased employment and population within the geographic area of interest which, in turn, could result in additional urbanization. Given the current population of Monroe County, Michigan, of 146,000, the additional urbanization would be minor.

Considering the presence of known wetlands and hydric soils on the site, building a new reactor at the Petersburg site would likely result in unavoidable wetland impacts. Impacts from potential transmission line development cannot be assessed without more specific routing information. Because of the largely agricultural landscape of the Petersburg vicinity, it is likely that a transmission line corridor could be routed to minimize impacts on wildlife and habitat.

Summary of Impacts on Terrestrial and Wetland Resources at the Petersburg Site

Impacts on terrestrial ecological resources and wetland resources were estimated based on information provided by Detroit Edison and the review team's independent review. Based on the conceptual layout (Detroit Edison 2009b), the permanently disturbed area could be as much as 80 ac, and the temporarily disturbed area could be as much as 200 ac. Much of the project area is currently used for row crops and hay and provides relatively low wildlife habitat value. After construction and preconstruction, habitat resources in temporarily disturbed areas would be expected to naturally regenerate. Wildlife would also recover but might not use the regenerated habitat to the same degree. Permanently disturbed areas would be converted to industrial use for the indefinite future. However, because of the likelihood of wetland impacts at the site, impacts are expected to be noticeable. Because the review team has no definitive information on the routing and length of a new transmission corridor, it cannot estimate the extent of affected habitats.

The review team concludes that the cumulative impacts on terrestrial wildlife and habitat would be MODERATE for a new reactor at the Petersburg site. Building and operating a new nuclear plant at the Petersburg site would be a significant contributor to this MODERATE impact.

9.3.5.4 Aquatic Resources

Aquatic habitats in the vicinity of the Petersburg site include engineered agricultural drains that drain the site and a small wetland area in the forested portion of the property (Section 9.3.5.2). Land use around agricultural drains is primarily cropland. No information exists regarding the aquatic organisms in the onsite wetlands and drains, and surveys would be needed to characterize the aquatic communities present. However, a variety of aquatic macroinvertebrates, such as mayflies, stoneflies, caddisflies, isopods, and chironomids are likely to be present, along with fish common to Great Lakes coastal habitats, such as sunfishes, shiners, suckers, and catfish (Bolsenga and Herdendorf 1993). The River Raisin is approximately 4 mi north of the proposed location for a new reactor and should not be affected by preconstruction, construction, and operations of a new reactor.

The western basin of Lake Erie would likely serve as the source of plant cooling water for a new reactor at the Petersburg site. Lake Erie supports an important commercial and recreational fishery. Common nearshore forage species include the emerald shiner (*Notropis atherinoides*), gizzard shad, rainbow smelt, and alewife. Salmonids (Family Salmonidae), sunfish, catfish, yellow perch, walleye, pike, and freshwater drum are commercially or recreationally important species found near the shoreline (USGS 2010). Some of the primary aquatic nuisance species are invasive waterfleas, dreissenid mussels, sea lamprey, common carp, and round goby. The ecology of Lake Erie has been dramatically altered by the introduction of dreissenid mussels, with quagga mussels dominating the eastern basin and zebra mussels dominating the western basin of Lake Erie (Benson et al. 2011). Dreissenid mussels have increased benthic productivity, reduced plankton and planktivorous fish abundance, and altered the substrate available to demersal organisms.

Federally and State-Listed Threatened and Endangered Species

One native freshwater mussel species listed by the FWS as endangered and two mussel species, proposed for listing as endangered, could be present in Monroe County (FWS 2010). The northern riffleshell (*Epioblasma torulosa rangiana*) is Federally listed as endangered, and the rayed bean and snuffbox mussel are proposed for listing as endangered (FWS 2010; 75 FR 67552). The white catspaw (*Epioblasma obliquata perobliqua*), which is Federally listed as endangered, historically occurred in Monroe County but is now considered to be extirpated from Michigan (FWS 2010). The northern riffleshell was historically present in the River Raisin drainages, but the most recent record from Monroe County is from 1977 (Carman and Goforth 2000c; FWS 2008). There are no designated critical habitats for any listed species in the vicinity of the Petersburg site. Within Monroe County, there are seven State-listed fishes and ten State-listed mussels potentially present on the Petersburg site, the River Raisin drainage, and in Lake Erie (Table 9-30). Suitable habitat for threatened and endangered mussels is not likely to be present near the Petersburg site. No recent records exist for the State-listed hickorynut (*Obovaria olivaria*), wavyrayed lampmussel, or white catspaw in Monroe County, although these species were historically present (Carman 2001c; Stagliano 2001a; Badra 2004a). The slippershell, round hickorynut (*Obovaria subrotunda*), threehorn wartyback (*Obliquaria reflexa*), lilliput (*Toxolasma parvus*), and the rayed bean, and snuffbox mussel are potentially present in streams within Monroe County as well as Lake Erie, although the rayed bean and threehorn wartyback are not likely to be present (Carman and Goforth 2000b; Carman 2001b, d; Carman 2002b; 75 FR 67552). Of the State-listed threatened and endangered fish, there are no recent records for the river darter (*Percina shumardi*) or eastern sand darter in Monroe County (Carman 2001e; Derosier 2004c). Lake sturgeon and sauger inhabit Lake Erie, although the sauger is uncommon (Goforth 2000; Derosier 2004b). The pugnose minnow (*Opsopoeodus emiliae*) and the channel darter have been recorded in nearshore areas of Lake Erie (Carman and Goforth 2000a; Carman 2001f).

Building Impacts

Impacts on aquatic habitats and biota could result from building the primary facilities, associated transmission lines, and the cooling water intake and discharge pipelines for a new reactor at the Petersburg site. As identified in Section 9.3.5.1, the area of the site that would be developed if the site were chosen for a new reactor facility consists primarily of agricultural land, and no streams are likely to be located directly within the construction footprint (Detroit Edison 2009b). Building new 15-mi intake and discharge pipelines between Lake Erie and the reactor site could affect aquatic habitat if present along the pipeline corridor and could require dredging, pile driving, and other alterations to the shoreline and benthic habitat of Lake Erie, potentially resulting in sedimentation, noise, turbidity, sediment removal, and accidental releases of contaminants (see Section 4.3.2 for a detailed description of potential impacts of building activities on aquatic habitat and biota). The impacts on aquatic organisms would likely be temporary and could be largely mitigated through the use of BMPs. Building activities within Lake Erie would require Section 10 and 404 permits from USACE and a regulatory permit from MDEQ, and these permits would contain stipulations that would further reduce impacts. Overall, the impact of the construction of cooling water intake and discharge structures on aquatic resources would be minor.

As described in Section 4.3.2, building activities at the location of the new reactor, including an increase in impervious land surface, vegetation removal, site grading, and dewatering, would have the potential to affect water quality and hydrology and therefore aquatic biota in wetlands located in the vicinity. Stormwater runoff could carry soil as well as contaminants (e.g., spilled fuel and oil) from construction equipment into wetlands located onsite. There is little high-quality aquatic habitat present at the Petersburg site, and impacts are expected to be minor.

Table 9-30. Federally and State-Listed Threatened and Endangered Aquatic Species That Have Been Reported from Monroe County, Michigan

Common Name	Scientific Name	Federal Status[(a)]	State Status[(b)]
Fish			
Channel darter	*Percina copelandi*	NL	E
Eastern sand darter	*Ammocrypta pellucida*	NL	T
Lake sturgeon	*Acipenser fulvescens*	NL	T
Pugnose minnow	*Opsopoeodus emiliae*	NL	E
River darter	*Percina shumardi*	NL	E
Sauger	*Sander canadensis*	NL	T
Silver chub	*Macrhybopsis storeriana*	NL	SC
Invertebrates			
Hickorynut	*Obovaria olivaria*	NL	E
Lilliput	*Toxolasma parvus*	NL	E
Northern riffleshell	*Epioblasma torulosa rangiana*	E	E
Rayed bean	*Villosa fabalis*	PE	E
Round hickorynut	*Obovaria subrotunda*	NL	E
Slippershell	*Alasmidonta viridis*	NL	T
Snuffbox mussel	*Epioblasma triquetra*	PE	E
Threehorn wartyback	*Obliquaria reflexa*	NL	E
Wavyrayed lampmussel	*Lampsilis fasciola*	NL	T
White catspaw	*Epioblasma obliquata perobliqua*	E[(c)]	E

(a) Federal status rankings determined by the FWS under the Endangered Species Act: NL = not listed, PE = proposed endangered, E = endangered. Source: FWS 2010

(b) State species information provided by MNFI (2010b): E = endangered, T = threatened, SC = species of concern.

(c) The white catspaw is considered extirpated in Michigan.

Information about the Petersburg site provided by Detroit Edison indicated that no wetland areas would be affected by building the new reactor facilities (Section 9.3.5.3). Assuming that required construction permits are obtained from MDEQ and/or USACE and that appropriate BMPs are implemented during building activities, the impacts on aquatic resources from onsite development activities would be temporary, easily mitigated, and minor.

It is possible that the transmission line for a new reactor at the Petersburg site could use existing substations and share or adjoin an existing transmission line corridor for some of its length. If so, building-related impacts on aquatic resources would be minimal. If the new transmission line is needed to service a new reactor, there is the potential for the construction-related impacts described above to affect aquatic habitat and aquatic biota if a new transmission line passes near or crosses a surface water feature. Expansion of existing corridors would be expected to result in minor environmental impacts, while establishing new corridors could result in greater impacts. However, based on the assumption that required construction permits would be obtained from MDEQ and appropriate BMPs implemented during building activities, the impacts on aquatic resources from development of additional transmission facilities would likely be temporary, easily mitigated, and minor.

The impacts of building a new reactor at the Petersburg Site on threatened and endangered aquatic species potentially present in the River Raisin are expected to be minimal because the land area that would be affected by reactor construction is located approximately 4 mi away and no water would be withdrawn from or discharged into the River Raisin. New reactor construction is also not expected to result in impacts on threatened and endangered aquatic species, given the lack of suitable habitat at the reactor location and the use of BMPs to minimize potential construction impacts. However, threatened and endangered and mussels found in Lake Erie or in aquatic habitat located along the route of the transmission line or cooling water intake and discharge pipelines could be affected by disturbance from building activities. Threatened or endangered mussels potentially present in Lake Erie include the slippershell, round hickorynut, threehorn wartyback, lilliput, and snuffbox mussel. As discussed above, the rayed bean and threehorn wartyback are not likely to be present in Lake Erie. Additional information would need to be collected and surveys may need to be conducted to evaluate the potential for threatened and endangered mussel species to be present in aquatic habitat that would be disturbed by construction of cooling water intake and discharge facilities. If threatened and endangered mussels were found, it is likely that mitigation measures would need to be developed to limit potential impacts. Habitat for State-listed fish species could be temporarily disturbed by shoreline and in-water preconstruction activities. However, fish are highly mobile and would likely avoid the affected areas during construction. On the basis of this information and because construction and preconstruction activities would be temporary and mitigable, the review team concluded that impacts on threatened and endangered aquatic species would be minor.

Operational Impacts

Operational impacts on aquatic habitat and biota could result from cooling water consumption, transmission line maintenance, cooling water system maintenance, cooling water discharge, and impingement and entrainment of aquatic biota by the cooling water system.

Operational cooling water requirements would be the major water demand of a new nuclear power reactor at the Petersburg site. Detroit Edison has proposed a closed cycle recirculating cooling system, which could reduce water use by 96 to 98 percent compared to a once-through cooling system (66 FR 65256). Assuming that cooling water needs would be similar to those identified for Fermi 3, approximately 34,000 gpm, or 49 MGD, would be needed (Detroit Edison 2011a). The withdrawal of water would not disrupt natural thermal stratification or turnover pattern for Lake Erie and would comply with EPA's CWA Section 316(b) Phase I regulations. Water available from Lake Erie would be sufficient to support the makeup water needs of a new reactor; therefore, the incremental impact from operating a new power plant at the Petersburg site would be minor (see Section 9.3.5.2). Consequently, the hydrologic impacts on aquatic resources in Lake Erie should be minimal.

Maintenance dredging in the vicinity of the water intake would periodically be necessary to maintain appropriate operating conditions for cooling water intake. Such dredging would result in a temporary localized increase in turbidity in Lake Erie in the vicinity of the intake bay and would be managed under a permit from the USACE. Dredged material is expected to be disposed of in a spoil disposal pond, where sedimentation would occur prior to discharge of the water back into Lake Erie. The periodic dredging of the intake bay would result in minimal impacts on aquatic biota and habitats in Lake Erie.

The effect of impingement and entrainment of aquatic organisms from Lake Erie was evaluated by the review team. Entrainment may result in mortality to zooplankton and phytoplankton. In addition, data from the Fermi 2 cooling water intake system (Section 5.3.2) suggests both demersal and pelagic fishes in Lake Erie would be vulnerable to entrainment and impingement. Particularly vulnerable are early life stages of fish (eggs and larvae), which lack the swimming ability to overcome intake suction and which are small enough to pass through the mesh of the intake screens. The use of fish screens and a closed cycle recirculating cooling system as proposed by Detroit Edison would reduce water use and physical damage to aquatic organisms and would decrease impingement and entrainment (Section 5.3.2). Based on the assumption of a closed cycle cooling system that meets the EPA's CWA Section 316(b) Phase I regulations for new facilities, the anticipated impacts on populations of aquatic biota from entrainment and impingement are expected to be minor.

Discharge would include warm cooling tower blowdown, treated process wastewater, and processed radwaste wastewater, all of which could affect aquatic biota through mortality or sublethal physiological, behavioral, and reproductive impairment (see Section 5.3.2). In addition, aquatic organisms may be affected by cold shock and the scouring of benthic habitat near the discharge pipeline (see Section 5.3.2). Proposed design features, such as the presence of riprap around the submerged discharge port and orientation of the discharge ports in an upward direction, are intended to reduce scouring (Detroit Edison 2011a). As identified in Section 9.3.5.2, a NPDES permit from MDEQ would be required for discharges from a new nuclear power plant at the Petersburg site. Such a permit would likely specify limits for chemical and thermal discharges in order to protect water quality, thereby limiting the potential for impacts on aquatic organisms. Given the 15-mi length of pipeline that would be required for a discharge system, at least partial temperature attenuation may take place prior to discharge into Lake Erie. Assuming that NPDES permitting requirements are met, the impacts of discharges on aquatic habitats and biota would be minor.

Impacts on aquatic resources from operation of a new reactor at the Petersburg site may include those associated with maintenance of transmission line corridors. The review team assumed that ITC*Transmission* would construct and operate any new transmission line needed and that it would follow current maintenance practices designed to minimize impacts on aquatic habitats and wetlands, such as minimizing disturbance to riparian habitat and minimizing the application of pesticides and herbicides, which can enter aquatic habitat and adversely affect aquatic biota (Detroit Edison 2011a). Although impacts of transmission line corridor maintenance would depend, in part, on the types and extent of aquatic habitat located near the transmission line, impacts on aquatic habitats and biota from maintenance of transmission lines would likely be minor as long as maintenance practices currently followed by ITC*Transmission* are implemented.

There is no suitable habitat for threatened and endangered mussels near the proposed location of the reactor, but species potentially found in surface waters located along the transmission line and cooling water intake and discharge pipelines could be adversely affected by maintenance activities. The potential for impacts on threatened and endangered species could be minimized by following BMPs. Mussels, including the round hickorynut, threehorn wartyback, lilliput, snuffbox mussel, and the rayed bean, are potentially present in Lake Erie, and these species may be vulnerable to cooling water intake and discharge operational impacts if present in the immediately affected areas. As eggs, mussels are not likely to be affected by system operation because the eggs are not free-floating, but rather, develop into larvae within the female. Mussels in the glochidial stage during which juveniles attach to a suitable fish host are vulnerable indirectly through host impingement and entrainment. Hosts for the snuffbox mussel (logperch), lilliput (several species of Centrachids), and rayed bean (largemouth bass) are present in Lake Erie and could be impinged during reactor operations. Fish hosts for the threehorn wartyback and round hickorynut are not known. Post-glochidial and adult-stage mussels are not likely to be susceptible to entrainment because they bury themselves in sediment.

The State-listed sauger is not common in Lake Erie, but the lake sturgeon historically spawned along the shoreline of Lake Erie in Monroe County, and early life stages may be vulnerable to entrainment and impingement. However, spawning activity in this area appears to have diminished or ceased since the 1970s (Goforth 2000). The State-listed channel darter could occur in Lake Erie but may be less likely to be entrained because it resides near the bottom. None of these species were observed during impingement and entrainment studies conducted during 2008 and 2009 (AECOM 2009) at the Fermi 2 intake in Lake Erie. Consequently, it is considered unlikely that significant numbers would be affected by cooling water intake for a new reactor at the Petersburg site. Overall, impacts on threatened and endangered species from reactor operations are expected to be minor.

Cumulative Impacts

Past, present, and reasonably foreseeable projects, facilities, and other environmental changes that contribute to cumulative impacts on aquatic resources along with the construction and operation of a new reactor at the Petersburg site include the activities and projects shown in Table 9-28 and current and future ecosystem changes from climate change, introduced dreissenid mussels, and recreational and commercial fishing.

As discussed above, potential building-related impacts on aquatic habitat and biota could result from altered hydrology, erosion, stormwater runoff of soil and contaminants, and disturbance or loss of benthic habitat from construction of the reactor, associated transmission lines, and the water intake and discharge system. Urbanization can affect aquatic resources by increasing impervious surface, non-point-source pollution and water use, as well as by altering riparian and in-stream habitat and existing hydrology patterns. Development of a new reactor on the Petersburg site could result in increased human populations and additional urbanization with subsequent impacts on aquatic resources.

Operational cooling water requirements would be the major water demand from a new nuclear power plant on surface water resources. Lake Erie would be sufficient to support the makeup water needs of a new reactor in addition to the cooling water needed by existing U.S. and Canadian power plants and other projects listed in Table 9-28 (Section 9.3.5.2). However, as described in Section 7.2.1, the effect of climate change could noticeably decrease the availability of surface water resources in the Great Lakes. If such a reduction in surface water were to occur, aquatic habitat on the reactor site and in Lake Erie may be altered or eliminated, with potentially adverse consequences for aquatic habitat and biota.

Impingement and entrainment of aquatic biota from Lake Erie due to a new reactor must be considered along with mortality resulting from existing power plants that already withdraw water from Lake Erie, commercial and recreational fishing, and introduced zebra mussels and quagga mussels, which have dramatically reduced plankton abundance in the region. Commercially important species that have been the target of restoration efforts in Lake Erie, such as yellow perch and walleye, occupy nearshore areas and could be vulnerable to cooling water intake.

Discharges into Lake Erie from a new nuclear power plant at the Petersburg site must be considered along with discharges into Lake Erie from the other projects identified in Table 9-28. Contaminant loads in Lake Erie may be reduced in the future by the Great Lakes Restoration Initiative, which attempts to (1) clean up toxics and areas of concern, (2) protect watersheds from polluted runoff, and (3) restore wetlands (see http://greatlakesrestoration.us/). If climate change results in reduced water levels and increased water temperatures, the impacts associated with contaminant concentrations and thermal stress from cooling water discharge into Lake Erie could also increase. As identified in Section 9.3.5.2, the incremental contribution to overall cumulative surface water quality impacts associated with a new nuclear power plant at the Petersburg site, is expected to be minor because of the expected localized extent of the impacts from projects and the adherence to BMPs and permitting requirements designed to avoid or minimize impacts. NPDES permits would also limit chemical and thermal discharges into Lake Erie. Similarly, the incremental contribution of a new reactor at the Petersburg site to cumulative impacts on aquatic biota from water quality changes due to operational discharges would also be minor.

Based on its evaluation, the review team concludes that the cumulative impacts on aquatic resources, including threatened or endangered species, could be substantial due to the continued inadvertent introduction of invasive species, overfishing, and increased urbanization resulting in further degradation of water quality and global climate change. The incremental impact from building and operating a new power plant at the Petersburg site would not contribute significantly to the overall cumulative impacts in the geographic area of interest.

Summary of Impacts on Aquatic Resources at the Petersburg Site

Impacts on wetlands, streams, Lake Erie, and associated aquatic biota could result from the construction of the reactor, transmission line, and cooling water intake and discharge pipelines at the Petersburg site. However, the impacts on aquatic organisms would be temporary and could be largely mitigated by avoiding aquatic habitats during siting of facilities and activity areas and by using BMPs during preconstruction and construction activities.

Operational impacts on aquatic resources could result from cooling water consumption, transmission line and cooling water system maintenance, alteration of water quality by cooling water discharge, and impingement and entrainment of aquatic biota by the cooling water system. If the reactor is constructed, impingement and entrainment would add to existing mortality sources for aquatic biota such as invasive species, commercial and recreational fishing, and the operation of other power plants using water from or discharging into Lake Erie.

Impingement and entrainment of aquatic organisms would be minimized by complying with EPA's CWA Section 316(b) Phase I regulations. Lake Erie could support the makeup water needs of a new reactor. However, climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. Similarly, while a NPDES permit would limit both chemical and thermal discharges, climate change has the potential to increase impacts of the discharges on aquatic communities. Transmission line and cooling water pipeline maintenance impacts on aquatic habitat and biota could be minimized by implementing BMPs.

Although suitable habitat is not likely to be present on the reactor site, State-listed fish and mussels could occur in Lake Erie or in aquatic habitat located along the transmission line or cooling water intake corridors and could be vulnerable to benthic disturbance associated with the construction, operation, and maintenance of the cooling water intake and discharge system. If required, surveys for threatened and endangered mussels could be conducted in aquatic habitats that would be disturbed by construction, and observed individuals could be relocated before building activities as a mitigation action. The potential for entrainment and impingement of threatened and endangered aquatic species in Lake Erie is possible but not likely to be significant. Overall, minor impacts on listed aquatic species are expected from reactor construction and operations.

The review team's conclusion, based on the information provided by Detroit Edison and the review team's independent evaluation, is that the impacts on aquatic resources, including threatened or endangered species, from the Petersburg reactor considered together with cumulative impacts from other activities and climate change would be MODERATE. Building and operating a new nuclear unit at the Petersburg site would not be a significant contributor to the overall cumulative impact.

9.3.5.5 Socioeconomics

The economic impact area for the Petersburg alternative site is a three-county area, including Monroe and Lenawee Counties, Michigan, and Lucas County, Ohio. The site is located in Monroe County and is 1 mi east of Lenawee County and 7 mi north of Lucas County. Because the plant would be located in Monroe County and near Lenawee and Lucas Counties, those jurisdictions are where the majority of the socioeconomic impacts are expected to occur from the in-migrating construction and operations workforces.

However, within a 50-mi radius are portions of several large metropolitan areas, including Toledo, Ohio, which is included in the economic impact area, and Detroit and Ann Arbor, Michigan, which are outside of the economic impact area. Detroit Edison may draw some of the construction and operations workers that currently reside in these large metropolitan areas, depending on the skills and availability of the workforce, even though the commute for the workers would be longer. Detroit, Michigan, is 45 mi northeast of the Petersburg site; Ann Arbor, Michigan, is 30 mi north of the site; and Toledo, Ohio, is 8 mi south of the site. Toledo, Ohio, is included in the economic impact area because it is located in Lucas County; however, impacts on the Detroit and Ann Arbor metropolitan areas are not considered because they are outside of the economic impact area.

Members of the in-migrating construction and operations workforces that choose to live within the Detroit-Warren-Livonia MSA, portions of the Toledo MSA outside of the economic impact area, or Ann Arbor MSA, are not likely to cause significant impacts in any single jurisdiction, and workers who currently reside in these large metropolitan areas would not affect housing, schools, or other public services, because they are members of the baseline population. The number of workers who would relocate within any single jurisdiction outside of Monroe, Lenawee, or Lucas County is expected to be small, because the number of possible jurisdictions in which members of the workforce could reside is large. Therefore, this analysis focuses on Monroe, Lenawee, and Lucas Counties, which encompass the plant location and where the majority of the in-migrating workers are expected to reside.

Physical Impacts

Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics. Because the physical impacts of building and operating a nuclear power plant are very similar between the proposed site and the alternative sites, the review team determined that, as assessed for the Fermi 3 site, all physical impacts related to the Petersburg site would be minor. See Sections 4.4.1 and 5.4.1 for a detailed discussion of physical impacts for Fermi 3.

Demography

The Petersburg site is located in Summerfield Township, Monroe County, 4 mi south of the town of Petersburg and approximately 1 mi east of the Lenawee County border. The western portion of Monroe County, where the site is located, is rural. The highest concentration of population in Monroe County is east along Lake Erie, including the City of Monroe and adjoining townships of Frenchtown Charter and Bedford. Lenawee County is rural; the largest population center is the City of Adrian. Toledo, Ohio, is the largest population center in Lucas County and is near the Michigan-Ohio border, approximately 7 mi south of the Petersburg site. Table 9-31 provides

Table 9-31. Demographics for Monroe, Lenawee, and Lucas Counties and Local Jurisdictions

County/City/Township	Population		
	2000 Actual	**2008 Estimate**	**2020 Projected**
Monroe County	145,945	152,949	159,461
City of Monroe	22,076	21,374	22,475
Frenchtown Charter Township	20,777	20,925	21,868
Bedford Township	28,606	31,141	31,669
Lenawee County	98,890	100,801	109,086[(a)]
City of Adrian	21,574	21,391	NA[(b)]
Lucas County	455,054	440,456	434,650
City of Toledo	313,619	293,201	NA[(b)]

Sources: The 2020 projections for Monroe County and townships within Monroe County are provided by SEMCOG (2008). For Lucas County, projections are provided by the Ohio Department of Development, Office of Policy Research and Strategic Planning (2003). The projection for Lenawee County is provided by the Lenawee County Planning Commission (2002). The 2008 estimates are from the USCB, Population Estimates Program (2009a, b), which also includes the 2000 data from the 2000 Census of Population and Housing.

(a) Lenawee County used three different methods to project its population in 2020 (Lenawee County Planning Commission 2002). The projection presented is an average of the three methods.

(b) NA = Population projections are not available for these jurisdictions.

the 2000 Census population, the USCB's 2008 population estimate, and the projected 2020 population for these areas.[(a)]

Detroit Edison estimates that the size of the construction workforce needed for a new nuclear power plant over a 10-year construction period would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, and that the average size of the onsite workforce during the 10-year construction period would be approximately 1000 workers (Detroit Edison 2011a).

The review team's assumptions for in-migrating and local workers are similar to that for the Fermi 3 plant site. Although the site is located in a rural area, it is also within commuting distance of highly urbanized areas. The site is within 50 mi of the Detroit-Warren-Livonia MSA, and the City of Toledo is approximately 7 mi south. Therefore, for comparative purposes between analyses of the site alternatives, the review team based the analysis of this site upon the assumptions presented in Section 4.4.2 of this EIS, with approximately 15 percent of the construction workforce (approximately 435 workers during the peak construction and 150 workers on an average annual basis) expected to relocate within a 50-mi radius of the project site. Approximately 85 percent of the construction workforce would be drawn from the existing workforce in the regional area.

If the facility were to be built at the Petersburg site and operations commenced, Detroit Edison expects an operations workforce of 900 workers in 2020 (Detroit Edison 2011a). For similar reasons, the review team determined that based on the analysis of impacts presented in Section 5.4.2 of this EIS, approximately 30 percent of the operations workforce (approximately 270 workers) would be expected to relocate within a 50-mi radius of the project site. Approximately 70 percent of the operations workforce would be drawn from the existing workforce in the regional area.

Using an average household size of 2.6, based on the national average household size in the USCB's 2008 population estimate, the total in-migrating population during the peak construction period is estimated to be approximately 1131 persons and less during periods of non-peak construction. The projected population increase associated with the in-migrating operations workers is estimated to be 702 persons.

(a) During the preparation of this draft EIS, the results of the mandated U.S. decadal census for 2010 were being released in topical and regional data sets. Although the U.S. Census Bureau has not issued all of the data sets in final form, some of the preliminary information was considered by the review team. While some of the final data sets were released for national-scale information, most of the fine-scale information is still under review by the U.S. Department of Commerce and other Federal agencies. The review team is not aware of information that appears to be inconsistent with the earlier information sets and those sets projected from the earlier census.

If all the in-migrating construction workers and their families settled in the three-county economic impact area for the 2-year peak construction period, the projected increase would be less than 1 percent of the projected 2020 population for these three counties. Demographic impacts during periods of non-peak construction would be less. The in-migrating construction workers and their families would likely settle in various cities and townships throughout the three-county area, and the population effects are expected to be minimal. The projected population increase for the operations workforce would be less than that projected for the peak construction period and would also be less than 1 percent of the projected 2020 population for the three-county area.

Given the small number of in-migrating workers compared to the projected 2020 population for Monroe, Lenawee, and Lucas Counties, the review team concludes that the demographic impact during peak building employment and during operations would be minor. Demographic impacts in the rest of the 50-mi region also would be minor.

Economic Impacts on the Community

<u>Economy</u>

The following provides an analysis of each of the three counties within the economic impact area.

Monroe County. There were nearly 70,000 workers employed in Monroe County in 2008 (USBLS 2009) (see Table 9-32). Approximately 40 percent of the jobs in Monroe County are in manufacturing, educational services, health care, and social assistance sectors (USCB 2009b). The four largest employers in Monroe County in 2007 were Detroit Edison, with approximately 1500 employees; Mercy Memorial Hospital, with approximately 1300 employees; the supermarket chain Meijer, Inc., with approximately 1025 employees; and the Monroe Public Schools school district, with approximately 1000 employees (Monroe County Finance Department 2008). Manufacturing businesses in Monroe County include Johnson Controls (720 employees), La-Z-Boy Incorporated (522 employees), Tenneco Automotive (500 employees), Gerdeau Macsteel (450 employees), Holcim US Inc. (cement; 350 employees), TWB Company (automotive body parts; 303 employees), and MTS Seating (300 employees) (Monroe County Chamber of Commerce 2010).

Between 2000 and 2008, Monroe County lost jobs in manufacturing, construction, and retail and wholesale trade but experienced growth in other sectors for a net gain in jobs between 2000 and 2008 (USCB 2000a, 2009b). In 2008, the construction industry supported 4816 jobs. The U.S. Bureau of Labor Statistics (USBLS) reported a rise in unemployment from 3.2 percent in 2000 to 8.9 percent in 2008. The unemployment rate has continued to increase, with the USBLS reporting an unemployment rate of 14.8 percent for Monroe County in 2009 (USBLS 2010).

Table 9-32. Labor Force Statistics for Monroe, Lenawee, and Lucas Counties (2000 and 2008)

	Monroe County		Lenawee County		Lucas County	
	2000	**2008**	**2000**	**2008**	**2000**	**2008**
Total labor force	77,194	76,285	51,699	49,278	227,304	222,647
Employed workers	74,756	69,471	49,769	44,429	217,049	204,204
Unemployed workers	2438	6814	1930	4849	10,255	18,443
Unemployment rate	3.2	8.9	3.7	9.8	4.5	8.3

Source: USBLS 2009

Lenawee County. There were 44,429 employed workers in Lenawee County in 2008 (USBLS 2009) (see Table 9-32). Approximately 25 percent of the jobs are in educational services, health care, and social assistance. Manufacturing and retail trade employ approximately 21 percent and 11 percent, respectively (USCB 2009b). The four largest employers in Lenawee County are Promedica Health Systems, with approximately 1062 employees; Lenawee County, with approximately 657 employees; Michigan Department of Corrections, with approximately 587 employees; and Adrian Mall (stores and management), with approximately 500 employees (Lenawee Economic Development Corporation 2010). Lenawee County has a number of manufacturing companies, many of which specialize in plastics, and has a strong agricultural base, with the largest number of farms of any county in Michigan and the highest revenue in the State for corn, soy, and wheat (Lenawee Economic Development Corporation 2010).

Between 2000 and 2008, Lenawee County lost jobs (USBLS 2009). Job losses occurred in most of the sectors, including agriculture, forestry, fishing and hunting, and mining; construction; manufacturing; and retail trade. Growth occurred in professional, scientific, management, and administrative fields; in waste management services; and in the educational services, health care, and social assistance sectors of the economy (USCB 2000a, 2009b). In 2008, an estimated 2402 jobs existed in the construction industry (USCB 2009b). Between 2000 and 2008, the unemployment rate for the county increased from 3.7 percent to 9.8 percent. The unemployment rate has continued to increase, with the USBLS reporting an unemployment rate of 15.6 percent for Lenawee County in 2009 (USBLS 2010).

Lucas County. There were 204,204 employed workers in Lucas County in 2008 (USBLS 2009). Approximately 25 percent of the workforce is employed in educational services, health care, and social assistance. Manufacturing and retail trade employ approximately 15 percent and 12 percent, respectively (USCB 2009c). The four largest employers in Lucas County in 2007 were Promedica Health Systems, with approximately 11,265 employees; Mercy Health Partners, with approximately 6723 employees; the University of Toledo, with approximately 4987 employees; and the Toledo School District, with approximately 4554 employees (Lucas County Auditor's Office 2008). Large manufacturing businesses in the Toledo area as of 2009 included General Motors Corporation (2924 employees), Chrysler LLC (2261 employees), The Andersons (grain storage, process, and retail [1793 employees]), Libbey, Inc. (glass manufacturing, 1047 employees), Owens-Corning (glass manufacturing, 950 employees), and Dana Corporation (automotive parts manufacturing, 850 employees) (Regional Growth Partnership 2010).

Between 2000 and 2008, Lucas County lost jobs (USBLS 2009). Job losses occurred in manufacturing, retail, and wholesale trade and in the educational services, health care, and social assistance sectors, with fewer job losses in other sectors of the economy. The county gained jobs in the arts, entertainment, recreation, and accommodation and food services sectors. Lucas County's construction workforce remained relatively stable, with 11,778 construction jobs in 2008 (USCB 2000b, 2009c). Between 2000 and 2008, the unemployment rate for the county increased from 4.5 percent to 8.3 percent. The unemployment rate has continued to increase, with the USBLS reporting an unemployment rate of 12.6 percent for Lucas County in 2009.

The economies of Monroe, Lenawee, and Lucas Counties would benefit over the estimated 10-year construction period through direct purchase of materials and supplies and direct employment of the construction workforce. Detroit Edison estimates the size of the construction workforce would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, averaging to an annual onsite construction workforce of 1000 workers. The review team estimates that based on an average salary estimate of $50,500, approximately $50.5 million would be expended directly in payroll annually during the construction period.

Detroit Edison expects direct employment for an operating new nuclear plant to be 900 full-time and contract employees. In addition, Detroit Edison estimates 1200 to 1500 workers would be employed during scheduled maintenance outages, which would occur every 24 months and require workers for a period of about 30 days. Based on an average salary estimate of $63,625, approximately $57.3 million would be expended directly in payroll annually during the 40-year operating license of the plant. In addition, every 24 months, an additional $6.3 to $7.9 million in payroll would be expended for the outage workforce for the plant.

New workers (i.e., in-migrating workers and those previously unemployed) would have an additional indirect effect on the local economy because these new workers would stimulate the regional economy through their spending on goods and services in other industries.

Additional expenditures would be necessary for construction of the transmission lines from the nuclear power plant at the Petersburg site to the existing transmission and distribution network. The local economy would benefit from the direct purchase of materials and supplies for the transmission line construction and the employment of workers to support the construction and operation of these lines.

Based on the information provided by Detroit Edison, review of existing documentation, and the review team's evaluation, the review team concludes that the impact of building and operations on the economy would be noticeable and beneficial in Monroe County and minor and beneficial elsewhere.

Taxes

Construction and operation of a new nuclear facility at the Petersburg site would result in increased tax revenues to State and local governments. State income tax revenue would accrue through income taxes on salaries of the new workers (i.e., in-migrating workers and those previously unemployed). Based on an estimated annual average of 362 new construction workers (i.e., 150 in-migrating and 212 previously unemployed) residing equally in Monroe, Lenawee, and Lucas Counties (i.e., one-third of the number of workers in each county) during the 10-year construction period and an average salary of $50,500, the State of Michigan would receive an estimated $0.5 million in income tax revenue and the State of Ohio would receive an estimated $0.2 million annually during the construction period. Estimated income tax revenues reflect the respective State income tax rate as described in Sections 2.5, 4.4, and 5.4. The State of Michigan would also receive tax revenue through increased sales expenditures by workers and for the plant construction, operation and maintenance, and business taxes during operation

The review team assumed an annual average of 327 new operations workers (i.e., 270 in-migrating and 57 previously unemployed) for operation of the plant would reside equally in Monroe, Lenawee, and Lucas Counties (e.g., one-third of the number of workers in each county), with an average salary of $63,625. Based on this assumption, the State of Michigan would receive an estimated $0.5 million in income tax revenue and the State of Ohio would receive an estimated $0.1 million in income tax revenue annually during the period of the 40-year operating license.

Property tax revenue would be the primary tax benefit to the local jurisdictions. The plant would be assessed during the construction period and be at its highest assessed value when it becomes operational. For purposes of analysis, the review team recognizes that the full estimated construction cost of $6.4 billion for a nuclear power plant of 1605 MW(e), as discussed in Section 4.4.3.1, may not be the actual assessed value for property tax purposes. However, for comparative purposes in the alternative sites analysis, the review team based its conclusions upon this construction cost estimate.

In 2009, the assessed value of Detroit Edison's properties in Monroe County was $821 million, approximately 13.3 percent of the $6.9 billion total assessed property value in the county

(Monroe County Finance Department 2009). Consequently, with completion of the construction of a new nuclear power plant at the Petersburg site, the total assessed property value in the county would be increased by about 100 percent. The review team recognizes that this would be an upper bound to the assessed value of the property and that a fee in lieu of agreement or other considerations may significantly reduce that assessed value. However, the review team believes that the property tax impact on Monroe County would be substantial and beneficial.

Summary of Economic Impacts and Taxes

Based on the information provided by Detroit Edison, review of reconnaissance-level existing documentation, and the review team's evaluation, the review team concludes that the impact of building and operations on the economy would be noticeable and beneficial in Monroe County and minor and beneficial elsewhere. The impact of tax revenues would be substantial and beneficial in Monroe County and minimal and beneficial elsewhere. An annual average of 150 new construction workers would relocate into the three-county area, and 212 workers who are currently unemployed would be employed for building activities over the 10-year construction period. A portion of the estimated $6.4 billion construction cost of the nuclear power plant would be spent on materials and supplies in the three-county area. Tax revenue to the State and local jurisdictions would accrue through personal income, sales, and property taxes and would have the largest benefit on the local jurisdictions within Monroe County.

During operations at the Petersburg site, an estimated 270 new operations workers would relocate into the area, and 57 workers who are currently unemployed would be employed in operating the plant. Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the economic impact of operating a nuclear power plant at the Petersburg site, including tax revenues, would be substantial and beneficial in Monroe County and minimal and beneficial elsewhere.

Infrastructure and Community Services

Traffic

Primary transportation routes servicing the Petersburg site are U.S. Routes 23 and 223. U.S. Route 23 is a north-south route. North of the site is an interchange on U.S. Route 23 with State Route 50, which proceeds east to the City of Monroe. U.S. Route 23 also provides access to the Ann Arbor MSA further north and to the Toledo MSA to the south. U.S. 223 provides access west to Adrian, in Lenawee County. There is no direct access to Detroit. The site is also served by numerous local roadways. Direct access to the site would be from Lake Road, approximately 2 mi from an interchange at U.S. Routes 23 and 223. Two local roadways cross the site: Morocco Road (east-west) and Payne Road (north-south).

Three major railway systems provide service within Monroe County: CN, CSX, and Norfolk Southern Railway (NS) (Monroe County Planning Department and Commission 2010). A CN rail line runs along the northern border of the site.

Local roadways may need to be upgraded to support the level of traffic generated by the plant construction and operation. In addition, unlike the Fermi site, the Petersburg site would require two roads that cross the site to be abandoned and rerouted to accommodate the building footprint and exclusion boundary. New road construction would require further analysis to determine whether local terrestrial, aquatic, and wetland resources would also be affected, depending on the reroutes identified and selected. Based on review of area maps, the review team believes such rerouting could affect local streams or rivers. Detroit Edison, in coordination with the MDOT and the Monroe County Road Commission, would need to conduct a transportation study that evaluates the roadway and traffic impacts and identifies the need for any road and/or bridge upgrades, the effects of roadway abandonments for site development, and mitigating strategies, such as road upgrades and/or road reroutes that would (1) mitigate impacts on transportation routes and (2) mitigate the traffic impacts to an acceptable level. For the above stated reasons, the review team expects that traffic impacts from building activities and operations, including construction workers, operations workers, and deliveries, could be substantial and potentially destabilizing and would warrant mitigation in coordination with MDOT and the Monroe County Road Commission, as well as USACE and MDEQ if impacts on waters of the United States and State-regulated waters would be affected.

<u>Recreation</u>

Recreational resources in Monroe, Lenawee, and Lucas Counties may be affected by construction and operation of a plant at the Petersburg site. Impacts may include increased user demand associated with the projected increase in population with the in-migrating workforce and their families, an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and condensate plume, or access delays associated with increased traffic from the construction and operations workforce on local roadways.

State recreational areas in Monroe County total 7413 ac and include Sterling State Park and three game areas – Point Mouille State, Petersburg State, and Erie State – as well as several boat access sites and road rest areas. In addition, numerous county, township, village, and city recreational areas are located throughout the county.

Lucas County contains many Federal, State, and local park and conservation lands. Along Lake Erie is the Ottawa National Wildlife Refuge (NWR) Complex, which consists of three NWRs and a waterfowl production area. The Cedar Point NWR, West Sister Island NWR, and a portion of the Ottawa NWR are located in Lucas County. State lands include the 2202-ac Magee Marsh Wildlife Refuge, the 3101-ac Maumee State Forest, and the 1336-ac Maumee Bay State Park (Ohio Department of Natural Resources 2009).

The Metroparks of the Toledo Area encompass 11 parks in and around the Toledo area, totaling 10,500 ac. These parks provide a variety of passive and active recreational opportunities and preserve the natural and cultural features of the area.

Three State parks (W.J. Hayes State Park, 654 ac; Lake Hudson State Park, 2700 ac; and Cambridge Historic State Park, 181 ac) and six county parks are located in Lenawee County. In addition, numerous city, village, and township parks are located throughout the county (Lenawee County Parks and Recreation Commission 2010). Water resources in the county used for recreation include the Raisin River, which flows into Monroe County and is designated by the MDNR as “readily canoeable,” and numerous lakes, ponds, streams, and rivers. The Irish Hills is a scenic recreational area in the northeastern part of Lenawee County and contains rolling hills and more than 50 lakes.

The recreational areas nearest to the Petersburg site are the Petersburg State Game Management Area in Monroe County, approximately 1.5 mi northeast of the site, and the Raisin River, approximately 4 mi north of the site.

The review team determines that the impacts associated with the increased use of the recreational resources in the vicinity and region would be minimal. The projected increase in population in the three-county area associated with in-migrating workers and their families for construction and operation is less than 1 percent of the projected 2020 population and would not affect the availability and use of recreational resources in the area.

People using recreational facilities near the site may experience roadway traffic congestion during the construction period, during morning and afternoon commutes of the operations workforce, and during the scheduled maintenance and forced outage periods. Measures to mitigate traffic impacts would be needed; these would alleviate impacts on users of recreational facilities as well as members of the general public.

The visual experience of users of recreational resources in the vicinity of the Petersburg site might be affected by the views of the 600-ft cooling tower and condensate plume that would occur during operation of the plant under certain meteorological conditions. The nuclear power plant and 600-ft cooling tower and condensate plume would be visible in a wide area, because the topography in the vicinity of the site is flat. Since the Petersburg site is a greenfield site, the visual intrusion of the cooling tower and other structures would offer a unique visual experience that the review team considers to be noticeable and adverse.

Housing

As shown in Table 9-33, an estimated 310,589 housing units are located within the three-county area, based on the USCB 2008 estimate of housing. An estimated 33,882 housing units are vacant within the three-county area, primarily in Lucas County.

Table 9-33. Housing Units in Monroe, Lenawee, and Lucas Counties (2008 Estimate)

Type of Housing Unit	Monroe County	Lenawee County	Lucas County
Total Housing Units	63,729	43,017	203,843
Occupied	58,785	37,184	180,738
Owner-occupied (units)	46,849	29,485	118,032
Owner-occupied (percent)	80	79	65
Renter-occupied (units)	11,936	7699	62,706
Renter-occupied (percent)	20	21	35
Vacant	4944	5833	23,105
Vacancy Rate			
Homeowner (percent)	1.8	2.8	3.9
Rental (percent)	5.6	4.5	8.9

Source: USCB 2009d, e

Demand for short-term housing is expected to be highest during the peak construction period, and demand for long-term housing is expected to be highest when operations commence. Based on the analysis of impacts presented in Section 4.4.2, most of the construction and operations workforces would already reside in the area, so they would be accommodated in existing housing. Approximately 15 percent of the peak construction workforce (approximately 435 workers during the peak construction) and approximately 30 percent of the operations workforce (approximately 270 workers) would be expected to relocate within a 50-mi radius of the project site. Considering that the construction workforce may choose short-term accommodations such as campsites or hotels, the review team expects that the existing housing supply is sufficient to accommodate the construction workforce of 435 workers during the peak construction period and the operations workforce of 270 workers in-migrating to the area without affecting the housing supply or prices in the local area or stimulating new housing construction. Therefore, the review team determines the housing impact from a Petersburg site would be minimal.

Public Services

In-migrating construction and operations workers and their families would increase the demand for water supply and wastewater treatment services within the communities where they choose to reside; the size of the total construction and operations workforce also would increase the demand for water supply and wastewater treatment services at the Petersburg site. The site is not currently served by water supply or sewer lines, pump stations, or other public utility infrastructure.

Monroe County. Several municipal water suppliers provide water to residents of Monroe County, including the City of Monroe; Frenchtown Charter Township; the City of Toledo, Ohio; and the Detroit Water and Sewerage Department (DWSD). Residents outside of these municipal suppliers obtain water through private wells (Monroe County Planning Department and Commission 2010). Residents of Summerfield Township obtain water through private wells. The City of Monroe provides bulk water to the City of Petersburg, but water lines do not extend out into Summerfield Township.

Wastewater treatment services are provided by a number of municipalities in Monroe County, including the City of Monroe; Frenchtown Charter, Monroe Charter, Berlin, Ash, and Ida Townships; Cities of Milan, Petersburg, and Luna Pier; and Villages of Dundee, Estral Beach, Carleton, South Rockwood, and Maybee. Other residents within the county are served by private onsite wastewater disposal systems (Monroe County Planning Department and Commission 2010). Residents of Summerfield Township have private sanitary waste disposal systems. The City of Petersburg serves the city and the Summerfield High School complex, which is located in Summerfield Township, just outside the city limits. Capacity of the wastewater treatment plant in the City of Petersburg is 0.5 MGD, and it treats an average daily flow of 0.08 MGD (Monroe County Planning Department and Commission 2010).

Lenawee County. The rural areas of Lenawee County receive potable water through private wells and use private waste disposal systems for treatment of sanitary wastewater (Lenawee County Planning Commission 2002). The four cities in Lenawee County (Adrian, Hudson, Morenci, and Tecumseh) and seven of the eight villages (Addison, Blissfield, Britton, Cement City, Clinton, Deerfield, and Onsted) are served by both municipal water supplies and wastewater treatment services. The Village of Clayton does not have a municipal water supply system, but does have wastewater treatment (Lenawee County Planning Commission 2002).

Lucas County. Residents in Lucas County are served by two municipal water suppliers. Toledo’s water treatment and distribution system serves the city residents and portions of Lucas County, including the Cities of Maumee, Sylvania, and Perrysburg and portions of Monroe County, Michigan, and Wood County, Ohio. The City of Oregon’s water treatment and distribution system serves city residents and portions of eastern Lucas County.

Lucas County residents are served by various wastewater treatment systems. The City of Toledo’s Bayview Wastewater Treatment Plant is one of the largest wastewater treatment facilities in northwest Ohio. It provides treatment services to an area of approximately 100 mi^2 with a population of approximately 398,000 residents within the City of Toledo, the City of Rossford, the Villages of Walbridge and Ottawa Hills, and portions of Wood County, Lucas County, and the Village of Northwood.

The water supply and wastewater treatment systems within the three-county area should be able to accommodate the in-migrating construction and operations workforces and their families, which would represent less than 1 percent of the projected populations in 2020. Increased demand for police, fire response, and health care services from the in-migrating construction and operations workforces and their families are also expected to be accommodated within the existing systems. Given the number of jurisdictions within the three-county area, the new workers in-migrating into the area from building and operating a nuclear plant at the Petersburg site would have a negligible impact on capacity of any of the public services within the three-county area.

However, currently no service is available to support the workforce at the plant site. Detroit Edison would need to develop private water supply and waste disposal systems or develop water supply and sewer lines from the City of Petersburg. In either case, the review team believes that the potable water supply and waste disposal service needed for operations of a Petersburg nuclear power plant would be minimal.

Education

Numerous public school districts are located throughout the three-county area, including 9 public school districts in Monroe County (Airport Community, Bedford, Dundee, Ida, Jefferson, Mason Consolidated (Monroe), Monroe, Summerfield, and Whiteford Agricultural) with a combined enrollment of 23,913 students; 13 public school districts in Lenawee County (Addison, Adrian, Blissfield, Britton-Macon, Clinton, Deerfield, Hudson, Lenawee, Madison (Lenawee), Morenci, Onsted, Sand Creek, and Tecumseh) with a combined enrollment of 18,107 students; and 8 public school districts in Lucas County (Anthony Wayne, Maumee, Oregon, Ottawa Hills, Springfield, Sylvania, Toledo, and Washington Local) with a combined enrollment of 58,843 students (U.S. Department of Education 2010). As stated in Section 4.4.4.5, approximately 202 school-age children are expected to in-migrate into the 50-mi region during building activities, and 124 school-age children are expected to in-migrate for operations. Given the number of schools and the total student enrollment, the new students in-migrating into the area from building and operating a nuclear plant at the Petersburg site would have a negligible impact on the capacity of school systems within the three-county area.

Summary of Impacts on Infrastructure and Community Services

The review team has concluded from the information provided by Detroit Edison, review of existing reconnaissance level documentation, and its own independent evaluation that the impact of building and operations activities on regional infrastructure and community services – including housing, water and wastewater facilities, police, fire, and medical facilities, and education – would be minor. The visual impacts under recreation would be noticeable and adverse. The estimated peak workforce of 2900 would have a substantial and adverse impact on traffic on local roadways near the Petersburg site. These traffic-related impacts could be reduced but not eliminated with proper planning and mitigation measures.

Cumulative Impacts

The geographic area of interest for analysis of cumulative socioeconomic impacts of the Petersburg site includes Monroe, Lenawee, and Lucas Counties, where most of the socioeconomic impacts of construction and operation of the Petersburg site are expected to occur.

The impact analyses presented for the Petersburg site are cumulative. Past and current economic impacts associated with activities listed in Table 9-28 already have been considered as part of the socioeconomic baseline or in the analyses discussed above for the Petersburg site. Construction and operation of a new nuclear facility at the Petersburg site could result in cumulative impacts on the demographics, economy, and community infrastructure of Monroe, Lenawee, and Lucas Counties in conjunction with those reasonably foreseeable future actions shown in Table 9-28, and generally result in increased urbanization and industrialization.

However, many impacts, such as those on housing or public services, are able to adjust over time, particularly with increased tax revenues. Furthermore, State and county plans, along with modeled demographic projections, include forecasts of future development and population increases. Because the projects within the geographic area of interest would be consistent with applicable land use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be manageable. Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics.

Based on the above considerations, Detroit Edison's ER, and the review team's independent evaluation, the review team concludes that under some circumstances building the nuclear power plant at the Petersburg site could make a temporary small adverse contribution to the cumulative effects associated with some socioeconomic issues. Those impacts would include physical impacts (workers and the local public, buildings, transportation, and visual aesthetics), demography, local infrastructures and community services (traffic; recreation; housing; water and wastewater facilities; and police, fire, and medical services; and schools), and would depend on the particular jurisdictions affected.

The cumulative effects on regional economies and tax revenues would be beneficial and SMALL with the exception of Monroe County, which would experience a MODERATE and beneficial cumulative effect on the economy and a LARGE and beneficial cumulative effect from property taxes. The cumulative effects on physical impacts, demography, infrastructure, and community services would be SMALL within the 50-mi region, except for a MODERATE and adverse cumulative impact on recreation (visual), and a LARGE and adverse cumulative effect on local traffic near the Petersburg site during construction and operation. Building and operating a new nuclear unit at the Petersburg site would be a significant contributor to the MODERATE and LARGE impacts.

9.3.5.6 Environmental Justice

The economic impact area for the Petersburg alternative site is a three-county area, including Monroe and Lenawee Counties, Michigan, and Lucas County, Ohio. To evaluate the distribution of minority and low-income populations near the Petersburg site, the review team conducted a demographic analysis of populations within the 50-mi region surrounding the proposed site in accordance with the methodology discussed in Section 2.6.1 of this EIS. The results of this analysis are displayed below in Table 9-34 and 9-35 and Figures 9-13, 9-14, 9-15, and 9-16.

Table 9-34. Results of the Census Block Group Analysis for Minority Populations of Interest within the Region Surrounding the Petersburg Alternative Site (50-mi radius)[(a)]

State/County	Total Number of Census Block Groups in the 50-mi Region	Number of Census Block Groups with Minority Populations of Interest					
		Black	American Indian	Asian	Pacific Islander	Hispanic	Aggregate
Michigan							
Hillsdale	35	0	0	0	0	0	0
Ingham	3	0	0	0	0	0	0
Jackson	126	11	0	0	0	0	9
Lenawee	87	1	0	0	0	5	1
Livingston	68	0	0	0	0	0	0
Monroe	127	1	0	0	0	0	1
Oakland	115	23	0	3	0	0	0
Washtenaw	260	23	0	16	0	0	33
Wayne	1585	606	0	5	0	61	228
Ohio							
Defiance	17	0	0	0	0	1	0
Fulton	31	0	0	0	0	0	0
Hancock	7	0	0	0	0	0	0
Henry	28	0	0	0	0	0	0
Lucas	434	99	0	0	0	9	71
Ottawa	36	0	0	0	0	0	0
Putnam	2	0	0	0	0	0	0
Sandusky	49	0	0	0	0	2	1
Seneca	15	0	0	0	0	0	0
Williams	31	0	0	0	0	0	0
Wood	86	0	0	0	0	0	9
Total	**3142**	**764**	**0**	**24**	**0**	**78**	**353**

Source: USCB 2011a

(a) Shaded rows indicate the economic impact area.

Table 9-35. Results of the Census Block Group Analysis for Low-Income Populations of Interest within the 50-mi Region of the Petersburg Alternative Site[(a)]

State/County	Total Number of Census Block Groups in the 50-mi Region	Number of Census Block Groups with Low-Income Populations of Interest	Percentage of Census Block Groups with Low-Income Populations of Interest
Michigan			
Hillsdale	35	0	0
Ingham	3	0	0
Jackson	126	9	7.1
Lenawee	87	1	1.2
Livingston	68	0	0
Monroe	127	1	0.8
Oakland	115	0	0
Washtenaw	260	33	12.7
Wayne	1585	228	14.4
Ohio			
Defiance	17	0	0
Fulton	31	0	0
Hancock	7	0	0
Henry	28	0	0
Lucas	434	71	16.4
Ottawa	36	0	0
Putnam	2	0	0
Sandusky	49	1	2.0
Seneca	15	0	0
Williams	31	0	0
Wood	86	9	10.5
Total	**3142**	**353**	**11.2**

Source: USCB 2011b

(a) Shaded rows indicate the economic impact area.

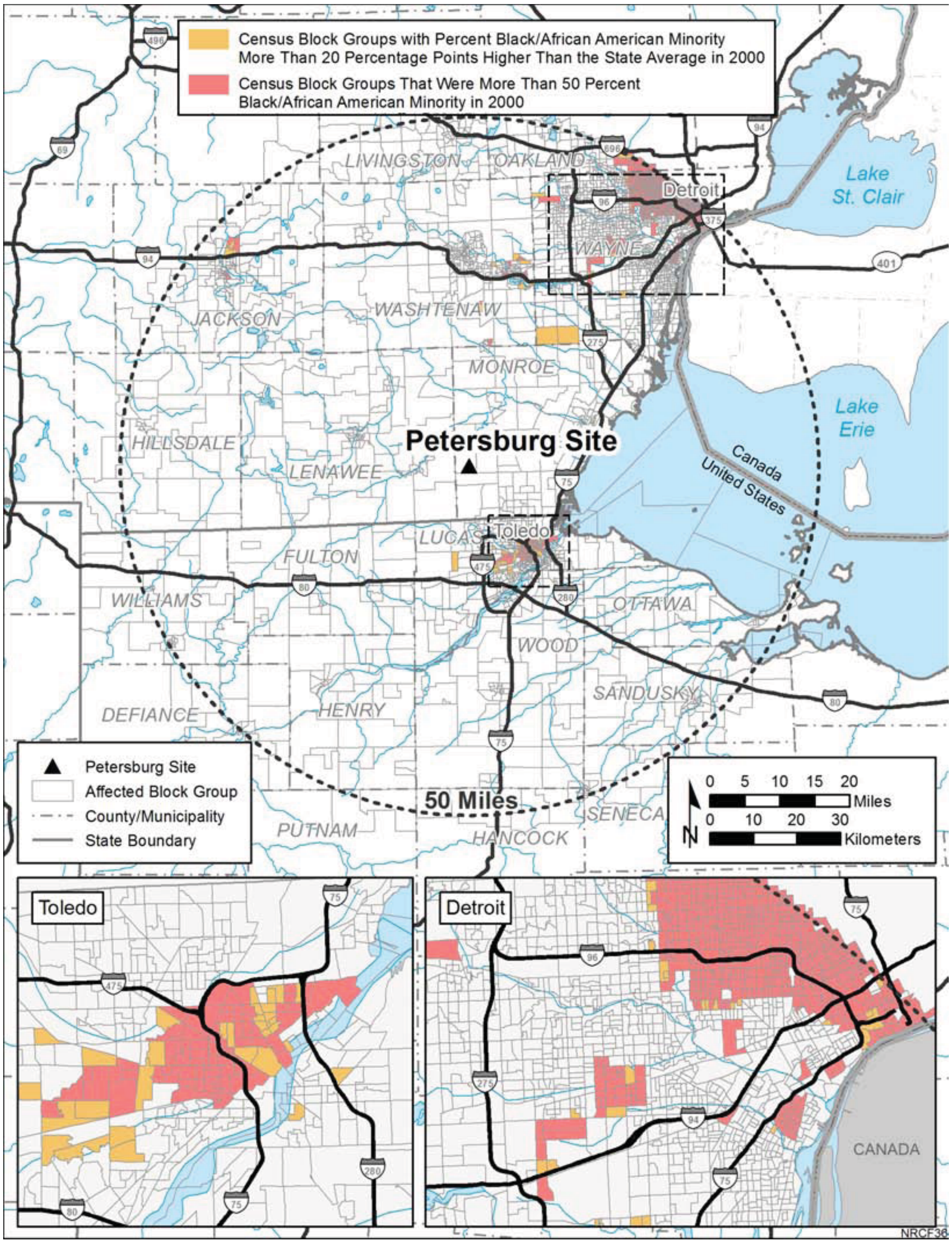

Figure 9-13. Black and African-American Minority Census Block Group Populations of Interest within a 50-mi Radius of the Petersburg Site (USCB 2011a)

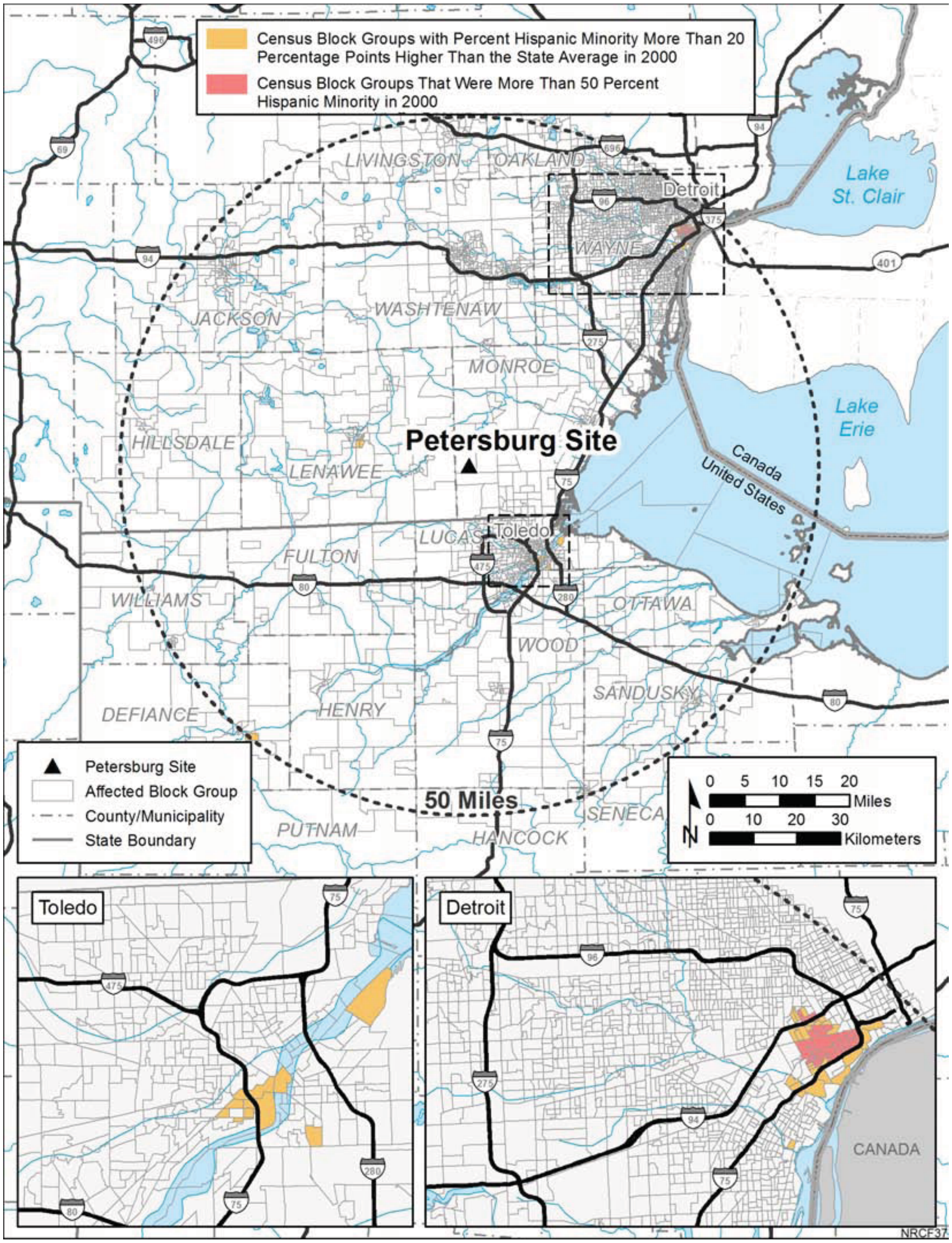

Figure 9-14. Hispanic Minority Census Block Group Populations of Interest within a 50-mi Radius of the Petersburg Site (USCB 2011a)

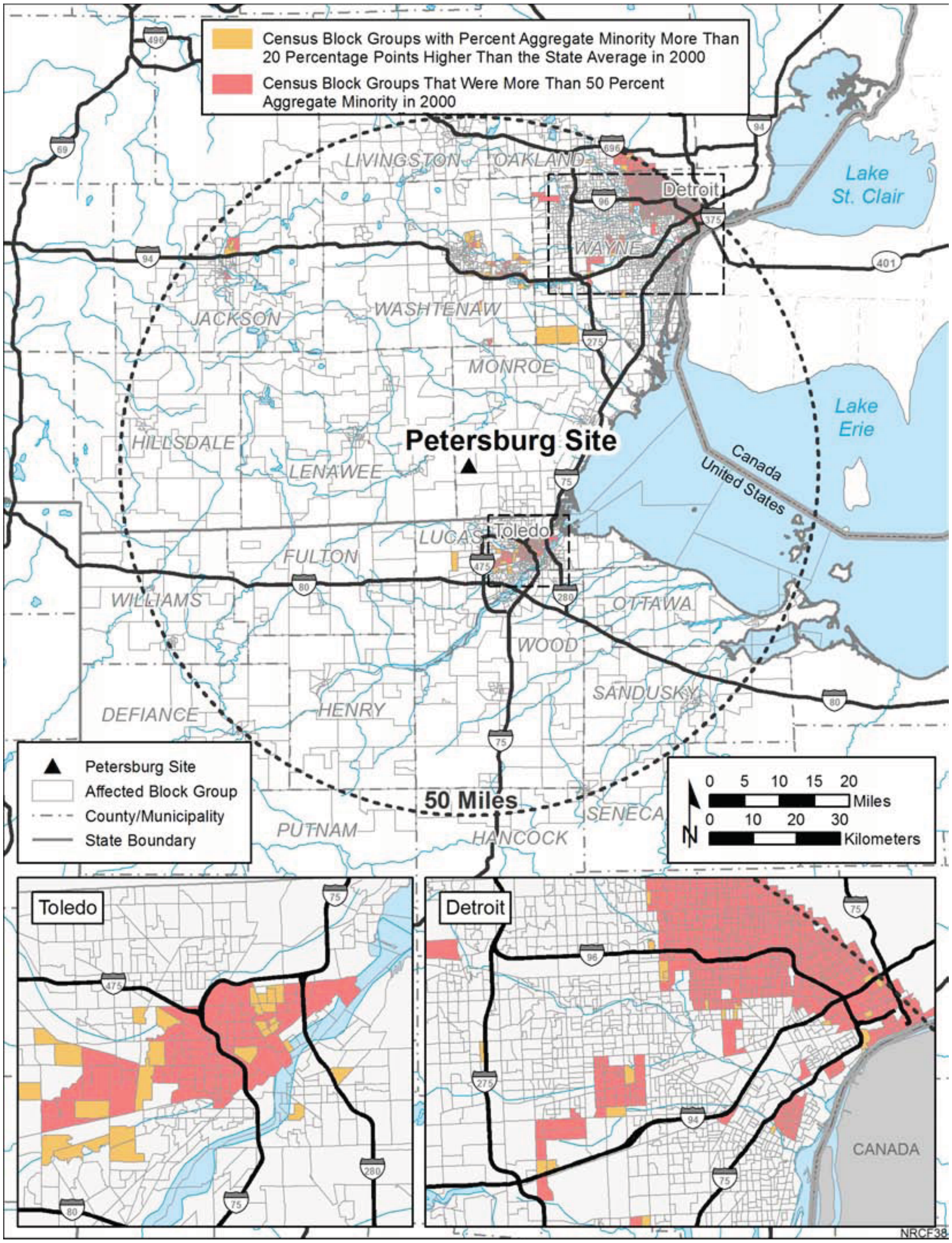

Figure 9-15. Aggregate Minority Census Block Group Populations of Interest within a 50-mi Radius of the Petersburg Site (USCB 2011a)

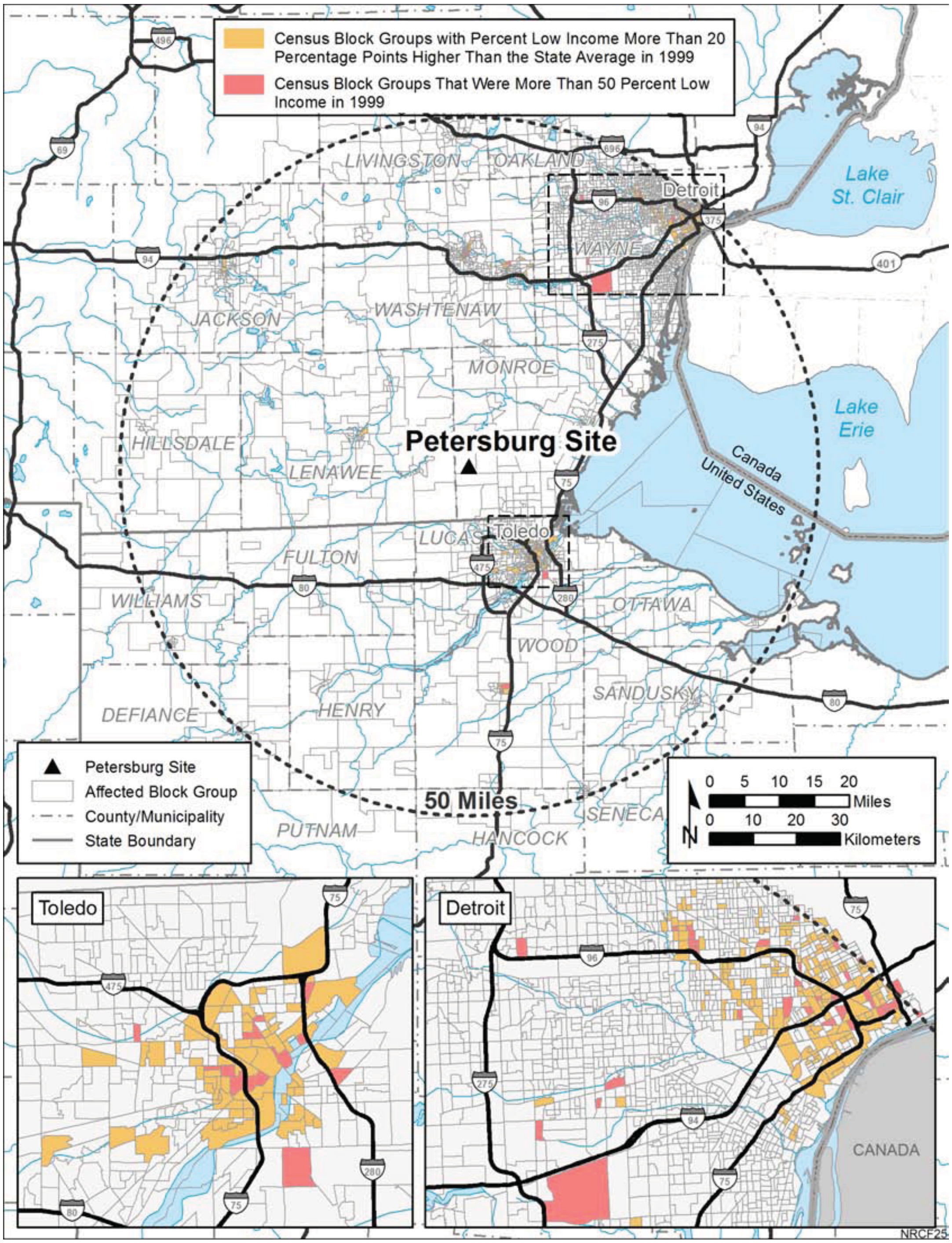

Figure 9-16. Low-Income Census Block Group Populations of Interest within a 50-mi Radius of the Petersburg Site (USCB 2011b)

Because of the proximity of the 50-mi region surrounding the Petersburg plant to the Fermi 3 site, the review team found the population to be similar in demographic distribution to the 50-mi region surrounding the proposed Fermi 3 site: rural, with few representative minority or low-income populations of interest outside the urban areas (for the Petersburg site, these urban areas are the same as those for Fermi 3, with Toledo about 10 mi to the south and Detroit near the boundary of the 50-mi region to the north). The review team identified Lenawee County as part of the economic impact area because of the proximity of the proposed site to the border between Lenawee and Monroe Counties. The review team also identified Monroe County in Michigan and Lucas County in Ohio, which were also the economic impact area for Fermi 3, as part of the economic impact area for the Petersburg alternative site. The review team focused its analysis upon the minority and low-income populations within these three counties. The review team found no low-income or minority populations of interest within 15 mi of the Petersburg site.

Based on this analysis, the review team determined that there do not appear to be any identified minority or low-income populations of interest in Monroe, Lenawee, or Lucas Counties that would be likely to experience disproportionate and adverse human health, environmental, physical, or socioeconomic effects as a result of construction or operation of a plant at the Petersburg site. The review team did not identify any subsistence activities in the economic impact area or elsewhere in the 50-mi region. For the other physical and environmental pathways described in Section 2.6.1, the review team determines that impacts at the Petersburg site would be similar to those at the Fermi site. Therefore, the review team determines the environmental justice impacts of building and operating a nuclear reactor at the Petersburg would be SMALL.

9.3.5.7 Historic and Cultural Resources

This section presents the review team’s evaluation of the potential impacts on historic and cultural resources of siting a new ESBWR at the Petersburg site. For the analysis of impacts on historic and cultural resources, the geographic area of interest is considered to be the APE that would be defined for a new nuclear power facility at the Petersburg site. This includes the physical APE, defined as the area directly affected by building and operating a new nuclear power plant and transmission lines, and the visual APE (i.e., the area from which the structures can be seen). The visual APE includes the physical APE and the area within a 1-mi radius of the physical APE.

The review team relied upon reconnaissance-level information to perform the alternative site evaluation. Reconnaissance-level activities in a cultural resources review have particular meaning. For example, these activities may include site file searches, background research for environmental and cultural contexts, and preliminary field investigations to confirm the presence or absence of cultural resources in an APE, or the sensitivity of an APE for cultural resources. For the purposes of preparing this alternatives analysis, reconnaissance-level information is considered data that are readily available from Federal and State agencies and other public sources. The following sources were used to identify reconnaissance-level information on historic and cultural resources in the APE at the Petersburg site:

- NPS's National Historic Landmarks Program database for designated National Historic Landmarks (NPS 2010a).
- NPS's NRHP database for properties listed in the NRHP (NPS 2010b).
- NationalRegisterofHistoricPlaces.com database for properties listed in the NRHP (NRHP 2010).
- Michigan's Historic Sites Online database for cultural resources significant to the State of Michigan (MSHDA 2010a).
- Detroit Edison's ER (Detroit Edison 2011a).
- *Cultural Resources Site File Review of Seven Alternative Sites in Monroe, Lenawee*, St. C*lair, and Huron Counties, Michigan, Fermi Nuclear Power Plant Unit 3 (Fermi 3) Project, Frenchtown and Berlin Townships, Monroe County, Michigan* (Lillis-Warwick et al. 2009).

No National Historic Landmarks or other historic properties listed in the NRHP were identified (NPS 2010a, b; NRHP 2010). Three previously recorded cultural resources have been identified within the APE for the Petersburg site. All three are archaeological resources (Sites 20MR576, 20MR574, and 20MR304); no architectural or aboveground cultural resources have been identified within the APE at the Petersburg site. None of these three previously recorded cultural resources have been included in or determined eligible for inclusion in the NRHP (Lillis-Warwick et al. 2009). Therefore, none of these three previously recorded cultural resources are considered a historic property pursuant to Section 106 of the NHPA.

Archaeological Site 20MR576 is a Late Archaic/Early Woodland Period (prehistoric) archaeological site of unknown function. Archaeological Site 20MR574 is a prehistoric isolated find (isolated artifact) of unknown cultural affiliation and unknown function. Archaeological Site 20MR304 is a prehistoric archaeological site of unknown function, with occupation and/or use dating from the Paleo-Indian, Archaic, and Late Woodland Periods. All three archaeological resources are located outside of physical APE, but within the indirect (visual) APE. None of the three archaeological resources have been evaluated for NRHP eligibility or Michigan SRHP eligibility (Lillis-Warwick et al. 2009).

One historic property is in the general vicinity of the APE at the Petersburg site, the Dundee Historic District (Site ID#P24264), a mid-nineteenth to mid-twentieth century historic district, which is 8 mi northeast of the APE (Detroit Edison 2011a). The Dundee Historic District straddles the River Raisin and includes the historic downtown commercial and industrial areas of Dundee. The district also includes a ca. 1850s mill, which was purchased by Henry Ford as part of his "Village Industries" experiment to determine whether factory work could be done in small town environments using water power. The Dundee Historic District was listed in the NRHP in 1990 (MSHDA 2010e) and is considered a historic property pursuant to Section 106 of the NHPA. This NRHP-listed property is outside of the indirect (visual) APE for the Petersburg site.

No archaeological and/or architectural surveys have been conducted at the alternative site to identify additional cultural resources in the APE and/or to determine or confirm the significance (NRHP eligibility) of the previously identified cultural resources in the APE at the Petersburg site. As currently designed, the proposed layout for a new nuclear power facility at the Petersburg site and potential water intake and discharge pipeline from Lake Erie would not affect any of the previously identified cultural resources within the APE. However, the proposed layout for a new nuclear power facility at the Petersburg site includes structures (buildings and cooling towers) and operational activities (condensation plumes) that would be new landscape elements within the APE at the Petersburg site.

Consultation with the Michigan SHPO would be necessary to determine the need for cultural resources investigations (including archaeological and architectural surveys) to (1) identify cultural resources within the APE prior to any onsite ground-disturbing activities; (2) determine whether any identified cultural resources are eligible for inclusion in the NRHP; (3) evaluate the potential impacts on cultural resources and/or historic properties; and (4) determine the effect of a new nuclear power facility at the Petersburg site pursuant to Section 106 of NHPA. As part of this consultation, Detroit Edison would be expected to put measures in place to protect discoveries in the event that cultural resources are found during building or operation of a new plant. If an unanticipated discovery was made during building activities, site personnel would have to notify the Michigan SHPO and consult with them in conducting an assessment of the discovery to determine whether additional work is needed.

The incremental impacts from installation and operation of offsite transmission lines and potential water intake and discharge pipelines to Lake Erie would be minimal if there are no significant alterations (either physical alteration or visual intrusion) to the cultural environment. If these activities result in significant alterations to the cultural environment, then the impact could be greater. Although building and operating potential water intake and discharge pipelines would be the responsibility of Detroit Edison, building and operating offsite transmission lines would be the responsibility of a transmission company. For impacts greater than small, mitigation may be developed in consultation with the appropriate Federal and State regulatory authorities. Only Federal undertakings would require a Section 106 review.

The APE at the Petersburg site does not contain any Indian Reservation land (BIA undated). However, consultation with Federally recognized Indian Tribes in the State of Michigan would be necessary in accordance with Section 106 of NHPA. Additionally, two Federally recognized

Indian Tribes located outside the State of Michigan – the Forest County Potawatomi Community of Wisconsin and the Ottawa Tribe of Oklahoma – have indicated an interest in Monroe County (NPS 2010d). As part of this consultation, the NRC would consult with all 12 Federally recognized Indian Tribes located within the state of Michigan (Michigan Department of Human Services 2001–2009), as identified for the Fermi site, and with the Forest County Potawatomi Community of Wisconsin and the Ottawa Tribe of Oklahoma.

The following cumulative impact analysis for historic and cultural resources includes building and operating a new nuclear power facility at the Petersburg site. This analysis also considers other past, present, and reasonably foreseeable future actions that could affect historic and cultural resources, as identified in Table 9-28. The APE for the cumulative impact analysis for historic and cultural resources for the Petersburg site consists of the alternative site area and any new transmission line corridors, and a 1-mi buffer area around the site and the corridors.

The Petersburg site is predominantly agricultural land, with one small area of second-growth woodland and two local roadways (Morocco Road [east-west] and Payne Road [north-south]). Although numerous farms are located within the APE, no previous industrial development (e.g., power plants, aboveground transmission lines, pipelines, and railroads) has occurred onsite. Agricultural activities such as plowing, disking, and harvesting (whether historic or modern [mid-nineteenth to mid-twentieth century]) and logging or clearing of original forests (prior to the reestablishment of the existing second-growth woodland area) are likely to have resulted in minimal subsurface disturbance, suggesting that areas at the Petersburg site that are currently used for agricultural purposes may have sustained minimal prior ground disturbance.

Additional past actions in the general vicinity of the Petersburg site, as identified from Table 9-28, may have also indirectly (visually) affected cultural resources within the visual APE. These past actions would have included construction and operation of the Holcim (US) Inc. Portland cement plant, approximately 7 mi north-northeast in Dundee, Michigan; the Stansley Mineral Resources, STONECO-Meanwell Road Site (Ida Road); and STONECO Inc.-Maybee sand, gravel, topsoil, and/or limestone mines or quarries, approximately 5 to 10 mi from the Petersburg site. However, the locations of these projects would likely be too far to result in cumulative indirect (visual) impacts on historic or cultural resources within the APE at the Petersburg site. Because a new nuclear power facility at the Petersburg site would be located on minimally developed agricultural property, it is likely that the proposed project would result in new significant indirect (visual) impacts on cultural resources that might be identified within the visual APE.

Based on reconnaissance-level information provided by Detroit Edison and identified by the review team and the review team's independent evaluation of this information, the review team concludes that the cumulative impacts on historic and cultural resources from building and operating a new nuclear power facility at the Petersburg site would be SMALL. This impact determination is based on available information, which indicates that no known historic properties would be affected (none of the cultural resources identified within the APE at the Petersburg site have been evaluated for NRHP eligibility), resulting in a SMALL impact determination. However, if a new nuclear power facility were to be developed at the Petersburg site, then cultural resources investigations within the APE and for any proposed transmission lines and water pipelines might reveal important historic or cultural resources that could be directly or indirectly affected, resulting in greater cumulative impacts.

9.3.5.8 Air Quality

Criteria Pollutants

For a plant with the same capacity as the proposed Fermi 3 plant, the emissions from building and operating a nuclear power plant at the Petersburg site are assumed to be comparable to those from Fermi 3. The alternative site is located in Monroe County, about 7 mi north of the Michigan-Ohio State boundary and 1 mi east of Lenawee County. Monroe County is in the Metropolitan Toledo Interstate AQCR (40 CFR 81.43), while Lenawee County is in the South Central Michigan Intrastate AQCR (40 CFR 81.196). Monroe County is designated as a nonattainment area for $PM_{2.5}$ NAAQS and as a maintenance area for 8-hr ozone NAAQS, while Lenawee County is in unclassifiable/attainment for all criteria pollutants, except in a maintenance area for 8-hr ozone NAAQS (EPA 2010b). In July 2011, MDEQ submitted a request asking the EPA to redesignate southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011). This request is based, in part, on air quality monitoring data collected in the 2007–2010 period showing all seven counties in southeast Michigan in attainment for the $PM_{2.5}$ NAAQS.

In Sections 4.7 and 5.7, the review team concludes that air quality impacts of building and operating a plant at Fermi 3, including those associated with transmission lines and cooling towers, would be SMALL, as long as appropriate measures are taken to mitigate dust during building activities. During operation, cooling towers would be the primary source of $PM_{2.5}$, which accounts for most of total $PM_{2.5}$ emissions of 9.51 tons per year at Fermi 3. However, these emissions would be relatively small and thus are not anticipated to elevate $PM_{2.5}$ concentrations in a designated nonattainment area. With dust mitigation, the impacts of building and operating a plant at the Petersburg site would also be SMALL. Any new industrial projects would either be small or subject to permitting by MDEQ. State permits are issued under regulations approved by the EPA and deemed sufficient to attain and maintain the NAAQS and comply with other Federal requirements under the CAA. Thus, the cumulative air quality impacts of building and operating a plant at the Petersburg site would be SMALL.

Greenhouse Gases

The extent and nature of climate change is not sensitive to where GHGs are emitted because the long atmospheric lifetimes of GHGs result in extensive transport and mixing of these gases.

Since the emissions of a plant at the Petersburg site would be comparable to those of a similar plant at the Fermi site, the discussions of Sections 4.7 and 5.7 for Fermi 3 also apply to building and operating a similar plant at Petersburg. Thus, the impacts of the plant's GHG emissions on climate change would be SMALL, but the cumulative impacts considering global emissions would be MODERATE. Building and operating a new nuclear unit at the Petersburg site would not be a significant contributor to the MODERATE impacts.

9.3.5.9 Nonradiological Health

The following impact analysis considers nonradiological health impacts from building activities and operations on the public and workers from a new nuclear facility at the Petersburg alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect nonradiological health, including other Federal and non-Federal projects and those projects listed in Table 9-28 within the geographic area of interest. The building-related activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operation-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and the transport of workers to and from the site.

Most of the nonradiological impacts of building and operation (e.g., noise, etiological agents, occupational injuries) would be localized and would not have significant impact at offsite locations. However, activities such as vehicle emissions from transport of personnel to and from the site would encompass a larger area. Therefore, for nonradiological health impacts, the geographic area of interest for cumulative impacts analysis includes projects within a 50-mi radius of the Petersburg site based on the influence of vehicle and other air emissions sources because the site is in a nonattainment area (Section 9.3.5.8). For cumulative impacts associated with transmission lines, the geographical area of interest is the transmission line corridor. These geographical areas are expected to encompass areas where public and worker health could be influenced by the proposed project and associated transmission lines, in combination with any past, present, or reasonably foreseeable future actions.

Building Impacts

Nonradiological health impacts on construction workers from building a new nuclear facility at the Petersburg site would be similar to those from building Fermi 3 at the Fermi site, as evaluated in Section 4.8. They include occupational injuries, noise, odor, vehicle exhaust, and dust. Applicable Federal, State, and local regulations on air quality and noise would be complied with during the plant construction phase. The Petersburg site does not have any characteristics that would be expected to lead to fewer or more construction accidents than would be expected for the Fermi site. The site is in a predominantly rural area, and construction impacts on the surrounding population areas that are classified as medium- and low-population areas would likely be minimal. Access routes to the site for construction workers would include U.S. Route 23 and Lake Road. Mitigation may be necessary to ease congestion, thereby improving traffic flow and reducing nonradiological health impacts (i.e., traffic accidents, injuries, and fatalities) during the building period.

Operational Impacts

Nonradiological health impacts on occupational health of workers and members of the public from operation of a new nuclear unit at the Petersburg site would be similar to those evaluated in Section 5.8 for the Fermi site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Petersburg site would likely be the same as those evaluated for workers at the new unit at the Fermi site. Discharges to the Lake Erie would be controlled by NPDES permits issued by MDEQ (Section 9.3.5.2). The growth of etiological agents would not be significantly encouraged at the Petersburg site because of the temperature attenuation in the length of the pipe required for a discharge system. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Effects of EMFs on human health would be controlled and minimized by conformance with NESC criteria. Nonradiological impacts of traffic during operations would be less than the impacts during building. Mitigation measures taken during building to improve traffic flow would also minimize impacts during operation of a new unit.

Cumulative Impacts

Past and present actions within the geographic area of interest that could contribute to cumulative nonradiological health impacts include the energy and mining projects in Table 9-28, as well as vehicle emissions and existing urbanization. Reasonably foreseeable future projects in the geographical area of interest that could contribute to cumulative nonradiological health impacts include construction of the proposed Cleveland-Toledo-Detroit Passenger Rail line, future transmission line development, and future urbanization.

The review team is also aware of the potential climate changes that could affect human health. A recent compilation of the state of the knowledge in this area (USGCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperature, increased likelihood of drought in summer, more heavy downpours, and an increase in precipitation, especially in the winter and spring, which may alter the presence of microorganisms and parasites. In view of the water source characteristics, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases.

Summary Nonradiological Health Impacts at the Petersburg Site

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team expects that the impacts on nonradiological health from building and operation of a new nuclear unit at the Petersburg site would be similar to the impacts evaluated for the Fermi site. Although there are past, present, and future activities in the geographical area of interest that could affect nonradiological health in ways similar to the building and operation of a new unit at the Petersburg site, those impacts would be localized and managed through adherence to existing regulatory requirements. Similarly, impacts on public health of a new nuclear unit operating at the Petersburg site would be expected to be minimal. The review team concludes, therefore, that the cumulative impacts of building and operating a nuclear unit at Petersburg on nonradiological health would be SMALL.

9.3.5.10 Radiological Health

The following impact analysis considers radiological impacts on the public and workers from building activities and operations for one nuclear unit at the Petersburg alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects, and those projects listed in Table 9-28 within the geographic area of interest. As described in Section 9.3.5, the Petersburg site is a greenfield site; there are no nuclear facilities currently on the site. The geographic area of interest is the area within a 50-mi radius of the Petersburg site. Existing facilities potentially affecting radiological health within this area are Fermi 2 and Davis-Besse. In addition, there are likely to be medical, industrial, and research facilities within 50 mi of the Petersburg site that use radioactive materials.

The radiological impacts of building and operating the proposed ESBWR unit at the Petersburg site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those at the proposed Fermi site.

The radiological impacts of Fermi 2 and Davis-Besse also include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring programs (REMPs) conducted around these plants. In addition, the NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive materials would be an insignificant contribution to the cumulative impact around the Petersburg site. This conclusion is based on data from REMPs conducted around currently operating nuclear power plants. Based on the information provided by Detroit Edison and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the proposed ESBWR and other existing projects and actions in the geographic area of interest around the Petersburg site would be SMALL.

9.3.5.11 Postulated Accidents

The following impact analysis considers radiological impacts from postulated accidents from operations for one nuclear unit at the Petersburg alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that impact radiological health from postulated accidents, including other Federal and non-Federal projects and those projects listed in Table 9-22 within the geographic area of interest. As described in Section 9.3.5, the Petersburg site is a greenfield site and there are no nuclear facilities currently on the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Petersburg site. Existing facilities potentially affecting radiological accident risk within this geographic area of interest are Fermi 2 and Davis-Besse, because the 50 mi radii for Fermi 2 and Davis-Besse overlap part of the 50-mi radius for the Petersburg site. No other reactors have been proposed within the geographic area of interest.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the proposed Fermi site would be minimal for an ESBWR. DBAs are addressed specifically to demonstrate that a reactor design is sufficiently robust to meet NRC safety criteria. The ESBWR design is independent of site conditions, and the meteorology of the alternative and the proposed Fermi sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the site would be SMALL.

Because the meteorology, population distribution, and land use for the Petersburg site are expected to be similar to those for the proposed Fermi site, risks from a severe accident for an ESBWR located at the Petersburg site are expected to be similar to those analyzed for the proposed Fermi site. These risks for the proposed Fermi site are presented in Tables 5-33 and 5-34 of this EIS and are well below the mean and median values for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (i.e., Fermi 2, and Davis-Besse), the Commission determined the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Because of the NRC's safety review criteria, it is expected that risks for any new reactors at any other locations within the geographic area of interest for the Petersburg site would be well below risks for current-generation reactors and would meet the Commission's safety goals. The severe accident risk due to any particular nuclear power plant becomes smaller as the distance from that plant increases. However, the combined risk at any location within 50 mi of the Petersburg site would be bounded by the sum of risks for all these operating nuclear power plants and would still be low.

On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Petersburg site would be SMALL.

9.3.6 South Britton Site

This section presents the review team's evaluation of the potential environmental impacts of siting a nuclear reactor at the South Britton site. The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the South Britton site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment are other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the South Britton site. Other actions and projects considered in this cumulative analysis are described in Table 9-36. The location and vicinity of the South Britton alternative site are shown in Figure 9-17.

Referred to by Detroit Edison in its site selection process as Site C, the South Britton site is located approximately 1 mi southeast of the town of Britton and 6.5 mi west of Dundee. This greenfield site occupies approximately 1140 ac in Sections 1, 2, 11, and 12 of Township 6 South, Range 5 East.

Road access to the site is provided by U.S. Route 50, which borders the site on the northeast. Rail access is via a spur track of the NS mainline, approximately 1 mi northwest of the site. A 345-kV transmission line approximately 1 mi north of the site is believed to have uncommitted current-carrying capacity.

Surface water on the site includes a tributary to the River Raisin, which crosses the site. The River Raisin is located about 5 mi south and 6 mi west of the site.

The site is currently in agricultural use. Approximately 15 to 25 residents are estimated to currently live on the site. Other than onsite residents, the nearest sensitive receptors are in the town of Britton. The site topography is flat with little variability. Aside from wheat, corn, and soybean cropland, the site supports several small patches of second-growth forest.

The nearest population centers are the towns of Toledo, Ohio, approximately 17.5 mi south, with a population of approximately 305,000 (2000 data), and the towns of Britton and Dundee,

Table 9-36. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the South Britton Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Energy Projects			
J.R. Whiting Power Plant	328-MW coal-fired plant	20 mi southeast of South Britton site	Operational
Detroit Edison Monroe Power Plant	3280-MW coal-fired plant	23 mi east-southeast of South Britton site	Operational
Bay Shore Power Plant	499-MW coal-fired plant	25 mi southeast of South Britton site in Maumee Bay, Ohio	Operational
Fermi Unit 2	1098-MW nuclear power plant	26 mi east of South Britton site	Operational
Davis Besse Nuclear Plant Unit 1	925-MW nuclear power plant	46 mi southeast of South Britton site on Lake Erie	Operational
Mining Projects			
Stansley Mineral Resources	Construction sand and gravel mine	12 mi northwest of South Britton site	Operational
STONECO-Meanwell Road Site	Commercial fill sand and topsoil	10 mi east-southeast of South Britton site	Operational
STONECO-Maybee Site	Limestone quarry	15 mi east-northeast of South Britton site	Operational
Transportation Projects			
Cleveland-Toledo-Detroit Passenger Rail Line	Addition to regional transportation hub with rail lines connecting Cleveland, Buffalo, Toronto, Pittsburgh, Cincinnati, and Detroit	Rail line would pass through Monroe County on its way to Detroit	Proposed; schedule undetermined
Other Actions/Projects			
Britton/Ridgeway Wastewater Stabilization Lagoon (WWSL)	WWSL that discharges to Schreeder Brook	1 mi north of South Britton site	Operational
Deerfield WWTP	WWTP that discharges to River Raisin	5 mi south-southeast of South Britton site on River Raisin	Operational
The Farms WWTP	WWTP that discharges to North Branch of Macon Creek	5 mi northeast of South Britton site	Operational

Table 9-36. (contd)

Project Name	Summary of Project	Location	Status
Petersburg WWTP	WWTP that discharges to River Raisin	6 mi southeast of South Britton site on River Raisin	Operational
Tecumseh WWTP	WWTP that discharges to River Raisin	6 mi west-northwest of South Britton site	Operational
Holcim (US) Inc. – Dundee	Portland cement plant	7 mi north-northeast of South Britton site	Operational
Dundee WWTP	WWTP that discharges to River Raisin	7 mi east of South Britton site on River Raisin	Operational
Blissfield WWTP	WWTP that discharges to River Raisin	9 mi south-southwest of South Britton site on River Raisin	Operational
Blissfield Manufacturing Company	Fabricated metal products	9 mi south-southwest of South Britton site on River Raisin	Operational
Milan WWTP	WWTP that discharges to Saline River	9 mi northeast of South Britton site	Operational
Midwest Grain Processing – Blissfield	Manufactures industrial organic chemicals with discharge to River Raisin	10 mi south-southwest of South Britton site	Operational
Global Ethanol Services	Manufactures industrial organic chemicals with discharge to Golf County Drain	10 mi south-southwest of South Britton site	Operational
Saline Valley Farms WWTP	WWTP that discharges to Saline River	11 mi north of South Britton site	Operational
Dairy Farmers of America	Milk processing facility with discharge to South Branch of River Raisin	11 mi west-southwest of South Britton site	Operational
Clinton WWTP	WWTP that discharges to River Raisin	11 mi northwest of South Britton site	Operational
Central Lenawee WWTP and landfill	WWTP and landfill that discharge to River Raisin	11 mi west-southwest of South Britton site	Operational
Adrian WWTP	WWTP that discharges to South Branch of River Raisin	11 mi west-southwest of South Britton site	Operational
Adrian WTP	WTP that discharges to Wolf Creek	12 mi west-southwest of South Britton site	Operational
Saline WWTP	WWTP that discharges to Saline River	13 mi north of South Britton site	Operational
Saline WTP	WTP that discharges to Saline River	13 mi north of South Britton site	Operational

Table 9-36. (contd)

Project Name	Summary of Project	Location	Status
Five additional minor dischargers	Dischargers to Saline River	13 mi north of South Britton site	Operational
Fairfield Township WWSL	WWSL that discharges to River Raisin	16 mi southwest of South Britton site	Operational
Manchester WWTP	WWTP that discharges to River Raisin	17 mi northwest of South Britton site	Operational
Onsted WWTP	WWTP that discharges to Wolf Creek	17 mi west of South Britton site	Operational
Monroe Metro WWTP	WWTP that discharges to Lake Erie–Plum Creek Channel	23 mi east-southeast of South Britton site	Operational
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land use planning documents. No specific data found concerning development/expansion of the towns within 20 mi of site.	Throughout region	Construction would occur in the future, as described in State and local land use planning documents.
Global Climate Change/ Natural Environmental Stressors	Short- or long-term changes in precipitation or temperature.	Throughout region	Impacts would occur in the future.

Source: Modified from NRC 2010a, e

with populations of 700 and 3522 (all 2000 data), respectively. Ann Arbor, Michigan, lies approximately 20 mi north of the site.

9.3.6.1 Land Use

The following impact analysis considers impacts on land use from building activities and operations at the South Britton site and within the geographic area of interest, which is the 15-mi region surrounding the South Britton site. The analysis also considers past, present, and reasonably foreseeable future actions that impact land use, including other Federal and non-Federal projects and those projects listed in Table 9-36 within the geographic area of interest.

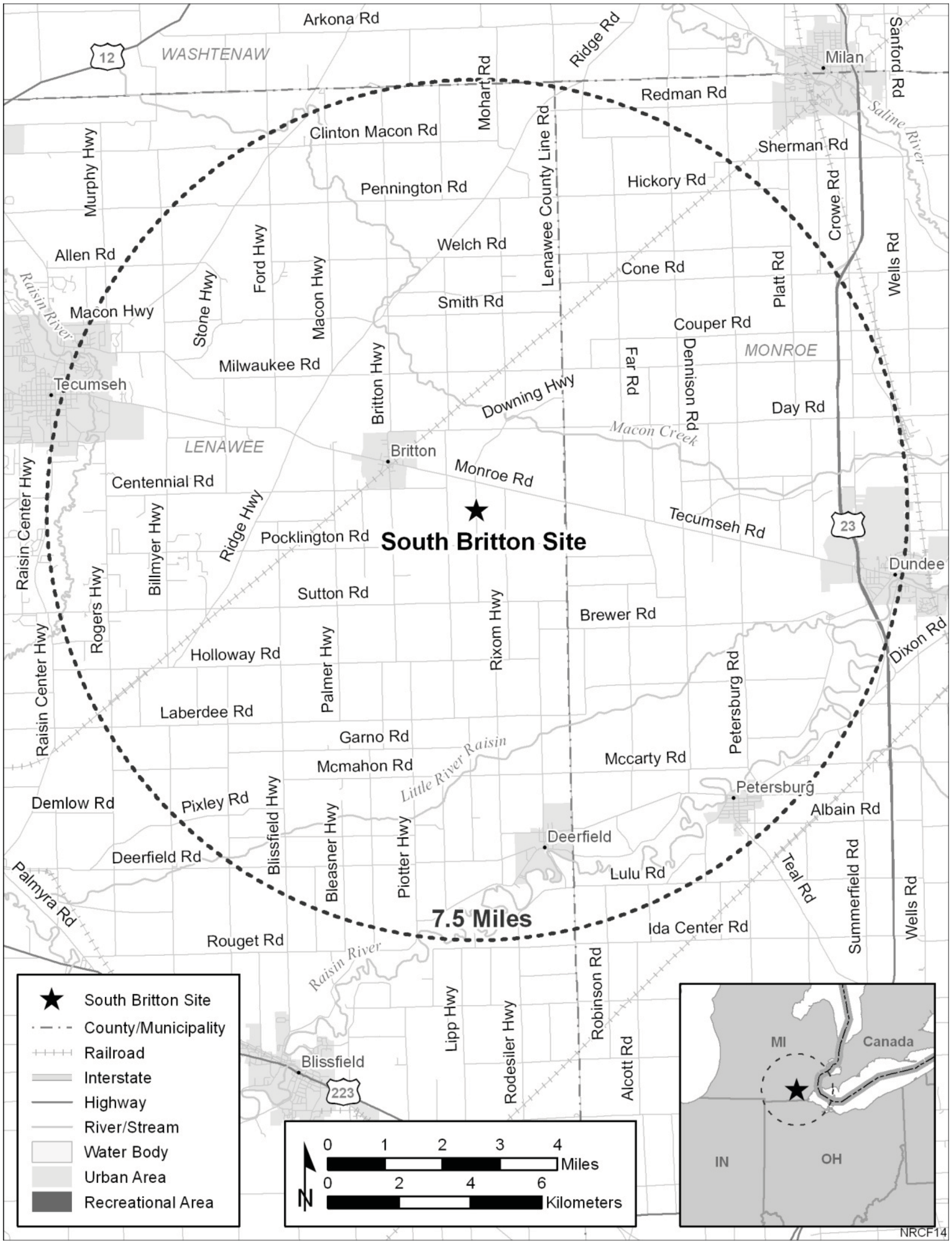

Figure 9-17. The South Britton Alternative Site and Vicinity

The South Britton site is owned by a number of private individuals and is zoned as agricultural (Detroit Edison 2011a). The proposed location for the new facility is in the southern part of the 1140-ac site. There are approximately 15 to 25 residential buildings on the site (Detroit Edison 2011a). Site topography is flat with very little variation and is primarily agricultural land, with some small areas of young mixed deciduous woodland. There are no mapped wetlands on the site (see Section 9.3.6.3). Although a tributary to the River Raisin runs through the site, it is outside the floodplain of the river (Detroit Edison 2011a).

If a new nuclear power plant were sited on the South Britton site, a large portion of the 1140-ac tract would be disturbed and some of the agricultural land (possibly including some prime farmland) and woodland areas on the tract would be lost. Based on Detroit Edison’s conceptual plan layout (Detroit Edison 2009b), the review team estimates that the new facilities would permanently occupy as much as 100 ac and temporarily disturb as much as 200 ac. Although their lengths are unknown, intake and discharge pipelines constructed to transfer water to and from Lake Erie could result in some offsite land use impacts, and the pipelines would likely cross railroad tracks and local roads. No new offsite roadways are expected to be needed.

The recreational area nearest to the site is the River Raisin, located 5 mi south and 6 mi west of the site. There are also three small parks in Adrian, about 8 mi southwest of the site. The Hidden Lake Gardens, a nature preserve and conservatory, is located about 15 mi west-northwest (Detroit Edison 2011a). Although it is not known whether pipeline or transmission lines would cross recreational areas, these resources in Monroe County may be affected by construction and operation of a plant at the South Britton site, including increased user demand associated with the projected increase in population from the in-migrating workforce and their families; an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and condensate plume; or access delays associated with increased traffic from the construction and operations workforces on local roadways.

Existing 120-kV and a 345-kV transmission lines run approximately 1 mi north of the site (Detroit Edison 2011a). Environmental conditions along the anticipated transmission line route are generally similar to those of the site, with a mixture of cropland, wooded areas, and some inland wetlands. Because of the short distances to the transmission interconnections, the review team believes that the land use impacts of building and operating transmission lines for a new nuclear plant at the South Britton site would be minor.

For cumulative land use analysis, the geographic area of interest is the 15-mi region surrounding the South Britton site. This geographic area of interest includes the primary communities (Britton Township and Dundee Township) that would be affected by the proposed project if it were located at the South Britton site.

There are a number of projects identified in Table 9-36 likely to affect land use in the geographic area of interest around the South Britton site. All would require slight changes in land use around the South Britton site. The proposed Cleveland-Toledo-Detroit rail line project, which would be within 10 mi of the proposed site, would require slight changes in land use around the South Britton site. Other projects identified in Table 9-36 have contributed or would contribute to some decreases in open lands, wetlands, and forested areas and generally result in increased urbanization and industrialization. However, existing parks, reserves, and managed areas would help preserve open lands, wetlands, and forested areas. The review team concludes that the land use impacts of building and operating a new nuclear generating unit and associated transmission lines at the South Britton site would be minimal because the projects within the geographic area of interest identified in Table 9-36 would be consistent with applicable land use plans and because the distance to the transmission interconnections is short.

As described for the Fermi site in Section 7.1, climate change could increase precipitation and flooding in the area of interest, while increased lake evaporation and reduced lake ice accumulation could reduce lake levels, thus changing land use through an increase in low-lying lakeshore areas (USGCRP 2009). Forest growth may increase as a result of more CO_2 in the atmosphere, while existing parks, reserves, and managed areas would help preserve wetlands and forested areas to the extent that they are not affected by the same factors (USGCRP 2009). In addition, climate change could reduce crop yields and livestock productivity (USGCRP 2009), which might change portions of agricultural land uses in the area of interest.

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the cumulative land use impacts associated with siting a reactor at the South Britton site would be SMALL, and no mitigation would be warranted.

9.3.6.2 Water Use and Quality

Surface water features in the vicinity of the South Britton site include small creeks and ditches. Because the surface water resources near the site are poor, water for a reactor at the South Britton site was originally proposed to come from the River Raisin (Detroit Edison 2011a), which is about 5 to 6 mi southeast of the site. During the review team's visit in January 2009, the River Raisin was observed to be of moderate size with modest flow, and concern was expressed by the review team regarding the adequacy of the river as a source of cooling water for a power plant and the river's ability to accept heated and chemically treated cooling tower blowdown discharges. Detroit Edison (2009c) has since indicated that a pipeline to Lake Erie would be a possible method of providing a dependable water source for power plant operations. A representative route along State highways and county roads was provided by Detroit Edison, with a total pipeline length of more than 25 mi. A new intake structure would be necessary at the lake (constructed under USACE and MDEQ permits). Discharge would include relatively warm cooling tower blowdown, treated process wastewater, and liquid radwaste. The receiving body of water for these discharges is not described by Detroit Edison (2011a), but it is assumed that a second pipeline would convey discharges back to Lake Erie, with such discharges controlled by an NPDES permit issued by MDEQ. Given the length of pipeline that would be required for a discharge system, at least partial temperature attenuation may take place prior to discharge in the lake.

Groundwater in the site vicinity is used for domestic and municipal purposes. The maximum groundwater-producing well is in the City of Britton and is located about 1 mi northwest of the proposed site (Detroit Edison 2011a). Groundwater resources exist within both a surficial aquifer and a Silurian and Devonian bedrock aquifer. The thickness of the surficial aquifer is 50 to 200 ft, and the thickness of the bedrock aquifer is about 100–200 ft, with well yields of 10 to 80 gpm and 15 to 30 gpm, respectively. Although groundwater quality is good, Detroit Edison notes that the feasibility of groundwater as a water source for supporting building or operating a new nuclear facility at the South Britton site is moderate to poor due to dropping water levels.

Building activities, including site grading and dewatering and building of new intake and discharge pipelines, would have the potential to affect water quality through increased erosion by stormwater, increased turbidity in surface water, and possible spills or leaks of fuel and other liquids. Pipeline construction would create the potential for impacts from erosion and turbidity, especially at stream crossings. These changes would be expected to be limited by following appropriate BMPs. Surface water quality may be affected by discharges, but the discharges should be controlled by NPDES permits for cooling water discharge to Lake Erie or for local stormwater management.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the South Britton site is the local ditches and creeks and Lake Erie, because these are the areas potentially affected by the proposed project. Key actions that have current and reasonably foreseeable potential impacts on water supply and water quality in this area of interest include active coal-fired and nuclear power plants, a sand pit, a bedrock quarry, wastewater treatment plants, and industries (e.g., metal fabrication, organic chemicals, cement plant). For the cumulative analysis of impacts on groundwater, the geographic area of interest is the surficial and bedrock aquifers in the vicinity of the site.

Water Use

Operational cooling water requirements would be the major demand of a new nuclear power plant on surface water resources. As described in Section 5.2, there would be sufficient Lake Erie water available to support the makeup water needs of a new reactor in addition to the cooling water needed by existing power plants and other projects listed in Table 9-36. The cumulative consumptive use of surface water is anticipated to have a small effect on the resource.

As described in Section 7.2.1, the greatest potential future impact on the Great Lakes water availability is predicted to be from climate change. The impact predicted for the lowest-emissions scenario discussed in the USGCRP report (2009) and by Hayhoe et al. (2010) would not be detectable or would be so minor that it would not noticeably alter the availability of water from the Great Lakes. However, if CO_2 emissions follow the trend evaluated in the highest-emissions scenario, the effect of climate change could noticeably increase air and water temperatures and decrease the availability of water in surface water resources in the Great Lakes region. As a result, the review team concludes that the potential impacts of use and climate change on surface water quantity would be SMALL to MODERATE. Based on its evaluation, the review team concludes that building and operating a nuclear plant at the South Britton site would not be a significant contributor to the cumulative impact on surface water use.

Groundwater withdrawals associated with site dewatering during construction or preconstruction of a new nuclear power plant would be temporary and localized. As discussed above, the feasibility of using groundwater as a cooling water source is low. The review team concludes that cumulative groundwater impacts associated with withdrawals while building a new nuclear power plant at the South Britton site and with projects identified in Table 9-36 would be SMALL.

Water Quality

An NPDES permit from MDEQ would be required for discharges from a new nuclear power plant at the South Britton site as well as for discharges from the other projects identified in Table 9-36. Such permits would limit both chemical and thermal discharges. Construction activities associated with the proposed facilities in Table 9-36, urbanization in the vicinity, and pipeline crossings have the potential to degrade surface water quality; adhering to BMPs would limit this impact.

The EPA's Great Lakes National Program Office has initiated the Great Lakes Restoration Initiative, a consortium of 11 Federal agencies that developed an action plan to address environmental issues. These issues fall into five areas: cleaning up toxics and areas of concern, combating invasive species, promoting nearshore health by protecting watersheds from polluted runoff, restoring wetlands and other habitats, and tracking progress and working with strategic partners. The results of this long-term initiative would presumably address water quality concerns of Lake Erie.

Climate change, as described in Section 7.2.1, has the potential to affect water quality within Lake Erie, leading to a MODERATE cumulative impact on surface water quality. Reduced lake levels could increase the impact of discharges. The review team concludes that cumulative surface water quality impacts associated a new nuclear power plant at the South Britton site and other past, present, and reasonably foreseeable actions in the region could result in a MODERATE impact; however, building and operating a nuclear power plant at the South Britton site would not be a significant contributor to the MODERATE cumulative impact on surface water.

Groundwater in the region could be affected by a new nuclear power plant at the South Britton site and other past, present, and reasonably foreseeable actions in the region identified in Table 9-36. These impacts would be expected to be localized and may be avoided or minimized through adherence to BMPs. The review team concludes that cumulative groundwater quality impacts would be SMALL.

9.3.6.3 Terrestrial and Wetland Resources

The site is composed primarily of cropland planted with crops such as wheat, corn, and soybeans. A few areas (one of less than 20 ac and others of less than 5 ac each) of second-growth forest are scattered about the site. Ash, oak, cottonwood, and maple appear to be the prevalent species in these woodlands. Other non-cropland areas are limited to disturbed roadside ROWs dominated by tall fescue or ditches (drains) where cattail or orchard grass dominate, depending on the amount of moisture available (Detroit Edison 2011a).

The site and surrounding vicinity is mostly cropland, with a few scattered and small islands of second-growth forest. The small forested areas provide daytime shelter for large mammals such as whitetail deer, nesting areas for birds, and other habitat needs for smaller mammals. Small mammals present in the area likely include opossum, raccoon, striped skunk, and a variety of rodents. Waterfowl (geese and ducks) and game birds presumably feed in the fields after crops are harvested, taking advantage of the grain and other seeds that remain. It is unlikely that fish are present in the vicinity, but small amphibians and reptiles can be found in the local ditches (Detroit Edison 2011a).

The NWI does not identify wetlands on the site. It is likely, however, that portions of the site contain wetlands, as evidenced by the presence of drainage ditches (Detroit Edison 2009b) and by the fact that most soils on the site are mapped as hydric soils (USDA 2010).

Four terrestrial species listed as threatened or endangered under the ESA are known to occur or could occur in Lenawee County. The eastern prairie fringed orchid is Federally listed as threatened and is known mostly from lakeplain prairies around Saginaw Bay and western Lake Erie (MNFI 2007a). The Indiana bat is Federally listed as endangered. It occurs in southern Michigan when it is not hibernating (wintering) in hibernacula (caves or other wintering locations) in southern Michigan and other States (MNFI 2007b). The bats generally require large trees (greater than 9-in. diameter) with exfoliating bark for summer roosting. According to the FWS (2009), however, trees with a diameter as small as 5 in. should be considered as potential habitat. The emerald ash borer is active in the project area (MDA 2009). It is likely that ash trees onsite have been killed by the borer, creating dead trees with loose bark and resulting in potential roosting habitat for the Indiana bat. The Karner blue butterfly is Federally listed as endangered. The species was recorded from neighboring Monroe County in 1986, but is otherwise known from the west-central portion of lower Michigan. Suitable habitat does not appear to exist at the project site or in the immediate vicinity. According to the MDNR Endangered Species Coordinator, Karner blue butterflies were introduced to Monroe County in the Petersburg State Game Area within the last decade (Hoving 2010). Because the maximum movement of the butterflies from their point of introduction is about 0.6 mi and the Game Area is approximately 8 mi to the southeast of the South Britton site, there is no likelihood that any butterflies introduced in the Game Area would occur on the site. Furthermore, suitable habitat does not appear to exist at the project site or in the immediate vicinity. Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*) also is Federally listed as endangered. The species has been recorded in Lenawee County. However, suitable habitat does not appear to exist at the project site or in the immediate vicinity. The bald eagle is no longer on the Federal endangered species list, although it is protected under the BGEPA and MBTA (MNFI 2007c). The bald eagle was also recently removed from the State list of threatened and endangered species and is now considered a species of concern. Although bald eagles are known to occur in the region, the species usually nests and roosts closer to fish-bearing waters. The potential for any impacts on protected species appears to be minimal, because of the type of habitat present.

More than 40 State-listed species occur in Lenawee County (see Table 9-37). Detroit Edison has not consulted with MDNR about potential impacts on State-listed species that could result from construction of the power plant at the South Britton site. Unlike the counties containing the Fermi site and the other alternative sites considered, the eastern fox snake is not recognized by MDNR as potentially occurring in Lenawee County.

Building Impacts

Agricultural land, possibly along with some forest and residential land, would have to be cleared and converted to industrial use in order to build a new reactor and associated facilities at the South Britton site. According to Detroit Edison, the total area of the South Britton site is approximately 1140 ac (Detroit Edison 2011a). Detroit Edison's conceptual plan layout shows that the new reactor facilities would occupy as much as 100 ac of the east-central part of the South Britton site (Detroit Edison 2011a). Although Detroit Edison's proposed conceptual plan layout (Detroit Edison 2009b) does not differentiate temporarily disturbed areas from the facility footprint, information about the proposed Fermi site location indicates that temporary disturbance could be as much as 200 ac.

Conversion of agricultural land would have minimal impact on wildlife and habitat. Conversion of forested areas would have some impact on most of the common species present onsite, by removing habitat used for shelter or other functions. With the possible exception of the Indiana bat, adverse impacts on Federally listed species are not anticipated. The forested areas of the site have the potential to provide habitat for the Indiana bat in the form of dead ash trees. If the

Table 9-37. Federally and State-Listed Terrestrial Species That Occur in Lenawee County and That May Occur on the South Britton Site or in the Immediate Vicinity

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Amphibians			
Blanchard's cricket frog	*Acris crepitans blanchardi*	NL	T
Birds			
Henslow's sparrow	*Ammodramus henslowii*	NL	E
Invertebrates			
Dukes' skipper	*Euphyes dukesi*	NL	T
Karner blue butterfly	*Lycaeides melissa samuelis*	E	T
Mitchell's satyr butterfly	*Neonympha mitchellii mitchellii*	E	E
Poweshiek skipperling	*Oarisma poweshiek*	NL	T
Regal fritillary	*Speyeria idalia*	NL	E
Mammals			
Indiana bat	*Myotis sodalis*	E	E
Plants			
American chestnut	*Castanea dentata*	NL	E
Beak grass	*Diarrhena obovata*	NL	T
Beaked agrimony	*Agrimonia rostellata*	NL	T
Canadian milk vetch	*Astragalus canadensis*	NL	T
Cup plant	*Silphium perfoliatum*	NL	T
Edible valerian	*Valeriana edulis* var. *ciliata*	NL	T
False pennyroyal	*Trichostema brachiatum*	NL	T
Forest skullcap	*Scutellaria ovata*	NL	T
Goldenseal	*Hydrastis canadensis*	NL	T
Hollow-stemmed Joe-pye weed	*Eupatorium fistulosum*	NL	T
Jacob's ladder	*Polemonium reptans*	NL	T
Eastern prairie fringed orchid	*Platanthera leucophaea*	T	E
Purple milkweed	*Asclepias purpurascens*	NL	T
Red mulberry	*Morus rubra*	NL	T
Round-seed panic-grass	*Dichanthelium polyanthes*	NL	E
Sedge	*Carex albolutescens*	NL	T
Sedge	*Carex conjuncta*	NL	T
Showy orchis	*Galearis spectabilis*	NL	T
Smooth ruellia	*Ruellia strepens*	NL	E
Southeastern adder's-tongue	*Ophioglossum vulgatum*	NL	E
Sullivant's milkweed	*Asclepias sullivantii*	NL	T
Swamp or black cottonwood	*Populus heterophylla*	NL	E
Toadshade	*Trillium sessile*	NL	T

Table 9-37. (contd)

Common Name	Scientific Name	Federal Status(a)	State Status(a)
Virginia bluebells	*Mertensia virginica*	NL	E
Virginia snakeroot	*Aristolochia serpentaria*	NL	T
Virginia water-horehound	*Lycopus virginicus*	NL	T
Western mugwort	*Artemisia ludoviciana*	NL	T
White lady slipper	*Cypripedium candidum*	NL	T
Wideflower phlox	*Phlox ovata*	NL	E
Wild hyacinth	*Camassia scilloides*	NL	T
Woodland lettuce	*Lactuca floridana*	NL	T
Reptiles			
Kirtland's snake	*Clonophis kirtlandii*	NL	E
Spotted turtle	*Clemmys guttata*	NL	T

Source: MNFI 2010a

(a) E = listed as endangered, NL = not listed, T = listed as threatened.

bat uses the areas that would be disturbed, impacts could be kept to minimal levels by limiting tree clearing to the times of year when the bats are not in the region.

The agricultural land and the small areas of forest on this site are not likely to provide habitat for State-listed species, but additional study would be needed to more precisely assess potential impacts on terrestrial ecological resources on the site and its vicinity.

Information about the South Britton site provided by Detroit Edison did not indicate whether wetlands would be affected by building the new reactor facilities (Detroit Edison 2009b, 2011a). The conceptual plan layout appears to locate the facilities on agricultural land away from wetlands mapped by NWI. However, considering the prevalence of hydric soils on the site, the layout likely affects unmapped wetlands not identified on NWI maps.

Detroit Edison's ER states that there appears to be an open circuit on a 345-kV transmission line that passes 1 mi north of the site and that capacity and reliability in the area are good. Nonetheless, it is possible that a new transmission line would be necessary for a number of reasons. A reactor built on the South Britton site rather than at the proposed Fermi site would still be expected to serve the same load centers as if it were at the Fermi site, and it is unclear whether there is sufficient uncommitted current carrying capacity left on the existing lines. No information was provided on where a possible transmission line would be constructed, how long it would be, or what terrestrial ecological resources might be affected by such a transmission line. It may be possible, however, that a new transmission line could share or adjoin an existing transmission line corridor for some of its length and use existing substations, thereby resulting in less ecological impact than completely new corridors and substations. The vicinity of the South Britton site is largely agricultural, with some forested areas. Although it appears possible to avoid most, if not all, important habitat with a new transmission line, a complete assessment would require a corridor location and site-specific information about the wildlife and habitat within the corridor.

Operational Impacts

During plant operation, wildlife would be subjected to increased mortality from traffic, but it is not expected that such effects would destabilize the local or regional populations of the common species of the site (Forman and Alexander 1998). Information about the local occurrence of important species and habitats would be needed to conduct a more complete assessment of potential project effects on those resources at the South Britton site. Potential impacts associated with transmission line operation would consist of bird collisions with transmission lines, habitat loss due to corridor maintenance, noise, and EMF effects on flora and fauna.

Direct mortality resulting from birds colliding with tall structures has been observed (Erickson et al. 2005). Factors that appear to influence the rate of bird collisions with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight during darkness by flocking birds has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play a role in bird mortality. Weather, such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon.

There would be a potential for bird mortality from colliding with the nuclear power plant structures at this site. Typically, the cooling tower and the meteorological tower are the structures likely to pose the greatest risk. The potential for bird collisions increases as structure heights and widths increase. MDCTs are of little concern because of their relatively low height compared to existing and proposed structures onsite. An NDCT, however, would be on the order of 600 ft high. Nonetheless, the NRC concluded that effects of bird collisions with existing cooling towers "involve sufficiently small numbers for any species that it is unlikely that the losses would threaten the stability of local populations or would result in a noticeable impairment of the function of a species within local ecosystems" (NRC 1996). Thus, the impacts on bird populations from collisions with the cooling tower are expected to be minimal.

Operational impacts of the transmission system on wildlife (e.g., bird collisions and habitat loss) resulting from the addition of new lines and towers cannot be fully evaluated without additional information on the length and location of any new transmission facilities. Nonetheless, Section 4.5.6.2 of the GEIS for license renewal (NRC 1996) provides a thorough discussion of the topic and concludes that bird collisions associated with the operation of transmission lines would not cause long-term reductions in bird populations. The same document also concludes that once a transmission corridor has been established, the impacts on wildlife populations would be from continued maintenance of transmission line corridors and are not significant (NRC 1996).

The review team assumed that ITC*Transmission* would construct and operate any new transmission lines needed for a new reactor at the South Britton site. ITC*Transmission* operates in accordance with industry standards for vegetation management (NERC 2010), including seasonal restriction on activities that could adversely affect important wildlife (Detroit Edison 2010a). According to ITC*Transmission*'s vegetation management policy, wetland areas within the corridor that have the potential to regenerate in forest vegetation would be periodically manually cleared of woody vegetation for line safety, thereby keeping them in a scrub/shrub or emergent wetland state (ITC*Transmission* 2010). Other forested areas would be managed similarly to prevent tree regrowth that could present safety or transmission reliability problems. Access to these areas for maintenance would likely be on foot or by using matting for vehicles so as not to disturb the soil. Pesticides or herbicides would be used only occasionally in specific areas where needed in the corridor. It is expected that the use of such chemicals in the transmission line corridor would be minimized to the greatest extent possible in wetland areas to protect these important resources (Detroit Edison 2010). The impact associated with corridor maintenance activities is loss of habitat, especially forested habitat, from cutting and herbicide application. The maintenance of transmission line corridors could be beneficial for some species, including those that inhabit early successional habitat or use edge environments. Impacts of transmission line corridor maintenance would depend on the types and extents of habitat crossed. In general, however, if a new transmission line is needed, the impacts would likely be minimal.

Detroit Edison provided no data on noise for the possible new reactor on the South Britton site, but it is likely that impacts would be minimal and similar to those of the Fermi 3 project.

EMFs are unlike other agents that have an adverse biological impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NIEHS 2002). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NIEHS 2002). At a distance of 300 ft, the magnetic fields from many lines are similar to typical background levels in most homes (NIEHS 2002). Thus, impacts on terrestrial flora and fauna of EMFs from transmission systems with variable numbers of power lines are of minor significance at operating nuclear power plants (NRC 1996). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2007). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2007). A review of the literature on health effects of electric and magnetic fields conducted for the Oregon Department of Energy looked at the effects of strong electric and magnetic fields on various bird species. While some studies concluded that some species of birds exhibited changes in activity levels and some physiological metrics, no studies demonstrated adverse effects on health or breeding success (Golder Associates, Inc. 2009).

Cumulative Impacts

Several past, present, and reasonably foreseeable projects could affect terrestrial resources in ways similar to siting a new reactor at the South Britton site (see Table 9-36). The geographic area of interest for the following analysis is defined by a 25-mi radius extending out from the site.

Past projects include three coal-fired generation facilities: the Detroit Edison Monroe power plant in Monroe, Michigan; the Bay Shore power plant in Oregon, Ohio; and the J.R. Whiting power plant in Luna Pier, Michigan. All three coal plants are at least 20 mi from the South Britton site. The Fermi 2 power plant is just outside the geographic area of interest, at a distance of approximately 26.4 mi. All four power plants were constructed at least two decades ago, and any short-term impacts of plant construction ended years ago. The long-term effects on terrestrial ecological resources from operating a new reactor at the South Britton site would be minimal, as evidenced by the low level of operational impacts described in the GEIS (NRC 1996) and the distances to the other existing power plants.

A future activity in the region that could noticeably affect wildlife and habitat in or near the geographic area of interest is future urbanization. Development of the South Britton site could result in increased employment and population within the geographic area of interest, which in turn could result in additional urbanization. Given the current populations of Lenawee, Washtenaw, and Monroe Counties, Michigan (approximately 99,000, 347,000, and 146,000, respectively), the additional impact on ecological resources from indirect urbanization if the South Britton site were developed would be minor.

Urbanization would likely result in conversion of agricultural land, forest land, wetlands, and other habitat to urban uses. Urbanization would involve some of the same activities as building a new reactor, including land clearing and grading (temporary and permanent), increased human presence, heavy equipment operation, traffic (including the resulting wildlife mortality), noise from construction equipment, and fugitive dust. Some of the effects of these activities, such as noise and dust, are short term and localized. The impacts of noise and dust from building a new reactor would be negligible. Other effects, such as clearing wildlife habitat that will not be restored, would be permanent. The effects of urbanization, including land clearing and grading, filling of wetlands, increased human presence, and increased traffic, would occur over a period of several years and in several locations away from the South Britton site.

Another project that has been proposed for the geographic area of interest is a passenger rail line that would run from Cleveland through Toledo to Detroit. As part of this project, a railway station could be built in the City of Monroe. The current status of this project is not known, but it would have some potential to encourage local economic development, including urbanization.

Considering the presence of hydric soils and drainage ditches on the site, it is likely that wetland habitat not identified on NWI maps would be unavoidably disturbed by building a new reactor at the South Britton site. The review team cannot assess impacts from potential transmission line development without more specific routing information. Because of the largely agricultural landscape surrounding the South Britton site, however, it is likely a transmission line corridor could be routed to minimize impacts on wildlife and habitat.

Summary of Impacts on Terrestrial and Wetland Resources at the South Britton Site

Impacts on terrestrial ecological resources and wetland resources were estimated based on information provided by Detroit Edison and the review team's independent review. Based on the conceptual layout (Detroit Edison 2009b), the permanently disturbed area could be as much as 100 ac, and the temporarily disturbed area could be as much as 200 ac. Much of the project area is currently used for row crops and provides relatively low wildlife habitat value. After construction and preconstruction, habitat resources in temporarily disturbed areas would be expected to naturally regenerate. Wildlife would also recover but might not use the regenerated habitat to the same degree. Permanently disturbed areas would be converted to industrial use for the indefinite future. However, because of the likelihood of wetland impacts at the site, impacts are expected to be noticeable. Because the review team has no definitive information on the routing and length of a new transmission corridor, it cannot estimate the extent of affected habitats.

The review team concludes that the cumulative impacts on terrestrial wildlife and habitat would be MODERATE for a new reactor at the South Britton site. Building and operating a new nuclear plant at the South Britton site would be a significant contributor to this MODERATE impact.

9.3.6.4 Aquatic Resources

The primary surface water features that could be affected by the construction and operation of a new reactor at the South Britton site include onsite ditches and small tributaries of the River Raisin, as well as Lake Erie to the east. There are no designated wetlands on the site (Section 9.3.6.2). No information exists regarding the aquatic organisms in the ditches and tributaries located onsite, and surveys would be needed to characterize the aquatic communities present. However, a variety of aquatic macroinvertebrates, such as mayflies, stoneflies, caddisflies, isopods, and chironomids, are likely to be present, along with fish common to Great Lakes coastal habitats, such as sunfishes, shiners, suckers, and catfish (Bolsenga and Herdendorf 1993).

The western basin of Lake Erie would likely serve as the source of plant cooling water for a new reactor at the Petersburg site. Lake Erie supports an important commercial and recreational fishery. Common nearshore forage species include the emerald shiner, gizzard shad, rainbow smelt, and alewife. Salmonids, catfish, yellow perch, walleye, pike, gizzard shad, and freshwater drum are commercially or recreationally important species found near the shoreline (USGS 2010). Some of the primary aquatic nuisance species are invasive waterfleas, dreissenid mussels, sea lamprey, common carp, and round goby. The ecology of Lake Erie has been dramatically altered by the introduction of dreissenid mussels, with quagga mussels dominating the Eastern Basin and zebra mussels dominating the western basin of Lake Erie (Benson et al. 2011). Dreissenid mussels have increased benthic productivity, reduced plankton and planktivorous fish abundance, and altered the substrate available to demersal organisms.

Federally and State-Listed Threatened and Endangered Species

One endangered native freshwater mussel species that and two species that have been proposed for Federal listing as endangered could occur in Lenawee and Monroe Counties (FWS 2010). The northern riffleshell is listed as Federally endangered, and the rayed bean (*Villosa fabalis*) and snuffbox mussel are proposed for Federal listing as endangered status (FWS 2010). The northern riffleshell was historically present in the River Raisin drainage, which passes through Lenawee and Monroe County; however, the most recent record from Monroe County is from 1977, and the most recent record from Lenawee County is from 1930 (Carman and Goforth 2000c; FWS 2008). Although the Federally listed white catspaw was historically reported from Monroe County, it is now considered to be extirpated from Michigan. There are no designated critical habitats for any listed species in the vicinity of the South Britton site. Within Lenawee and Monroe Counties in the River Raisin drainage and in Lake Erie, there are 11 State-listed fish species and 15 listed mussels potentially present (Table 9-38). Of the State-listed threatened or endangered species, the hickorynut and white catspaw were historically present, but no recent records exist for these species in Monroe County or Lenawee County (Carman 2001c; Badra 2004a). The purple lilliput, slippershell (*Alasmidonta viridis*), purple wartyback (*Cyclonaias tuberculata*), rainbow (*Villosa iris*), round pigtoe (*Pleurobema sintoxia*), and wavyrayed lampmussel are present in small to medium-size streams in Monroe County in the River Raisin drainage, and therefore could be present in tributaries on the South Britton site (Stagliano 2001a; Carman 2002a, b; Badra 2004b; Badra 2007a, b). The threehorn wartyback, round hickorynut (*Obovaria subrotunda*), lilliput, rayed bean, and the snuffbox mussel may occur in streams within Monroe County as well as in Lake Erie (Carman 2001b, d; Carman and Goforth 2000b; 75 FR 67552). Of the State-listed threatened and endangered fish, the creek chubsucker (*Erimyzon claviformis*), river darter, pugnose shiner, southern redbelly dace (*Phoxinus erythrogaster*), and eastern sand darter historically occurred in Monroe County or Lenawee County in the River Raisin drainage or in Lake Erie, but these species have not been found in recent surveys (Carman and Goforth 2000a; Stagliano 2001b; Carman 2001e; Derosier 2004c, d). The pugnose minnow and the channel darter have been recorded in nearshore areas of Lake Erie (Carman and Goforth 2000a; Carman 2001f). Lake sturgeon and sauger are

Table 9-38. Federally and State-Listed Threatened and Endangered Aquatic Species That Are Known to Occur in Lenawee and Monroe Counties and That May Occur on the South Britton Site, in the River Raisin Drainage, and in Lake Erie

Scientific Name	Common Name	Federal Status[(a)]	State Status[(b)]
Fish			
Brindled madtom	*Noturus miurus*	NL	SC
Channel darter	*Percina copelandi*	NL	E
Creek chubsucker	*Erimyzon claviformis*	NL	E
Eastern sand darter	*Ammocrypta pellucida*	NL	T
Lake sturgeon	*Acipenser fulvescens*	NL	T
Pugnose minnow	*Opsopoeodus emiliae*	NL	E
Pugnose shiner	*Notropis anogenus*	NL	E
River darter	*Percina shumardi*	NL	E
Sauger	*Sander canadensis*	NL	T
Silver chub	*Macrhybopsis storeriana*	NL	SC
Southern redbelly dace	*Phoxinus erythrogaster*	NL	E
Invertebrates			
Elktoe	*Alasmidonta marginata*	NL	SC
Hickorynut	*Obovaria olivaria*	NL	E
Lilliput	*Toxolasma parvus*	NL	E
Northern riffleshell	*Epioblasma torulosa rangiana*	E	E
Purple lilliput	*Toxolasma lividus*	NL	E
Purple wartyback	*Cyclonaias tuberculata*	NL	T
Rainbow	*Villosa iris*	NL	SC
Rayed bean	*Villosa fabalis*	PE	E
Round hickorynut	*Obovaria subrotunda*	NL	E
Round pigtoe	*Pleurobema sintoxia*	NL	SC
Slippershell	*Alasmidonta viridis*	NL	E
Snuffbox mussel	*Epioblasma triquetra*	PE	E
Threehorn wartyback	*Obliquaria reflexa*	NL	E
Wavyrayed lampmussel	*Lampsilis fasciola*	NL	T
White catspaw	*Epioblasma obliquata perobliqua*	E[(c)]	E

(a) Federal status rankings determined by the FWS under the Endangered Species Act: NL = not listed, PE = proposed endangered, E = endangered. Source: FWS 2010.
(b) State species information provided by MNFI (2010a): E = endangered, T = threatened, SC = species of concern.
(c) The white catspaw is considered extirpated, from Michigan.

potentially found in Lake Erie, although the sauger is uncommon (Goforth 2000; Derosier 2004b).

Building Impacts

Impacts on aquatic habitat and biota on the South Britton site and in Lake Erie could result from building the primary facilities, associated transmission lines, and the cooling water intake and discharge system for a new reactor at the South Britton site. As identified in Section 9.3.6.1, the area of the site that would be developed if the South Britton site were chosen for a new reactor facility consists primarily of agricultural land. There are not likely to be any aquatic habitats located directly within the construction footprint (Detroit Edison 2009b). Building a new cooling water intake and discharge pipeline between Lake Erie and the reactor site could affect aquatic habitat if present along the pipeline corridor and could require dredging, pile driving, and other alterations to the shoreline and benthic habitat of Lake Erie, potentially resulting in sedimentation, noise, turbidity, sediment removal, and accidental releases of contaminants (see Section 4.3.2 for a detailed description of potential impacts of construction activities on aquatic habitats and biota). The potential for impacts could be limited by avoiding surface water features, and any impacts on aquatic organisms would likely be temporary and could be largely mitigated through the use of BMPs. Preconstruction and construction activities within Lake Erie would require Section 10 and 404 permits from USACE, as well as a regulatory permit from MDEQ, and these permits would likely contain stipulations that would further reduce impacts. Overall, the impact of the building of cooling water intake and discharge structures on aquatic resources would be minor.

As described in Section 4.3.2, building activities at the location of the new reactor, including an increase in impervious land surface, vegetation removal, site grading, and dewatering, would have the potential to affect water quality and hydrology, and therefore aquatic biota in ditches and streams located within the South Britton site and in downstream areas outside of the site. Stormwater runoff could carry soil as well as contaminants (e.g., spilled fuel and oil) from construction equipment into onsite streams and ditches. There does not appear to be high-quality aquatic habitat present at the South Britton site, and impacts are expected to be minor. Impacts on aquatic resources from construction site discharges could be controlled by NPDES and stormwater permits. Implementation of appropriate BMPs would further reduce the potential for sediments to enter surface water.

It is possible that a new transmission line for a new reactor at the South Britton site could share or adjoin the existing 345-kV transmission line corridor located 1 mi from the site, where environmental conditions are similar to those of the site, with a mixture of cropland, wooded areas, and some wetlands. If so, building-related impacts on aquatic resources would be minimal. If a new transmission line is needed to service a new reactor, there is the potential for the building-related impacts described above to affect aquatic habitat and aquatic biota, if the new transmission line passes near or crosses a surface water feature. Expansion of existing corridors would be expected to result in minor environmental impacts, while establishing new corridors could result in greater impacts. However, based on the assumptions that required construction permits were obtained from MDEQ and/or USACE and appropriate BMPs were implemented during building activities, the impacts on aquatic resources from development of additional transmission facilities would likely be temporary, easily mitigated, and minor.

Building a new reactor is not expected to result in impacts on threatened and endangered aquatic species, given the lack of suitable habitat at the location of the South Britton site. However, several threatened and endangered species of fish and freshwater mussels were historically present in the River Raisin drainage, and a tributary of the River Raisin is present at the South Britton site. The potential for construction-related impacts on threatened and endangered species can be minimized by avoiding construction near streams, surveying streams for species, and implementing BMPs. Threatened and endangered fish and mussels found in Lake Erie or in aquatic habitat located along the route of the transmission line or cooling water pipelines may be affected by disturbance from building activities. Based on recent records, the threatened or endangered mussels potentially present in Lake Erie include the round hickorynut, threehorn wartyback, lilliput, snuffbox mussel, and rayed bean. Additional information would need to be collected and surveys may need to be conducted to evaluate the potential for Federally and State-listed mussel species to be present in aquatic habitat that would be disturbed by building activities. If threatened or endangered mussels were found, it is likely that mitigation measures would need to be developed to limit potential impacts. Habitat for State-listed fish species could be temporarily disturbed by shoreline and in-water preconstruction activities. However, fish are highly mobile and would likely avoid the affected areas during these activities. On the basis of this information and because construction and preconstruction activities would be temporary and mitigable, the review team concludes that impacts on threatened and endangered aquatic species would be minor.

Operational Impacts

Operational impacts on aquatic resources could result from cooling water consumption, transmission line maintenance, cooling water system maintenance, cooling water discharge, and impingement and entrainment of aquatic biota in Lake Erie by the cooling water system.

Operational cooling water requirements would be the major water demand of a new nuclear power reactor at the South Britton site. Detroit Edison has indicated a closed cycle recirculating cooling system would be used, which could reduce water use by 96 to 98 percent compared to a once-through cooling system (66 FR 65256). Assuming that cooling water needs would be similar to those identified for the proposed Fermi 3, approximately 34,000 gpm, or 49 MGD, would be needed (Detroit Edison 2011a). The withdrawal of water would not disrupt natural thermal stratification or turnover pattern for Lake Erie and would comply with EPA’s CWA Section 316(b) Phase 1 regulations. Water available from Lake Erie would be sufficient to support the makeup water needs of a new reactor (Section 9.3.6.2), and therefore the incremental impact from operating a new power plant at the South Britton site would be minor (see Section 9.3.6.2). Consequently, the hydrologic impacts on aquatic habitat in Lake Erie from water withdrawal should be minimal.

Maintenance dredging of the water intake area would likely be necessary to maintain appropriate operating conditions for cooling water intake. Such dredging would be managed under permits from USACE and MDEQ, and could result in temporary localized increases in turbidity in the vicinity of the intake bay. Dredged material is expected to be disposed of in a spoil disposal pond, where sediment would settle out prior to discharge of the water back into Lake Erie as allowed and managed under existing NPDES permit regulations. The periodic dredging of the intake bay would result in minor impacts on aquatic biota and habitats in Lake Erie.

The effect of impingement and entrainment of aquatic organisms from Lake Erie was evaluated by the review team. Entrainment may result in mortality to zooplankton and phytoplankton. In addition, data from the Fermi 2 cooling water intake system (Section 5.3.2) suggests that demersal and pelagic fish species in Lake Erie would be vulnerable to entrainment and impingement. Particularly vulnerable are early life stages of fish (eggs and larvae), which lack the ability to overcome intake suction and which are small enough to pass through the mesh of the intake screens. The use of fish screens and a closed cycle recirculating cooling system as proposed by Detroit Edison would reduce water use and physical damage to aquatic organisms and decrease the impingement and entrainment of organisms (Section 5.3.2). Based on the assumption of a closed cycle cooling system that meets the EPA's CWA Section 316(b) Phase I regulations for new facilities, anticipated impacts on aquatic populations from entrainment and impingement are expected to be minor.

Discharge would include warm cooling tower blowdown, treated process wastewater, and processed radwaste wastewater, all of which could affect aquatic biota through mortality or sublethal physiological, behavioral, and reproductive impairment. In addition, aquatic organisms may be affected by cold shock and the scouring of benthic habitat near the discharge pipeline (see Section 5.3.2). However, proposed design features such as the presence of riprap around the submerged discharge ports and orientation of the discharge ports in an upward direction are intended to reduce scouring (Detroit Edison 2011a). As identified in Section 9.3.6.2, an NPDES permit from MDEQ would be required for discharges from a new nuclear power plant at the South Britton site. Such a permit would likely specify limits for chemical and thermal discharges in order to protect water quality, thereby limiting the potential for impacts on aquatic organisms. Given the length of pipeline that would be required for a discharge system, at least partial temperature attenuation may take place prior to discharge into Lake Erie (see Section 9.3.6.2). Assuming that NPDES permitting requirements are met, the impacts of discharges on aquatic habitats and biota would be minor.

Impacts on aquatic resources from operation of a new reactor at the South Britton site may include those associated with maintenance of transmission line corridors. The review team assumed that ITC*Transmission* would construct and operate any new transmission line needed to service a new reactor at the South Britton site, and it is assumed that it would follow current maintenance practices designed to minimize impacts on ditches, creeks, rivers, and wetlands, such as minimizing disturbance to riparian habitat and minimizing the application of pesticides and herbicides, which can enter aquatic habitat and adversely affect aquatic biota (Detroit Edison 2011a). Although impacts of transmission line corridor maintenance would depend, in part, on the types and extent of aquatic habitat located near the transmission line, impacts on aquatic habitats and biota from maintenance of transmission lines would likely be minor as long as maintenance practices currently followed by ITC*Transmission* are implemented.

Threatened and endangered aquatic species potentially found in surface waters located along the transmission line and cooling water intake and discharge pipelines could be adversely affected by maintenance activities. The potential for impacts on threatened and endangered aquatic species could be minimized by avoiding streams and following BMPs. Threatened or endangered mussels, including the round hickorynut, threehorn wartyback, lilliput, snuffbox mussel, and rayed bean, could be present in Lake Erie, and these species could be vulnerable to cooling water intake and discharge impacts. As eggs, mussels are not likely to be affected by operations because they are not free-floating, but rather develop into larvae within the female. Mussels in the glochidial stage, during which juveniles attach to a suitable fish host, are vulnerable indirectly through host impingement and entrainment. Hosts for the snuffbox mussel (logperch), lilliput (several species of Centrachids), and rayed bean (largemouth bass [*Micropterus salmoides*]) are present in Lake Erie and could be impinged during reactor operations. Fish hosts for the round hickorynut and threehorn wartyback are not known. Post-glochidial and adult stages of mussels are not likely to be susceptible to entrainment because they bury themselves in sediment.

The State-listed channel darter and eastern sand darter may be less likely to be entrained because they bury themselves in sediment and remain near the bottom. The State-listed sauger is not common in Lake Erie, but lake sturgeon were historically observed to spawn along the shoreline of Lake Erie in Monroe County, and early life stages may be vulnerable to entrainment and impingement. However, spawning activity in this area appears to have diminished or ceased since the 1970s (Goforth 2000). None of these species were observed during impingement and entrainment studies conducted during 2008 and 2009 (AECOM 2009) at the Fermi 2 intake in Lake Erie. Consequently, it is unlikely that significant numbers would be affected by the cooling water intake of a new reactor at the South Britton site. Overall, impacts on threatened and endangered species from reactor operations are expected to be minor.

Cumulative Impacts

Past, present, and reasonably foreseeable projects, facilities, and other environmental changes that may contribute to cumulative impacts on aquatic resources in the area include the activities and projects shown in Table 9-36 and current and future ecosystem changes resulting from climate change, introduced dreissenid mussels, and recreational and commercial fishing.

As discussed above, potential building-related impacts on aquatic habitat and biota could result from altered hydrology, erosion, stormwater runoff of soil and contaminants, and disturbance or loss of benthic habitat from construction of the reactor, associated transmission lines, and water intake and discharge system. Urbanization can affect aquatic resources by increasing impervious surfaces, non-point-source pollution, and water use, as well as altering riparian and in-stream habitat and existing hydrology patterns. Development of a new reactor on the South Britton site and the other projects in the region could result in an increased human population and additional urbanization with subsequent impacts on aquatic resources.

The primary operational impacts on aquatic habitat and biota could result from makeup water needs, transmission line maintenance, alteration in water quality from cooling water discharge, and impingement and entrainment of aquatic biota during cooling water intake. Impingement and entrainment of aquatic biota from Lake Erie resulting from operations of a new reactor must be considered along with mortality resulting from existing power plants that already withdraw water from Lake Erie, from commercial and recreational fishing, and from introduced zebra mussels and quagga mussels, which have dramatically reduced plankton abundance in the region. Commercially important species that have been the target of restoration efforts in Lake Erie such as yellow perch and walleye occupy nearshore areas and could be vulnerable to cooling water intake.

Operational cooling water requirements would be the major water demand from a new nuclear power plant on surface water resources. As described above, the water available from Lake Erie would be sufficient to support the makeup water needs of a new reactor in addition to the cooling water needed by existing power plants and other projects listed in Table 9-36 (Section 9.3.6.2). However, as described in Section 7.2.1, climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. If such a reduction in surface water were to occur, aquatic habitats on the South Britton site and in Lake Erie may be altered or eliminated with potentially adverse consequences for aquatic habitats and biota.

Discharges into Lake Erie from a new nuclear power plant at the South Britton site must be considered together with discharges into Lake Erie from the other projects identified in Table 9-36. Contaminant loads in Lake Erie may be reduced in the future by the Great Lakes Restoration Initiative, which attempts to (1) clean up toxics and areas of concern, (2) protect watersheds from polluted runoff, and (3) restore wetlands (see http://greatlakesrestoration.us/).

However, if climate change results in reduced water levels and increased water temperatures, the impacts associated with contaminant concentrations and thermal stress from cooling water discharge into Lake Erie could also increase. As identified in Section 9.3.6.2, the overall cumulative surface water quality impacts associated with a new nuclear power plant at the South Britton site together with other past, present, and reasonably foreseeable actions in the region are expected to be minor because of the expected localized extent of the impacts from projects and the adherence to BMPs and permitting requirements designed to avoid or minimize impacts. NPDES permits would also limit chemical and thermal discharges into Lake Erie. Similarly, the incremental contribution of a new reactor at the South Britton site to cumulative impacts on aquatic biota from water quality changes due to operational discharges would also be minor.

Based on its evaluation, the review team concludes that the cumulative impacts on aquatic resources, including threatened or endangered species, could be substantial due to continued inadvertent introduction of invasive species, overfishing, and increased urbanization resulting in further degradation of water quality and global climate change. The incremental impact from building and operating a new power plant at the South Britton site would not contribute significantly to the overall cumulative impacts in the geographic area of interest.

Summary of Impacts on Aquatic Resources at the South Britton Site

Impacts on aquatic habitats and associated biota at the South Britton site could result from reactor, transmission line, and cooling water intake pipeline preconstruction and construction activities. However, the impacts on aquatic organisms would be temporary and could be largely mitigated by avoiding aquatic habitats during siting of facilities and activity areas and through the use of BMPs during preconstruction and construction activities.

Operational impacts on aquatic resources could result from cooling water consumption, transmission line and cooling water system maintenance, alteration of water quality by cooling water discharge, and impingement and entrainment of aquatic biota by the cooling water system. Impingement and entrainment from the nearshore environment of Lake Erie would add to existing mortality sources for aquatic biota, such as invasive species, commercial and recreational fishing, and the operation of other power plants using water from or discharging into Lake Erie.

Impingement and entrainment of aquatic organisms would be minimized by complying with EPA's CWA Section 316(b) Phase I regulations. Water availability in Lake Erie is adequate to support the makeup water needs of a new reactor. However, climate change could noticeably decrease the availability of surface water resources in the Great Lakes region. Similarly, while a NPDES permit would limit chemical and thermal discharges, climate change has the potential to increase impacts of the discharges on aquatic communities. Transmission line and cooling water pipeline maintenance impacts on aquatic habitat and biota could be minimized by implementing BMPs.

State-listed fish and mussels may be found in the River Raisin drainage (tributaries of which flow through the site), in Lake Erie, or in aquatic habitat located along the transmission line or cooling water system corridors. Avoiding streams and implementing BMPs would reduce the probability of impacts associated with construction activities. As a mitigation action, surveys should be conducted for threatened and endangered mussels in aquatic habitats that would be affected by preconstruction and construction activities, and any individuals found should be relocated before initiating building activities. The potential for entrainment and impingement of listed aquatic species in Lake Erie is possible but not likely to be significant. Overall, minor impacts are expected on listed aquatic species from operations.

The review team's conclusion, based on the information provided by Detroit Edison and the review team's independent evaluation, is that the impacts on aquatic resources, including threatened or endangered species, from a new reactor at the South Britton site, considered together with cumulative impacts from other activities and climate change, would be MODERATE. Building and operating a new nuclear unit at the South Britton alternative site would not be a significant contributor to the overall cumulative impact.

9.3.6.5 Socioeconomics

The economic impact area for the South Britton alternative site is a two-county area, including Lenawee and Monroe Counties, Michigan. The site is located in the rural county of Lenawee. The nearest residential concentrations are the Cities of Tecumseh and Adrian, 5 and 13 mi west of the South Britton site, respectively, although several smaller towns and villages are located in both Lenawee County and western Monroe County. The majority of the socioeconomic impacts are expected to occur in these two counties.

The site is also centrally located between larger urban areas, including the City of Monroe, approximately 20 mi east in Monroe County; the City of Ann Arbor, approximately 20 mi north of the South Britton site in Washtenaw County; the City of Toledo, approximately 25 mi south in Lucas County, Ohio; and the City of Detroit, approximately 45 mi northeast in Wayne County. Detroit Edison may also draw some of the construction and operations workers who currently reside in these larger metropolitan areas, depending on the skills and availability of the workforce, even though the commute for the workers would be longer.

Physical Impacts

Physical impacts include impacts on workers and the general public, noise, air quality, buildings, roads, and aesthetics. Because the physical impacts of building and operating a nuclear power plant are very similar between the proposed site and the alternative sites, the review team determined that as assessed for the Fermi 3 site, all physical impacts related to the South Britton site would be minor. See Sections 4.4.1 and 5.4.1 for a detailed discussion of physical impacts for Fermi 3.

Demography

The South Britton site is located in Ridgeway Township, Lenawee County, 4 mi east of Tecumseh and approximately 1 mi west of the Monroe County border. The eastern portion of Lenawee County, where the South Britton site is located, is rural. Most of Lenawee County's population (i.e., 57 percent) is located along the State Route 52 corridor between Adrian and Clinton, including the Cities of Adrian and Tecumseh (Lenawee County Planning Commission 2002). The highest concentration of population in Monroe County is east along Lake Erie, including the City of Monroe and adjoining township of Frenchtown Charter, and in Bedford Township, near the southern border of Monroe County and Lucas County, Ohio. Table 9-39 provides the 2000 Census population, the USCB's 2008 population estimate, and the projected 2020 population for these areas.[(a)]

Table 9-39. Demographics for Lenawee and Monroe Counties and Local Jurisdictions

County/City/Township	Population		
	2000 Actual	**2008 Estimate**	**2020 Projected**
Lenawee County	98,890	100,801	109,086[(a)]
City of Adrian	21,574	21,391	NA[(b)]
City of Tecumseh	8574	8610	NA
Monroe County	145,945	152,949	159,461
City of Monroe	22,076	21,374	22,475
Frenchtown Charter Township	20,777	20,925	21,868
Bedford Township	28,606	31,141	31,669

Source: The 2020 projections for Monroe County and townships within Monroe County are provided by SEMCOG (2008). The projection for Lenawee County is provided by the Lenawee County Planning Commission (2002). The 2008 estimates are from the USCB, Population Estimates Program (USCB 2009a), which also includes the 2000 data from the 2000 Census of Population and Housing.

(a) Lenawee County used three different methods to project its population in 2020 (Lenawee County Planning Commission 2002). The projection presented is an average of the three methods.

(b) NA = Population projections are not available for these jurisdictions.

(a) During the preparation of this draft EIS, the results of the mandated U.S. decadal census for 2010 were being released in topical and regional data sets. While the USCB has not issued all the data sets in final form, some of the preliminary information was considered by the review team. While some of the final data sets were released for national scale information, most of the fine-scale information is still under review by the Department of Commerce and other Federal agencies. The review team is not aware of information that appears to be inconsistent with the earlier information sets and those sets projected from the earlier census.

Detroit Edison estimates that the size of the construction workforce needed for the nuclear power plant over a 10-year construction period would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, and that the average size of the onsite workforce during the 10-year construction period would be approximately 1000 workers (Detroit Edison 2011a).

The review team's assumptions for in-migrating and local workers are similar to those for the Fermi 3 plant site. Although the plant is located in a rural area, it is also within commuting distance of highly urbanized areas, including Toledo, Detroit and Ann Arbor, as discussed above. Therefore, for comparative purposes between analyses of the site alternatives, the review team based the analysis of this site upon the assumptions presented in Section 4.4.2 of this EIS, with approximately 15 percent of the construction workforce (approximately 435 workers during the peak construction and 150 workers on an average annual basis) expected to relocate within a 50-mi radius of the project site.

If the facility were to be built at the South Britton site and operations commenced, Detroit Edison expects an operations workforce of 900 workers in 2020 (Detroit Edison 2011a). For similar reasons, the review team determined that based on the analysis of impacts presented in Section 5.4.2, approximately 30 percent of the operations workforce (approximately 270 workers) would relocate within a 50-mi radius of the project site.

Based on an average household size of 2.6, which is the national average household size in the USCB's 2008 population estimate, the total in-migrating population during the peak construction period is estimated to be approximately 1131 persons and less during periods of non-peak construction. The projected population increase associated with the in-migrating operations workers is estimated to be 702 persons.

If all the in-migrating construction workers and their families settled in either Lenawee or Monroe County for the 2-year peak construction period, the projected increase would be less than 1 percent of the projected 2020 population for these counties. Demographic impacts during periods of non-peak construction would be less. The in-migrating construction workers and their families would likely settle in various cities and townships throughout the two-county area, and the population effects are expected to be minimal. The projected population increase for the operations workforce would be less than that projected for the peak construction period, and would also be less than 1 percent of the projected 2020 population for the two-county area.

Given the small number of in-migrating workers compared to the projected 2020 population for Lenawee and Monroe Counties, the review team concludes that the demographic impact during peak construction and operation would be minor.

Economic Impacts on the Community

Economy

The following provides an analysis of each of the two counties within the economic impact area.

Lenawee County. There were 44,429 employed workers in Lenawee County in 2008 (USBLS 2009) (see Table 9-40). Approximately 25 percent of the jobs were in educational services, health care, and social assistance. Manufacturing and retail trade employed approximately 21 percent and 11 percent, respectively (USCB 2009b). The four largest employers in Lenawee County are Promedica Health Systems, with approximately 1062 employees; Lenawee County, with approximately 657 employees; Michigan Department of Corrections, with approximately 587 employees; and Adrian Mall (stores and management) with approximately 500 employees (Lenawee Economic Development Corporation 2010). Lenawee County has a number of manufacturing companies, many of which specialize in plastics and has a strong agricultural base, having the largest number of farms of any county in Michigan with the highest revenue in the State for corn, soybeans, and wheat (Lenawee Economic Development Corporation 2010).

Table 9-40. Labor Force Statistics for Monroe, and Lenawee Counties (2000 and 2008)

	Monroe County		Lenawee County	
	2000	**2008**	**2000**	**2008**
Total labor force	77,194	76,285	51,699	49,278
Employed workers	74,756	69,471	49,769	44,429
Unemployed workers	2438	6814	1930	4849
Unemployment rate	3.2	8.9	3.7	9.8

Source: USBLS 2009

Between 2000 and 2008, Lenawee County lost jobs (USBLS 2009). Job losses occurred in most of the sectors, including agriculture, forestry, fishing and hunting, mining, construction, manufacturing, and retail trade. Growth occurred in the professional, scientific, management, and administrative fields; waste management services; educational services; and health care and social assistance sectors of the economy (USCB 2000a, 2009b). In 2008, an estimated 2402 jobs existed in the construction industry (USCB 2009b). Between 2000 and 2008, the unemployment rate for the county increased from 3.7 percent to 9.8 percent. The unemployment rate has continued to increase, with the USBLS reporting an unemployment rate of 15.6 percent for Lenawee County in 2009 (USBLS 2010).

Monroe County. There were nearly 70,000 workers in Monroe County in 2008 (USBLS 2009) (see Table 9-40). Approximately 40 percent of the jobs in Monroe County are in manufacturing, educational services, health care, and social assistance sectors (USCB 2009b). The four largest employers in Monroe County in 2007 were Detroit Edison, with approximately 1500 employees; Mercy Memorial Hospital, with approximately 1300 employees; the supermarket chain Meijer Inc., with approximately 1025 employees; and the Monroe Public Schools school district, with approximately 1000 employees (Monroe County Finance Department 2008). Manufacturing businesses in Monroe County include Johnson Controls (720 employees), La-Z-Boy Incorporated (522 employees), Tenneco Automotive (500 employees), Gerdeau Macsteel (450 employees), Holcim (US) Inc. (cement, 350 employees), TWB Company (automotive body parts, 303 employees), and MTS Seating (300 employees) (Monroe County Chamber of Commerce 2010).

Between 2000 and 2008, Monroe County lost jobs in manufacturing, construction, and retail and wholesale trade but did experience growth in other sectors, for a net gain in jobs between 2000 and 2008 (USCB 2000a, 2009b). In 2008, the construction industry supported 4816 jobs. The USBLS reported a rise in unemployment from 3.2 percent in 2000 to 8.9 percent in 2008. The unemployment rate has continued to increase, with the USBLS reporting an unemployment rate of 14.8 percent for Monroe County in 2009 (USBLS 2010).

The economies of Lenawee and Monroe Counties would benefit over the estimated 10-year construction period through direct purchase of materials and supplies and direct employment of the construction workforce. Detroit Edison expects the size of the construction workforce would range from a minimum of 35 workers to a peak construction workforce of 2900 workers, averaging to an annual onsite construction workforce of 1000 workers. Based on an average salary estimate of $50,500, approximately $50.5 million would be directly expended in payroll annually during the construction period.

Detroit Edison expects direct employment when the plant becomes operational to be 900 full-time and contract employees. In addition, Detroit Edison estimates 1200 to 1500 workers would be employed during scheduled outages, which would occur every 24 months and require workers for a period of about 30 days. Based on an average salary estimate of $63,625, approximately $57.3 million would be expended directly in payroll annually during the plant's 40-year operating license. In addition, every 24 months, an additional $6.3 to $7.9 million in payroll would be expended for the plant's outage workforce.

New workers (i.e., in-migrating workers and those previously unemployed) would have an additional indirect effect on the local economy, because these new workers would stimulate the regional economy through their spending on goods and services in other industries.

Additional expenditures would be needed for construction of the transmission lines from the nuclear power plant at the South Britton site to the existing transmission and distribution network. The local economy would benefit from the direct purchase of materials and supplies for the transmission line construction and the employment of workers to support the construction and operation of these lines.

Taxes

Construction and operation of a plant at the South Britton site would result in increased tax revenues to State and local governments. State income tax revenue would accrue primarily through income taxes on salaries of the new workers (i.e., in-migrating workers and those previously unemployed). Based on an estimated annual average of 362 new workers (i.e., 150 in-migrating and 212 previously unemployed) residing in the two-county area during the 10-year construction period, and an average salary of $50,500, the State of Michigan would receive an estimated $0.7 million in income tax revenue annually during the construction period. Estimated income tax revenue reflects the State income tax rate as described in Sections 2.5, 4.4, and 5.4. Based on an estimated annual average of 327 new workers (i.e., 270 in-migrating and 57 previously unemployed) for operation of the plant, and an average salary of $63,625, the State of Michigan would receive an estimated $0.8 million in income tax revenue annually during the period of the 40-year operating license. The State of Michigan would also receive tax revenue through increased sales expenditures by workers and for the plant construction, operation and maintenance, and business taxes during operation.

Property tax revenue would be the primary tax benefit to the local jurisdictions. The plant would be assessed during the construction period and be at its highest assessed value when it becomes operational. For purposes of analysis, the review team recognizes that the full estimated construction cost of $6.4 billion for a nuclear power plant of 1605 MW(e), as discussed in Section 4.4.3.1, may not be the actual assessed value for property tax purposes. However, for comparative purposes in this alternative sites analysis, the review team based its conclusions upon this construction cost estimate. In 2009, the assessed value of all taxable property in Lenawee County was $4.2 billion (Michigan Department of Treasury 2009).. Consequently, with completion of the construction of a nuclear power plant at the South Britton site, the total assessed property value in Lenawee County would be increased by about 150 percent. The review recognizes that this would be an upper bound to the assessed value of the property and that a fee in lieu of agreement or other considerations may significantly reduce that assessed value. However, the review team believes that the property tax impact on Lenawee County would be substantial and beneficial.

Summary of Economic Impacts and Taxes

Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the impact of building activities on the economy would be substantial and beneficial in Lenawee County and minor and beneficial elsewhere. The impact of tax revenue would be substantial and beneficial in Lenawee County and minimal and beneficial elsewhere. An annual average of 150 new construction workers would relocate into

Lenawee and Monroe Counties, and 212 workers who are currently unemployed would be employed for construction and preconstruction over the 10-year construction period. A portion of the estimated $6.4 billion construction cost of the nuclear power plant would be spent on materials and supplies in Lenawee and Monroe Counties. Tax revenue to the State and local jurisdictions would accrue through personal income, sales, and property taxes and would have the largest benefit on the local jurisdictions within Lenawee County.

During operations at the South Britton site, an estimated 270 new operations workers would relocate into the area, and 57 workers who are currently unemployed would be employed in operating the plant. Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the economic impact of operating a nuclear power plant at the South Britton site, including tax revenues, would be substantial and beneficial in Lenawee County and minimal and beneficial elsewhere.

Infrastructure and Community Services

<u>Traffic</u>

The primary transportation route servicing the South Britton site is M-50. M-50 is an east-west route, which would border the site on the northeast side. M-50 extends east to the City of Monroe, in Monroe County, and west to the City of Tecumseh, before heading north toward Jackson, Michigan. M-50 also connects with U.S. Route 23, which provides access to the Ann Arbor MSA further north and to the Toledo MSA to the south. In the City of Monroe, M-50 connects to Interstate 75 (I-75), which leads north to Detroit and south to Toledo. The site is also served by numerous local roadways. Two local roadways cross the site: Pocklington Road (east-west) and Downing Highway (north-south). A spur from the mainline of the Norfolk Southern railroad would provide railway access to the site.

Local roadways may need to be upgraded to support the level of traffic generated by the plant construction and operation. In addition, unlike the Fermi site, the South Britton site would require two roads that cross the site to be abandoned and rerouted to accommodate the building footprint and exclusion boundary. New road construction would require further analysis to determine whether local, terrestrial, aquatic, and wetland resources would also be affected depending on the reroutes identified and selected. Based on review of area maps, the review team believes such rerouting could affect local streams or rivers. Detroit Edison, in coordination with MDOT and the Lenawee County Road Commission, would need to conduct a transportation study that evaluates the roadway impacts and traffic impacts and identifies the need for any road and/or bridge upgrades, the effects of roadway abandonments for site development, and mitigating strategies, such as road upgrades and/or road reroutes that would (1) mitigate impacts on transportation routes and (2) mitigate traffic impacts to an acceptable level. For the above stated reasons, the review team expects that traffic impacts from building activities and operations, including construction workers, operations workers, and deliveries, could be substantial and potentially destabilizing, and would warrant mitigation in coordination with MDOT, the Lenawee County Road Commission, and USACE and MDEQ if waters of the United States and/or State-regulated waters would be affected.

Recreation

Recreational resources in Lenawee and Monroe Counties may be affected by construction and operation of a plant at the South Britton site. Impacts may include increased user demand associated with the projected increase in population from the in-migrating workforce and their families; an impaired recreational experience associated with the views of the proposed 600-ft cooling tower and condensate plume; or access delays associated with increased traffic from commuting of the construction and operations workforces and deliveries of goods and materials during construction on local roadways.

Three State parks (W.J. Hayes State Park, 654 ac; Lake Hudson State Park, 2700 ac; and Cambridge Historic State Park, 181 ac) and six county parks are located in Lenawee County. In addition, numerous city, village, and township parks are located throughout the county (Lenawee County Park and Recreation Commission 2010). Water resources in the county used for recreation include the River Raisin, which flows into Monroe County and is designated by MDNR as “readily canoeable,” and numerous lakes, ponds, streams, and rivers. The Irish Hills is a scenic recreational area in the northeastern part of Lenawee County and contains rolling hills and more than 50 lakes.

State recreational areas in Monroe County total 7413 ac and include Sterling State Park and three game areas – Point Mouille State, Petersburg State, and Erie State – as well as several boat access sites and road rest areas. In addition, numerous county, township, village, and city recreational areas are located throughout the county.

The recreational area nearest to the South Britton site is the River Raisin, the main parts of which are 5 mi south and 6 mi west of the site.

Local residences, traffic on M-50, and users of recreational resources in the vicinity of the South Britton site may be affected by the views of the 600-ft cooling tower and condensate plume that would occur during operation of the plant under certain meteorological conditions. The nuclear power plant and 600-ft cooling tower and condensate plume would be visible in a wide area, because the topography in the vicinity of the site is flat. Because the South Britton site is a greenfield site, the visual intrusion of the cooling tower and other structures would offer a unique visual experience that the review team considers to be noticeable and adverse.

The review team determined the impacts associated with the increased use of the recreational resources in the vicinity and region would be minimal. The projected increase in population in the three-county area associated with in-migrating workers and their families for construction and operation is less than 1 percent of the projected 2020 population and would not affect the availability and use of recreational resources in the area.

People using recreational facilities near the site might experience traffic congestion on the roads during the construction period, during morning and afternoon commutes of the operations workforce, and during the scheduled maintenance and forced outage periods. Measures to mitigate traffic impacts would be needed and would alleviate impacts on users of recreational facilities as well as members of the general public.

Housing

As shown in Table 9-41, an estimated 106,746 housing units are located within Lenawee and Monroe Counties, based on the USCB 2008 estimate of housing. An estimated 10,777 housing units are vacant. In the 2000 census of housing, approximately 50 percent of the vacant housing units in Lenawee County were units used for seasonal, recreational, or occasional purposes. In Monroe County, approximately 13 percent of the vacant housing units were used for seasonal, recreational, or occasional purposes. The number of vacant units in Lenawee County has increased from 3839 to 5833 between 2000 and 2008; and in Monroe County, from 2699 to 4944. If the proportion of vacant housing units used for seasonal, recreational, or occasional purposes remains consistent in these two counties, an estimated 7217 units would be available for rent or sale.

Table 9-41. Housing Units in Lenawee and Monroe Counties (2008 Estimate)

Housing Units	Lenawee County	Monroe County
Total Housing Units	43,017	63,729
Occupied	37,184	58,785
Owner-occupied (units)	29,485	46,849
Owner-occupied (percent)	79	80
Renter-occupied (units)	7699	11,936
Renter-occupied (percent)	21	20
Vacant	5833	4944
Vacancy Rate		
Homeowner (percent)	2.8	1.8
Rental (percent)	4.5	5.6

Source: USCB 2009d

Demand for housing is expected to be highest during the peak construction period. Based on the analysis of impacts presented in Section 4.4.2, most of the construction and operations workforces would already reside in the area and so would be accommodated in existing housing. Approximately 15 percent of the peak building-related workforce (approximately 435 workers during the peak construction) and approximately 30 percent of the operations workforce (approximately 270 workers) would be expected to relocate within a 50-mi radius of the project site. Considering that the construction workforce may choose short-term accommodations, such as campsites or hotels, the review team expects that the existing housing supply would be sufficient to accommodate the construction workforce of 435 workers during the peak construction period and the operations workforce of 270 workers in-migrating to the area without affecting the housing supply or prices in the local area or stimulating new housing construction. Therefore, the impacts on housing would be minor.

Public Services

In-migrating construction and operations workers and their families would increase the demand for water supply and wastewater treatment services within the communities where they choose to reside; the size of the total construction and operations workforce also would increase the demand for water supply and wastewater treatment services at the South Britton site.

The rural areas of Lenawee County receive potable water through private wells and use private waste disposal systems for treatment of sanitary wastewater (Lenawee County Planning Commission 2002). The four cities in Lenawee County (Adrian, Hudson, Morenci, and Tecumseh) and seven of the eight villages (Addison, Blissfield, Britton, Cement City, Clinton, Deerfield, and Onsted) are served by both municipal water supplies and wastewater treatment services. The Village of Clayton does not have a municipal water supply system, but does have wastewater treatment (Lenawee County Planning Commission 2002).

Several municipal water suppliers provide water to residents of Monroe County, including the City of Monroe; Frenchtown Charter Township; the City of Toledo, Ohio; and the DWSD. Residents outside of these municipal suppliers obtain water through private wells (Monroe County Planning Department and Commission 2010).

Wastewater treatment services are provided by a number of municipalities in Monroe County, including the City of Monroe; Frenchtown Charter, Monroe Charter, Berlin, Ash, and Ida Townships; Cities of Milan, Petersburg, and Luna Pier; and Villages of Dundee, Estral Beach, Carleton, South Rockwood, and Maybee. Other residents within the county are served by private onsite wastewater disposal systems (Monroe County Planning Department and Commission 2010). The City of Petersburg serves the city and the Summerfield High School complex, which is located in Summerfield Township, just outside the city limits.

The water supply and wastewater treatment systems within the two-county area should be able to accommodate the in-migrating construction and operations workforces and their families, which would represent less than 1 percent of the projected populations in 2020.

Increased demand for police, fire response, and health care services from the in-migrating construction and operations workforces and their families are also expected to be accommodated within the existing systems. Given the number of jurisdictions within the three-county area, the new workers in-migrating into the area from building and operating a nuclear plant at the South Britton site would have a negligible impact on capacity of any of the public services within the three-county area.

However, currently no service is available to support the workforce at the plant site. Detroit Edison would need to develop private water supply and waste disposal systems or develop water supply and sewer lines to the South Britton site. In either case, the review team believes that the potable water supply and waste disposal service needed for operations of a nuclear power plant at the South Britton site would be minimal.

For the reasons discussed above, the review team determines the impact on public services from a South Britton power plant would be minimal.

Education

Numerous public school districts are located throughout Lenawee and Monroe Counties, including 13 public school districts in Lenawee County (Addison, Adrian, Blissfield, Britton-Macon, Clinton, Deerfield, Hudson, Lenawee, Madison (Lenawee), Morenci, Onsted, Sand Creek, and Tecumseh) with a combined enrollment of 18,107 students; and 9 public school districts in Monroe County (Airport Community, Bedford, Dundee, Ida, Jefferson, Mason Consolidated (Monroe), Monroe, Summerfield, and Whiteford Agricultural) with a combined enrollment of 23,913 students (U.S. Department of Education 2010). As stated in Section 4.4.4.5, approximately 202 school-age children are expected to in-migrate into the 50-mi region during construction activities, and 124 school-age children are expected to in-migrate for operations. Given the number of schools and the total student enrollment, the new students in-migrating into the area as a result of constructing and operating a nuclear plant at the South Britton site would have a negligible impact on the capacity of school systems within the two-county area.

Summary of Impacts on Infrastructure and Community Services at the South Britton Site

From the information provided by Detroit Edison, review of existing reconnaissance level documentation, and its own independent evaluation, the review team concludes that the impact of building and operations activities on regional infrastructure and community services – including housing, water and wastewater facilities, police, fire, and health care services, and education – would be minor. The visual impacts under recreation would be noticeable and adverse. The estimated peak workforce of 2900 would have a substantial and adverse impact on traffic on local roadways near the South Britton site. These traffic-related impacts could be reduced but not eliminated with proper planning and mitigation measures.

Cumulative Impacts

The geographic area of interest for analysis of cumulative socioeconomic impacts of the South Britton site includes Lenawee and Monroe Counties, where most of the socioeconomic impacts of construction and operation of the South Britton site are expected to occur.

The impact analyses presented for the South Britton site are cumulative. Past and current economic impacts associated with activities listed in Table 9-36 already have been considered as part of the socioeconomic baseline or in the analyses discussed above for the South Britton site. Construction and operation of the South Britton plant could result in cumulative impacts on the demographics, economy, and community infrastructure of Lenawee and Monroe Counties, in conjunction with those reasonably foreseeable future actions shown in Table 9-36, and generally result in increased urbanization and industrialization.

However, many impacts, such as those on housing or public services, are able to adjust over time, particularly with increased tax revenues. Furthermore, State and county plans, along with modeled demographic projections, include forecasts of future development and population increases. Because the projects within the geographic area of interest identified in Table 9-36 would be consistent with applicable land use plans and control policies, the review team considered the cumulative socioeconomic impacts from the projects to be manageable. Physical impacts include effects on workers and the general public, noise, air quality, buildings, roads, and aesthetics.

Based on the above considerations, Detroit Edison's ER, and the review team's independent evaluation, the review team concludes that under some circumstances, building the nuclear power plant at the South Britton site could make a temporary detectable adverse contribution to the cumulative effects associated with some socioeconomic issues. Those impacts would include physical effects (workers and the local public, noise, air quality, buildings, roads, and aesthetics), demography, and local infrastructure and community services (transportation; recreation; housing; water and wastewater facilities; police, fire, and medical services; and schools), and would be dependent on the particular jurisdictions affected.

The cumulative effects on regional economies and tax revenues would be beneficial and SMALL, with the exception of Lenawee County, which would experience a MODERATE and beneficial cumulative effect on the economy and a LARGE and beneficial cumulative effect from property taxes. The cumulative effects on physical impacts, demography, infrastructure, and community services would be SMALL within the 50-mi region, except for a LARGE and adverse cumulative effect on local traffic near the South Britton site during construction and operations and a MODERATE impact on the aesthetic aspect of recreation. Building and operating a new nuclear unit at the South Britton alternative site would be a significant contributor to the cumulative impacts.

9.3.6.6 Environmental Justice

The economic impact area for the South Britton alternative site is a two-county area, including Lenawee and Monroe Counties, Michigan. To evaluate the distribution of minority and low-income populations near the South Britton site, the review team conducted a demographic analysis of populations within the 50-mi region surrounding the proposed site in accordance with the methodology discussed in Section 2.6.1 of this EIS. The results of this analysis are displayed below in Tables 9-42 and 9-43 and Figures 9-18, 9-19, 9-20, and 9-21.

In general, the review team found the population within the 50-mi region surrounding the South Britton site to be similar in demographic distribution to the 50-mi region surrounding the proposed Fermi 3 site: rural, with few representative minority or low-income populations of interest outside the urban areas (for the South Britton site, these urban areas are the same as for the Fermi 3 site, with Detroit to the north and east near the border of the 50-mi region and Toledo about 20 mi to the south of the site). Because the review team identified Monroe and Lenawee Counties in Michigan as the economic impact area for the South Britton alternative site, the review team focused its analysis upon the minority and low-income populations within those counties. The review team identified several minority populations of interest surrounding the South Britton site at a distance of about 10 mi. These are the closest populations of interest to the alternative site. The review team identified a single population of interest about 15 mi to the east of the South Britton site.

Based on this analysis the review team determined that there do not appear to be any identified minority or low-income populations of interest in Monroe or Lenawee Counties that would be likely to experience disproportionate and adverse human health, environmental, physical, or socioeconomic effects as a result of construction or operation of a plant at the South Britton site. The review team did not identify any subsistence activities in the economic impact area or elsewhere in the 50-mi region. For the other physical and environmental pathways described in Section 2.6.1, the review team has determined that impacts at the South Britton site would be similar to those at the Fermi 3 site. Therefore, the review team has determined the environmental justice impacts of building and operating a nuclear reactor at the South Britton site would be SMALL.

9.3.6.7 Historic and Cultural Resources

This section presents the review team’s evaluation of the potential impacts of siting a new ESBWR at the South Britton site on historic and cultural resources. For the analysis of impacts

Table 9-42. Results of the Census Block Group Analysis for Minority Populations of Interest within the Region Surrounding the South Britton Alternative Site (50-mi radius)[(a)]

State/County	Total Census Block Groups	Number of Census Block Groups with Minority Populations of Interest					
		Black	American Indian	Asian	Pacific Islander	Hispanic	Aggregate
Michigan							
Calhoun	4	0	0	0	0	0	0
Hillsdale	41	0	0	0	0	0	0
Ingham	15	0	0	0	0	0	0
Jackson	134	11	0	0	0	0	11
Lenawee	87	1	0	0	0	5	1
Livingston	109	0	0	0	0	0	0
Macomb	6	0	0	0	0	0	1
Monroe	127	1	0	0	0	0	1
Oakland	485	64	0	3	0	0	70
Washtenaw	260	23	0	16	0	0	47
Wayne	1852	847	0	7	0	61	864
Ohio							
Defiance	4	0	0	0	0	0	0
Fulton	31	0	0	0	0	0	0
Henry	23	0	0	0	0	0	0
Lucas	434	99	0	0	0	9	102
Ottawa	24	0	0	0	0	0	0
Sandusky	14	0	0	0	0	0	0
Williams	20	0	0	0	0	0	0
Wood	77	0	0	0	0	0	0
Total	**3747**	**1046**	**0**	**26**	**0**	**75**	**1097**

Source: USCB 2011a
(a) Shaded rows indicate the economic impact area.

Table 9-43. Results of the Census Block Group Analysis for Low-Income Populations of Interest within the 50-Mi Region of the South Britton Alternative Site

State/County	Total Number of Census Block Groups	Number of Census Block Groups with Low-Income Populations of Interest	Percentage of Census Block Groups with Low-Income Populations of Interest
Michigan			
Calhoun	4	0	0
Hillsdale	41	0	0
Ingham	15	0	0
Jackson	134	9	6.7
Lenawee[(a)]	87	1	1.2
Livingston	109	0	0
Macomb	6	0	0
Monroe	127	1	0.8
Oakland	485	2	0.4
Washtenaw	260	33	12.7
Wayne	1852	347	18.7
Ohio			
Defiance	4	0	0
Fulton	31	0	0
Henry	23	0	0
Lucas	434	71	16.4
Ottawa	24	0	0
Sandusky	14	0	0
Williams	20	0	0
Wood	77	9	11.7
Total	**3747**	**473**	**12.6**

Source: USCB 2011b
(a) Shaded row indicates the economic impact area.

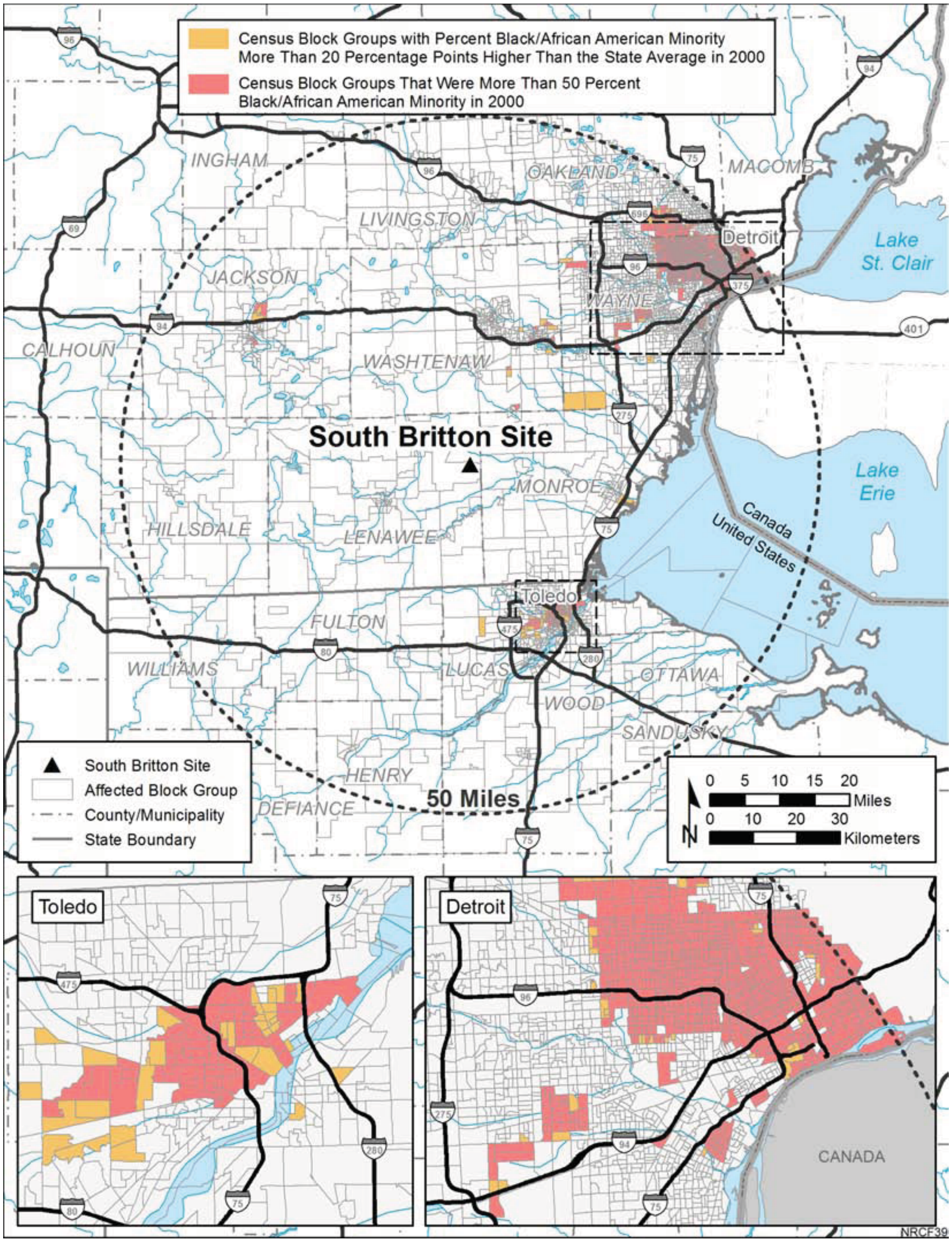

Figure 9-18. Black and African-American Minority Census Block Group Populations of Interest within a 50-mi Radius of the South Britton Site (USCB 2011a)

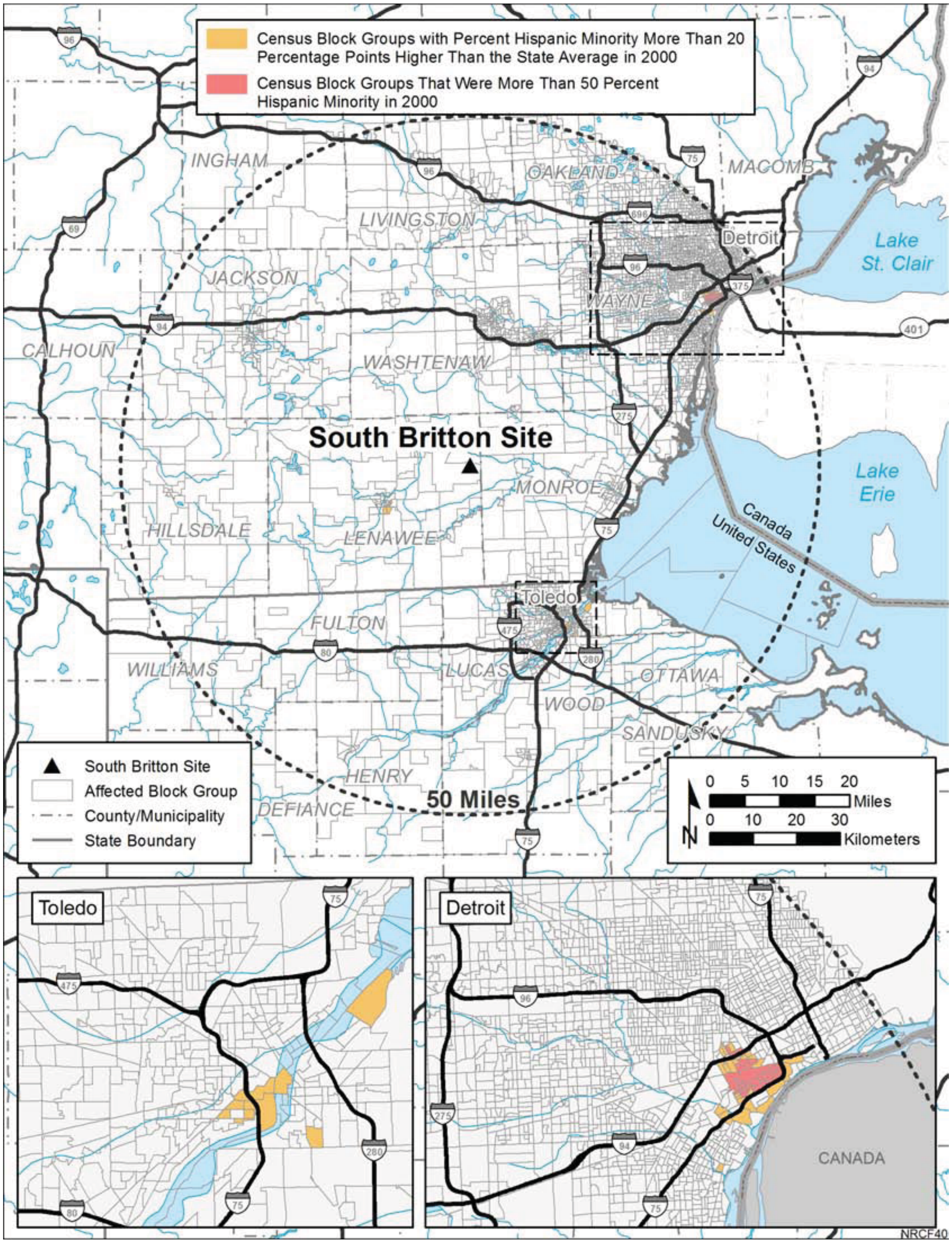

Figure 9-19. Hispanic Minority Census Block Group Populations of Interest within a 50-mi Radius of the South Britton Site (USCB 2011a)

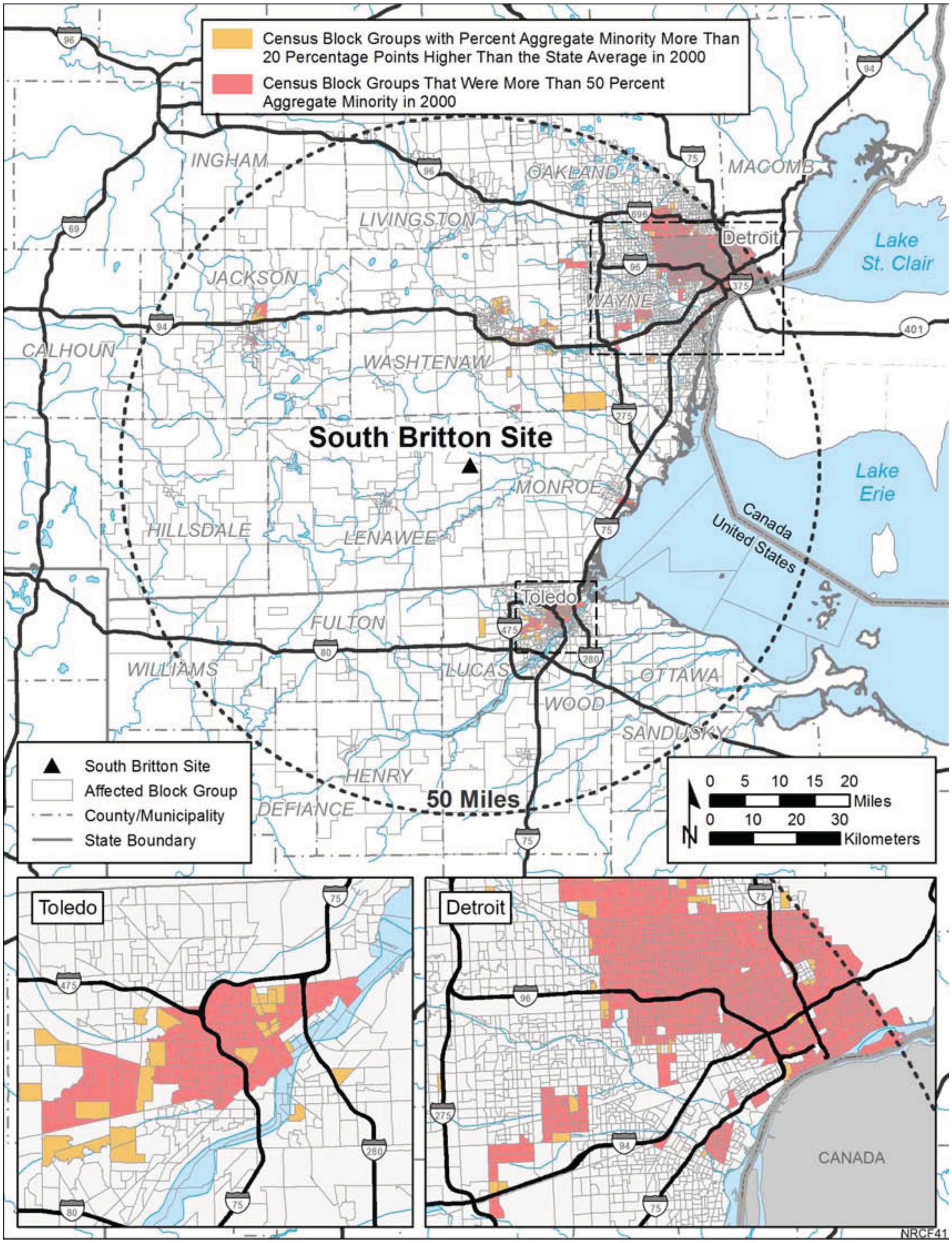

Figure 9-20. Aggregate Minority Census Block Group Populations of Interest within a 50-mi Radius of the South Britton Site (USCB 2011a)

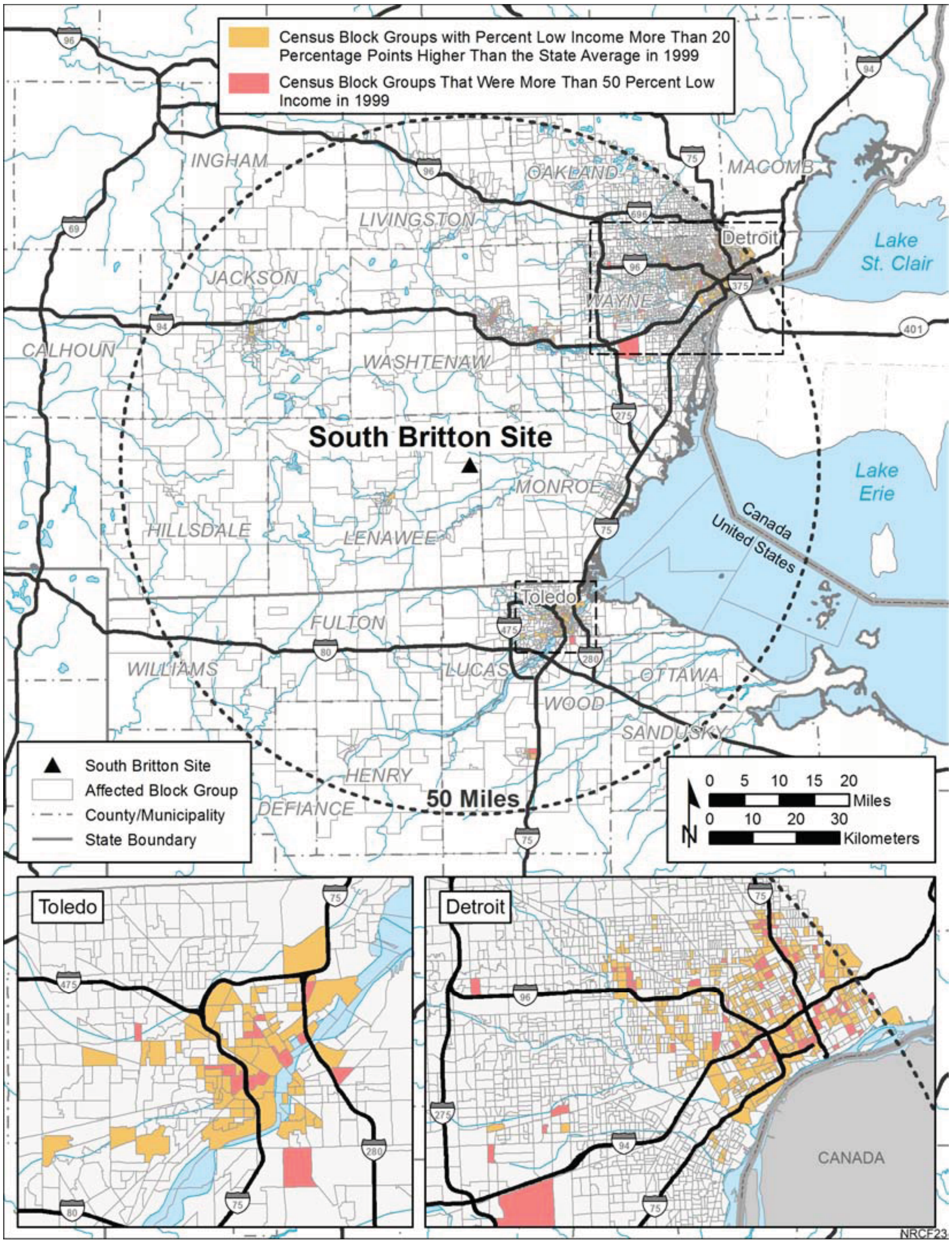

Figure 9-21. Low-Income Census Block Group Populations of Interest within a 50-mi Radius of the South Britton Site (USCB 2011b)

on historic and cultural resources, the geographic area of interest is considered to be the APE that would be defined for a new nuclear power facility at the South Britton site. This includes the physical APE, defined as the area directly affected by building and operating a new nuclear power plant and transmission lines, and the visual APE (i.e., the area from which the structures can be seen). The visual APE includes the physical APE and the area within a 1-mi radius of the physical APE.

The review team relied upon reconnaissance-level information to perform its alternative site evaluation. Reconnaissance-level activities in a cultural resources review have particular meaning. For example, these activities may include site file searches, background research for environmental and cultural contexts, and preliminary field investigations to confirm the presence or absence of cultural resources in an APE or the sensitivity of an APE for cultural resources. For the purposes of preparing this alternatives analysis, reconnaissance-level information is considered data that are readily available from Federal and State agencies and other public sources. The following sources were used to identify reconnaissance-level information on historic and cultural resources in the APE at the South Britton site:

- NPS's National Historic Landmarks Program database for designated National Historic Landmarks (NPS 2010a).
- NPS's NRHP database for properties listed in the NRHP (NPS 2010b).
- NationalRegisterofHistoricPlaces.com database for properties listed in the NRHP (NRHP 2010).
- Michigan's Historic Sites Online database for cultural resources significant to the State of Michigan (MSHDA 2010a).
- Detroit Edison's ER (Detroit Edison 2011a).
- *Cultural Resources Site File Review of Seven Alternative Sites in Monroe, Lenawee, St. Clair, and Huron Counties, Michigan, Fermi Nuclear Power Plant Unit 3 (Fermi 3) Project, Frenchtown and Berlin Townships, Monroe County, Michigan* (Lillis-Warwick et al. 2009).

No National Historic Landmarks or other historic properties listed in the NRHP were identified (NPS 2010a, b; NRHP 2010). Three previously recorded cultural resources have been identified within the APE for the South Britton site. Two are archaeological resources (Sites 20LE202 and 20LE203); one is an aboveground resource (La Plaisance Bay Pike). None of these previously recorded cultural resources have been included in, or determined eligible for inclusion in, the NRHP (Lillis-Warwick et al. 2009; MSHDA 2010f). Therefore, none of these three previously recorded cultural resources are considered a historic property, pursuant to Section 106 of the NHPA of 1966, as amended.

Archaeological Site 20LE202 is a prehistoric archaeological site of unknown function and unknown cultural period. Archaeological Site 20Le203 is also a prehistoric archaeological site of unknown function, with occupation and/or use dating from the Paleo-Indian, Archaic, and Late Woodland Periods. Both archaeological resources are located outside of the physical APE, but within the indirect (visual) APE. Neither of the two archaeological resources has been evaluated for NRHP eligibility (Lillis-Warwick et al. 2009).

La Plaisance Bay Pike (Site ID#P23945), is an early-nineteenth century road, begun in 1832 and completed in 1835, and extending from La Plaisance Bay along the Lake Erie shoreline near Monroe, in Monroe County, west to the Chicago Road at Cambridge Junction, Lenawee County. The alignment of La Plaisance Bay Pike appears to follow what is now State Route 50; a portion of this alignment extends roughly east to west across the indirect (visual) APE for the South Britton site. La Plaisance Bay Pike was used by early settlers moving into western Michigan. Its NRHP eligibility status is not known; it was listed on the Michigan SRHP in 1965, and the State of Michigan erected a historical marker for La Plaisance Bay Pike at the Tecumseh Community Center on State Route 50 near the Monroe County line in 1966 (MSHDA 2010f).

One historic property is in the general vicinity of the APE for the South Britton site, the Lenawee County Courthouse (Site ID#P23895), a late-nineteenth century courthouse building, which is 12 mi southwest of the APE at the South Britton site, in the town of Adrian, Lenawee County (Detroit Edison 2011a). The Lenawee County Courthouse was constructed in 1885 and represents an example of county courthouses and an important work by its architect, E.O. Fallis of Toledo, Ohio, who designed eight massive courthouses in the Midwest during the 1880s. The Lenawee County Courthouse was listed on the Michigan SRHP in 1974, and the State of Michigan erected a historical marker in front of it in 1981. It was subsequently listed in the NRHP in 1991 (MSHDA 2010g) and is considered a historic property, pursuant to Section 106 of the NHPA. This NRHP-listed property is outside of the indirect (visual) APE for the South Britton site.

No archaeological and/or architectural surveys have been conducted at the alternative site to identify additional cultural resources in the APE and/or to determine or confirm the significance (NRHP eligibility) of the previously identified cultural resources in the APE at the South Britton site. As currently designed, the proposed layout for a new nuclear facility at the South Britton site would not affect any of the previously identified cultural resources within the APE. However, potential water intake and discharge pipelines from Lake Erie have the potential to affect one of the previously identified cultural resources (i.e., La Plaisance Pike along State Route 50) and may result in disturbance or destruction of intact archaeological deposits associated with La Plaisance Pike during preconstruction activities. This portion of State Route 50 would have to be investigated to determine whether it aligns with the early to mid-nineteenth century La Plaisance Pike, determine the NRHP eligibility of any archaeological or aboveground resources associated with La Plaisance Pike, and determine the effect of potential pipelines on this resource pursuant to 36 CFR Part 800.

Additionally, the proposed layout for a new nuclear power facility at the South Britton site includes structures (buildings and cooling towers) and operational activities (condensation plumes) that would be new landscape elements within the APE at the South Britton site, including within viewsheds from the apparent alignment of La Plaisance Pike. The indirect (visual) effect of a new nuclear power facility at the South Britton site on historic and cultural resources in the indirect (visual) APE would have to be evaluated pursuant to 36 CFR Part 800.

Consultation with the Michigan SHPO would be necessary to determine the need for cultural resources investigations (including archaeological and architectural surveys) to identify cultural resources within the APE prior to any onsite ground-disturbing activities, to determine whether any identified cultural resources are eligible for inclusion in the NRHP, to evaluate the potential impacts on cultural resources and/or historic properties, and to determine the effect of a new nuclear power facility at the South Britton site pursuant to Section 106 of the NHPA. As part of this consultation, Detroit Edison would be expected to put measures in place to protect discoveries in the event that cultural resources are found during building or operation of a new plant. If an unanticipated discovery were made during building activities, site personnel would have to notify the Michigan SHPO and consult with them in conducting an assessment of the discovery to determine whether additional work is needed.

The incremental impacts from installation and operation of offsite transmission lines and potential water intake and discharge pipelines to Lake Erie would be minimal if there are no significant alterations (either physical alteration or visual intrusion) of the cultural environment. If these activities result in significant alterations of the cultural environment, then the impacts could be greater. Although building and operating potential water intake and discharge pipelines would be the responsibility of Detroit Edison, building and operation offsite transmission lines would be the responsibility of a transmission company. For impacts greater than small, mitigation may be developed in consultation with the appropriate Federal and State regulatory authorities. Only Federal undertakings would require a Section 106 review.

The APE at the South Britton site does not contain any Indian Reservation land (BIA undated). However, consultation with Federally recognized Indian Tribes in the State of Michigan would be necessary in accordance with Section 106 of the NHPA. Additionally, one Federally recognized Indian Tribe located outside the State of Michigan, the Forest County Potawatomi Community of Wisconsin, has indicated an interest in Lenawee County (NPS 2010c). As part of this consultation, the NRC would consult with all 12 Federally recognized Indian Tribes located within the State of Michigan (Michigan Department of Human Services 2001–2009), as identified for the Fermi site, and with the Forest County Potawatomi Community of Wisconsin.

The following cumulative impact analysis for historic and cultural resources considers building and operating a new nuclear power facility at the South Britton site. This analysis also considers other past, present, and reasonably foreseeable future actions that could affect historic and cultural resources, as identified in Table 9-36. The APE for the cumulative impact analysis for historic and cultural resources for the South Britton site consists of the alternative site area and any new transmission line corridors, and a 1-mi buffer area around the site and the corridors.

The South Britton site is predominantly agricultural land, with some small areas of second-growth woodland and two roads (Pocklington Road, east-west, and Downing Highway, north-south). No previous development (e.g., power plants, aboveground transmission lines, pipelines, railroads) has occurred onsite. Agricultural activities such as plowing, disking, and harvesting (whether historic or modern [mid-nineteenth to mid-twentieth century]) and logging or clearing of original forests (prior to the reestablishment of the existing second-growth woodland areas) are likely to have resulted in minimal subsurface disturbance, suggesting that at least some areas at the South Britton site, currently used for agricultural purposes, may have sustained minimal prior ground disturbance.

Additional past actions in the general vicinity of the South Britton site, as identified from Table 9-36, may have also indirectly (visually) affected cultural resources within the visual APE. These past actions would have included construction and operation of the Holcim (US) Inc.-Dundee Portland cement plant, approximately 7 mi east-northeast in Dundee, Michigan, and the Stansley Mineral Resources, STONECO-Meanwell Road Site (Ida Road), and STONECO Inc.-Maybee sand, gravel, topsoil, and/or limestone mines and quarries, located 9 to 15 mi from the South Britton site. However, the locations of these projects would likely be too far to incur cumulative indirect (visual) impacts on historic or cultural resources within the APE at the South Britton site. Because a new nuclear power facility at the South Britton site would be located on undeveloped property, it is likely that the proposed project would result in new significant indirect (visual impacts) on cultural resources that might be identified within the visual APE.

Based on reconnaissance-level information provided by Detroit Edison and identified by the review team and the review team's independent evaluation of this information, the review team concludes that the cumulative impacts on historic and cultural resources from building and operating a new nuclear power facility at the South Britton site would be SMALL. This impact determination is based on available information, which indicates that no known historic properties would be affected (none of the cultural resources identified within the APE at the South Britton site have been evaluated for NRHP eligibility), resulting in an impact determination of SMALL. However, if a new nuclear power facility was to be developed at the South Britton site, then cultural resources investigations within the APE and for any proposed transmission lines and water pipelines might reveal important historic or cultural resources that could be directly or indirectly affected, resulting in greater cumulative impacts.

9.3.6.8 Air Quality

Criteria Pollutants

For a plant with the same capacity as the proposed Fermi 3 plant, the emissions from building and operating a nuclear power plant at the South Britton site are assumed to be comparable to those from Fermi 3, as described in Chapters 4 and 5. The alternative site is located in Lenawee County, 1 mi west of Monroe County. Lenawee County is in the South Central Michigan Intrastate AQCR (40 CFR 81.196), while Monroe County is in Metropolitan Toledo Interstate AQCR (40 CFR 81.43). Lenawee County is in unclassifiable/attainment for all criteria pollutants, except in a maintenance area for 8-hr ozone NAAQS, while Monroe County is designated as a nonattainment area for $PM_{2.5}$ NAAQS and as a maintenance area for 8-hr ozone NAAQS (b). In July 2011, MDEQ submitted a request asking the EPA to redesignate southeast Michigan as being in attainment with the $PM_{2.5}$ NAAQS (MDEQ 2011). This request is based, in part, on air quality monitoring data collected in the 2007-2010 period showing all seven counties in Southeast Michigan in attainment for the $PM_{2.5}$ NAAQS.

In Sections 4.7 and 5.7, the review team concludes that air quality impacts of building and operating a plant at Fermi 3, including those associated with transmission lines and cooling towers, would be SMALL, as long as appropriate measures are taken to mitigate dust during building activities. During operation, cooling towers would be the primary source of $PM_{2.5}$, which accounts for most of total $PM_{2.5}$ emissions of 9.51 tons/yr at Fermi 3. However, these emissions would be relatively small and thus are not anticipated to elevate $PM_{2.5}$ concentrations in a designated nonattainment area. With dust mitigation, the impacts of building and operating a plant at the South Britton site would also be SMALL. Any new industrial projects would either be small or subject to permitting by MDEQ. State permits are issued under regulations approved by the EPA and deemed sufficient to attain and maintain the NAAQS and comply with other Federal requirements under the CAA. Thus, the cumulative air quality impacts of building and operating a plant at the South Britton site would be SMALL.

Greenhouse Gases

The extent and nature of climate change is not sensitive to where GHGs are emitted because the long atmospheric lifetimes of GHGs result in extensive transport and mixing of these gases. Because the emissions of a plant at the South Britton site would be comparable to those of a similar plant at the Fermi site, the discussions of Sections 4.7 and 5.7 for Fermi 3 also apply to building and operating a similar plant at the South Britton site. Thus, the impacts of the plant's GHG emissions on climate change would be SMALL, but the cumulative impacts considering global emissions would be MODERATE. Building and operating a new nuclear unit at the South Britton site would not be a significant contributor to the MODERATE impacts.

9.3.6.9 Nonradiological Health

The following impact analysis considers nonradiological health impacts from building activities and operations on the public and workers from a new nuclear facility at the South Britton alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that impact nonradiological health, including other Federal and non-Federal projects and those projects listed in Table 9-36 within the geographic area of interest. The building-related activities that have the potential to affect the health of members of the public and workers include exposure to dust and vehicle exhaust, occupational injuries, noise, and the transport of construction materials and personnel to and from the site. The operations-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological agents, noise, EMFs, and impacts from the transport of workers to and from the site.

Most of the nonradiological impacts of building and operation (e.g., noise, etiological agents, occupational injuries) would be localized and would not have significant impact at offsite locations. However, activities such as vehicle emissions from transport of personnel to and from the site would encompass a larger area. Therefore, for nonradiological health impacts, the geographic area of interest for cumulative impacts analysis includes projects within a 50-mi radius of the South Britton site based on the influence of vehicle and other air emissions sources because neighboring Monroe County is in nonattainment (Section 9.3.6.8). For cumulative impacts associated with transmission lines, the geographical area of interest is the transmission line corridor. These geographical areas are expected to encompass areas where public and worker health could be influenced by the proposed project and associated transmission lines, in combination with any past, present, or reasonably foreseeable future actions.

Building Impacts

Nonradiological health impacts on the construction workers from building a new nuclear facility at the South Britton site would be similar to those from building Fermi 3 at the Fermi site, as evaluated in Section 4.8. They include occupational injuries, noise, odor, vehicle exhaust, and dust. Applicable Federal. State, and local regulations on air quality and noise would be complied with during the plant construction phase. The South Britton site does not have any characteristics that would be expected to lead to fewer or more construction accidents than would be expected for the Fermi site. The site is in a predominantly rural area, and construction impacts on the surrounding populations classified as medium- and low-population areas would likely be minimal. Access routes to the site for construction workers would include State Route 50 and minor local roads. Mitigation may be necessary to ease congestion, thereby improving traffic flow and reducing nonradiological health impacts (i.e., traffic accidents, injuries, and fatalities) during the building period.

Operational Impacts

Nonradiological health impacts on occupational health of workers and members of the public from operation of a new nuclear unit at the South Britton site would be similar to those evaluated in Section 5.8 for the Fermi site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the South Britton site would likely be the same as those evaluated for workers at the new unit at the Fermi site. Discharges to the Lake Erie would be controlled by NPDES permits issued by MDEQ (Section 9.3.6.2). The growth of etiological agents would not be significantly encouraged at the South Britton site due to the temperature attenuation in the length of the pipe required for a discharge system. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Effects of EMFs on human health would be controlled and minimized by conformance with NESC criteria. Nonradiological impacts of traffic during operations would be smaller than the impacts during building. Mitigation measures undertaken during construction to improve traffic flow would also minimize impacts during operation of a new unit.

Cumulative Impacts

Past and present actions within the geographic area of interest that could contribute to cumulative nonradiological health impacts include the energy and mining projects in Table 9-36, as well as vehicle emissions and existing urbanization. Reasonably foreseeable future projects in the geographical area of interest that could contribute to cumulative nonradiological health impacts include construction of proposed Cleveland-Toledo-Detroit Passenger Rail Line, future transmission line development, and future urbanization.

The review team is also aware of the potential climate changes that could affect human health. A recent compilation of the state of the knowledge in this area (USGCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate for the region include an increase in average temperatures, increased likelihood of drought in summer, more heavy downpours, and an increase in precipitation, especially in the winter and spring, which may alter the presence of microorganisms and parasites. In view of the water source characteristics, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change in the incidence of waterborne diseases.

Summary of Nonradiological Health Impacts at the South Britton Site

Based on the information provided by Detroit Edison and the review team's independent evaluation, the review team expects that the impacts on nonradiological health from building and operating a new nuclear unit at the South Britton site would be similar to the impacts evaluated for the Fermi site. While there are past, present, and future activities in the geographical area of interest that could affect nonradiological health in ways similar to the construction and operation of a new unit at the South Britton site, those impacts would be localized and managed through adherence to existing regulatory requirements. Similarly, impacts on public health of a new nuclear unit operating at the South Britton site would be expected to be minimal. The review team concludes, therefore, that the cumulative impacts of building and operating a nuclear unit at South Britton on nonradiological health would be SMALL.

9.3.6.10 Radiological Health

The following impact analysis considers radiological impacts on the public and workers from building activities and operations for one nuclear unit at the South Britton alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects and those projects listed in Table 9-36 within the geographic area of interest. As described in Section 9.3.6, the South Britton site is a greenfield site; there are currently no nuclear facilities. The geographic area of interest is the area within 50-mi radius of the South Britton site. Existing facilities potentially affecting radiological health within this area are Fermi 2 and Davis-Besse. In addition, there are also likely to be medical, industrial, and research facilities within 50 mi of the South Britton site that use radioactive materials.

The radiological impacts of building and operating the proposed ESBWR unit at the South Britton site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those at the proposed Fermi site.

The radiological impacts of Fermi 2 and Davis-Besse also include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits, as demonstrated by the ongoing REMPs conducted around these plants. In addition, the NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive materials would be an insignificant contribution to the cumulative impact around the South Britton site. This conclusion is based on data from radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Detroit Edison and the NRC staff’s independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the proposed ESBWR and other existing projects and actions in the geographic area of interest around the South Britton site would be SMALL.

9.3.6.11 Postulated Accidents

The following impact analysis considers radiological impacts from postulated accidents from operations for one nuclear unit at the South Britton alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and those projects listed in Table 9-36 within the geographic area of interest. As described in Section 9.3.6, the South Britton site is a greenfield site, and there are currently no nuclear facilities on the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the South Britton site. Existing facilities potentially affecting radiological accident risk within this geographic area of interest are Fermi 2 and Davis-Besse 1, because the 50-mi radii for Fermi 2 and Davis-Besse overlap part of the 50-mi radius for the South Britton site. No other reactors have been proposed within the geographic area of interest.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the proposed Fermi site would be minimal for an ESBWR. DBAs are addressed specifically to demonstrate that a reactor design is sufficiently robust to meet NRC safety criteria. The ESBWR design is independent of site conditions, and the meteorology of the alternative and the proposed Fermi sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the site would be SMALL.

Because the meteorology, population distribution, and land use for the South Britton site are expected to be similar to those for the proposed Fermi site, risks from a severe accident for an ESBWR located at the South Britton site would be expected to be similar to those analyzed for the proposed Fermi site. These risks for the proposed Fermi site are presented in Tables 5-33 and 5-34 of this EIS and are well below the mean and median values for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For the existing plants within the geographic area of interest (i.e., Fermi 2 and Davis-Besse), the Commission has determined the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Because of the NRC's safety review criteria, it is expected that risks for any new reactors at any other locations within the geographic area of interest for the South Britton site would be well below risks for current-generation reactors and would meet the Commission's safety goals. The severe accident risk due to any particular nuclear power plant gets smaller as the distance from that plant increases. However, the combined risk at any location within 50 mi of the South Britton site would be bounded by the sum of risks for all these operating nuclear power plants and would still be low. On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the South Britton site would be SMALL.

9.3.7 Comparison of the Impacts of the Proposed Action and Alternative Sites

This section summarizes the review team's impact characterizations for cumulative impacts related to locating one new nuclear unit (an ESBWR) at the proposed site or at each alternative site. The four Michigan sites selected for detailed review as part of the alternative sites environmental analysis included two existing Detroit Edison power plant facilities – the Belle River-St. Clair Energy Facility and the Greenwood Energy Center, both located in St. Clair County – and two greenfield sites in Monroe and Lenawee Counties – the Petersburg and South Britton sites. Comparisons were made between the proposed site and each of the alternatives to determine whether one of the alternative sites is environmentally preferable to the proposed site. The NRC's determination as to whether an alternative site is environmentally preferable to the proposed site for Fermi 3 is independent of the USACE's determination of the LEDPA pursuant to the CWA Section 404(b)(1) Guidelines at 40 CFR Part 230. USACE will conclude its analysis of both offsite and onsite alternatives in its permit decision document.

The need to compare the proposed site with alternative sites arises from the requirement in Section 102(2)(c)(iii) (42 USC 4332) of NEPA that EISs include an analysis of alternatives to the proposed action. The NRC criteria to be employed in assessing whether a proposed site is to be rejected in favor of an alternative site are based on whether the alternative site is "obviously superior" to the site proposed by the applicant (Public Service Co. of New Hampshire 1977). An alternative site is "obviously superior" to the proposed site if it is "clearly and substantially" superior to the proposed site (Rochester Gas and Electric Corp. 1978). The standard of obviously superior "is designed to guarantee that a proposed site will not be rejected in favor of an alternate unless, on the basis of appropriate study, the Commission can be confident that such action is call for" (New England Coalition on Nuclear Pollution 1978).

The "obviously superior" test is appropriate for two reasons. First, the analysis performed by the NRC staff in evaluating alternative sites is necessarily imprecise. Key factors considered in the alternative site analysis, such as population distribution and density, hydrology, air quality, aquatic and terrestrial ecological resources, aesthetics, land use, and socioeconomics, are difficult to quantify in common metrics. Given this difficulty, any evaluation of a particular site must have a wide range of uncertainty. Second, Detroit Edison's proposed site has been analyzed in detail, with the expectation that most adverse environmental impacts associated with the site have been identified. The alternative sites have not undergone a comparable level of detailed study. For these reasons, a proposed site may not be rejected in favor of an alternative site when the alternative site is marginally better than the proposed site, but only when it is obviously superior (Rochester Gas and Electric Corp. 1978). NEPA does not require that a nuclear plant be constructed on the single best site for environmental purposes. Rather, "all that NEPA requires is that alternative sites be considered and that the effects on the environment of building the plant at the alternative sites be carefully studied and factored into the ultimate decision" (New England Coalition on Nuclear Pollution 1978).

The NRC staff's review of alternative sites consists of a two-part sequential test (NRC 2000). The first part of the test determines whether any of the alternative sites are environmentally preferable to the applicant's proposed site. The NRC staff considers whether the applicant has (1) reasonably identified candidate sites, (2) evaluated the likely environmental impacts of building and operation at these sites, and (3) used a logical means of comparing sites that led to the applicant's selection of the proposed site. Based on NRC's own independent review, the NRC staff then determines whether any of the alternative sites are environmentally preferable to the applicant's proposed site. If the NRC staff determines that one or more alternative sites are environmentally preferable, then it would compare the estimated costs (i.e., environmental, economic, and time) of constructing the proposed plant at the proposed site and at the environmentally preferable site or sites (NRC 2000). The second part of the test determines whether an environmentally preferable alternative site is obviously superior to the proposed site. The NRC staff must determine that (1) one or more important aspects, either singly or in combination, of an environmentally preferable alternative site are obviously superior to the corresponding aspects of the applicant's proposed site and (2) the alternative site does not have offsetting deficiencies in other important areas. An NRC staff conclusion that an alternative site is obviously superior to the applicant's proposed site would normally lead to a recommendation that the application for the license be denied.

Section 9.3.7.1 discusses the process the NRC staff used to compare the alternative sites to the proposed Fermi 3 site. Sections 9.3.7.2 and 9.3.7.3 discuss the environmental impacts of the proposed site in relation to the alternative sites as they relate to "environmentally preferable" and "obviously superior" evaluations, respectively.

9.3.7.1 Comparison of the Proposed Site and Alternative Site Cumulative Impacts

The review team's characterizations of the cumulative environmental impacts of building and operating a new nuclear generating unit at the proposed site (impact levels from Chapter 7) and four alternative sites (from Sections 9.3.3 through 9.3.6) are listed in Table 9-44.

The review team performed reconnaissance-level reviews of each of the four alternative sites and reviewed information provided in Detroit Edison's ER and RAI responses, information from other Federal and State agencies, and information gathered during visits to each alternative site. The review team found that Detroit Edison implemented a reasonable process to select alternative sites and used a logical process to compare the impacts of the proposed site to those at the alternative sites. The following discussion summarizes the staff's independent assessment of the proposed and alternative sites.

The review team's characterizations of the expected cumulative environmental impacts of building and operating a new unit at the Fermi site and alternative sites are summarized by impact category level in Table 9-44. Full explanations for the particular characterizations are provided in Chapter 7 for the proposed Fermi 3 site and in Sections 9.3.3 through 9.3.6 for the four alternative sites. The staff's impact category levels are based on professional judgment, experience, and consideration of controls likely to be imposed under required Federal, State, or local permits that would not be acquired until an application for a COL is under way. These

Table 9-44. Comparison of Cumulative Impacts at the Proposed and Alternative Sites

Resource Category	Fermi	Belle River-St. Clair	Greenwood	Petersburg	South Britton
Land Use	SMALL	SMALL	SMALL	SMALL	SMALL
Water Resources					
Surface Water Use	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Groundwater Use	SMALL	SMALL	SMALL	SMALL	SMALL
Surface Water Quality	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater Quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecology					
Terrestrial and Wetland Resources	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Aquatic Resources	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Socioeconomics					
Physical Impacts	SMALL	SMALL	SMALL	SMALL	SMALL
Demography	SMALL (beneficial)	SMALL	SMALL	SMALL	SMALL
Taxes and Economy	SMALL (region) to LARGE (Monroe County) (beneficial)	SMALL (region) to LARGE (St. Clair County) (beneficial)	SMALL (region) to LARGE (St. Clair County) (beneficial)	SMALL (region) to LARGE (Monroe County) (beneficial)	SMALL (region) to LARGE (Lenawee County) (beneficial)
Traffic	SMALL (region); MODERATE (Monroe County)	SMALL (region) to MODERATE (St. Clair County)	SMALL (region) to MODERATE (St. Clair County)	SMALL (region) to LARGE (Monroe County)	SMALL (region) to LARGE (Lenawee County)
Recreation	SMALL	SMALL	SMALL	SMALL (region) to MODERATE (Monroe County)	SMALL (region) to MODERATE (Monroe and Lenawee Counties)
Housing	SMALL	SMALL	SMALL	SMALL	SMALL
Public Services	SMALL	SMALL	SMALL	SMALL	SMALL

Table 9-44. (contd)

Resource Category	Fermi	Belle River-St. Clair	Greenwood	Petersburg	South Britton
Education	SMALL	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	MODERATE	SMALL	SMALL	SMALL	SMALL
Air Quality	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Nonradiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Nonradioactive Waste	SMALL	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL	SMALL

considerations and assumptions were similarly applied at each of the alternative sites to provide comparisons of impact levels between the proposed site and each alternative site.

9.3.7.2 Environmentally Preferable Sites

Neither the proposed site nor any of the four alternative sites appear to have inherent characteristics that would completely preempt building a nuclear plant at that location. However, as shown in Table 9-44, there are some differences in the review team's projections of impacts among the sites. Comparisons among the proposed site and the four alternatives to identify an environmentally preferable site, or subsequently an obviously superior site, are typically made across all the impact categories. However, in this particular instance, impacts on land use, groundwater use, groundwater quality, physical socioeconomic parameters, environmental justice, radiological health, nonradiological health, nonradioactive waste, and postulated accidents are projected by the review team to be SMALL for all the sites. Consequently, these categories are not discriminators in the exercise of selecting an environmentally preferable or obviously superior site and were not considered further in site comparisons. While impacts to demography are all identified in Table 9-44 as SMALL, the review team has concluded that the impacts at the Fermi site are beneficial, which is not the case for the four alternative sites.

For some impact categories, different levels of impact are simultaneously possible in different portions of each site's ROI, for example, from SMALL to LARGE for traffic. Such variability of impact levels within the affected regions of each site is especially prominent for the two greenfield sites, Petersburg and South Britton. Finally, for those impact categories in which the projected impact is anything greater than SMALL, sites are differentiated on the basis of the expected contribution of a new reactor to cumulative impacts in those categories.

In evaluating the three sites with existing power plants, the review team assumed that current power production activities would continue unchanged and that the necessary expansions of cooling system and transmission infrastructures to increase their capacities are technically feasible. The review team assumed that the existing infrastructure, with modifications, would be used to the greatest extent possible as a way to minimize environmental impacts; however, the review team also concluded that the building of some new infrastructure may also be necessary.

In the comparison of the Fermi and Belle River-St. Clair sites, the impacts are the same except for demography and historic and cultural resources. Building the new unit at the Fermi site would have a SMALL beneficial impact on demography, as discussed in Chapters 4 and 5, but a SMALL adverse impact at the Belle River-St. Clair site. Regarding cultural resources, building a new unit at the Fermi site would require dismantling Fermi 1 and the review team concluded that this was a MODERATE impact. The review team noted that the dismantlement would be performed following the stipulations in an agreement that would be set between the Michigan

SHPO and Detroit Edison to mitigate the impacts. At the Belle River-St. Clair site, the review team did not identify any cultural resources known to be eligible for listing on the NRHP that would be affected by a new plant. Overall, the review team concludes that the two sites rank closely and therefore concludes that the Belle River-St. Clair site is not environmentally preferable to the Fermi site.

Comparing the Fermi and Greenwood sites, the review team noted that the impacts at the Greenwood site are essentially the same as those at the Belle River-St. Clair site. The comparison to the Fermi site would follow the same lines, and the review team therefore concludes that the Greenwood site is not environmentally preferable to the Fermi site.

In the comparison of the Fermi and Petersburg sites, the impacts are the same except for traffic, recreation, and historic and cultural resources. Building the new unit at the Fermi site would have a MODERATE impact on traffic and a SMALL impact on recreation, while it would have a LARGE impact on traffic and a MODERATE impact on recreation at the Petersburg site because of the site's rural nature. Regarding cultural resources, building a new unit at the Fermi site would require dismantling Fermi 1, and the review team concluded that this was a MODERATE impact. The review team noted that the dismantlement would be performed following the stipulations in an agreement that would be set between the Michigan SHPO and Detroit Edison to mitigate the impacts. At the Petersburg site, the review team did not identify any cultural resources known to be eligible for listing on the NRHP that would be affected by a new plant. Overall, the review team concludes that the impacts of building and operating a new nuclear plant at the Petersburg site would be greater than the impacts of the same project at the Fermi site. The review team therefore concludes that the Petersburg site is not environmentally preferable to the Fermi site.

In the comparison of the Fermi and South Britton sites, the impacts are the same except for traffic, recreation, and historic and cultural resources. Building the new unit at the Fermi site would have a MODERATE impact on traffic, while the traffic impacts at the South Britton site would be LARGE. Building the new unit at the Fermi site would have a SMALL impact on recreation, but a MODERATE impact at the South Britton site because of its rural nature. Regarding cultural resources, building a new unit at the Fermi site would require dismantling Fermi 1 and the review team concluded that this was a MODERATE impact. The review team noted that the dismantlement would be performed following the stipulations in an agreement that would be set between the Michigan SHPO and Detroit Edison to mitigate the impacts. At the South Britton site, the review team did not identify any cultural resources known to be eligible for listing on the NRHP that would be affected by a new plant. Overall, the review team concludes that the impacts of building and operating a new nuclear plant at the South Britton site would be greater than the impacts of the same project at the Fermi site. The review team therefore concludes that the South Britton site is not environmentally preferable to the Fermi site.

The review team concludes that despite the observed differences in projected impacts among the sites, none of the alternative sites are environmentally preferable to the Fermi site.

9.3.7.3 Obviously Superior Sites

Because none of the alternative sites are environmentally preferable to the proposed site, none could be obviously superior, and no additional evaluations in that regard are required.

9.4 System Design Alternatives

The review team considered a variety of heat dissipation systems and circulating water system (CIRC) alternatives for Fermi 3. While other heat-dissipation systems and water systems exist, by far the largest and the most likely to dominate the environmental consequences of operation is the CIRC that cools and condenses the steam for the turbine generator. Other water systems, such as the station water system (SWS), are much smaller than the CIRC. As a result, the review team considered only alternative heat dissipation and water treatment systems for the CIRC. The proposed CIRC is a closed cycle system that uses an NDCT for heat dissipation (Detroit Edison). The proposed system is discussed in detail in Chapter 3.

9.4.1 Heat Dissipation Systems

About two-thirds of the heat from a commercial nuclear reactor is rejected as heat to the environment. The remaining one-third of the reactor-generated heat is converted into electricity. Normal heat-sink cooling systems transfer the rejected heat load into the atmosphere and/or nearby water bodies, primarily as latent heat exchange (evaporating water) or sensible heat exchange (warmer air or water). Different heat dissipation systems rely on different exchange processes. The following sections describe alternative heat dissipation systems considered by the staff for the proposed Fermi 3 reactor.

A closed cycle cooling system using an NDCT was selected by Detroit Edison to provide heat dissipation for Fermi 3. The NDCT induces the flow of ambient air by convection up through the large (600-ft tall and 400-ft diameter) tower and allows an exchange of heat from the cooling water to the air by a counter-flowing cascade of warm cooling water downward in the lower portion of the cooling tower. As heat transfers from the water to the air in the tower, the air becomes more buoyant and rises. This buoyant circulation induces more air to enter the tower through its open base. A portion of the water evaporates, resulting in the cooling of the remaining portion of the water. To control scale and biological organisms in the recirculating water, a portion of the water in the closed cooling system is periodically discharged as blowdown and replaced with an equal volume of treated water. Likewise, the volume of water lost to evaporation is also replaced to maintain the design volume of water in the system. Lake Erie would be the source of cooling water, including water to replace blowdown and evaporative losses. After treatment, blowdown water would be discharged to Lake Erie under the auspices of an NPDES permit issued by MDEQ. Other impacts of the selected system include the potential for drift, visual impacts from both the natural draft cooling tower and a condensate plume (during certain weather conditions), and small amounts of wastes resulting from required water treatment.

In its ER, Detroit Edison considered a range of heat dissipation systems, including a once-through cooling system, several alternative closed cycle cooling system configurations, dry cooling systems, and wet/dry hybrid systems (Detroit Edison 2011a). The review team's evaluation of each of these alternative systems appears in the following paragraphs. Each is evaluated on its own merits and, as well, compared to the proposed closed cycle wet natural draft system when such comparisons are relevant, on matters such as water requirements, water consumption, impacts on water quality and aquatic ecosystems, parasitic loads, noise, atmospheric effects, and visual impacts.

9.4.1.1 Once-Through Cooling

A once-through cooling system would withdraw water from Lake Erie and return virtually the same volume of water to the lake at an elevated temperature. The water intake and discharge structures would be separated to limit recirculation. Lake Erie would be capable of supplying the substantial volumes of water continuously required for a once-through system. The discharge of cooling water back to Lake Erie would require an NPDES permit that would establish thermal limits for the discharging water to prevent or mitigate adverse impacts on aquatic ecosystems. Because there is no evaporative loss associated with exchange of heat with the steam water, there is no consumptive use of water in a once-through system as the water passes through the plant heat exchangers. However, the elevated temperature of the receiving water body would result in induced evaporative loss that decreases the net water supply. A once-through system would withdraw substantially more water from Lake Erie than the proposed system (Detroit Edison estimates 720,000 gpm for a once-through system versus 34,000 gpm for the proposed closed cycle system [Detroit Edison 2011a). The large intake and discharge flows associated with once-through cooling systems require large intake and discharge structures, result in higher levels of impingement and entrainment, and may result in hydrologic alterations in the source/receiving water bodies. Based on recent changes to implementation plans to meet Section 316(b) of the CWA, the review team has determined that once-through cooling systems for new nuclear reactors are unlikely to be permitted in the future, except in rare and unique situations. Because once-through systems do not use any sort of cooling tower, have an otherwise low profile, and do not produce a condensate plume, visual impacts are greatly reduced and land requirements are minimized. Noise impacts from pump operation are also expected to be minimal.

The likely locations for both intake and discharge structures for a once-through system would be in a relatively shallow portion of Lake Erie, potentially further exacerbating any adverse impacts of impingement, entrainment, or thermal plumes. For these reasons, in addition to the CWA considerations, the review team concludes that a once-through cooling system is not an environmentally preferable alternative cooling system for Fermi 3.

9.4.1.2 Once-Through System with Helper Tower

A variant of the once-through system involves adding a helper tower between the condenser and the discharge. The helper tower is typically a conventional MDCT. Operators have the ability to divert a portion of the water leaving the condenser to the helper tower, where it can undergo further cooling before being recombined with the rest of the cooling water and discharged to Lake Erie. Such systems are used at some nuclear power plants that are located on bodies of water for which thermal effects are a concern. The advantage of such a system is the enhanced ability to lower the temperature of the discharging water by transferring some of the heat in the water diverted to the helper tower to the atmosphere instead. Such a system may be essential in ensuring that the facility meets the thermal limits of its NPDES discharge permit. However, this option would require slightly more water than the once-through system alone to account for evaporative losses in the helper tower. It also adds complexity to the simple once-through system, adds land requirements, and does nothing to ameliorate the adverse impacts of impingement or entrainment that may be associated with the once-through system. Introduction of the MDCT increases the parasitic load of the plant (due to operation of extra water pumps and air fans) and introduces noise, drift, and visual impacts. Because this system would not result in diminution of impingement or entrainment impacts typically associated with once-through systems, it offers only the incremental advantage of enhanced control of thermal impacts on Lake Erie. For the same reasons that apply to once-through systems, the review team has concluded that a once-through system with a helper tower is not an environmentally preferable alternative cooling system for Fermi 3.

9.4.1.3 Combination Dry and Wet Cooling Tower System

Hybrid systems combine conventional closed cycle wet mechanical or natural draft cooling systems with dry cooling systems. The two cooling systems can be arranged either in parallel or in series. Operators can control the extent of cooling that occurs through adjustments of the operating parameters of each cooling system or, in the case of the parallel arrangement, by controlling the amount of cooling water diverted to each. During cold weather, heat rejection demands could be met exclusively by the dry system, thus greatly reducing water impacts typically associated with wet cooling, albeit with some performance penalties with respect to power production. Although the hybrid system offers some advantages, it also involves adverse impacts such as added complexity and maintenance requirements, parasitic loads, noise, and visual impacts that are additive between the two systems. Water from Lake Erie would still be required to support the wet system, although evaporative losses could be expected to be smaller than for the proposed system operating alone. Blowdown from the wet cooling system would still be discharged to the lake (albeit in slightly lesser quantities than from a wet cooling system operating alone), and makeup water to replace blowdown and evaporative losses would still be withdrawn from the lake and would need chemical treatment before use. Further, performance of the dry cooling system is dependent on atmospheric conditions with maximum performance occurring during periods of low relative humidity, an unlikely condition in southeastern Michigan during periods of peak summer loads when heat rejection capacity is most needed. Although a hybrid system is technically feasible and adverse impacts on Lake Erie may be incrementally smaller, other impacts such as increased visual impacts, noise, variable performance of the dry system, and parasitic loads counterbalance any advantages. Despite its technical feasibility, the review team does not believe that a hybrid cooling system would offer substantial benefits over the proposed natural draft wet cooling system. The review team concludes that this option is not environmentally preferable to the proposed system.

9.4.1.4 Mechanical Draft Wet Cooling System

The mechanical draft wet cooling system option is closely related to the proposed natural draft cooling system. Heat rejection mechanisms are identical, and water demands and impacts on Lake Erie would be virtually the same. Water requirements and water consumption would be virtually the same as the proposed natural draft cooling system. Blowdown discharges to the lake would still occur under an NPDES permit. Water pumping loads would be about the same, but the fans of the mechanical draft system would increase parasitic loads over the natural draft system. Condensate plumes and drift are still possible with the mechanical draft system, but because it has a much smaller profile, the mechanical draft system offers less visual impact from both the cooling tower and its condensate plume than its natural draft counterpart. However, because the natural draft cooling towers supporting Fermi 2 would still be operative, both the proposed natural draft system and the mechanical draft alternative would add only incrementally to the existing visual impacts of the Fermi site. Although their technical feasibility is virtually equivalent to the proposed natural draft wet cooling system, the review team has determined that a mechanical draft wet cooling system is not environmentally preferable to the proposed system.

9.4.1.5 Spray Ponds

Spray pond cooling systems use engineered ponds to cool water and enhance evaporative cooling by spraying water into the atmosphere. In addition to evaporation, heat transfer from the spray ponds to the atmosphere occurs through blackbody radiation and conduction. Spray pond systems comprise a number of spray nozzles installed on an extensive plumbing system, which may introduce significant maintenance requirements. Operational noise would be minimal and localized. Spray ponds would require a substantial initial charge of water to the system as well as replacement of evaporative losses would still be supplied from the lake. Blowdown from the spraypond to maintain water quality would likely be to Lake Erie. Some drift losses are possible, and in some weather conditions, a ground fog (rather than a condensate plume) may occur. Although system efficiency is somewhat dependent on ambient conditions, it is reasonable to assume that the pond would have sufficient capacity to easily overcome any weather-related deleterious impacts on performance. The parasitic load of a spray pond results primarily from water pumping and is expected to be slightly greater than that of a once-through system, but still smaller than any of the other options considered. It is reasonable to expect that a spray pond would represent the greatest land requirement among all the heat rejection options considered. Although Detroit Edison did not identify a required size, it concluded that the land required for a spray pond of sufficient capacity would likely not be available within the Fermi site's current footprint, especially since much of the fallow land is wetland. Primarily because of the impacts associated with the increased land requirements, the review team concludes that a spray pond cooling system is not environmentally preferable to the proposed natural draft system.

9.4.1.6 Dry Cooling Towers

Dry cooling towers would greatly reduce water-related impacts from cooling system operation, because no water would be consumed by evaporation. However, dry cooling systems require much larger cooling systems, and their efficiency is dependent on ambient conditions of temperature and humidity, with their lowest performance occurring during periods of high dry bulb temperature. Unfortunately, this is a condition that is likely to occur during periods of peak summer demand in southeastern Michigan, when the greatest heat dissipation capacity is required. Dry cooling systems result in the greatest power-producing performance penalties of all the heat dissipation systems evaluated. This loss in generation efficiency translates into increased impacts from the fuel cycle. In addition, a dry cooling system sized to cool the plant under all conditions would be very large, occupying a much larger area than the proposed cooling tower and potentially increasing both land use and terrestrial impacts.

Although the cumulative surface water use impacts identified by the review team in Section 7.2.2 are SMALL to MODERATE, these impacts result primarily from climate change, and the proposed Fermi 3 cooling system is not a significant contributor to those impacts. Using a dry cooling system would not lead to any noticeable reduction in the cumulative impacts on surface water use. The review team determined that construction and operation of dry cooling towers would not be environmentally preferable to the proposed cooling system.

9.4.2 Circulating Water Systems

The review team considered water supply alternatives for both the normal power heat sink (NPHS) cooling system (the proposed natural draft closed cycle cooling system), and the plant service water system (PSWS). The capacity requirements of the intake and discharge systems are defined primarily by the requirements of the proposed heat dissipation system. The maximum design basis for the cooling system is represented by maximum normal power operation during summer months and includes a total makeup water intake to the cooling system of 34,234 gpm, composed of 17,124 gpm to replace drift and evaporation losses and

17,110 gpm NPHS discharges (blowdown from the cooling tower). The total maximum flow of the PSWS is 40,000 gpm (Detroit Edison 2011a).

9.4.2.1 Intake Alternatives

Lake Erie would provide water for plant cooling and industrial applications. Water would be withdrawn from the lake through an intake bay adjacent to the existing intake bay for Fermi 2, between the two rock groins that extend into the lake (see Figure 3-5 of the ER [Detroit Edison 2011a]). The intake system is described in Section 3.2.2.2 of this EIS and in Section 3.4.2.1 of the ER (Detroit Edison 2011a). The intake would supply water to the SWS, which supports all non-safety-related cooling in the plant. The ultimate heat sink for Fermi 3 would be a separate system.

The intake would be equipped with a trash rack to screen out large objects and three traveling screens with 3/8-in. mesh arranged side-by-side to further screen out litter from the water before it reaches the SWS pump. Trash collected on the rack and screens would be periodically removed and disposed of. After water enters the pump house, it would be treated by using sodium hypochlorite as a biocide/algaecide before it enters the pumps at the location of the biocide injection diffuser. There would be two groups of pumps in the intake bay: three pumps, each equipped to pump at 50 percent capacity for makeup water to the cooling tower basins, and two pumps, each designed to pump (at 100-percent capacity) makeup water to the auxiliary heat sink and fire protection system during shutdown.

In the ER, Detroit Edison considered two alternatives to the proposed intake structure: an offshore intake positioned just above the bottom of the lake and located some unspecified distance from the shore, and an alternative shoreline intake structure located some unspecified distance from the Fermi 2 intake. The review team focused its evaluation of alternative intake designs on these two alternatives.

The offshore alternative could result in adverse impacts during building of the structure, including increased water turbidity and significant disturbance to the lake bottom. Conversely, positive attributes associated with this option include (1) the ability to position the intake at a location with less abundant aquatic resources, (2) minimization of land use impacts, and (3) no measurable differences regarding water use. Nevertheless, the potential for substantial adverse impacts during construction led the review team to conclude that the offshore alternative would not be environmentally preferable.

An alternative shoreline location would disrupt the shoreline to a greater degree than the disruptions anticipated from the necessary modifications to the existing intake. Because the Fermi 2 intake would remain in service, the second separate intake would increase operational impacts from such necessary activities as periodic dredging. Water use from the operation of two separate intakes for Fermi 2 and Fermi 3 would be indistinguishable from impacts expected from the use of a single intake structure. Finally, adequate separation between the intakes and discharges would be required to prevent recirculation of discharged cooling water. The review team concludes that a second separate shoreline intake would not be environmentally preferable to the proposed intake.

9.4.2.2 Discharge Alternatives

The discharge structure proposed for Fermi 3 would be located offshore, adjacent to the intake canal, and extend sufficiently into the lake to prevent recirculation of discharged cooling water. In its ER, Detroit Edison identified one alternative discharge system and one alternative discharge location; the alternative discharge system is a shoreline discharge, while the alternative discharge location is an inland discharge to any of the existing lagoons on the Fermi site. In evaluating these alternatives, the review team considered impacts on aquatic resources, land, and water and the feasibility of securing the necessary permits.

Alternative Discharge System

The proposed offshore discharge system would have a discharge port located on the bottom of the lake bed, sufficiently removed from the intake structure to prevent recirculation of discharged heated cooling water. Construction of such a system would result in temporary land impacts from installation of the discharge piping and staging of equipment to support installation of offshore system elements. However, construction would result in substantial disruption of the lake bed, with concomitant disruptions to the benthic communities in the affected area and a temporary decrease in water quality in the vicinity due to an increase in total suspended solids. Construction of the alternative shoreline discharge system would result in little disruption to the lake bed but greater land impacts, most of which would be permanent. Operational impacts on aquatic organisms from the two systems would depend on the communities existing at the locations selected for each system. It is reasonable to presume that a shoreline discharge point would be selected to avoid sensitive nearshore wetland areas. Even so, water discharged from a shoreline system would have a greater probability of migrating to such a sensitive area than would the offshore discharge. A shoreline discharge system would be expected to have greater potential for impacts on shoreline wetland areas and on the littoral zone of the lake, and thus could be expected to have greater overall impact on the aquatic ecosystem than the offshore system. Depending on its location relative to the intake, either discharge system could affect both the temperature and turbidity of water drawn into the intake, which could subsequently affect the cooling efficiency of the heat dissipation system and introduce additional maintenance issues at the intake. The design basis for the offshore discharge system has already considered such impacts, and the location has been determined to be far enough away from the intake that no deleterious effects on intake water would be expected, even through seasonal variations of lake currents. Similar considerations could be made in the selection of a shoreline discharge system location, such that operational impacts on water quality would be essentially the same for either system. Either discharge system would likely require an NPDES permit.

The feasibility of securing the necessary permits is considered to be the same for either system. The review team concludes that an offshore discharge system would result in fewer impacts than a shoreline discharge system.

Alternative Discharge Location

In its comparison of building impacts at alternative discharge locations, Detroit Edison noted that the proposed offshore location is in the same general area as the cooling water intake pipe for the now-decommissioned Fermi 1 reactor, and therefore has been previously disturbed. Conversely, construction impacts would be new if the discharge structure were built in any of the inland lagoons selected for the inland discharge alternative. Land impacts from construction are expected to be essentially the same for either discharge location alternative. Operational impacts, however, could be greater for an inland discharge system. The inland lagoons connect to the lake through a series of engineered culverts, but they are also in hydraulic communication with inland wetland areas. These inland wetland areas may play a significant role for animals that frequent the site. Discharges to the lagoons could result in adverse impacts on the inland wetlands and those terrestrial communities that rely on them. Both thermal and chemical impacts may be more significant on the lagoons than they would be on the lake, given the relatively smaller volumes of water expected to absorb those discharges. The review team concludes that an offshore discharge location would result in fewer impacts than an inland discharge location.

Water Supplies

In Section 5.2.2.1 of this EIS, the review team considers the impacts of using Lake Erie as the proposed source of water to support the operation of Fermi 3 and concludes that the impacts would be SMALL and that no mitigation warranted. The review team identified alternative sources for the CIRC that included water reuse, groundwater, and surface water, and evaluated each for its environmental equivalency to Lake Erie as a source of water.

<u>Water Reuse</u>

Sources of water for reuse can come either from the plant itself or from other local water users. Sanitary wastewater treatment plants are the most ubiquitous sources of water for reuse in the vicinity of the Fermi site. Other activities in the vicinity of Fermi that could provide water include industrial activities and quarry dewatering. Although sanitary wastewaters are likely to be available in abundance within the Detroit metropolitan area, such water sources would require substantial treatment before becoming available for application in the CIRC or for any other Fermi application. In addition, a significant investment in infrastructure and associated disturbance of terrestrial and aquatic resources would be required to bring this water source to the Fermi site. Industrial wastewaters would also require extensive treatment and substantial investments in infrastructure. Quarry dewatering would produce water that is likely to require lesser amounts of treatment; however, pipeline or alternative transport infrastructure is also lacking, and the constancy of such a source is not guaranteed. The review team therefore concludes that no source of reused water would be environmentally preferable to Lake Erie.

Groundwater

Groundwater hydrology in the vicinity of the Fermi site is described in Section 2.3.1. Comparing the accessibility and availability of groundwater beneath the Fermi site and in the vicinity of the site with the expected demands of Fermi 3's CIRC, the review team concludes that the use of groundwater for cooling would result in greater impacts than using water from Lake Erie.

Surface Water

Surface water hydrology in the vicinity of the Fermi site is described in Section 2.3.1. No other suitable source of surface water exists to support the expected demands for Fermi 3 power plant operations.

Water Treatment

As proposed by Detroit Edison, both inflow and effluent water would receive chemical treatment to ensure that they meet plant water needs and effluent water standards. Detroit Edison has identified two alternatives to chemical treatment of cooling water: mechanical treatment and thermal shock. In the mechanical treatment option, periodic mechanical treatment of the cooling tower could be performed to control the accumulation of biological species such as zebra mussels or the accumulation of scale, both of which, in sufficient quantities, could compromise the efficiency of the cooling tower. However, while mechanical cleaning is environmentally preferable to the use of chemicals, the physical design of the cooling tower basin makes mechanical cleaning impractical. Furthermore, during such cleaning, the cooling tower and reactor must be shut down. By comparison, chemical cleaning and biological control can occur continuously while the cooling tower is in operation. (However, for large accumulations of zebra mussels, shock chlorination is best accomplished through the short-term isolation of the SWS.) Biological control, especially of zebra mussels, could also be accomplished through thermal shock by raising the temperature for a brief period of time. However, artificially raising the temperature of water in the cooling system is counterproductive to the cooling system's purpose, and such elevated temperatures would not be compatible with some cooling system components. Both mechanical cleaning and thermal shock treatment are environmentally preferable to the use of chemicals; however, both alternatives are impractical and would result in the interruption of the cooling tower's function for some period of time. The review team therefore concludes that no viable alternatives to the proposed chemical treatment of water in the cooling tower and the CIRC exist.

9.4.3 Summary

The review team considered alternative systems designs, including six alternative heat-dissipation systems and alternative intake, discharge, and water supply systems and locations. As discussed in previous sections, the staff identified no feasible alternative that would be environmentally preferable to those proposed by Detroit Edison.

9.5 References

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10.0 Conclusions and Recommendations

This chapter provides a discussion of the conclusions reached in earlier parts of this environmental impact statement (EIS), as well as the U.S. Nuclear Regulatory Commission (NRC) staff's recommendations. Section 10.1 summarizes the impacts of the proposed action. Section 10.2 summarizes the proposed project's unavoidable adverse impacts and is accompanied by a table, and Section 10.3 discusses the relationship between the short-term use of resources and long-term productivity of the human environment. Section 10.4 summarizes the irretrievable and irreversible use of resources, and Section 10.5 summarizes the alternatives to the proposed action. Section 10.6 discusses benefits and costs. Section 10.7 includes the NRC staff's recommendation.

On September 18, 2008, the U.S. Nuclear Regulatory Commission (NRC) received an application from the Detroit Edison Company (Detroit Edison) for a combined license (COL) for the proposed Enrico Fermi Unit 3 (Fermi 3) to be located on the Enrico Fermi Atomic Power Plant (Fermi) site. The site is located approximately 30 mi southwest of Detroit, Michigan, and 7 mi from the United States–Canada international border. A COL, which is a combined construction permit and operating license, is a Commission approval to build and operate one or more nuclear power facilities. In its application, Detroit Edison specified the economic simplified boiling water reactor (ESBWR) as the proposed reactor design for Fermi 3.

The U.S. Army Corps of Engineers (USACE) is participating as a cooperating agency in preparing this EIS. Detroit Edison will be required to obtain a Department of the Army (DA) permit to perform building activities that would result in alteration of waters of the United States, including wetlands. As a step in this permitting process, on June 17, 2011, Detroit Edison submitted a Joint Permit Application (JPA) (Detroit Edison 2011c) to the Michigan Department of Environmental Quality (MDEQ) for regulated activities associated with building and operating Fermi 3. On September 9, 2011, Detroit Edison subsequently submitted Revision 1 of the JPA (Detroit Edison 2011d) to USACE.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA; 42 USC 4321 *et seq.*) directs that an EIS is required for major Federal actions that significantly affect the quality of the human environment. Section 102(2)(C) of NEPA requires that an EIS include information on:

- the environmental impact of the proposed action,
- any adverse environmental effects that cannot be avoided, should the proposal be implemented,
- alternatives to the proposed action,

- the relationship among local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and
- any irreversible and irretrievable commitments of resources that would be involved if the proposed action is implemented.

The NRC has set forth regulations for implementing NEPA in Title 10 of the Code of Federal Regulations (CFR) Part 51. In 10 CFR 51.20, the NRC requires preparation of an EIS for issuance of COLs. Subpart C of 10 CFR Part 52 contains the NRC regulations related to COLs.

The proposed actions in the COL and USACE joint permit applications are (1) NRC issuance of a COL for construction and operation of a power reactor at the Fermi site in Monroe County, Michigan, and (2) the USACE issuance of a permit pursuant to Section 404 of the Federal Water Pollution Control Act (also referred to as the Clean Water Act) (33 USC 1251 *et seq*.), and Section 10 of the Rivers and Harbors Appropriation Act of 1899 (33 USC 403 *et seq*.). If issued, the USACE permit would authorize the impact on waters of the United States, including wetlands, from various regulated integral project components associated with the Fermi 3 facility, including access roads, a barge slip, blowdown pipelines, a makeup water pipeline, and cooling water intake structure.

The environmental review described in this EIS was conducted by a review team consisting of NRC staff, its contractors' staff, and staff from the USACE. During the course of preparing this EIS, the staff reviewed the Environmental Report (ER) submitted by Detroit Edison (Detroit Edison 2011a) and supplemental documentation; consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in NUREG-1555, *Environmental Standard Review Plans* (NRC 2000) and Staff Memorandum *Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements* (NRC 2011). In addition, the NRC considered the public comments related to the environmental report received during the scoping process. These comments are provided in Appendix D of this EIS.

Included in this EIS are (1) the results of the NRC staff's preliminary analyses, which consider and weigh the environmental effects of the proposed action, (2) mitigation measures for reducing or avoiding adverse impacts, (3) the environmental impacts of alternatives to the proposed action, and (4) the NRC staff's preliminary recommendation regarding the proposed action based on its environmental review.

The USACE's role as a cooperating agency in the preparation of this EIS is to ensure to the maximum extent practicable that the information presented is adequate to fulfill the requirements of USACE regulations. Section 404(b)(1) of the Clean Water Act, "Guidelines for Specification of Disposal Sites for Dredged or Fill Material" (40 CFR Part 230), contains the substantive environmental criteria used by USACE in evaluating discharges of dredged or fill material into waters of the United States. Although the USACE, as part of the review team, concurs with the designation of impact levels for terrestrial and aquatic resources, insofar as waters of the United States are concerned, the USACE must conduct a quantitative comparison of impacts on waters of the United States as part of the 404(b)(1) analysis. USACE's Public Interest Review (PIR) (33 CFR 320.4) directs the USACE to consider a number of factors as part of a balanced evaluation process. USACE's PIR will be part of its permit decision document and will not be addressed in this EIS. The USACE will document its conclusion of the review process, including the requirement for compensatory mitigation, in accordance with 33 CFR Part 332, "Compensatory Mitigation for Losses of Aquatic Resources," in its permit-decision document.

Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections. During its environmental review, the review team considered planned activities and actions that Detroit Edison indicated it and others would likely take if Detroit Edison receives a COL. In addition, Detroit Edison provided estimates of the environmental impacts resulting from the building and operation of a new nuclear unit on the Fermi site.

10.1 Impacts of the Proposed Action

In a final rule dated October 9, 2007 (72 *Federal Register* [FR] 57416), the Commission limited the definition of "construction" to those activities that fall within its regulatory authority in 10 CFR 51.4. Many of the activities required to build a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term "preconstruction." Preconstruction activities include clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. Because the preconstruction activities are not part of the NRC action, their impacts are not reviewed as a direct effect of the NRC action. Rather, the impacts of the preconstruction activities are considered in the context of cumulative impacts. Although the preconstruction activities are not part of the NRC action, they support or are requisite to the NRC action. In addition, certain preconstruction activities require permits from the USACE, as well as from other Federal, State, and local agencies.

Chapter 4 of this EIS describes the relative magnitudes of impacts related to preconstruction and construction activities, and a summary of impacts is given in Table 4-22. Impacts associated with operation of the proposed facilities are discussed in Chapter 5 of this EIS and summarized in Table 5-33. Chapter 7 describes the impacts associated with preconstruction and construction activities and operation of Fermi 3 when considered along with the cumulative impacts of other past, present, and reasonably foreseeable future projects in the geographical region around the Fermi site.

10.2 Unavoidable Adverse Environmental Impacts

Section 102(2)(C)(ii) of NEPA requires that an EIS include information on any adverse environmental effects that cannot be avoided if the proposal is implemented. Unavoidable adverse environmental impacts are those potential impacts of the NRC and USACE action that cannot be avoided and for which no practical means of mitigation are available.

10.2.1 Unavoidable Adverse Impacts during Preconstruction and Construction

Chapter 4 discusses in detail the potential impacts from preconstruction and construction of the proposed new Fermi 3 nuclear unit at the Fermi site and presents mitigation and controls intended to lessen the adverse impacts. Table 10-1 presents the unavoidable adverse impacts associated with construction and preconstruction activities to each of the resource areas evaluated in this EIS, as well as the mitigation measures that would reduce the impacts. Those impacts remaining after mitigation is applied (e.g., avoidance and minimization, but not including compensatory mitigation) are identified in Table 10-1 as unavoidable adverse impacts. Unavoidable adverse impacts are the result of both construction and preconstruction activities, unless otherwise noted. The impact determinations in Table 10-1 are for the combined impacts of construction and preconstruction. However, the impact determinations for NRC-regulated construction are the same for all resource areas.

The unavoidable adverse impacts are primarily attributable to preconstruction activities due to the initial land disturbance from clearing the land, excavation, filling wetlands and waterways, adding impervious surfaces, and dredging.

The primary unavoidable adverse environmental impacts during building activities would be related to land use and terrestrial habitat loss. Approximately 301 ac on the Fermi site would be disturbed by the Fermi 3 project. Of that, approximately 189 ac would consist of presently undisturbed habitat, including approximately 34.5 ac of wetlands. About 8.3 ac of wetland habitat would be permanently filled. Other wetland impacts would be temporary or consist of tree clearing only. Temporary wetland impacts related to fill for construction laydown areas would include the temporary loss of wetland functions from the time the wetland is filled until it is restored to its pre-construction functional condition.

Permanent and temporary impacts resulting from building offsite facilities (transmission lines) could total 1069 ac, plus approximately 21 ac to expand the Milan Substation. Additional areas could be disturbed on a short-term basis as a result of temporary activities and facilities and laydown areas.

Table 10-1. Unavoidable Adverse Environmental Impacts from Preconstruction and Construction of Fermi 3

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Land Use	SMALL	Comply with requirements of applicable Federal, State, and local permits. Implement erosion control measures described in the Fermi 3 Soil Erosion and Sedimentation Control (SESC) Plan.	Onsite: 301 ac Offsite (transmission lines): 1069 ac. Also needs approximately 21 ac to expand Milan Substation.
Water Use	SMALL	None.	Lake Erie water would be used for concrete batch plant operation, temporary fire protection, dust control, and sanitary needs, but needs would be small enough to not require a review under the Great Lakes Compact. Dewatering systems would depress the water table in the general vicinity, but the impacts would be localized and temporary.
Water Quality	SMALL	Observe best management practices (BMPs), including those that address spills or leaks of petroleum and other chemicals. Obtain appropriate Federal, State, and local permits and certifications prior to preconstruction and construction activities, and follow required plans and comply with permit conditions.	Hydrological alterations associated with building on and near the Fermi site would include dredging for the intake and discharge structures, altering the surface topography and hydrology (e.g., site grading, laydown areas, filling of onsite water bodies), and dewatering the excavation in order to construct the nuclear facilities. Offsite alterations would be associated with the proposed new or expanded transmission line corridors where they cross streams and wetlands.

Table 10-1. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Terrestrial and Wetland Resources	SMALL	Observe BMPs and obtain appropriate Federal and State permits and certifications prior to preconstruction and construction activities and comply with permit conditions. Restore approximately 21 ac of temporarily affected onsite wetlands and restore and enhance 82 ac of offsite wetlands. Submit Habitat and Species Conservation Plan for the eastern fox snake to MDNR and implement the plan to satisfaction of MDEQ and MDNR. Confer with MDEQ and MDNR on possible measures to mitigate impacts to American lotus.	Onsite: approximately 189 ac of habitat would be disturbed, including approximately 34.5 ac of wetlands. About 8.3 ac of impacted wetlands would be permanently filled. For the temporarily filled wetlands, a temporary loss of function would occur from the time wetland is filled until the time the wetland is returned to pre-construction functional condition. Offsite (transmission lines): 1069 ac of habitat would be disturbed. Approximately 21 ac of additional habitat would be used to expand Milan Substation. Potential impact on eastern fox snake (State-listed as threatened) and its habitat.
Aquatic Ecology	SMALL	Observe BMPs and obtain appropriate Federal and State permits and certifications prior to preconstruction and construction activities and comply with permit conditions.	Minor impacts on aquatic resources on and near the Fermi site from dredging for the intake and discharge structures, loss of lake bottom habitat due to discharge and intake structures, alterations in the surface topography and hydrology, and filling of some onsite water bodies. Minor impacts to offsite aquatic resources from building activities where proposed new or expanded transmission line corridors cross streams and wetlands.
Socioeconomics			
Physical	SMALL	Observe BMPs for noise control and dust and vehicle emissions; resurface roadways where needed.	None.

Table 10-1. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Socioeconomics (contd)			
Demography	No adverse impact. Impact is beneficial.	None.	None.
Community economics	No adverse impacts. All impacts are beneficial.	None.	None.
Infrastructure and services	SMALL (most impacts) to MODERATE (traffic)	Implement traffic control and management measures to reduce traffic congestion impacts.	Increase in local traffic during construction, resulting in increased congestion during the peak construction period.
Environmental Justice	SMALL	None.	None.
Historic and Cultural Resources	MODERATE	Mitigate adverse effects from demolition of recommended NRHP-eligible Fermi 1 according to measures and plans developed during consultation among the NRC, USACE, Michigan SHPO, and Detroit Edison.	Demolition of Fermi 1.
Air Quality	SMALL	Implement BMPs to reduce vehicle and equipment exhaust emissions and fugitive dust in accordance with all applicable State and Federal permits and regulations.	Vehicle and equipment exhaust emissions and fugitive dust emissions from operation of earthmoving equipment would be sources of air pollution, but impacts would be temporary.
Nonradiological Health	SMALL	Comply with Federal, State, and local regulations governing construction activities and construction vehicle emissions; comply with Federal and local noise-control ordinances; comply with Federal and State occupational safety and health regulations; implement traffic management plan and noise monitoring program.	Temporary public health impacts from exposure to fugitive dust and vehicular emissions, noise, and increased occupational injuries and traffic fatalities during the building phase.
Radiological Health	SMALL	Maintain doses to construction workers below NRC public dose limits.	Small dose to construction workers that would be less than NRC public dose limit.

Table 10-1. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Nonradioactive Wastes	SMALL	Manage hazardous and nonhazardous solid wastes according to county and State handling and transportation regulations; implement recycling and waste minimization program.	Minor decrease in capacity of waste treatment and disposal facilities.

(a) MDNR = Michigan Department of Natural Resources; NRHP = *National Register of Historic Places*; SHPO = State Historic Preservation Office.

As part of USACE regulations, Detroit Edison must demonstrate to the USACE why the proposed project could not be reconfigured or reduced in scope to minimize or avoid adverse impacts on waters of the United States. In order to comply with the U.S. Environmental Protection Agency (EPA) 404(b)(1) Guidelines, proposed aquatic resource fill activities associated with building Fermi 3 would have to demonstrate that no practicable alternative with less damaging impacts is available. Detroit Edison has prepared and submitted to USACE an onsite alternative analysis that identifies their proposed Least Environmentally Damaging Practicable Alternative (LEDPA) to satisfy these requirements (Detroit Edison 2011b; see Appendix J of this EIS). In addition to avoiding impacts on wetlands by siting facilities in nonwetland areas to the extent practicable, and minimizing wetland impacts by avoiding wetland fragmentation and maintaining existing hydrology to the extent practicable, Detroit Edison has proposed a conceptual aquatic resource compensatory mitigation strategy that calls for restoration of approximately 21 ac of onsite, temporarily affected wetlands post-construction and restoration and enhancement of approximately 82 ac of offsite wetlands in the coastal zone of western Lake Erie (Detroit Edison 2011c). Detroit Edison will comply with State and Federal wetland permit conditions with respect to mitigating wetland impacts and restoring wetland habitat to offset the permanent loss of wetlands resulting from building Fermi 3 (Detroit Edison 2011a).

The eastern fox snake (*Pantherophis gloydi*) is State-listed as threatened and occurs on the site in the project area. Detroit Edison has developed a Habitat and Species Conservation Plan (Detroit Edison 2011a) that identifies mitigation of direct impacts from construction and preconstruction on the snake. This plan would mitigate the potential for building-related mortality and would limit the amount of fox snake habitat disturbed during construction and preconstruction.

The impacts from building the proposed Fermi 3 on onsite historic properties would be MODERATE if the Fermi 1 structure was present when Fermi 3 preconstruction activities would begin. The NRC, in consultation with the Michigan State Historic Preservation Office (SHPO), has determined that work associated with the proposed project would have an adverse effect on Fermi 1. Consultation to determine measures to mitigate adverse effects is ongoing.

10.2.2 Unavoidable Adverse Impacts during Operation

Chapter 5 provides a detailed discussion of the potential impacts from operation of the proposed Fermi 3 at the Fermi site. The unavoidable adverse impacts related to operation are listed and summarized in Table 10-2.

Unavoidable adverse impacts on land use from operation of Fermi 3 would be minimal and associated with the offsite development that is expected to occur to accommodate new workers at the plant. Land use changes would include the conversion of some land in nearby areas to housing and retail development to serve plant workers. Property tax revenue from Fermi 3 could lead to additional growth in Monroe County as a result of infrastructure improvements (e.g., new roads and utility services).

Fermi 3 operations would result in an average consumptive use of approximately 7.6 billion gal of Lake Erie water per year. This represents approximately 4.1 percent of the current consumptive use in the Lake Erie basin. Surface water quality impacts could result from stormwater runoff and cooling tower blowdown discharge. These water-related impacts would be mitigated through compliance with the site's National Pollution Discharge Elimination System (NPDES) permit, MDEQ Large Quantity Water Withdrawal Permit, Clean Water Act Section 404 permit, MDEQ Water Quality Standards Certification, and through Detroit Edison's adherence to BMPs and the Stormwater Pollution Prevention Plan (SWPPP). Remaining adverse impacts on water use and water quality during operation would be minimal and limited to increased use of surface water for cooling, potential increases in sedimentation in surface water bodies, and potential surface water and groundwater contamination from inadvertent spills.

Unavoidable adverse impacts on terrestrial ecology resources would include the increased risk of birds and bats colliding with structures; the avoidance of the site by wildlife as a result of noise; the potential vehicle-related mortality of wildlife, including the State-listed eastern fox snake; and the maintenance-related disturbance of habitats within transmission line corridors. If BMPs are followed as proposed and a mitigation plan is developed and implemented for the eastern fox snake, terrestrial impacts during operations would be minor. Unavoidable adverse impacts on aquatic ecology resources would include an increased potential for entrainment, impingement, and thermal loading to Lake Erie, but the operation of the additional unit would not increase them such that they would noticeably alter the aquatic resources of the lake. Other impacts from operational activities, such as cooling tower drift, maintenance dredging, and transmission line corridor maintenance, would be minor.

Although minor impacts on transportation, recreation, housing, public services, and education would be associated with an increase in population related to Fermi 3 operations, these adverse

Table 10-2. Unavoidable Adverse Environmental Impacts from Operation of Fermi 3

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Land Use	SMALL	Adhere to all applicable land use and zoning regulations of Monroe County and Frenchtown Charter Township as well as regional and State land use plans.	Permanent commitment of approximately 155 ac onsite, and 1069 ac within the offsite transmission corridor for the operational life of Fermi 3. Approximately 21 ac offsite would be converted for the expanded Milan Substation. Some offsite land use changes are expected to indirectly result from operational activities, including the conversion of some land in surrounding areas to housing and retail developments to serve plant workers.
Water Use	SMALL	Comply with MDEQ Large Quantity Water Withdrawal Permit requirements.	Average consumptive use of approximately 7.6 billion gal per year from Lake Erie. No groundwater use or dewatering during operations.
Water Quality	SMALL	Comply with NPDES permit limitations for blowdown and stormwater discharges. Comply with permits for maintenance dredging activities, including Clean Water Act Section 404, Section 10 of the Rivers and Harbors Act, and MDEQ Act 451, Section 325.	Surface water impacts would include thermal, chemical, and radiological wastes and physical changes in Lake Erie resulting from stormwater runoff and effluents discharged by the proposed plant. No unavoidable adverse impacts on groundwater quality are anticipated during operations.

Table 10-2. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[a]	Unavoidable Adverse Impacts
Terrestrial and Wetland Resources	MODERATE	Use industry-standard BMPs for transmission ROW maintenance. MDEQ and MDNR may require the development and implementation of a plan to mitigate operational impacts on the eastern fox snake.	Onsite: long-term maintenance of approximately 155 ac of developed land. Offsite: maintenance of 1069 ac in the transmission line corridor. Approximately 21 ac would be converted for the expanded Milan Substation. Potential impact on eastern fox snake (State-listed as threatened) from vehicle-related mortality. Detroit Edison’s Species and Habitat Conservation Plan addresses potential eastern fox snake impacts during preconstruction and construction but not operations.
Aquatic Ecology	SMALL	Comply with NPDES permit limitations. If a shutdown of the proposed Fermi 3 is planned for the winter months, gradually reduce the discharge of cooling water to prevent cold shock.	Minor impacts to aquatic resources in Lake Erie from operation of the cooling system due to thermal discharges, impingement, and entrainment.
Socioeconomics			
Physical	SMALL	Implement traffic control and management measures to reduce the potential for traffic-related accident and health impacts.	Small increase in noise levels and traffic. Cooling tower and associated condensate plume would be visible offsite.
Demography	No adverse impact. Impact is beneficial.	None.	None.
Community economics	No adverse impacts. All impacts are beneficial.	None.	None.

Table 10-2. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[a]	Unavoidable Adverse Impacts
Infrastructure and services	SMALL (most impacts) to MODERATE (traffic during outages)	Implement roadway improvements either during the construction period or as recommended by Monroe County Road Commission (MCRC) or Michigan Department of Transportation (MDOT) following review of the site development plan.	Minor impacts on transportation, recreation, housing, public services, and education associated with population increase offset by increase in tax revenue. Increase in local traffic during operations, resulting in increased congestion, especially during outages.
Environmental Justice	SMALL	None.	None.
Historic and Cultural Resources	SMALL	None.	Minor impacts on offsite historical properties associated with visible condensate plume from cooling towers.
Air Quality	SMALL	Comply with Federal, State, and local air permits. Use cooling-tower drift eliminators. Water, reseed, or pave areas used for construction. Treat cooling water prior to discharge to reduce salt released into the atmosphere.	Slight increase in certain criteria pollutants and carbon dioxide from plant auxiliary combustion equipment (e.g., diesel generators). Plumes and drift from cooling towers. Minimal impacts on vegetation, soils, electrical equipment, and transmission lines.
Nonradiological Health	SMALL	Comply with Federal, State, and local regulations governing noise, electromagnetic fields (EMFs), occupational safety, and health impacts.	Minor increase in noise levels at nearest sensitive receptor. Occupational safety and health concerns. EMFs. Traffic fatalities.
Radiological Health	SMALL	Maintain doses to members of the public below NRC and EPA standards; maintain worker doses below NRC limits and as low as reasonably achievable (ALARA); keep doses to biota other than humans well below National Council on Radiation Protection and Measurements (NCRP) and International Atomic Energy Agency (IAEA) guidelines.	Small radiation doses (below NRC and EPA standards) to members of the public; ALARA doses to workers; and biota doses well below NCRP and IAEA guidelines.

Table 10-2. (contd)

Resource Area	Adverse Impacts	Actions to Mitigate Impacts[(a)]	Unavoidable Adverse Impacts
Fuel Cycle (including radioactive waste), Transportation, and Decommissioning	SMALL	Industry-wide changes in technology are reducing fuel cycle impacts. Implement waste-minimization program. Comply with NRC and U.S. Department of Transportation (DOT) regulations.	Small impacts from fuel cycle as presented in Table S-3, 10 CFR Part 51. Small impacts from carbon dioxide, radon, and technetium-99. Small radiological doses that are within NRC and DOT regulations from transportation of fuel and radwaste. Small impacts from decommissioning as presented in NUREG-0586 (NRC 2002).
Nonradioactive Waste	SMALL	Manage hazardous and nonhazardous solid wastes according to county and State handling and transportation regulations. Treat sanitary wastewater and discharge it to Frenchtown Charter Township Sewage Treatment Facility for treatment under an existing permit. Implement stormwater management plan. Implement recycling and waste minimization program.	Minor decrease in the capacity of waste treatment and disposal facilities. Minor increases in stormwater runoff, liquid discharges, and air emissions maintained within permit limits.

(a) MDEQ = Michigan Department of Environmental Quality; NPDES = National Pollution Discharge Elimination System; MDNR = Michigan Department of Natural Resources.

impacts would be offset by an increase in tax revenue. Because the site is located in a predominantly agricultural area, is light industrial site by its nature, and is well masked by vegetation in most directions, its impacts on aesthetics would be minor. Local traffic would increase during operations, resulting in increased congestion, especially during outages. Impacts on local roadways would be mitigated by implementation of roadway improvements either during the construction period or as recommended by the Monroe County Road Commission (MCRC) or Michigan Department of Transportation following review of the site development plan.

The review team found no evidence of unique characteristics or practices among current minority and low-income populations that would make them differentially affected by operational activities. No unusual resource dependencies of the minority and low-income populations in the region were identified.

The cooling tower condensate plume would be visible within the visual setting of 21 architectural resources that have been determined or recommended eligible for listing in the *National Register of Historic Places* (NRHP). The existing visual setting of these properties, which are all located offsite but within the indirect area of potential effect, currently includes existing condensate plumes from the active Fermi 2 power plant facilities on the Fermi property and from the active Monroe County coal-fired power plant to the south along the Lake Erie shoreline. The Fermi 3 cooling tower plume would be consistent with the existing visual settings and views from these 21 architectural resources, and there would be no new significant visual impacts that would affect their NRHP-eligibility determination or recommendations for their eligibility.

Unavoidable adverse air quality impacts would be negligible, and pollutants emitted during operations would not be significant. Unavoidable adverse nonradiological health impacts on members of the public from operations – including impacts related to etiological agents, noise, EMFs, occupational health, and transportation of materials and personnel – would be minimal because Detroit Edison would implement controls and measures in compliance with Federal and State regulations.

Radiological doses to members of the public from operation of proposed Fermi 3 would be below the NRC and EPA standards. Doses to workers from operation of Fermi 3 would also be below NRC limits and maintained as low as reasonably achievable (ALARA). The radiation protection measures designed to maintain doses to members of the public below NRC and EPA standards would also ensure that doses to biota other than humans would be well below National Council on Radiation Protection and Measurements (NCRP) and International Atomic Energy Agency (IAEA) guidelines.

Impacts from the nuclear fuel cycle would be bounded by the impacts in presented in Table S-3 of 10 CFR Part 51, and are therefore small. Impacts from carbon dioxide, radon, and technetium-99 were not addressed in Table S-3; Section 6.1 of this EIS addresses those impacts and concludes that they are small. Radiological doses from transportation of fuel and radiological waste would be within NRC and DOT regulations, and therefore small. Impacts from decommissioning are addressed in Section 6.3 of this EIS; they are also consistent with the impacts presented in NUREG-0586 (NRC 2002), and are therefore small.

10.3 Relationship between Short-Term Uses and Long-Term Productivity of the Human Environment

Section 102(2)(C)(iv) of NEPA requires that an EIS include information on the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The local use of the human environment by the proposed project can be summarized in terms of the unavoidable adverse environmental impacts of preconstruction, construction, and operations and the irreversible and irretrievable commitments of resources. With the exception of the consumption of depletable resources as a result of building and operating Fermi 3, these uses may be classified as short-term. The principal short-term benefit of the plant is represented by the production of electrical energy; and the economic productivity of the site, when used for this purpose, would be extremely large when compared with the short-term productive use of that portion of the Fermi site that would be developed for Fermi 3. The portion of the Fermi site where Fermi 3 would be built is not currently available for agricultural or industrial uses until Fermi 1 and 2 are decommissioned.

The maximum long-term impact on productivity would result if the plant was not immediately dismantled at the end of its operations and the land occupied by the plant structures was thus not be available for any other use. However, it is expected that the enhancement of regional productivity that would result from the electrical energy produced by Fermi 3 would result in a correspondingly large increase in regional long-term productivity that would not be equaled by any other long-term use of the site. In addition, most long-term impacts resulting from land use preemption by plant structures could be eliminated by removing these structures or by converting them to other productive uses. Once Fermi 3 was shut down, it would be decommissioned according to NRC regulations. Once decommissioning was complete and the NRC license was terminated, the site would be available for other uses.

10.4 Irreversible and Irretrievable Commitments of Resources

Section 102(2)(C)(v) of NEPA requires that an EIS include information on any irreversible and irretrievable commitments of resources that would occur if the proposed actions were implemented. The term “irreversible commitments of resources” refers to environmental resources that would be irreparably changed by building and operating Fermi 3 and that could not be restored at some later time to what their state was before the relevant activities occurred. “Irretrievable commitments of resources” refers to materials that would be used for or consumed by Fermi 3 in such a way that they could not, by practical means, be recycled or restored for other uses. The environmental resources and the anticipated impacts on them are discussed in Chapters 4, 5, and 6 of this EIS.

10.4.1 Irreversible Commitments of Resources

Irreversible commitments of environmental resources resulting from the construction, preconstruction, and operation of Fermi 3, in addition to the materials used for the nuclear fuel, are described below.

10.4.1.1 Land Use

Land committed to the disposal of radioactive and nonradioactive wastes is committed to that use and cannot be used for other purposes. The land used for Fermi 3, with the exception of any filled wetlands, is not irreversibly committed because once Fermi 3 ceases operations and the plant is decommissioned in accordance with NRC requirements, the land supporting the facilities could be returned to other industrial or nonindustrial uses. Approximately 64 ac of prime farmland on the Fermi site would either be irreversibly converted to developed land or experience surface soil damage during temporary use such that the soil properties responsible for the prime farmland designation would be irreversibly damaged. Most prime farmland within the proposed transmission line corridors would not be lost, as agricultural use remains possible for land traversed by transmission lines.

10.4.1.2 Water Use and Quality

Approximately 7.6 billion gal per year of water from Lake Erie would be lost through consumptive use as evaporative and drift losses from the natural draft cooling tower during operation. Some chemicals, including very low concentrations of radioisotopes, would be released from the facility into the surface water. Because these releases would conform to applicable Federal and State regulations, their impact on public health and the environment would be limited. The review team expects no irreversible commitment to water resources because Fermi 3 releases would be made in accordance with duly issued permits.

10.4.1.3 Terrestrial and Aquatic Resources

Preconstruction and construction activities would permanently convert some portions of terrestrial and aquatic habitats on the Fermi site, which would temporarily adversely affect the abundance and distribution of local terrestrial and aquatic species. Irretrievable commitments of resources include losses of approximately 51 ac of currently undeveloped land, including 8.3 ac of wetlands and 33.7 ac of upland habitat. Approximately 147 ac of habitat (including 23.7 ac of wetlands) would be disturbed during preconstruction and construction, but these areas would not support new facilities once building was complete. Although considered “temporary impacts,” these impacts may persist for a long period of time before forested habitats that are ecologically similar to mature forest in the region could develop through natural successional processes, and temporarily filled wetland habitats could return to pre-construction functional levels after initial site restoration. In addition, vegetation cutting to maintain the new transmission corridor will permanently convert forested wetlands to other wetland types resulting in a permanent alteration in wetland functions provided by the impacted wetlands.

Dredging and the laying of pipes would temporarily affect benthic habitats in Lake Erie. Most of these areas are expected to recover, although periodic maintenance dredging would interrupt complete recovery near the barge slip. The intake and discharge structures on the lake bottom will result in permanent loss of lake bottom habitat. No irretrievable losses of resources detectable at the population level are expected to result from operations, and any impacts that would result from operations would cease post operations. Building and maintaining transmission line rights-of-way (ROWs) would result in the conversion of about 1069 ac of upland and wetland habitat to maintained early successional habitats (grassland and shrubland). Approximately 21 ac of additional upland habitat would be developed permanently to support an expanded Milan Substation. The ability to recover these habitats once the transmission lines and expanded substation were no longer needed is possible, but could require several decades. The majority of terrestrial and aquatic habitat losses would be due to preconstruction activities.

10.4.1.4 Socioeconomic Resources

The review team expects that no irreversible commitments would be made to socioeconomic resources, since they would be reallocated for other purposes once the plant was decommissioned.

10.4.1.5 Historic and Cultural Resources

Historical and cultural resources could be permanently altered by the preconstruction and construction of Fermi 3 and associated transmission lines. Fermi 1 is considered eligible for listing in the NRHP. Detroit Edison has not determined whether or not to remove Fermi 1 after the facility is decommissioned and its NRC license is terminated. If the Fermi 1 external structure is present when Fermi 3 building activities begin, then demolition of Fermi 1 would be required to construct Fermi 3, and demolition would represent an irreversible commitment of resources. Visual impacts (alteration of the existing landscape) would occur during operations.

10.4.1.6 Air Quality

Dust and other emissions, such as vehicle exhaust, would be released to the air during preconstruction and construction activities. During operations, vehicle exhaust emissions would continue, and other air pollutants and chemicals, including very low concentrations of radioactive gases and particulates, would be released from the facility into the air. Because these releases would conform with applicable Federal and State regulations, their impact on public health and the environment would be limited. The review team expects no irreversible commitment to air resources because all Fermi 3 releases would be in accordance with duly issued permits.

10.4.2 Irretrievable Commitments of Resources

In ER Revision 2 (Detroit Edison 2011a), Detroit Edison estimated the irretrievable commitment of resources for the construction of Fermi 3 as follows:

- 460,000 yd^3 of concrete
- 46,000 tons of rebar
- 25,000 tons of structural steel
- 690,000 ft of piping
- 220,000 ft of cable tray
- 1,200,000 ft of conduit
- 1,400,000 ft of power cable
- 5,400,000 ft of control wire
- 740,000 ft of process and instrument tubing.

The review team expects that the construction materials used and the energy consumed for Fermi 3, while irretrievable, would be of small consequence with respect to the quantities of such resources that are available.

Uranium would be irretrievably committed during operation of Fermi 3. The availability of uranium ore and existing stockpiles of highly enriched uranium in the United States and Russia that could be processed into fuel is sufficient (OECD, NEA, and IAEA 2008), and the irreversible and irretrievable commitment is expected to be negligible.

10.5 Alternatives to the Proposed Action

Alternatives to the proposed action are discussed in Chapter 9 of this EIS. Alternatives considered are the no action alternative, energy production alternatives, system design alternatives, and alternative sites. For the purposes of the USACE's evaluation, onsite alternatives are addressed in Appendix J.

The no action alternative, described in Section 9.1, refers to a scenario in which the NRC would deny the request for the COL. If no other power plant was built or if no electrical power supply strategy was implemented to take its place, the electrical capacity to be provided by the project would not become available, and the benefits (electricity generation) associated with the proposed action would not occur, so the need for power would not be met.

Alternative energy sources are described in Section 9.2. Alternatives that would not require additional generating capacity are described in Section 9.2.1. Detailed analyses of coal- and natural-gas-fired alternatives are provided in Section 9.2.2. Other energy sources are discussed in Section 9.2.3. A combination of energy alternatives is discussed in Section 9.2.4.

The NRC staff concluded that none of the alternative energy options were both (1) consistent with Detroit Edison's objective of building baseload generation units and (2) environmentally preferable to the proposed action.

Alternative sites are discussed in Section 9.3. The cumulative impacts of building and operating the proposed facilities at the alternative sites are compared to the impacts at the proposed Fermi site in Section 9.3.7. Table 9-36 contains the review team's characterization of cumulative impacts at the proposed and alternative sites. On the basis of this review, the NRC staff concludes that although there are differences in cumulative impacts at the proposed and alternative sites, none of the alternative sites would be environmentally preferable or obviously superior to the proposed Fermi site. The NRC's determination is independent of the USACE's determination of a Least Environmentally Damaging Practicable Alternative pursuant to Clean Water Act Section 404(b)(1) guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its permit decision document.

Alternative heat dissipation and circulating water system designs are discussed in Section 9.4. The NRC staff concluded that none of the alternatives considered would be environmentally preferable to the proposed system designs.

10.6 Benefit-Cost Balance

NEPA (42 U.S.C. 4321 *et seq.*) requires that all agencies of the Federal Government prepare detailed EISs on proposed major Federal actions that can significantly affect the quality of the human environment. A principal objective of NEPA is to require each Federal agency to consider, in its decisionmaking process, the environmental impacts of each proposed major action and the available alternative actions. In particular, Section 102 of NEPA requires that all Federal agencies, to the fullest extent possible, identify and develop methods and procedures, in consultation with the Council on Environmental Quality (CEQ) established by Title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations.

However, neither NEPA nor the CEQ requires the costs and benefits of a proposed action to be quantified in dollars or any other common metric.

This section focuses on the monetized values of only those activities closely related to the building and operation of the proposed Fermi 3. The section does not identify and provide monetary estimates of all potential societal benefits of the proposed project and compare these to a monetized estimate of the potential costs of the proposed project. The review team offers quantified assessments for other benefits and costs that are of sufficient magnitude or importance that their inclusion in this analysis can inform the NRC and USACE decisionmaking processes. This section compiles and compares the pertinent analytical conclusions reached in earlier chapters of this EIS. It gathers all of the expected impacts from building and operating Fermi 3 and aggregates them into two final categories: the expected environmental costs and the expected benefits to be derived from approval of the proposed action.

Although the analysis in this section is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the intent is to identify potential societal benefits of proposed activities and compare these to their potential internal (i.e., private) and external (i.e., societal) costs. The purpose is to generally inform the COL process by gathering and reviewing information that demonstrates the likelihood that the benefits of the proposed activities outweigh the aggregate costs.

General issues related to Detroit Edison’s financial viability are outside the scope of NRC’s EIS process and are thus not considered in this EIS. Issues related to Detroit Edison’s financial qualifications will be addressed in the NRC’s safety evaluation report. It is not possible to quantify and assign a value to all benefits and costs of the proposed action. This analysis, however, attempts to identify, quantify, and provide monetary values for benefits and costs when reasonable estimates are available.

Section 10.6.1 discusses the benefits associated with the proposed action. Section 10.6.2 discusses the costs associated with the proposed action. A summary of benefits is shown in Table 10-3. In accordance with NRC’s guidance in NUREG-1555 (NRC 2000, pages 10.4.2–10.4.4), the internal costs of the proposed project are presented in monetary terms. Internal costs include all of the costs included in a total capital cost assessment: the direct and indirect costs of preconstruction and construction plus the annual costs of operation and maintenance. Section 10.6.3 provides a summary of the impact assessments, bringing previous sections together to establish a general impression of the relative magnitude of the proposed project’s costs and benefits.

10.6.1 Benefits

The most obvious benefit from building and operating a power plant is that it would generate power and provide thousands of residential, commercial, and industrial consumers with

Table 10-3. Benefits of Building and Operating Fermi 3

Category of Benefit	Description of Benefit	Impact Assessment
Electricity generated	14 million MWh per year for the 40-year life of the plant	–
Generating capacity	1605 MW(e)	–
Fuel diversity and energy security	Nuclear power generation provides diversity to Detroit Edison's and the Midwest Independent Transmission System Operator, Inc. (MISO) region's baseload generation inventory	SMALL
Tax revenues	Sales taxes paid by Detroit Edison for local purchases of about $14 million (in 2008 U.S. dollars) annually over the 40-year life of the unit; and local sales taxes and other taxes paid by in-migrating workers that amount to about $0.25 million divided between Michigan and Ohio locales (see Section 5.4.3.2).	SMALL to MODERATE
	Property taxes paid by Detroit Edison to Monroe County and local governments over the 40-year life of the unit.	LARGE
Local economy	Increased jobs would benefit the area economically and increase the economic diversity of the region (see Sections 4.4.3.1 and 5.4.3.1).	SMALL to MODERATE
Traffic	Minor upgrades to roads around the Fermi site to mitigate anticipated traffic quality degradation from Fermi 3 worker commutes.	SMALL
Public services and education	Additional tax revenues and philanthropic dollars to the community expected from Detroit Edison corporate donations as well as donations of time and money from its employees (see Sections 4.4.4.4, 4.4.4.5, 5.4.4.4, and 5.4.4.5).	SMALL

electricity. The social and economic benefits of maintaining an adequate supply of electricity in any given region could be large, given that reliable electricity supplies are key to economic stability and growth in a region. In addition to nuclear power, however, there are a number of different power generation technology options that could meet the need for electric power, including natural-gas-powered plants, coal-fired generation, and hydroelectric plants. Because the focus of this EIS is on the proposed expansion of generating capacity at the Fermi site, this section focuses primarily on the relative benefits of the Fermi option rather than the broader, more generic benefits of electricity supply.

10.6.1.1 Societal Benefits

For the production of electricity to be beneficial to a society, there must be a corresponding demand or "need for power" in the region. Chapter 8 of this EIS defines and discusses the need for power in more detail. From a societal perspective, the power itself is the primary benefit to society because it helps maintain the Nation's standard of living. However, price stability and longevity, energy security, and fuel diversity also are key benefits associated with nuclear power generation relative to the benefits from most other alternative generating technologies. These benefits are described in this section.

Price Stability and Longevity

Because of nuclear power's relatively low and nonvolatile fuel costs (approximately one-half cent per kWh) and a projected capacity utilization rate of 85 to 93 percent, nuclear energy is a dependable source of electricity that can be provided at relatively stable prices. Because of its low costs, the fuel price elasticity of electricity demand (how the consumer's demand for electricity changes as the price of uranium changes the cost of producing that electricity) is the lowest of all baseload electricity-generating fuels. The price of uranium fuel is only 3 to 5 percent of the cost of a kilowatt hour of nuclear-generated electricity. Doubling the price of uranium increases the cost of electricity by about 7 percent. In contrast, doubling the price of natural gas adds about 70 percent to the price of electricity; and doubling the cost of coal adds about 36 percent to the price of electricity (WNA 2007).

Unlike some other energy sources, nuclear energy is generally not subject to unreliable weather or climate conditions, unpredictable cost fluctuations, or dependence on foreign suppliers. In addition to low fuel prices, the relative lack of volatility in fuel prices when compared with fuel prices for natural gas-fired and oil-fired power plants, along with projected power plant availability rates of 85 to 93 percent, mean that nuclear energy is a dependable source of electricity that can be provided to the consumer at relatively stable prices over a long period of time.

Energy Security and Fuel Diversity

Currently, more than 70 percent of the electricity generated in the United States is generated by using fossil-based technologies. Nuclear power adds diversity and flexibility to the U.S. energy mix, thereby hedging the risk of shortages and price fluctuations that would result from an overdependence on any one power generating system.

A diverse fuel mix helps protect consumers from contingencies, such as fuel shortages or disruptions, price fluctuations, and changes in regulatory practices. Within Detroit Edison's service area, coal provides 57 percent of the electricity generation, natural gas provides 23 percent, oil provides 11 percent, and nuclear power provides 9 percent (Detroit

Edison 2011a). The proposed expansion of the Fermi site generating capacity could provide additional nuclear power generating capacity to the generation mix and thus give the region a hedge against risks of future shortages and price fluctuations associated with alternative generating systems.

10.6.1.2 Regional Benefits

Regional benefits of building and operating Fermi 3 include enhanced tax revenues at the State, county, and local levels; opportunities for increased regional productivity in industry, manufacturing, and other business categories; and improvements in local infrastructure and services derived from the increased tax base provided by the proposed Fermi 3 plant.

Tax Revenue Benefits

Tax revenues would come from various sources during preconstruction, construction, and operation of Fermi 3, including (a) State taxes on worker incomes, (b) State sales taxes on materials and supplies, (c) State sales taxes on worker expenditures, and (d) local property taxes or payments in lieu of taxes based on the incremental increase in the value of Fermi 3 during construction. The tax structure of the region is discussed in Section 2.5.2.2 of this EIS.

State income tax revenue during the building of Fermi 3 would be approximately $1 million annually ($0.9 million annually for the State of Michigan and approximately $0.12 million annually for the State of Ohio – see Section 4.4.3.2). During operations, about $0.25 million in income taxes would be received: about $0.2 million would be received by the State of Michigan, and $0.03 million would be received by the State of Ohio (see Section 5.4.3.2). The States of Michigan and Ohio and some of the local jurisdictions in Ohio would also receive sales tax revenue on expenditures made by the new workers and on purchases of building materials and supplies in the local area. The review team estimated, on the basis of information provided by Detroit Edison, that the State of Michigan would receive new sales tax revenue of about $8.3 million over the 10-year building period for Fermi 3 and that the State of Ohio would receive about $5.1 million.

Assuming a State sales tax rate in Michigan of 6 percent, an estimated $0.5 million in sales tax revenue would be received by the State of Michigan annually over the 40-year life of the Fermi 3 COL. Assuming a State sales tax rate in Ohio of 5.5 percent, an estimated $0.3 million in sales tax revenue would be received by the State annually from the purchase of materials and supplies for the operation and maintenance of Fermi 3.

A number of local jurisdictions, including Monroe County and Frenchtown Charter Township, would benefit from increased property taxes associated with Fermi 3. In 2009, the assessed value of property owned by Detroit Edison in Monroe County was $821 million (Monroe County Finance Department 2009), which is approximately 13.3 percent of the total county taxable assessed value of slightly more than $6.1 billion. Given that the expected Fermi 3 overnight cost of construction is $6.4 billion, upon completion of the construction of Fermi 3, the total assessed property value in Monroe County would increase by about 100 percent.

In 2009, Detroit Edison paid a millage rate of approximately 47.33 mills, which was dispersed to Frenchtown Charter Township (6.8 mills), Monroe County (including Monroe Intermediate School District, Monroe Community College, and the Monroe Library) (13.23 mills), Jefferson Resort School District (18.5 mills), and the Resort Authority (2.8 mills) (Detroit Edison 2011a). As the assessed value of property would increase each year during the project, so would the taxes paid to Monroe County, Frenchtown Charter Township, and other local jurisdictions. These incremental increases in taxes would have a significant impact on annual property tax revenues in these jurisdictions.

Regional Productivity and Community Impacts

Building of Fermi 3 would require an average workforce of about 1000 workers per year over the 10-year construction period, with a peak building employment of about 2900 workers. The Fermi 3 workforce would produce, on average, about $50.5 million in income each year over the entire preconstruction and construction period (see Section 4.4.3.1). Stimulus from these new jobs and income would induce a multiplier effect that would create additional indirect jobs in the economic impact area – Monroe, Wayne, and Lucas Counties – producing about 253 new jobs during the building of Fermi 3. Operations would create 900 direct jobs and $57.3 million in income annually and would be maintained throughout the life of the plant (see Section 5.4.3.1). Additional annual indirect jobs and indirect income would be created in the three-county area by the new operational jobs, for a total of 458 indirect jobs during operations. An estimated 1200 to 1500 workers would also be employed at Fermi 3 during scheduled refueling outages, which would occur every 24 months and require outage workers for a period of 30 days, producing an additional $7.9 million in income every 2 years (Detroit Edison 2011a).

10.6.2 Costs

Internal costs to Detroit Edison as well as external costs to the surrounding region and environment would be incurred during the preconstruction, construction, and operation of Fermi 3. Internal costs include the costs to build the power plant (capital costs), as well as operating and maintenance costs and the costs of fuel, waste disposal, and decommissioning. External costs include all costs imposed on the environment and region surrounding the plant and may include the loss of regional productivity, environmental degradation, and loss of wildlife habitat. Internal and external costs of building and operating Fermi 3 are presented in Table 10-4.

10.6.2.1 Internal Costs

The most substantial monetary cost associated with nuclear energy is the cost of capital. Nuclear power plants typically have relatively high capital costs but low fuel costs relative to alternative power generation systems. Because of the high capital costs for nuclear power and because of the relatively long construction period before revenue is returned, servicing the capital costs of a nuclear power plant is the most important factor in determining the economic competitiveness of nuclear energy. Because a power plant does not yield profits during construction, longer construction times can add significantly to the cost of a plant through higher interest expenses on borrowed construction funds.

Preconstruction and Construction Costs

In evaluating monetary costs related to constructing Fermi 3, Detroit Edison reviewed recent published literature, vendor information, internally generated financial information, and internally generated, site-specific information (Detroit Edison 2011a). The cost estimates reviewed were not based on nuclear plant construction experience in the United States, which is more than 20 years old, but rather on construction costs overseas, which are more recent. A phrase commonly used to describe the monetary cost of constructing a nuclear plant is "overnight capital cost." Capital costs are those incurred during construction and include engineering, procurement, and construction costs, measured during the period(s) when the actual outlays for equipment, construction, and engineering are expended. Overnight costs assume that the plant is constructed "overnight," with no interest included in the capital cost estimate. Studies of new power plant construction indicate that the estimated construction costs of a nuclear power plant average approximately $4000 per kilowatt (kW) of electrical generating capacity (MIT 2010).

Operation Costs

Operation costs are frequently expressed in terms of the levelized cost of electricity, which is the price per kilowatt-hour (kWh) of producing electricity, including the cost needed to cover operating costs and annualized capital costs. Overnight capital costs account for a third of the levelized cost, and interest costs on the overnight costs account for another 25 percent (University of Chicago 2004). A recent Massachusetts Institute of Technology (MIT) study concluded that at an 85 percent capacity factor, electricity generation costs vary between 6.7 and 7.0 cents per kWh, depending on the economic life of the plant (MIT 2010). Estimates include decommissioning but, because of the effect of discounting a cost that would occur as late as 40 years in the future, decommissioning costs have relatively little effect on the levelized cost.

Table 10-4. Internal and External Costs of Building and Operating Fermi 3

Benefit-Cost Category	Description (except where noted, costs are in 2008 U.S. dollars)	Impact Assessment[a]
Internal Costs[b]		
Construction cost	$6.4 billion (overnight capital cost).	–
Operating cost	6.7–7.0 cents per kWh (levelized cost of electricity) (MIT 2010).	–
Spent fuel management	0.1 cent/kWh (WNA 2007).[c]	–
Decommissioning	0.1–0.2 cent/kWh (WNA 2007).[d]	–
Material and resources	460,000 yd^3 of concrete 46,000 tons of rebar 25,000 tons of structural steel 690,000 ft of piping 220,000 ft of cable tray 1,200,000 ft of conduit 1,400,000 ft of power cable 5,400,000 ft of control wire 740,000 ft of process and instrument tubing.	–
Tax payments	State income taxes of $0.7 million annually during construction and operation (see Section 5.4.3.2).	SMALL
	Annual sales taxes of $0.3 million during construction and of $0.2 million during operations.	SMALL
	Approximately $14 million per year in local property taxes paid by Detroit Edison over the 40-year life of the COL.	SMALL
Land use	Approximately 155 ac occupied on a long-term basis by the new nuclear reactor and associated infrastructure. An estimated 1069 ac of land for ROWs would need to be acquired and developed for electricity transmission (see Sections 4.1 and 5.1). An additional 21 ac would be developed to expand the Milan Substation.	SMALL
External Costs		
Land use	The land acquired for new transmission line ROWs (estimated as 1069 ac) and expanded Milan Substation (estimated 21 ac) may be taken out of other productive or beneficial use (see Sections 4.1 and 5.1)	SMALL

Table 10-4. (contd)

Benefit-Cost Category	Description (except where noted, costs in 2008 U.S. dollars)	Impact Assessment[a]
Air quality impacts	Negligible impacts (see Sections 4.2, 5.2, and 9.2). Avoidance of sulfur dioxide, nitrogen oxide, carbon monoxide, carbon dioxide, and particulate emissions.	SMALL
Water-related impacts	Small impact on surface and groundwater use and water quality. Water effluents would be regulated by MDEQ's Environmental Protection Division under an NPDES permit (see Sections 4.2 and 5.2).	SMALL
Ecological impacts	Loss or disturbance of upland, wetland, and aquatic habitat and associated plant and animal species onsite and along the transmission line corridor. Proposed mitigation would offset some impacts. Operational impacts on most species and habitats are expected to be minor.	SMALL (most resources), MODERATE (eastern fox snake during operation)
	Potential impact on eastern fox snake (State-listed as threatened) and its habitat (see Sections 4.3 and 5.3) during operations unless mitigation is adopted to reduce the potential for vehicle-related mortality.	
Physical impacts on community	Impacts limited primarily to boundaries of the site; potentially moderate offsite traffic impacts (see Sections 4.4.1 and 5.4.1).	SMALL
Housing	Potential short-term housing shortage (possibly driving up housing prices and rental rates) in Monroe County during the 10-year construction period (see Section 4.4.4.3).	SMALL
Traffic	Short-term stress on the local road network because of congestion during construction affecting commuting patterns and potential degradation from vehicles used for construction and operational activities (see Sections 4.4.4.1 and 5.4.4.1).	MODERATE
Public services	Minimal short-term strain on community services in Monroe County during early stages of 10-year construction period (see Section 4.4.4.4).	SMALL
Recreation	Because the in-migrating workforce for construction and operations would be small relative to the population of the region, there would be little marginal impact on recreation from Fermi 3 (see Sections 4.4.1.4, 4.4.3.4, 5.4.1.4, and 5.4.3.4).	SMALL

Table 10-4. (contd)

Benefit-Cost Category	Description (except where noted, all costs in 2008 U.S. dollars)	Impact Assessment[(a)]
Cultural resources	There would be an adverse effect to a historic property if Fermi 1 was demolished for the Fermi 3 project. Detroit Edison has committed to developing procedures to manage cultural resources in the event of an inadvertent discovery onsite (see Sections 4.6 and 5.6).	MODERATE
Health impacts (nonradiological and radiological)	Impacts of radiological exposures on construction workers would be SMALL. Radiological doses to the public and occupational workers would be monitored and controlled in accordance with regulatory limits (see Sections 4.8, 4.9, 5.8, and 5.9). Nonradiological health impacts to the public and occupational workers would be SMALL; hazards would be monitored and controlled in accordance with regulatory limits (see Sections 4.8 and 5.8).	SMALL

(a) Impact assessments are listed for all impacts evaluated in detail as part of this EIS. The details on impact assessments are found in the indicated sections of this EIS.
(b) Internal costs are costs incurred by Fermi to implement proposed construction and operation at the Fermi site. Note that no impact assessments are provided for these private financial impacts.
(c) Based on Yucca Mountain waste maintenance levy (WNA 2007).
(d) Decommissioning costs are included in total operating costs.

Fuel Costs

From the outset, the basic attraction of nuclear energy has been its low fuel costs when compared with those of coal-, oil-, and gas-fired plants. Uranium, however, has to be processed, enriched, and fabricated into fuel elements, and about half of the cost results from enrichment and fabrication. Allowances must also be made for the management of radioactive spent fuel and the ultimate disposal of this spent fuel or the wastes separated from it. Even with these costs included, the total fuel costs of a nuclear power plant are typically about a third of those for a coal-fired plant and between a quarter and a fifth of those for a natural gas combined-cycle plant (University of Chicago 2004). The International Energy Agency estimated the average fuel cost for a nuclear generating plant to be less than one-half cent per kWh at a 5 percent discount rate.

Waste Disposal

The backend costs of nuclear power contribute a very small share to total cost, both because of the long lifetime of a nuclear reactor and the fact that provisions for waste-related costs can be accumulated over that time. It should also be recognized, however, that radioactive nuclear waste poses unique disposal challenges for long-term management. The United States and other countries have yet to implement final disposition of spent fuel or high-level radioactive waste streams created at various stages of the nuclear fuel cycle. Because these radioactive wastes present some danger to present and future generations, the public and its elected representatives, as well as prospective investors in nuclear power plants, properly expect continuing and substantial progress toward a solution to the waste-disposal problem. Successful operation of a geological repository would ease, but not solve, the waste-disposal issue for the United States and other countries, if nuclear power expands substantially (MIT 2003).

Decommissioning

At 10 CFR 50.75, the NRC has requirements for licensees to provide a reasonable assurance that funds would be available for the decommissioning process. Because of the effect of discounting a cost that would occur as much as 40 years in the future, decommissioning costs have relatively little effect on the levelized cost of electricity generated by a nuclear power plant (WNA 2007), estimated to be between 0.1 and 0.2 cents per kWh, which is no more than 5 percent of the cost of the electricity produced (WNA 2007).

10.6.2.2 External Costs

External costs are social and/or environmental effects caused by the proposed construction of and generation of a new power reactor at the Fermi site. This EIS includes the NRC staff's analysis that weighs the environmental impacts of constructing and operating a new nuclear unit at the Fermi site or at alternative sites and mitigation measures available for reducing or avoiding these adverse impacts. It also includes the review team's recommendation to the Commission regarding the proposed action.

Environmental and Social Costs

Chapter 4 of this EIS describes the impacts on the environment from building Fermi 3 with respect to land use, air quality, water, terrestrial and aquatic ecosystems, socioeconomics, historic and cultural resources, environmental justice, and nonradiological and radiological health effects. It also describes measures and controls to limit adverse impacts during the building of Fermi 3. Chapter 5 examines the impacts associated with the operation of Fermi 3 for an initial 40-year period on these same topic areas, as well as postulated accidents. Applicable measures and controls that would limit the adverse impacts of station operation during the 40-year operating period are considered.

Chapter 6 similarly addresses the environmental impacts from the (1) uranium fuel cycle and solid waste management, (2) transportation of radioactive material, and (3) decommissioning of Fermi 3. Chapter 7 of this EIS places all of the potential impacts of the new unit in the context of all past, present, and reasonably foreseeable future activities in the general area that may have a connection to the region. Chapter 9 includes the review team's review of alternative sites, alternative power generation systems, and alternative cooling system designs. In Chapter 10, impacts were also compared to the adverse impacts for the alternative sites. Section 10.2 identifies unavoidable adverse impacts of the proposed action (i.e., impacts after consideration of proposed mitigation actions), and Section 10.4 identifies irretrievable commitments of resources.

Unlike the situation when electricity is generated from coal and natural gas, the normal operation of a nuclear power plant does not result in significant emissions of criteria air pollutants (e.g., nitrogen oxides or sulfur dioxide), methyl mercury, or greenhouse gases associated with global warming and climate change. Combustion-based power plants are responsible for 36 percent of the carbon dioxide, 64 percent of the sulfur dioxide, 26 percent of the nitrogen oxide, and 13 percent of the mercury emissions from industrial sources in the United States (DOE/EIA 2006). The majority of the electric power industry's emissions are likely from coal-fired plants. Chapter 9 of this EIS analyzes coal- and natural-gas-fired alternatives to the building and operation of Fermi 3. Air emissions from these alternatives and nuclear power are summarized in Chapters 4, 5, and 9.

10.6.3 Summary of Benefits and Costs

Detroit Edison's business decision to pursue expansion of Fermi generating capacity by adding a nuclear reactor is an economic decision, based on private financial factors subject to regulation by the Michigan Public Service Commission. The internal costs to construct additional units appear to be substantial; however, Detroit Edison's decision to pursue this expansion implies that the company has already concluded that the private, or internal, benefits of the proposed facility outweigh the internal costs. Although no specific monetary values could reasonably be assigned to the identified societal benefits, it would appear that the potential societal benefits of the proposed expansion of Fermi generating capacity are substantial. In comparison, the external socioeconomic and environmental costs imposed on the region appear to be relatively small.

As described in Section 8.4, there is increasing baseload demand and decreasing baseload supply in the region of interest. Without additional baseload generating capacity, Detroit Edison's electricity network will fail to maintain an adequate power reserve margin to meet its public service obligations to provide adequate power and will jeopardize the utility's commitment to provide power to other electric service providers within the region. Fermi 3 would help meet the increasing baseload demand in the region by supplying average annual electrical energy generation of about 12,000,000 megawatt-hours (MWh).

As described in this section, the additional direct and indirect creation of jobs would place some temporary burdens on local services and infrastructure, but the additional annual taxes and revenue generated by the new workers would contribute to the local economy and stimulate future growth. By comparison, the external socioenvironmental costs imposed on the region appear to be relatively small.

The review team concludes, on the basis of the assessments summarized in this EIS, that the building and operation of the proposed Fermi 3, with mitigation measures identified by the review team, would accrue benefits that most likely would outweigh the economic, environmental, and social costs associated with constructing and operating a new unit at the Fermi site.

10.7 Staff Conclusions and Recommendations

The NRC staff's preliminary recommendation to the Commission related to the environmental aspects of the proposed action is that the COL should be issued. The staff's evaluation of the safety and emergency preparedness aspects of the proposed action will be addressed in the staff's safety evaluation report that is anticipated to be published in the future.

The staff's preliminary recommendation is based on (1) the ER submitted by Detroit Edison (Detroit Edison 2011a); (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's own independent review; (4) the staff's consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and in the EIS. In addition, in making its preliminary recommendation, the staff determined that none of the alternative sites assessed is obviously superior to the Fermi site. The NRC's determination is independent of the USACE's determination of a Least Environmentally Damaging Practicable Alternative pursuant to Clean Water Act Section 404(b)(1) guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its permit decision document.

10.8 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

33 CFR Part 320. Code of Federal Regulations, Title 33, *Navigation and Navigable Waters*, Part 320, "General Regulatory Policies."

33 CFR Part 332. Code of Federal Regulations, Title 33, *Navigation and Navigable Waters*, Part 332, "Compensatory Mitigation for Losses of Aquatic Resources."

40 CFR Part 230. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 230, "Guidelines for Specification of Disposal Sites for Dredged or Fill Material."

40 CFR Part 1508. Code of Federal Regulations. Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

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U.S. Nuclear Regulatory Commission (NRC). 2011. Staff Memorandum from Scott Flanders, DSER Division Director, to Brent Clayton, RENV Branch Chief, dated March 4, 2011, "Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historic Resources Analysis Issues in Environmental Impact Statements." Accession No. ML110380369.

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Appendix A

Contributors to the Environmental Impact Statement

Appendix A

Contributors to the Environmental Impact Statement

The overall responsibility for the preparation of this environmental impact statement was assigned to the Office of New Reactors, U.S. Nuclear Regulatory Commission (NRC). The U.S. Army Corps of Engineers (USACE) is participating as a cooperating agency. The environmental impact statement was prepared by members of the Office of New Reactors with assistance from other NRC organizations, the USACE, Argonne National Laboratory, Energy Research, Inc., Ecology and Environment, Inc., and Dade Moeller and Associates.

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Jack Cushing	Office of New Reactors	Senior Staff Oversight
Peyton Doub	Office of New Reactors	Land Use, Terrestrial Ecology, Transmission Lines
Daniel Barnhurst	Office of New Reactors	Hydrology, Surface Water
Laurel Bauer	Office of New Reactors	Geology
Michael Masnik	Office of New Reactors	Aquatic Ecology, Transmission Lines
Daniel Mussatti	Office of New Reactors	Socioeconomics, Environmental Justice, Need for Power
Andrew Kugler	Office of New Reactors	Alternative Energies, Alternative Sites
John Fringer	Office of New Reactors	Cultural Resources, Nonradiological Health
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David Sisk	Office of New Reactors	Demography
Charles Hinson	Office of New Reactors	Radiological Health Impacts – Occupational
George Cicotte	Office of New Reactors	Radiological Health Impacts – Effluent
Brad Harvey	Office of New Reactors	Meteorology and Air Quality
Richard Emch	Office of New Reactors	Radiological Health Impacts, Radioactive Waste Systems, Uranium Fuel Cycle, Accidents
Stan Echols	Office of Nuclear Material Safety and Safeguards	Uranium Fuel Cycle
David Brown	Office of New Reactors	Design Basis Accidents
Edward Fuller	Office of New Reactors	Severe Accidents, Severe Accident Mitigation Alternatives
Jessica Glenny	Office of Nuclear Material Safety and Safeguards	Transportation of Radioactive Materials
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Tim Allison		Land Use, Benefit Cost Analysis
Adrianne Carr		Hydrology – Groundwater
John Quinn		Geology, Hydrology – Surface Water
Sunita Kamboj		Radiological Health, Nonradiological Health/ Waste Systems/Decommissioning
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David Weeks		Terrestrial Ecology
Jone Guerin		Demography, Socioeconomics, Environmental Justice
DADE MOELLER & ASSOCIATES, INC.		
David McCormack		Uranium Fuel Cycle

(a) Argonne National Laboratory is operated for the U.S. Department of Energy by UChicago Argonne, LLC.

Appendix B

Organizations Contacted

Appendix B

Organizations Contacted

The following Federal, State, regional, Tribal, and local organizations were contacted during the course of the U.S. Nuclear Regulatory Commission staff's independent review of potential environmental impacts from the construction and operation of a new nuclear unit, Enrico Fermi Unit 3, at the Detroit Edison Company Enrico Fermi Atomic Power Plant site in Monroe County, Michigan:

Advisory Council on Historic Preservation, Washington, D.C.

Bay Mills Indian Community, Brimley, Michigan

Delaware Nation, Anadarko, Oklahoma

Forest County Potawatomi Community of Wisconsin, Crandon, Wisconsin

Grand Traverse Band of Ottawa and Chippewa Indians, Suttons Bay, Michigan

Great Lakes Fisheries Commission, Lansing, Michigan

Hannahville Indian Community, Wilson, Michigan

Huron Potawatomi, Inc., Fulton, Michigan

International Joint Commission, Great Lakes Water Quality Board, Washington, D.C.

Keweenaw Bay Indian Community, Baraga, Michigan

Lac Vieux Desert Band of Lake Superior Chippewa Indians, Watersmeet, Michigan

Little River Band of Ottawa Indians, Manistee, Michigan

Little Traverse Bay Bands of Odawa Indians, Harbor Springs, Michigan

Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan, Dorr, Michigan

Michigan Department of Environmental Quality, Lansing, Michigan

Michigan Department of Natural Resources, Lansing, Michigan

Michigan State Historic Preservation Office, Michigan Historical Center, Department of History, Arts and Libraries, Lansing, Michigan

Michigan Natural Features Inventory, Lansing, Michigan

National Marine Fisheries Service, Northeast Regional Office, Gloucester, Massachusetts

Ohio Department of Natural Resources, Division of Natural Areas & Preserves, Ohio Natural Heritage Data Base, Columbus, Ohio

Ottawa Tribe of Oklahoma, Miami, Oklahoma

Pokagon Band of Potawatomi Indians, Dowagiac, Michigan

Saginaw Chippewa Indian Tribe of Michigan, Mt. Pleasant, Michigan

Sault Ste. Marie Tribe of Chippewa Indians of Michigan, Sault Ste. Marie, Michigan

Shawnee Tribe, Miami, Oklahoma

U.S. Environmental Protection Agency, Region 5, Chicago, Illinois

U.S. Fish and Wildlife Service, East Lansing Michigan Field Office, East Lansing, Michigan

Wyandotte Nation, Wyandotte, Oklahoma

Appendix C

NRC and USACE Environmental Review Correspondence

Appendix C

NRC and USACE Environmental Review Correspondence

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) or the U.S. Army Corps of Engineers (USACE) and Detroit Edison, and other correspondence related to the environmental review for a combined license (COL) application for Enrico Fermi Unit 3 (Fermi 3) near Monroe, Michigan. This application was submitted by the Detroit Edison Company (Detroit Edison).

All documents, with the exception of those containing proprietary information, are available through the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the component of ADAMS. The ADAMS accession numbers for each document are included below.

September 18, 2008	Letter from Mr. J.M. Davis, Detroit Edison, to NRC transmitting application for Combined License for the Fermi Nuclear Power Plant (Accession No. ML082730763).
October 10, 2008	Letter from Mr. Chandu Patel, NRC, to Mr. Jack M. Davis, DTE, acknowledging receipt of the combined license application for Fermi Nuclear Power Plant, Unit 3 (Accession No. ML082381079).
December 3, 2008	Letter from Mr. G.P. Hatchett, NRC, to Mr. J.M. Davis, Detroit Edison, transmitting Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Related to a Combined License for Fermi Nuclear Power Plant, Unit 3 (Accession No. ML083110329).
December 10, 2008	Letter from Mr. Stephen Lemont, NRC, to Ms. Margo Zieske, Monroe County Libraries, regarding maintenance of reference materials at the Dorsch Library for the environmental review of the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML082560486).

December 23, 2008	Notice of Public Meeting to discuss Environmental Scoping Process for the Fermi Nuclear Power Plant Combined License Application for Unit 3 (Accession No. ML083500473).
December 23, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Craig Czarnecki, Field Supervisor, U.S. Fish and Wildlife Service, regarding request for participation in the environmental scoping process and a list of protected species within the area under evaluation for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151398).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Ms. Mary Colligan, NOAA National Marine Fisheries Service, Northeast Regional Office, regarding request for participation in the environmental scoping process and a list of protected species within the area under evaluation for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151403).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Ms. Patricia Jones, Ohio Department of Natural Resources, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151404).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Kelley Smith, Chairman, Great Lakes Fisheries Commission, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151400).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Don Klima, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151399).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Warren C. Swartz, President, Keweenaw Bay Indian Community, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190398).

December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to the Honorable Jeffrey D. Parker, President, Bay Mills Indian Community, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190083).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Robert Kewaygoshkum, Chairman, Grand Traverse Band of Ottawa and Chippewa Indians, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190375).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. James Williams, Jr., Chairman, Lac Vieux Desert Band of Lake Superior Chippewa Indians, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190406).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Frank Ettawageshik, Chairman, Little Traverse Bay Bands of Odawa Indians, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190425).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to the Honorable John A. Miller, Chairman, Pokagon Band of Potawatomi Indians, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190442).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Aaron Payment, Chairperson, Sault Ste. Marie Tribe of Chippewa Indians of Michigan, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190489).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Kenneth Meshigaud, Chairman, Hannahville Indian Community, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190379).

December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Ms. Laura Spurr, Chairperson, Huron Potawatomi, Inc., regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190382).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Fred Cantu, Jr., Chief, Saginaw Chippewa Indian Tribe of Michigan, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190448).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. David K. Sprague, Chairman, Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190436).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to The Honorable Larry Romanelli, Little River Band of Ottawa Indians, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083190415).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. James G. Chandler, International Joint Commission, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151401).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Brian D. Conway, Michigan State Historic Preservation Officer, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151405).
December 24, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Ms. Leni Wilsmann, Michigan Natural Features Inventory, regarding request for participation in the scoping process and list of State Listed Protected Species for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083151402).

December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Harold G. Frank, Forest County Potawatomi, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083520641).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Ms. Anna Miller, U.S. EPA Region 5, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083590143).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC, to Mr. Steven Chester, Director, Michigan Dept. of Environmental Quality, regarding request for participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083590138).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC to Mr. Ron Sparkman, Shawnee Tribe, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083530066).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC to Mr. Edgar L. French, Delaware Nation, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083530050).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC to Ms. Leaford Bearskin, Wyandotte Nation, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083530077).
December 31, 2008	Letter from Mr. Gregory P. Hatchett, NRC to Mr. Charles Todd, Ottawa Tribe of Oklahoma, regarding request for consultation and participation in the scoping process for the environmental review for the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML083530043).

January 21, 2009	Letter from Ms. Mary A. Colligan, NOAA National Marines Fisheries Service Northeast Region, to Mr. Gregory P. Hatchett, NRC, providing information on endangered and threatened species and Essential Fish Habitat within the project area for the Fermi Nuclear Power Plant (Accession No. ML090711069).
January 28, 2009	Letter from Mr. Craig Czarnecki, U.S. Fish and Wildlife Service, to Mr. Gregory P. Hatchett, NRC, providing information on endangered and threatened species within the project area for the Fermi Nuclear Power Plant (Accession No. ML090750973).
March 3, 2009	Letter from Mr. John Konik, U.S. Army Corps of Engineers, to Mr. Scott Flanders, NRC, regarding cooperating status on the Fermi Nuclear Power Plant Environmental Impact Statement (Accession No. ML090850037).
March 3, 2009	Summary of the Public Scoping Meetings Conducted Related to the Combined License Application Review of the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML090291080).
May 12, 2009	Letter from Mr. Stephen Lemont, NRC, to Mr. Peter Smith, DTE Energy, transmitting requests for additional information for the environmental review of the Fermi Nuclear Power Plant, Unit 3 combined license application (Accession No. ML090980159).
June 19, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML091940218).
July 2, 2009	Scoping Summary Report Related to the Environmental Scoping Process for the Fermi Nuclear Power Plant, Unit 3 Combined License Application Review (Accession No. ML091520145).
July 31, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML092290662).
August 25, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML092400535).

August 28, 2009	Trip Report for the Fermi 3 Environmental Site Audit from February 2-6, 2009 (Accession No. ML092390538).
August 28, 2009	Trip Report for the Fermi 3 Alternatives Site Visit from January 12-13, 2009 (Accession No. ML092390543).
September 30, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML093350028).
October 30, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML093090165).
November 13, 2009	Letter from Mr. Ryan Whited, NRC, to Mr. Peter Smith, DTE, regarding project manager change for the combined license environmental review for Fermi Nuclear Power Plant Unit 3 (Accession No. ML093000568).
November 23, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML093380365).
December 23, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML093380362).
December 23, 2009	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML093650121).
January 29, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML100331451).

February 15, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML100541329).
February 16, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML100500278).
March 24, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML100850542).
March 30, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML100960472).
July 9, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML ML102000566).
July 26, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML102180224).
September 1, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML102510498).
October 29, 2010	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML103120126).

December 2, 2010	Letter from Bruce A. Watson, NRC, to Mr. Brian D. Conway, Michigan State Historic Preservation Officer, initiating Section 106 process for the Fermi Nuclear Power Plant, Unit 1 license termination plan review (Accession No. ML101790096).
December 16, 2010	Letter from Mr. Ryan Whited, NRC, to Mr. Brian D. Conway, Michigan State Historic Preservation Officer, regarding Section 106 process for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML101820302).
January 10, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting updates to the Fermi 3 combined license application (COLA) reflecting changes to the Fermi site layout (Accession Nos. ML110280350, ML110280351, ML110280352, ML110280353).
February 14, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting Detroit Edison Company application for a combined license for Fermi 3 update and establishment of the licensing-basis information freeze point for the Fermi 3 COLA (Accession No. ML110600656).
March 4, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting responses to environmental requests for additional information for the combined license application for the Fermi Nuclear Power Plant, Unit 3 (Accession No. ML110670232).
May 13, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, Detroit Edison Company responses to NRC transmitting requests for additional information letter related to the environmental review (Accession No. ML11136A278).
June 17, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, Detroit Edison response to NRC questions related to the environmental review-site selection process (Accession No. ML11171A2960).
June 17, 2011	Letter from Randall D. Westmoreland, Detroit Edison, to Michigan Department of Environmental Quality, transmitting the Joint Permit Application for Detroit Edison, Fermi 3 Nuclear Power Plant (Accession No. ML111940490).
July 7, 2011	Letter from Mr. Peter W. Smith, Detroit Edison, to NRC, transmitting Detroit Edison Company's responses to NRC questions related to the environmental review and supplemental response (Accession No. ML11192A190).

July 15, 2011	Letter from Peter W. Smith, Detroit Edison, to NRC, updates to the Fermi 3 combined license application (COLA) reflecting changes to conform with the Fermi 3 Joint Permit Application (Accession No. ML112000169).
August 11, 2011	Summary of Public Teleconferences with Detroit Edison Company to Discuss Status and Progress of Fermi 3 Combined License Environmental Review (Accession No. ML111870069).
August 22, 2011	Letter from John Fringer, NRC, to Martha MacFarlane Faes, Michigan State Historic Preservation Office, regarding Request for Review of Supplemental Information Related to Section 106 Process for the Fermi Nuclear Power Plant, Unit 3 Combined License Application Review – SHPO #ER06-683 (Accession No. ML112070027).
August 24, 2011	Letter from John Fringer, NRC, to Martha MacFarlane Faes, Michigan State Historic Preservation Office, regarding Draft Memorandum of Agreement Between the U.S. Nuclear Regulatory Commission and the Michigan State Historic Preservation Officer Regarding the Demolition of the Enrico Fermi Atomic Power Plant, Unit 1 Facility Located in Monroe County, Michigan – SHPO #ER06-683 (Accession No. ML112070043).
September 16, 2011	Letter from John Konik, U.S. Army Corps of Engineers, to Bruce Olson, U.S. Nuclear Regulatory Commission, regarding concurrence in the release of the Fermi 3 Draft EIS for public comment (Accession No. ML112660005.

Appendix D

Scoping Comments and Responses

Appendix D

Scoping Comments and Responses

On December 10, 2008, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent to prepare an environmental impact statement (EIS) and conduct a scoping process in the *Federal Register* (FR) (73 FR 75142) with regard to the combined license (COL) application received from Detroit Edison Company (Detroit Edison) for one unit identified as Enrico Fermi Unit 3 (Fermi 3), to be located at its existing Fermi site. The Fermi site is located in eastern Monroe County, Michigan, along the western shore of Lake Erie, approximately 24 mi northeast of Toledo, Ohio, 30 mi southwest of Detroit, Michigan, and 7 mi from the United States-Canada border. This EIS has been prepared in accordance with provisions of the National Environmental Policy Act of 1969, as amended (NEPA), Council on Environmental Quality guidelines, and Title 10 of the Code of Federal Regulations (CFR) Parts 51 and 52. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the *Federal Register* Notice. The NRC invited the applicant; Federal, Tribal, State, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at the scheduled public meeting and/or submitting written suggestions and comments no later than February 9, 2009.

D.1 Overview of the Scoping Process

The scoping process provides an opportunity for public participants to identify issues to be addressed in the EIS and highlight public concerns and issues. The Notice of Intent identified the following objectives of the scoping process:

- Define the proposed action that is to be the subject of the EIS.
- Determine the scope of the EIS and identify the significant issues to be analyzed in depth.
- Identify and eliminate from detailed study those issues that are peripheral or that are not significant.
- Identify any environmental assessments and other EISs that are being or will be prepared that are related to but not part of the scope of the EIS being considered.
- Identify other environmental review and consultation requirements related to the proposed action.
- Identify parties the NRC must consult with under the National Historic Preservation Act, as set forth in 36 CFR 800.8(c)(1)(i).

- Indicate the relationship between the timing of the preparation of the environmental analyses and the Commission's tentative planning and decision-making schedule.
- Identify any cooperating agencies and, as appropriate, allocate assignments for preparation and schedules for completing the EIS to the NRC and any cooperating agencies.
- Describe how the EIS will be prepared, including any contractor assistance to be used.

Two public scoping meetings were held at the Monroe County Community College's La-Z-Boy Center Meyer Theater in Monroe, Michigan, on Wednesday, January 14, 2009. Approximately 100 people attended the afternoon scoping meeting, and approximately 60 attended the evening session. The scoping meetings began with NRC staff members providing a brief overview of the COL process and the NEPA process. After the NRC's prepared statements, the meeting was open for public comments. Forty afternoon scoping meeting attendees and 25 evening attendees provided either oral comments or written statements that were recorded and transcribed by a certified court reporter. Twenty-five written statements were received during the meeting. In addition to the oral and written statements provided at the public scoping meeting, 26 letters and 51 emails were received during the scoping period.

Transcripts for both the afternoon and evening scoping meetings can be found in the NRC Agency Document Access and Management System (ADAMS), under accession numbers ML090440586 and ML090440588, respectively. The written comments provided at the public meetings can be found in ADAMS under accession numbers ML090440585, ML090480683, and ML090430317. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams/web-based.html (in the Public Electronic Reading Room). (Note: the URL is case-sensitive.) Additional comments received later in letters or emails are also available. A meeting summary memorandum under accession number ML090291080 was issued March 3, 2009.

At the conclusion of the scoping period, the NRC staff reviewed the scoping meeting transcripts and all written material received during the comment period and identified individual comments. These comments were organized according to topic within the proposed EIS or according to the general topic, if outside the scope of the EIS. Once comments were grouped according to subject area, the NRC staff determined the appropriate response for each comment. The staff made a determination on each comment that it was one of the following:

- A comment that was actually a question and introduced no new information.
- A comment that was either related to support of or opposition to combined licensing in general (or specifically the Fermi 3 COL) or that made a general statement about the COL process. In addition, it provided no new information and did not pertain to 10 CFR Part 52.
- A comment about an environmental issue that

- provided new information that would require evaluation during the review or
- provided no new information.

- A comment that was outside the scope of the COL, which included, but was not limited to, a comment on the safety of the existing units.

Preparation of the EIS has taken into account the relevant issues raised during the scoping process. The comments received on the draft EIS will be considered in the preparation of the final EIS. The final EIS, along with the NRC staff's Safety Evaluation Report (SER), will provide much of the basis for the NRC's decision on whether to grant the Fermi 3 COL.

The comments related to this environmental review are included in this appendix. They were extracted from the *Fermi Nuclear Power Plant, Unit 3, Combined License Scoping Summary Report* and are provided for the convenience of those interested specifically in the scoping comments applicable to this environmental review. The comments that are outside the scope of the environmental review for the proposed Fermi 3 site are not included here. These include comments related to:

- safety
- emergency preparedness
- NRC oversight for operating plants
- security and terrorism
- support or opposition to the licensing action, licensing process, nuclear power, hearing process, or the existing plant.

More detail regarding the disposition of general or out of scope comments can be found in the Scoping Summary Report. To maintain consistency with the Scoping Summary Report, the comment source ID and comment number along with the name of the commenter used in that report is retained in this appendix.

Table D-1 identifies in alphabetical order the individuals providing comments during the scoping period, their affiliation, if given, and the ADAMS accession number that can be used to locate the correspondence. Although all commenters are listed, the comments presented in this appendix are limited to those within the scope of the environmental review. Table D-2 lists the comment categories in alphabetical order and commenter names and comment numbers for each category. The balance of this appendix presents the comments themselves with NRC staff responses organized by topic category. Table D-3 presents the comment categories in the order to be presented.

1 **Table D-1**. Individuals Providing Comments during the Scoping Comment Period

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
–, Richa	Self	Email (ML091020580)	0006
Anderson, Alan	Southern Wayne County Regional Chamber	Meeting Transcript (ML090440586)	0058
Askwith, Annemarie	Self	Email (ML090401003)	0027
B., M. J.	Self	Meeting Transcript (ML090440585)	0082
Baker, Mildred M	Self	Email (ML090401002)	0026
Barnes, Kathryn	Don’t Waste Michigan, Sherwood Chapter	Meeting Transcript (ML090480683)	0083
Barnes, Kathryn	Self	Meeting Transcript (ML090440588)	0059
Barnes, Kathryn	Self	Meeting Transcript (ML090480683)	0083
Bell, Mary Faith	Sisters, Servants of IHM	Letter (ML090440092)	0063
Bettega, Gayle	Self	Email (ML090410070)	0047
Biernot, Marilyn	Self	Email (ML090340438)	0020
Bihn, Sandy	Western Lake Erie Association	Meeting Transcript (ML090440585)	0082
Bihn, Sandy	Western Lake Erie Association	Meeting Transcript (ML090440586)	0058
Brown, George	City of Monroe	Meeting Transcript (ML090440586)	0058
Browne, Elizabeth M.	Land and Water Management Division, Michigan Department of Environmental Quality	Letter (ML0906504561)	0079
Campana, Jean Ann	Self	Letter (ML0904402021)	0075
Cappuccilli, Al	Self	Meeting Transcript (ML090440585)	0082
Carey, Corinne	Don’t Waste Michigan	Email (ML09120578)	0004
Carroll, Connie	United Way of Monroe County	Meeting Transcript (ML090440586)	0058
Carroll, Connie	United Way of Monroe County	Meeting Transcript (ML090440588)	0059
Colligan, Mary A.	National Marine Fisheries Service, Northeast Region	Letter (ML090711069)	0085
Conner, Mary V.	Self	Email (ML090401007)	0030

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Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Cumbow, Kay	Citizens for Alternatives to Chemical Contamination	Email (ML090410081)	0051
Cumbow, Kay	Citizens for Alternatives to Chemical Contamination	Meeting Transcript (ML090440586)	0058
Czarnecki, Craig A.	U.S. Fish and Wildlife Service, East Lansing Office	Letter (ML090750973)	0087
D'Amour, James Carl	Self	Email (ML090401016)	0038
Davis, Gary	Self	Letter (ML09040093)	0064
Diederichs, Dorothy	Self	Letter (ML09040094)	0065
Drake, Gerald A.	Self	Email (ML090410097)	0054
Duggan, Marion	Self	Letter (ML0904400870)	0067
Dyson, Ed	Self	Meeting Transcript (ML090440586)	0058
Eddy, Dorothy	Sisters, Servants of the Immaculate Heart of Mary	Letter (ML090440196)	0069
Edwards, Gordon	Canadian Coalition for Nuclear Responsibility,	Email (ML090410071)	0048
Ellison, Jacob	Self	Meeting Transcript (ML090440586)	0058
Englund, Lance	Self	Email (ML090401035)	0041
Farris, Mark	Self	Meeting Transcript (ML090440588)	0059
Fedorowicz, Meg	Self	Email (ML090410092)	0052
Feldpausch, Larry	Self	Meeting Transcript (ML090440586)	0058
Feldpausch, Regina A.	Self	Letter (ML0906504611)	0077
Fischer, Lydia	Self	Meeting Transcript (ML090440586)	0058
Freiburger, Chris	MDNR	Email (ML090401006)	0029
Fulara, Dan	Self	Meeting Transcript (ML090440588)	0059
Green, Frank	Self	Meeting Transcript (ML090440588)	0059
Gruelle, Martha	Wildlife Habitat Council	Meeting Transcript (ML090440585)	0082

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Guthrie, Patricia	Self	Email (ML0904430199)	0055
Hart, Donna	Self	Email (ML090350415)	0021
Henige, Ann	Self	Meeting Transcript (ML090440588)	0059
Henige, Ann	Self	Meeting Transcript (ML090480683)	0083
Henige, Margaret Ann	IHM Sisters	Letter (ML090440091)	0062
Hesson, Gerald	Self	Meeting Transcript (ML090440586)	0058
Holden, Anna	Self	Meeting Transcript (ML090440586)	0058
Hungerman, Marie Gabriel	Self	Email (ML090400999)	0024
Ingels, Mike	Self	Meeting Transcript (ML090440588)	0059
Kamps & Keegan, Kevin and Michael	Self	Meeting Transcript (ML090430317)	0084
Kamps, Kevin	Beyond Nuclear	Email (ML090410076)	0050
Kamps, Kevin	Beyond Nuclear	Letter (ML09028048060)	0057
Kamps, Kevin	Beyond Nuclear	Meeting Transcript (ML090440586)	0058
Kamps, Kevin	Beyond Nuclear	Meeting Transcript (ML090440588)	0059
Karas, Josephine	Self	Letter (ML090440197)	0070
Kaufman, Hedi	Self	Email (ML090401038)	0042
Kaufman, Hedi	Self	Meeting Transcript (ML090480683)	0083
Kaufman, Hedwig	Self	Meeting Transcript (ML090440588)	0059
Kaufman, Hedwig	Self	Meeting Transcript (ML090480683)	0083
Keegan, Michael	Self	Meeting Transcript (ML090440586)	0058
Keegan, Michael	Self	Meeting Transcript (ML090440588)	0059
Keith, Fred	Self	Meeting Transcript (ML090440586)	0058
Lavelline, Joe	Michigan Chapter of the American Nuclear Society	Meeting Transcript (ML090440586)	0058
Lavelline, Joe	Michigan Chapter of the American Nuclear Society	Meeting Transcript (ML090440588)	0059

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Lavelline, Joe	Michigan Chapter of the American Nuclear Society	Meeting Transcript (ML090480683)	0083
Lawson, Ph.D., Charles	International Joint Commission	Email (ML090270697)	0015
Lawson, Ph.D., Charles	International Joint Commission	Letter (ML090440198)	0071
Leonard, Dolores	Self	Email (ML090291092)	0017
Lodge, Terry	Self	Email (ML090410065)	0045
Lodge, Terry	Self	Meeting Transcript (ML090440585)	0082
Lodge, Terry	Self	Meeting Transcript (ML090440586)	0058
Mahoney, Charlie	Four-M Associates-Communications Group	Email (ML090230099)	0010
Mangano, Joseph	Self	Meeting Transcript (ML090430317)	0084
Mantai, Frank	Self	Meeting Transcript (ML090440588)	0059
Mantai, Frank	Self	Meeting Transcript (ML090480683)	0083
Marks, Esq., D.Min, Betram	Self	Email (ML090230107)	0014
May, Ron	DTE Energy	Meeting Transcript (ML090440586)	0058
May, Ron	DTE Energy	Meeting Transcript (ML090440588)	0059
McArdle, Ed	Self	Meeting Transcript (ML090440586)	0058
McGuire, Jim	Area Agency on Aging	Meeting Transcript (ML090440586)	0058
Mechtenberg, Marilynn	I.H.M.	Email (ML090400997)	0023
Mentel, Floreine	Monroe County	Meeting Transcript (ML090440586)	0058
Mentel, Floreine	Monroe County	Meeting Transcript (ML090440588)	0059
Meyer, Richard	Self	Meeting Transcript (ML090440586)	0058
Meyers, Marcie	Self	Meeting Transcript (ML090440588)	0059
Micka, Jeanne	Lotus Garden Club of Monroe	Meeting Transcript (ML090440585)	0082
Micka, Jeanne	Lotus Garden Club of Monroe	Meeting Transcript (ML090440586)	0058

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Micka, Richard	Experiential Tourism Task Group War of 1812 Bicentennial Steering Committee	Meeting Transcript (ML090440585)	0082
Micka, Richard	Experiential Tourism Task Group War of 1812 Bicentennial Steering Committee	Meeting Transcript (ML090440586)	0058
Micka, Richard	Experiential Tourism Task Group War of 1812 Bicentennial Steering Committee	Meeting Transcript (ML090440588)	0059
Miller, Anna	U.S. EPA-Region 5	Email (ML090401019)	0040
Mitchell, Rita	Self	Email (ML090401017)	0039
Morris, Bill	Self	Meeting Transcript (ML090440586)	0058
Morris, Bill	Self	Meeting Transcript (ML090440588)	0059
Morris, William P.	Monroe County Industrial Development Corporation	Meeting Transcript (ML090440585)	0082
Mumaw, Joan	IHM Sisters, Monroe	Meeting Transcript (ML090440588)	0059
Mumaw, Joan	IHM Sisters, Monroe	Meeting Transcript (ML090480683)	0083
Nash, Sarah	Self	Email (ML090401013)	0036
Nett, Ann C.	Self	Email (ML090401011)	0034
Newman, Kent	Self	Email (ML090120581)	0007
Newnan, Hal	Self	Meeting Transcript (ML090440586)	0058
Nixon, Dave	Monroe County Community College	Meeting Transcript (ML090440588)	0059
Nordness, Dorothy	Self	Email (ML090410095)	0053
Oberleiter, Tracy	Monroe County Economic Development Corporation	Meeting Transcript (ML090440585)	0082
Oberleiter, Tracy	Monroe County Economic Development Corporation	Meeting Transcript (ML090440586)	0058

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Oberleiter, Tracy	Monroe County Economic Development Corporation	Meeting Transcript (ML090440588)	0059
Patterson, John	Monroe County Convention & Tourism Bureau	Email (ML090230104)	0012
Petrak, IHM, Genevieve	Sisters, Servants of the Immaculate Heart of Mary	Letter (ML090440088)	0060
Pfeiffer, Jelica B.	Self	Letter (ML0906504661)	0078
Pfeiffer, Jelica B.	Self	Meeting Transcript (ML090440586)	0058
Pitoniak, Gregory	SEMCA	Meeting Transcript (ML090440588)	0059
Pitoniak, Gregory	SEMCA	Meeting Transcript (ML090480683)	0083
Rabaut, Martha	Self	Email (ML090350435)	0022
Richmond, Roberta	Sisters, Servants of the Immaculate Heart of Mary	Letter (ML090440089)	0061
Richters, Karina	City of Windsor	Email (ML090410074)	0049
Ripple, Florence	Self	Letter (ML0906504651)	0076
Ripple, John	Self	Letter (ML090440200)	0073
Rivera, Gloria	Self	Email (ML090291091)	0016
Ryan, Janet	IHM	Letter (ML0906504681)	0081
Rysztak, Robert	Self	Email (ML090401009)	0032
Rysztak, Robert	Self	Email (ML0904021008)	0031
Sanchez, Mira	Self	Email (ML090230106)	0013
Sargent, Lori	Michigan Dept. of Natural Resources	Email (ML090401014)	0037
Sargent, Lori	Michigan Dept. of Natural Resources	Letter (ML090750975)	0086
Schemanksi, Sally	Self	Email (ML090340437)	0019
Schwartz, R.	Self	Email (ML090020433)	0002
Scobie, Randall	Self	Letter (ML090440201)	0074
Seubert, Nancy	IHM Sisters	Meeting Transcript (ML090440586)	0058

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Seubert, Nancy	IHM Sisters	Meeting Transcript (ML090480683)	0083
Shiffler, Nancy L.	Self	Email (ML090401005)	0028
Shumaker, John	Self	Email (ML090401018)	0056
Simonton, Aaron	The Monroe Center for Healthy Aging	Email (ML090120579)	0005
Simpson, Robert	Self	Meeting Transcript (ML090440586)	0058
Smolinski, Myron	Self	Meeting Transcript (ML090440586)	0058
Spencer, Dr. Donald A.	Monroe County Intermediate School District	Meeting Transcript (ML090440585)	0082
Spencer, Dr. Donald A.	Monroe County Intermediate School District	Meeting Transcript (ML090440586)	0058
Stock, Ed & Kim	Self	Email (ML090230105)	0011
Stone, Paula	CASEnergy Coalition	Email (ML090410069)	0046
Sweat, Ron	Plumbers and Pipefitters, Local 671	Meeting Transcript (ML090440585)	0082
Sweat, Ron	Plumbers and Pipefitters, Local 671	Meeting Transcript (ML090440586)	0058
Sweat, Ron	Plumbers and Pipefitters, Local 671	Meeting Transcript (ML090440588)	0059
Tigay, Barry	Oakland Psychological Clinic, P.C.	Email (ML090140205)	0009
Timmer, Marilyn	Self	Letter (ML090440199)	0072
Tinnirello, Nicole	Self	Letter (ML090440086)	0066
Van Ooteghem, Rose Bernadette	Self	Email (ML090401000)	0025
Vaughn, Charlene Dwin	Advisory Council on Historic Preservation	Email (ML090410060)	0044
VItale, Fred	Self	Email (ML090401012)	0035
Walby, Charlotte	Self	Letter (ML090440195)	0068
Walker, Joseph	Self	Email (ML083640037)	0003

Table D-1. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Corres-pondence ID
Weber, Margaret	Adrian Dominican Sisters	Meeting Transcript (ML090440585)	0082
Weber, Margaret	Adrian Dominican Sisters	Meeting Transcript (ML090440586)	0058
Westlake, Kenneth A.	Office of Enforcement and Compliance Assistance, U.S. EPA Region 5	Letter (ML0906504671)	0080
White, Greg	Michigan Department of Energy, Labor and Economic Growth	Meeting Transcript (ML090440586)	0058
Wolfe, Joan	Self	Meeting Transcript (ML090440588)	0059
Wolfe, Joan	Self	Meeting Transcript (ML090480683)	0083
Wolfe, Robert	Self	Meeting Transcript (ML090440588)	0059
Worrell, Mark	City of Monroe	Meeting Transcript (ML090440586)	0058
Yascolt, Stas	Self	Meeting Transcript (ML090440586)	0058
Zorn, Dale	Self	Meeting Transcript (ML090440588)	0059

Table D-2. Comment Categories with Associated Commenters and Comment IDs

Comment Category	Commenter (Comment ID)
Accidents-Design Basis	• Meyer, Richard (0058-125) • Ryan, Janet (0081-2)
Accidents-Severe	• Barnes, Kathryn (0059-13) (0083-23) • Cumbow, Kay (0051-4) • Kamps, Kevin (0050-3) (0050-8) (0058-71) • Newnan, Hal (0058-81) • Sanchez, Mira (0013-2) • Timmer, Marilyn (0072-2) • Wolfe, Joan (0059-50) (0083-4)
Alternatives-Energy	• Askwith, Annemarie (0027-2) • Barnes, Kathryn (0059-20) (0083-34) • Bettega, Gayle (0047-7) • Campana, Jean Ann (0075-1) • Conner, Mary V. (0030-2) • Cumbow, Kay (0058-25)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• D'Amour, James Carl (0038-1) • Davis, Gary (0064-2) • Edwards, Gordon (0048-9) • Farris, Mark (0059-67) • Henige, Ann (0059-40) (0083-10) • Henige, Margaret Ann (0062-2) • Kamps, Kevin (0050-24) (0050-25) (0059-74) (0059-76) • Karas, Josephine (0070-4) • Keith, Fred (0058-139) • Lodge, Terry (0058-115) • Mantai, Frank (0059-24) • May, Ron (0058-4) (0058-6) (0059-36) • McArdle, Ed (0058-103) • Meyer, Richard (0058-128) • Mitchell, Rita (0039-4) (0039-7) • Nett, Ann C. (0034-4) • Newman, Kent (0007-3) • Newnan, Hal (0058-85) • Pfeiffer, Jelica B. (0058-31) • Rivera, Gloria (0016-4) • Rysztak, Robert (0031-7) (0032-2) • Schwartz, R. (0002-2) • Shiffler, Nancy L. (0028-4) • Simpson, Robert (0058-41) • Sweat, Ron (0058-145) (0059-31) (0082-6) • Tinnirello, Nicole (0066-2) (0066-4) • VItale, Fred (0035-2) • White, Greg (0058-64) • Wolfe, Joan (0059-53) (0083-6) • Wolfe, Robert (0059-57)
Alternatives-Sites	• Bihn, Sandy (0058-56) (0082-25)
Benefit-Cost Balance	• –, Richa (0006-1) • Askwith, Annemarie (0027-3) • B., M. J. (0082-40) • Barnes, Kathryn (0059-19) (0083-33) • Carey, Corinne (0004-8) • Davis, Gary (0064-1) • Drake, Gerald A. (0054-4) • Edwards, Gordon (0048-1) (0048-2) (0048-7) • Englund, Lance (0041-2) • Farris, Mark (0059-66) (0059-69) • Fedorowicz, Meg (0052-1) (0052-3)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Fischer, Lydia (0058-89) • Henige, Margaret Ann (0062-1) • Holden, Anna (0058-98) (0058-102) • Kamps, Kevin (0050-23) (0059-73) • Karas, Josephine (0070-2) • Keegan, Michael (0058-63) • Mahoney, Charlie (0010-5) • Mantai, Frank (0083-36) • McGuire, Jim (0058-136) • Meyer, Richard (0058-130) • Nett, Ann C. (0034-3) • Nordness, Dorothy (0053-5) (0053-6) • Pfeiffer, Jelica B. (0058-30) • Pitoniak, Gregory (0083-21) • Schemanksi, Sally (0019-10) • Seubert, Nancy (0058-18) (0083-35) • Tinnirello, Nicole (0066-1) • Weber, Margaret (0058-69) (0082-35) • Wolfe, Joan (0059-47) (0059-52) (0059-54) (0083-1) (0083-7) • Wolfe, Robert (0059-59) • Yascolt, Stas (0058-32)
Cumulative Impacts	• Askwith, Annemarie (0027-1) • Bihn, Sandy (0058-46) (0058-49) (0058-50) (0058-51) (0058-55) (0058-58) (0082-13) (0082-15) (0082-17) (0082-24) • Carey, Corinne (0004-9) • Freiburger, Chris (0029-6) • Guthrie, Patricia (0055-3) • Kamps, Kevin (0050-12) (0050-14) (0050-19) • Leonard, Dolores (0017-2) • May, Ron (0059-35) • Mumaw, Joan (0059-42) (0083-9) • Newman, Kent (0007-1) (0007-2) • Schemanksi, Sally (0019-6) • Shiffler, Nancy L. (0028-1) (0028-3)
Ecology-Aquatic	• Barnes, Kathryn (0059-16) (0083-31) • Bihn, Sandy (0058-45) (0058-47) (0058-48) (0058-52) (0058-54) (0082-10) (0082-12) (0082-20) (0082-21) (0082-23) • Colligan, Mary A. (0085-1) (0085-2) (0085-3) • Cumbow, Kay (0058-27) • D'Amour, James Carl (0038-2) • Englund, Lance (0041-4) • Freiburger, Chris (0029-1) (0029-3) (0029-4) (0029-5)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Hungerman, Marie Gabriel (0024-1) • Kamps, Kevin (0050-15) (0050-17) (0050-21) • McArdle, Ed (0058-109) • Mitchell, Rita (0039-6) • Schemanksi, Sally (0019-5) • Wolfe, Joan (0059-49) (0083-3)
Ecology-Terrestrial	• Browne, Elizabeth M. (0079-3) (0079-5) • Czarnecki, Craig A. (0087-1) (0087-2) (0087-3) (0087-4) • Freiburger, Chris (0029-8) (0029-9) (0029-11) • Gruelle, Martha (0082-1) • May, Ron (0058-10) • Micka, Jeanne (0058-123) (0082-26) • Micka, Richard (0082-28) • Miller, Anna (0040-2) • Sargent, Lori (0037-1) (0086-1) • Westlake, Kenneth A. (0080-2)
Geology	• Miller, Anna (0040-3) • Westlake, Kenneth A. (0080-3)
Health-Non-Radiological	• Cumbow, Kay (0051-5)
Health-Radiological	• Anderson, Alan (0058-86) • Barnes, Kathryn (0059-12) (0059-18) (0083-22) • Bell, Mary Faith (0063-1) • Bettega, Gayle (0047-5) • Cumbow, Kay (0051-7) (0058-19) (0058-22) (0058-24) • Diederichs, Dorothy (0065-1) • Drake, Gerald A. (0054-3) • Duggan, Marion (0067-1) • Guthrie, Patricia (0055-1) (0055-2) • Kamps, Kevin (0050-6) (0050-7) (0050-9) (0050-11) (0050-13) (0050-16) • Karas, Josephine (0070-3) • Keegan, Michael (0059-64) • Lawson, Ph.D., Charles (0015-2) (0071-2) • Mangano, Joseph (0084-1) • McArdle, Ed (0058-106) • Meyers, Marcie (0059-88) • Mitchell, Rita (0039-2) • Mumaw, Joan (0059-41) (0059-43) (0083-8) (0083-13) (0083-14) • Nash, Sarah (0036-1) • Nett, Ann C. (0034-2) • Petrak, IHM, Genevieve (0060-1)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Pfeiffer, Jelica B. (0058-28) (0058-29) (0078-1) • Ryan, Janet (0081-1) (0081-4) • Rysztak, Robert (0031-5) (0032-3) (0032-4) (0032-5) • Schemanksi, Sally (0019-3) (0019-8) • Simpson, Robert (0058-40) • Walby, Charlotte (0068-1) • Wolfe, Joan (0059-48) (0083-2) • Wolfe, Robert (0059-58) • Yascolt, Stas (0058-34) (0058-35) (0058-36) (0058-37)
Historic and Cultural Resources	• Micka, Richard (0082-29) (0082-32) • Vaughn, Charlene Dwin (0044-1)
Hydrology-Groundwater	• Barnes, Kathryn (0059-17) (0083-32)
Hydrology-Surface Water	• Bihn, Sandy (0058-53) (0082-11) (0082-14) (0082-18) (0082-19) (0082-22) • Browne, Elizabeth M. (0079-2) (0079-4) • Cumbow, Kay (0058-26) • Dyson, Ed (0058-134) • Freiburger, Chris (0029-2) (0029-7) • Holden, Anna (0058-100) • Kamps, Kevin (0050-18) (0050-20) • Kaufman, Hedwig (0083-30) • McArdle, Ed (0058-108) (0058-110) • Rivera, Gloria (0016-3) • Rysztak, Robert (0031-4) • Schemanksi, Sally (0019-4) • Shiffler, Nancy L. (0028-2) • Weber, Margaret (0058-68) (0082-34)
Land Use-Site and Vicinity	• Browne, Elizabeth M. (0079-1) • Ingels, Mike (0059-80) • Micka, Richard (0058-124) (0059-87) (0082-27) (0082-30) (0082-31)
Meteorology and Air Quality	• Edwards, Gordon (0048-3) • Lavelline, Joe (0058-120) • McArdle, Ed (0058-107) • Mitchell, Rita (0039-3)
Need for Power	• Baker, Mildred M (0026-1) • Barnes, Kathryn (0059-14) (0059-15) (0059-22) (0083-24) (0083-25) • Bettega, Gayle (0047-1) (0047-3) (0047-6) • Biernot, Marilyn (0020-1) • Bihn, Sandy (0058-57) (0082-16) • Carey, Corinne (0004-1) (0004-2) (0004-3)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Drake, Gerald A. (0054-1) (0054-6) • Dyson, Ed (0058-133) • Edwards, Gordon (0048-4) (0048-8) (0048-10) • Englund, Lance (0041-1) (0041-5) (0041-7) • Farris, Mark (0059-70) • Fischer, Lydia (0058-90) • Freiburger, Chris (0029-10) • Green, Frank (0059-83) • Holden, Anna (0058-97) • Kamps, Kevin (0050-1) (0050-4) (0050-5) (0059-78) • Karas, Josephine (0070-1) • Kaufman, Hedi (0042-1) (0042-2) (0042-3) (0083-28) • Kaufman, Hedwig (0059-45) • Keegan, Michael (0059-63) • Keith, Fred (0058-138) • Leonard, Dolores (0017-1) (0017-4) • Mahoney, Charlie (0010-3) • Mantai, Frank (0059-25) • May, Ron (0058-5) (0058-8) (0059-34) (0059-39) • McGuire, Jim (0058-135) • Mechtenberg, Marilynn (0023-4) • Mentel, Floreine (0058-13) (0059-5) • Mitchell, Rita (0039-1) • Mumaw, Joan (0083-17) • Nett, Ann C. (0034-1) • Newnan, Hal (0058-80) (0058-83) (0058-84) • Nixon, Dave (0059-72) • Nordness, Dorothy (0053-1) (0053-2) (0053-3) (0053-7) • Pfeiffer, Jelica B. (0078-2) • Pitoniak, Gregory (0083-19) • Rivera, Gloria (0016-1) • Rysztak, Robert (0031-1) (0031-2) (0031-6) (0032-1) (0032-8) • Schemanksi, Sally (0019-1) (0019-11) • Schwartz, R. (0002-1) • Shumaker, John (0056-1) • Simpson, Robert (0058-42) • Timmer, Marilyn (0072-3) (0072-4) • Tinnirello, Nicole (0066-3) • VItale, Fred (0035-1) • Walker, Joseph (0003-1) • White, Greg (0058-65) • Wolfe, Robert (0059-55) (0059-56) (0059-60) (0059-61) • Worrell, Mark (0058-93) (0058-95) (0058-96)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Yascolt, Stas (0058-39) • Zorn, Dale (0059-3)
Process-ESP-COL	• Browne, Elizabeth M. (0079-6) • Carey, Corinne (0004-4) (0004-5) (0004-10) • Cumbow, Kay (0051-1) (0051-8) (0058-23) • D'Amour, James Carl (0038-4) • Fischer, Lydia (0058-87) • Kamps & Keegan, Kevin and Michael (0084-2) • Kamps, Kevin (0050-22) (0057-2) • Kaufman, Hedi (0083-26) • Keegan, Michael (0058-62) • Leonard, Dolores (0017-3) • Lodge, Terry (0058-117) (0058-118) (0082-37) • May, Ron (0058-3) (0058-7) (0058-9) (0058-11) (0059-38) • McArdle, Ed (0058-105) • Meyer, Richard (0058-132) • Rysztak, Robert (0032-7) • Shiffler, Nancy L. (0028-5) • Spencer, Dr. Donald A. (0058-59) • Stock, Ed & Kim (0011-2)
Process-NEPA	• Askwith, Annemarie (0027-4) • Carey, Corinne (0004-7) • Cumbow, Kay (0051-2) (0051-3) (0058-20) • Fischer, Lydia (0058-88) • Hart, Donna (0021-2) • Kamps, Kevin (0057-1) • Kaufman, Hedi (0083-29) • Keegan, Michael (0058-61) (0059-62) • Lawson, Ph.D., Charles (0015-1) (0071-1) • Lodge, Terry (0045-1) (0045-2) (0045-3) (0045-4) (0058-116) • Miller, Anna (0040-1) (0040-4) • Richters, Karina (0049-1) • Simpson, Robert (0058-43) • Stock, Ed & Kim (0011-1) • Westlake, Kenneth A. (0080-1) (0080-4)
Socioeconomics	• Anderson, Alan (0058-79) • Brown, George (0058-1) (0058-2) • Cappuccilli, Al (0082-38) • Carroll, Connie (0058-44) (0059-82) • Ellison, Jacob (0058-111) (0058-112) • Englund, Lance (0041-6)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Fulara, Dan (0059-71) • Gruelle, Martha (0082-2) • Hesson, Gerald (0058-147) • Ingels, Mike (0059-79) (0059-81) • Kamps, Kevin (0059-75) • Keith, Fred (0058-140) (0058-141) • Lavelline, Joe (0058-119) (0058-121) (0058-122) (0059-84) (0059-85) (0059-86) (0083-11) (0083-12) (0083-15) • Mahoney, Charlie (0010-1) (0010-2) (0010-4) • Marks, Esq., D.Min, Betram (0014-1) (0014-2) • May, Ron (0059-37) • McArdle, Ed (0058-104) • McGuire, Jim (0058-137) • Mentel, Floreine (0058-12) (0058-14) (0058-15) (0058-16) (0058-17) (0059-4) (0059-6) (0059-7) (0059-8) • Meyer, Richard (0058-127) (0058-129) (0058-131) • Morris, Bill (0058-78) (0059-9) (0059-10) (0059-11) • Morris, William P. (0082-36) • Oberleiter, Tracy (0058-76) (0058-77) (0059-26) (0059-27) (0082-39) (0082-42) • Patterson, John (0012-1) • Pitoniak, Gregory (0059-23) (0083-18) (0083-20) • Scobie, Randall (0074-1) • Simonton, Aaron (0005-1) (0005-2) • Smolinski, Myron (0058-113) (0058-114) • Spencer, Dr. Donald A. (0058-60) (0082-8) (0082-9) • Stone, Paula (0046-1) • Sweat, Ron (0058-142) (0058-143) (0058-144) (0058-146) (0059-28) (0059-29) (0059-30) (0059-32) (0059-33) (0082-3) (0082-4) (0082-5) (0082-7) • Tigay, Barry (0009-1) • White, Greg (0058-66) • Worrell, Mark (0058-94) • Zorn, Dale (0059-1) (0059-2)
Transportation	• Mechtenberg, Marilynn (0023-2)
Uranium Fuel Cycle	• Barnes, Kathryn (0059-21) • Bettega, Gayle (0047-2) (0047-4) • Carey, Corinne (0004-6) • Conner, Mary V. (0030-1) • Cumbow, Kay (0051-6) (0058-21) • D'Amour, James Carl (0038-3)

Table D-2. (contd)

Comment Category	Commenter (Comment ID)
	• Drake, Gerald A. (0054-2) (0054-5)
	• Eddy, Dorothy (0069-1)
	• Edwards, Gordon (0048-5) (0048-6)
	• Englund, Lance (0041-3)
	• Farris, Mark (0059-68)
	• Fedorowicz, Meg (0052-2) (0052-4)
	• Feldpausch, Larry (0058-91) (0058-92)
	• Feldpausch, Regina A. (0077-1)
	• Hart, Donna (0021-1)
	• Holden, Anna (0058-99) (0058-101)
	• Kamps, Kevin (0050-2) (0050-10) (0058-70) (0058-72) (0058-73) (0058-74) (0058-75) (0059-77)
	• Kaufman, Hedi (0083-27)
	• Kaufman, Hedwig (0059-44) (0059-46)
	• Keegan, Michael (0059-65)
	• Mechtenberg, Marilynn (0023-1) (0023-3)
	• Meyer, Richard (0058-126)
	• Mitchell, Rita (0039-5)
	• Newnan, Hal (0058-82)
	• Nordness, Dorothy (0053-4)
	• Rabaut, Martha (0022-1)
	• Richmond, Roberta (0061-1)
	• Ripple, Florence (0076-1)
	• Ripple, John (0073-1)
	• Rivera, Gloria (0016-2)
	• Ryan, Janet (0081-3)
	• Rysztak, Robert (0031-3) (0032-6)
	• Sanchez, Mira (0013-1)
	• Schemanksi, Sally (0019-2) (0019-7) (0019-9)
	• Timmer, Marilyn (0072-1)
	• Van Ooteghem, Rose Bernadette (0025-1)
	• Weber, Margaret (0058-67) (0082-33)
	• Wolfe, Joan (0059-51) (0083-5)
	• Yascolt, Stas (0058-33) (0058-38)

Table D-3. Comment Categories in Order as Presented in this Report

D.1.1 Comments Concerning Process – ESP – COL
D.1.2 Comments Concerning Process – NEPA
D.1.3 Comments Concerning Land Use – Site and Vicinity
D.1.4 Comments Concerning Meteorology and Air Quality
D.1.5 Comments Concerning Geology
D.1.6 Comments Concerning Hydrology – Surface Water
D.1.7 Comments Concerning Hydrology – Groundwater
D.1.8 Comments Concerning Ecology – Terrestrial
D.1.9 Comments Concerning Ecology – Aquatic
D.1.10 Comments Concerning Socioeconomics
D.1.11 Comments Concerning Historic and Cultural Resources
D.1.12 Comments Concerning Health – Non-Radiological
D.1.13 Comments Concerning Health – Radiological
D.1.14 Comments Concerning Accidents – Design Basis
D.1.15 Comments Concerning Accidents – Severe
D.1.16 Comments Concerning the Uranium Fuel Cycle
D.1.17 Comments Concerning Transportation
D.1.18 Comments Concerning Cumulative Impacts
D.1.19 Comments Concerning the Need for Power
D.1.20 Comments Concerning Alternatives – Energy
D.1.21 Comments Concerning Alternatives – Sites
D.1.22 Comments Concerning Benefit-Cost Balance

D.1.1 Comments Concerning Process – ESP – COL

Comment: Finally, you've heard about the application that we put in. We spent a couple of years on it. It's now going through the process. We're very comfortable with where we are, and we feel that it would be an important step to really search through this application process and ensure that we're on the right track. (**0058-11** [May, Ron])

Comment: You're aware that we filed a combined license application for Fermi 3 in September. You just heard that. And we also think that today's hearing is not only an important milestone for that licensing process, but it also provides us, with you as our neighbors, many of you as our customers, gives you an opportunity to influence the way we're thinking about this, but also the way your community is shaping up. And we don't take that lightly. We know the NRC is very interested in your comments, but we are as well.

I would also like to make it clear that this is a process for us. So we haven't decided to build a nuclear power plant. We decided to put a license in for that building if eventually we decide to. And, why would we do that? (**0058-3** [May, Ron])

Comment: But it won't take care of the day when the wind doesn't blow or the sun doesn't shine; and what do we want to have that next power be? And we're thinking that we should not avoid looking hard at a nuclear power plant. And there's no good way to do that, in my feeling, and I think our company as well, without actually going through the process. So we really feel comfortable with the fact that we put our application in. We're in the game, but we haven't committed yet to build. (**0058-7** [May, Ron])

Comment: And I would say overall we're looking at a GE plant, not a plant from France. We are looking at a company called Detroit Edison to own and operate this plant. We did not put an application in for loan guarantees, so there's nothing out there currently that would say that we're trying to do something in some sort of way that would obligate future generation, or some of the statements around other taxpayers. (**0059-38** [May, Ron])

Response: *The comments are general in nature and outline Detroit Edison's plans for the project; the comments do not provide new information relating to environmental effects of the proposed action, and will not be evaluated in the EIS.*

Comment: Although no other MDEQ divisions have comments on this project at this time, we recommend that the NRC and DEC maintain communications with the appropriate MDEQ staff throughout the planning, permitting, and development processes. The LWMD will be in contact with those divisions, as well as coordinating with the Michigan Department of Natural Resources (MDNR) on their fisheries and wildlife comments and the U.S. Army Corps of Engineers, as this project progresses. Based on our preliminary review of potential impacts to rare resources on the site, the LWMD may have significant concerns about this project. We recommend that DEC schedule a pre-application meeting with us as soon as possible. The pre-application form can be found under Information at www.michigan.gov/deqwetlands. (**0079-6** [Browne, Elizabeth M.])

Response: *In developing the EIS, the NRC staff will interact with Federal and State agencies, including the Michigan Department of Natural Resources and Environment and others, to obtain information relevant to the environmental review.*

Comment: Where do you follow the standards of the International Joint Commission, by irrefutable Treaty applicable to our precious Great Lakes and Fermi's location on Lake Erie? (**0004-4** [Carey, Corinne])

Response: *In developing the EIS, the NRC staff will interact with Federal and State agencies, as well as the International Joint Commission (IJC), to obtain information relevant to the environmental review. In fact, the NRC staff specifically solicited scoping comments from the IJC, and the IJC provided comments that will be considered as NRC's environmental review proceeds.*

Comment: Where do you respect and include testimony and hearings with the many highly expert scientists and organizations such as NIRS and NEIS and Sierra, etc. etc. etc.? (**0004-5** [Carey, Corinne])

Response: *The NRC staff prepares an EIS in accordance with the requirements of NEPA, 10 CFR Part 52, and 10 CFR Part 51. In its review, the NRC staff focuses on the environmental effects of construction and operation of a new reactor. The staff's review is based on information presented in the COL application Environmental Report (ER) submitted by the applicant and information obtained from independent sources. During the scoping process, interested organizations and the public are invited to participate by submitting comments. The information presented in the applicant's ER is open for comment during the scoping process. If a member of the public is aware of something missing from the ER, or if other information is available that the NRC staff needs to be aware of for its review, the NRC staff is interested in obtaining that information during the scoping process so that it may be considered.*

Comment: Until, and IF ever, NRC processes act in the necessary far more scientific way, you and those processes regarding nuclear uses are to be held highly suspect and rejected for the sake of we, the living, and our grandchildren, and theirs... (**0004-10** [Carey, Corinne])

Comment: I contend it is on these environmental issues alone that the NRC should discontinue further review of DTE Energy's applications for construction of a new facility until these matters are resolved. (**0038-4** [D'Amour, James Carl])

Response: *These comments provide general information in opposition to NRC's COL process and will not be evaluated further. The NRC staff will carefully review the application against its regulations that are intended to protect public health and safety and the environment.*

Comment: Why the rush? Money? Why not wait to see what programs President Obama can implement with wind and solar? Both are probably less expensive, less harm to human and animals alike. There is a thinking these days about renewable energy and energy efficiency. (**0017-3** [Leonard, Dolores])

Comment: Since we can't get rid of the waste of Fermi 1&2, why is Fermi 3 being rushed into as the way to go? (**0032-7** [Rysztak, Robert])

Comment: There are two comment periods right now going on, both on emissions and influence from nuclear power plants. Both of them encompassed the Thanksgiving holiday and the Christmas holiday, and they all come before the Obama administration can be involved in setting those standards. (**0058-23** [Cumbow, Kay])

Response: *As an independent executive agency accountable to Congress, NRC has a timely obligation to initiate the review in response to a COL application as long as the application is considered by the NRC staff to be technically sufficient and complete. Decisions regarding which generation sources and alternatives to deploy are made by the applicant and regulatory bodies such as State energy planning agencies. The alternatives must be technically viable, feasible, and competitive. Alternative actions such as the no-action alternative (energy efficiency and demand-side management), new generation alternatives, purchased electrical power, alternative technologies (including renewable energy such as wind and solar), and the combination of alternatives will be considered in Chapter 9 of the EIS.*

Comment: There are many other critical issues, that need to be addressed and cannot be addressed in this short time period. (**0051-8** [Cumbow, Kay])

Response: *The licensing process for COL applications is specified in 10 CFR Part 52; it will take several years to complete. The process includes a detailed review of an applicant's COL application to determine the environmental effects of construction and operation of a nuclear power facility. After review of the application against the regulations and regulatory guidance, a hearing will be conducted to determine whether it is appropriate to grant the license. Safety issues as well as environmental issues will be evaluated before a decision on an application is reached. As described in the regulations, based on the finding of its review, NRC can deny issuance of a license if it would not meet the regulatory requirements.*

Comment: I just want to really encourage DTE and the NRC to employ a deliberative process that will ensure that Fermi 3, if it is built, is safe and a clean alternative for its users, and I believe that it can be. (**0058-59** [Spencer, Dr. Donald A.])

Response: *This comment provides general information in support of NRC's COL process and will not be evaluated further. NRC will carefully review the application against its regulations that are intended to protect public health and safety and the environment.*

Comment: The procedure is premature because the Nuclear Regulatory Commission has not yet approved the design of the reactor that Detroit Edison said it intends to order. That is the GE-Hitachi Economic Simplified Boiling Water Reactor. The design has been abandoned by several other utilities and isn't yet certified by federal officials. It does not make sense to make comments on a reactor design which does not exist. If in fact design has been abandoned by several other utilities and isn't yet certified by federal officials, which new plant design will be chosen? (**0011-2** [Stock, Ed & Kim])

Comment: The application proposes the use of an Economic Simplified Boiling Water Reactor (ESBWR), a design which is not yet complete and which has not yet been certified by the NRC.

Five other proposed uses of this design around the country have been cancelled, and the Department of Energy has indicated that this design will not receive any of the nuclear loan guarantee funding already approved by Congress.

DTE will inevitably have withdraw this design and resubmit the application, making this current process a waste of time and taxpayer money. (**0028-5** [Shiffler, Nancy L.])

Comment: DTE's proposed Economically Simplified Boiling Water Reactor (ESBWR) design is woefully incomplete, and thus the current NRC licensing proceeding is premature. Hundreds of thorny technical questions have yet to be answered, and no date certain has been established for final NRC certification. The two largest nuclear power utilities in the U.S., Exelon of Chicago and Entergy of New Orleans, have cancelled four ESBWRs due to the design's uncertain status. It is absurd for the concerned public to be asked to comment on the environmental impacts of a proposed reactor design that does not yet exist. This proceeding should be suspended until the ESBWR design is finalized and NRC-certified. (**0050-22** [Kamps, Kevin])

Comment: I ask that the NRC's review of the Environmental Report be suspended until a reactor is chosen that has a finalized design that citizens can actually critique. Simply stated, a reactor is the heart of a reactor project. The ESBWR does not have a finalized design nor is it certified or approved by the NRC. To shut the public out of the scoping process for the EIS for a reactor project before a reactor is chosen is saying that every reactor is alike, with the same risks. This and many of the reactors being chosen today are untried in the real world and the citizens are the guinea pigs, both financially and in the case of safety questions and the long-term protection of the ecosystem, as any serious accident or incident with a nuclear reactor could prove devastating to the Great Lakes and its inhabitants, whose lives are tied intimately to the Great Lakes, for fisheries (a four billion dollar industry), drinking water, recreation, and tourism. (**0051-1** [Cumbow, Kay])

Comment: A compelling reason to grant the 120 day extension to the comment deadline is the fact that the ESBWR design is not yet certified by NRC. In fact, GE-Hitachi has yet to finish the design. There remain hundreds of unresolved technical issues. Thus, it is impossible for us to comment meaningfully on a design that is neither complete nor certified. Some nuclear utilities (Exelon, Entergy), in fact, have cancelled their involvement with the ESBWR design, given its incomplete status. It would be a violation of the public's good will and good faith to rush this Fermi 3 licensing proceeding only to have DTE Energy cancel its pursuit of the ESBWR design -- a not unlikely possibility, given recent developments -- for concerned citizens and environmental organizations would have participated in good faith, only to have their significant investment of time, work and resources wasted when DTE announces it has decided to cancel its ESBWR proposal.

For the reasons laid out above, and on behalf of our members in Michigan and Ohio, I request a 120 day extension to the environmental scoping deadline for public comments on Fermi 3. This would make much more possible meaningful public involvement by a much larger number of concerned citizens and environmental organizations. (**0057-2** [Kamps, Kevin])

Comment: The other problem I see, and I've provided a letter to the Nuclear Regulatory Commission today, is this problem of the economically simplified boiling water reactor design. The problem with it is that it doesn't exist. It has to undergo a formal rulemaking, which is just barely gotten off the ground, which is not anticipated to be completed before 2011, and yet you're being asked to comment on a boiling water reactor design that will be different in some major respects from existing reactor designs, that is not proven, that is not economically going to be sanctioned for taxpayer underwriting by the Department of Energy at any point in the near future; that in effect will not be finalized or certified, if indeed it is -- I understand the NRC staff has asked many, many dozens of very complex and intelligent questions. But it's a design that won't exist yet by March 9th, 2009. Public organizations and people who want to have a trial, contenting that there are problems with the idea of putting up a Fermi 3, have to have identified their experts, have to of identified their information and evidence to combat a design that they don't know for sure will be the ultimate design.

In this proceeding by early February, you are being asked to talk about environmental considerations for design that is neither approved nor is final. Without a fixed, certified, ESBWR design, public commentors in this ongoing NEPA proceeding, and the adjudicatory proceeding, of which it will ultimately be a part, can't meaningfully comment concerning operational prospects and associated environmental effects, accident scenarios, and the fallout, if you will, from those. Nor can they be afforded an understanding of the ongoing routine radiation emissions that come from all operating nuclear power plants. (**0058-117** [Lodge, Terry])

Comment: The public faces these deadlines to comment in this NEPA proceeding and to decide whether or not and how to join the issues by March 9th in the adjudicatory proceeding without knowing with any certainty even whether it will be an ESBWR. Any licensing efforts that are conducted by the NRC will, as a result, be riddled with doubts and conditions which will of course heighten the growing perception that the fix is in and that this process is, unfortunately, merely bread and circuses. (**0058-118** [Lodge, Terry])

Comment: this is all premature because we are asked to be making comment on a reactor design which does not exist. Recently there have been several revelations. There were six -- there were five utilities which chose to go with the economically simplified boiling water reactor. Five of those utilities have canceled those projects.

General Electric's Hitachi's Economic Simplified Boiling Water Reactor Design, proposed by DTE to be built as a new Fermi 3 reactor, has not even been completed, let alone certified by the U.S. NRC. The ESBWR has suffered many recent setbacks calling into serious question its viability.

November 24th, Exelon, the largest nuclear utility in the nation, canceled their facilities in Texas. Just this past Friday, Entergy and Dominion canceled the ESBWR as well. That leaves Detroit Edison standing alone as the only utility embracing this uncompleted design, which is not scheduled for review until mid 2011. So we are asked to be making comment, environmental comment, on a facility that doesn't even exist and has not been tested. So we need to go back to square one. This whole EIS scoping meeting is invalid because we do not have a valid reactor design which to challenge, which to address.

The ESBWR design has over 200 requests for additional information. There are many many unresolved problems. For Detroit Edison to pursue this utility, this design, they are putting the ratepayers and the taxpayers in great jeopardy. This is a design that is not going to come to fruition. Detroit Edison needs to come clean with it. What this meeting amounts to is a bait and switch. They will be aborting this design and choosing another, so this is all premature. (**0058-62** [Keegan, Michael])

Comment: I say no to Fermi 3 because recent news confirmed that this type of reactor, the ESBWR, has yet to be completed, making today's NRC hearing premature. This of course I am reiterating a point by a couple of people who spoke before me. The viability of this type of reactor is seriously in doubt. Out of the six such reactors that had been proposed to be built by different utilities in different states, five have been canceled, and only one, DTE, is proposing to build and its plans are left standing. Obviously there are serious doubts about the worthiness and viability of this design.

In fairness to the public and ratepayers, DTE should withdraw its application and NRC should suspend this proceeding until the ESBWR design has been certified, which will be no earlier than 2011, if ever.

That is the path chosen by the second largest nuclear generator in the US, Entergy, which on January 9 was the third utility to announce the cancellation of its ESBWR reactor proposal at each of two sites previously chosen. The truth seems to be that there are no nuclear reactors ready to install right now. (**0058-87** [Fischer, Lydia])

Comment: The other is the fact that that application that we've put in has chosen the ESBWR. It's one that like the other applications throughout the country, are looking to have their designs approved by the NRC. We are as well. And that's in flight. We won't get the license as we just heard, until after those designs are approved. (**0058-9** [May, Ron])

Comment: The Michigan Chapter of the Sierra Club, Beyond Nuclear, Citizens for Alternatives to Chemical Contamination, Citizens Resistance at Fermi 2, Coalition for a Nuclear-Free Great Lakes, Don't Waste Michigan, and Toledo Coalition for Safe Energy, along with several individual residents in the Monroe, Michigan area respectfully request that the U.S. Nuclear Regulatory Commission immediately suspends the current proceedings aimed and review and ultimately, approval of DTE Energy Company's combined construction and operating license application ("COLA") for Fermi 3, a proposed new nuclear power plant near Monroe, Michigan.

These public organizations and citizens make this request to suspend the COLA adjudication for Fermi 3 pending the commencement and completion of the design certification rulemaking proceeding or the proposed Economically Simplified Boiling Water Reactor ("ESBW") design on which DTE's COLA depends. We ask that the Commission repudiate a recent policy statement that would unlawfully remove the COLA's design-related contents from the scope of issues that may be challenged in the COLA adjudication and refer those issues to be resolved in a separate, parallel rulemaking proceeding to our knowledge has not been scheduled or commenced, the Policy Statement on the Conduct of New Reactor Licensing Proceedings, 72 Fed. Reg. 20 963 (April 17, 2008) (2008 Policy Statement). The 2008 Policy Statement - which is not enforceable law or regulation -should be ignored because it violates Section 189a of the Atomic Energy Act ("AEA"), as well as judicial precedents interpreting the AEA, and the NRC s Part 52 regulations for the conduct of licensing proceedings on COLAs. Pacific Gas & Electric Co. v. FPC, S06 F. 2d 33, 38-39 (D.C. C r . 1974) (when an agency applies a policy in a particular situation, it must be prepared to support the policy just as if the policy state lent had never been issued). The Commission should further reconsider and revoke a recent... (**0082-37** [Lodge, Terry])

Comment: General Electric-Hitachi's so-called Economic Simplified Boiling Water Reactor (ESBWR) design, proposed by DTE to be built as the new Fermi 3 reactor, has not even been completed, let alone certified by the U.S. Nuclear Regulatory Commission. The ESBWR has suffered many recent setbacks, calling into serious question its viability.

On November 23, 2008 there were six ESBWRs proposed to be built across the country: one by Dominion Nuclear at North Anna, Virginia; others by Entergy Nuclear at Grand Gulf, Mississippi and River Bend, Louisiana; two more by Exelon Nuclear at Victoria County Station, Texas; and the sixth by DTE at Fermi nuclear power plant near Monroe, Michigan.

However, on November 24th the ESBWR dominoes began to fall. That's when Exelon announced it would abandon the ESBWR design for its proposed two new reactors at Victoria County Station, Texas

Texans for a Sound Energy Policy had objected to NRC allowing an ESBWR licensing proceeding to continue, given the incomplete status of the design. In fact, they argued that the continuation of the licensing proceeding would violate federal laws and NRC regulations. Such pressure contributed to the nuclear utility, Exelon, the largest in the U.S., announcing that it was no longer considering the ESBWR design for its Victoria County Station, Texas twin reactor project. Exelon notified NRC it would seek another reactor design, stating technologies other than the ESBWR provide the project greater commercial and schedule certainty...As a result, Exelon is considering reactor technologies that have more mature designs, more certain cost structures and better availability of information than the ESBWR."

January 9, 2009 marked Black Friday for the ESBWR design. Entergy, the second-largest nuclear generator in the United States, announced cancellation of its ESBWR new reactor proposals at both Grand Gulf, Mississippi and River Bend, Louisiana. An Entergy press release reported:

The company asked the Nuclear Regulatory Commission on Friday to suspend reviews specific to GE Hitachi's Economic Simplified Boiling Water Reactor after unsuccessful attempts to come to mutually acceptable business terms with GEH [General Electric-Hitachi]. Entergy Nuclear also will temporarily defer environmental reviews related to the construction and operating license applications for potential projects at its nuclear sites at Grand Gulf, near Port Gibson, Miss., and River Bend, near St. Francisville, La. Paul Hinnenkamp, vice president of Entergy Nuclear's business development function, said ... this action simply reflects the fact that we have not been able to come to mutually agreeable terms and conditions with GEH for the potential deployment of an ESBWR."

Later that same day, Reuters reported that Dominion Resources Inc. had likewise been unable to reach an agreement with GE Hitachi to pursue development of a new nuclear plant in Virginia.... Reuters went on: [Spokesman]. Jim Norvelle said Dominion has decided to open a competitive bidding process to select a new engineering, procurement and construction partner for a proposed single new reactor at the North Anna nuclear station in Virginia. While Exelon, Entergy, and Dominion have pledged to continue pursuing new reactors at these same sites, they have made clear that they would not be ESBWRs. (**0084-2** [Kamps & Keegan, Kevin and Michael])

Response: *10 CFR 52.55(c) allows a COL applicant, at its own risk, to reference a design that is under review by NRC but not yet certified. The Economic Simplified Boiling Water Reactor*

(ESBWR) design is one such design currently under review. However, a COL cannot be issued by NRC until the reactor design is certified by NRC. Applicants select a reactor technology based on their own business criteria. If the ESBWR does not receive certification, then Detroit Edison Company (Detroit Edison) would have to determine whether it would proceed with a different reactor technology. A change in the reactor technology would need to be considered by NRC to determine whether the change would be significant in terms of the environmental impacts of construction or operation.

Comment: I have a complaint about the documents. I've got an old type phone-in type computer that operates on the phone line, called phone modem, and it takes a long time to download documents. And to take up space and time at a library to download some of this stuff, you know, is asking a lot. And so I haven't read the Environmental Review by the company. So some of the things I may say may not be pertinent. But I would appreciate if hard copy documents could be available in more locations. Perhaps -- there's a reference library at the University of Michigan-Dearborn, there's one at the Centennial Library in Dearborn, Detroit Library I'm sure has one, probably Toledo also. That would be helpful. (**0058-105** [McArdle, Ed])

Comment: I understand that at this time DTE/Detroit Edison and NRC documentation regarding the Fermi 3 project is available for public review at only the main branch (Ellis Branch) of the Monroe County Library. Fermi 2 is in Frenchtown Charter Township and I understand that the DTE/Detroit Edison proposal is to build Fermi 3 next to Fermi 2. The main branch of the Monroe County Library is not in Frenchtown Charter Township. However three other branches of that library are. Could you add those three other branches and the Frenchtown Township government center to the list of locations where Fermi 3 environmental review and other documentation will be available for review? (**0083-26** [Kaufman, Hedi])

Response: *Detroit Edison's ER is available for public inspection at the NRC Public Document Room in Rockville, Maryland. The ER is also available electronically through NRC's ADAMS Web site at http://www.nrc.gov/reading-rm/adams.htmland at http://www.nrc.gov/reactors/new-reactors/col/fermi.html. The Public Document Room can also be contacted at http://www.nrc.gov/reading-rm/pdr/copy-service.html to request a paper copy or CD/DVD of the document for a fee. NRC also wanted to ensure that there was an opportunity for meaningful public participation in the environmental review for such circumstances where electronic access could be difficult; consequently, the NRC staff is providing local access to Detroit Edison's ER and certain other documents at the Ellis Reference & Information Center of the Monroe County Library System in Monroe, Michigan. The NRC staff believes that these options offer reasonable opportunities for public access.*

Comment: As far as a reactor design, the criticism of a license for that reactor vessel, it's an upscale of what already exists. It's just adding more fuel bundles in a larger diameter vessel, so not very much to think about. (**0058-132** [Meyer, Richard])

Response: *The comment refers to characteristics of the ESBWR design. It provides no new information relevant to the environmental review and will not be considered further.*

D.1.2 Comments Concerning Process – NEPA

Comment: For all actions significantly affecting the quality of the human environment, the federal agency must provide a detailed statement on the environmental impact of the proposed action, alternatives to the proposed actions, and any irreversible and irretrievable commitments of resources that would occur with implementation of the action. 42 U.S.C. 4332(2)(C). The Environmental Impact Statement must contain a full and fair discussion of significant environmental impacts that is supported by evidence that the agency has made the necessary environmental analyses. 40 C.F.R. 1502.1. The discussion must include an analysis of the direct, indirect, and likely cumulative impacts of the proposed action. See 40 C.F.R. 1508.7, 1508.8, 1508.25. Federal agencies also must analyze and discuss significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. 40 C.F.R.1502.9(c). To satisfy NEPA, the NRC must demonstrate it has taken a hard look at the environmental consequences of the proposed action. To comply with NEPA's "hard look" requirement an agency must adequately identify and evaluate environmental concerns. Friends of the Bow v. Thompson, 124 F.3d 1210, 1213 (10th Cir. 1997).

NEPA's twin objectives are to ensure that the federal agency consider[s] every significant aspect of the environmental impact of a proposed action and to inform the public that it has indeed considered environmental concerns in its decision-making process. Earth Island Inst. v. U.S. Forest Serv., 442 F.3d 1147, 1153-54 (9th Cir. 2006); Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, 462 U.S. 87, 97 (1983). See also 40 C.F.R. 1500.1(b), (c). Thus, NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken [emphasis supplied]... Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Id. 1500.1(b).

NEPA's emphasis on the importance of coherent and comprehensive up-front environmental analysis. . . ensure[s] informed decision-making to the end that the agency will not act on incomplete information, only to regret its decision after it is too late to correct. Blue Mtns. Biodiversity Project v. Blackwood, 161 F.3d 1208, 1216 (9th Cir. 1998). In Foundation on Economic Trends v. Heckler, 756 F.2d 143 (D.C. Cir. 1985), the D.C. Circuit Court of Appeals characterized NEPA litigation as the critical juncture in judicial enforcement of the hard look doctrine, to ensure that the agency has adequately considered and disclosed the environmental impacts of its actions and that its decision is not arbitrary or capricious. Id. at 151. The purpose of NEPA is to ensure that agencies do not make uninformed - as opposed to unwise - decisions. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 348 (1989). (**0045-2** [Lodge, Terry])

Response: *The comment relates to the requirements set forth in NEPA for preparing an EIS. Section 102 of NEPA directs that an EIS be prepared for major Federal actions that have the potential to significantly affect the quality of the human environment. NRC has implemented Section 102 of NEPA in 10 CFR Part 51. Further, in 10 CFR 51.20, the Commission has determined that the issuance of a COL under 10 CFR Part 52 is an action that requires an EIS. The comment is consistent with NRC policy and practice, but it provides no specific information related to the proposed licensing action for the Fermi 3 nuclear plant, and will not be considered in developing the EIS.*

Comment: The scoping for the draft EIS should include a thorough review of all environmental and safety implications to Essex County, Ontario, Canada including the City of Windsor. The following entities shall be invited to participate in the scoping process:

The City of Windsor and other municipalities bordering the Detroit River and Lake Erie;

The County of Essex;

The Ontario Ministry of the Environment; and

Environment Canada.

Further notifications shall be direct to:
City Clerk's Office
City of Windsor
350 City Hall Square, Rm 201
Windsor, Ontario Canada
N9A 6S1 (**0049-1** [Richters, Karina])

Response: *The environmental impacts in Canada from the construction or operation of the proposed Fermi 3 nuclear plant will be considered as appropriate. Public notices of the scoping process were provided in a* Federal Register *(FR) Notice of Intent to conduct scoping (73 FR 75142), advertisements in U.S. and Canadian newspapers, and a press release.*

Comment: Due to the timing of the past meeting, in the dead of winter, the federal Nuclear Regulatory Commission should extend the deadline for accepting comments on the scope of the planned federal environmental review of the proposal for at least 90 days and hold another hearing in the spring when the weather would be better and provide a better input by the community at large. (**0011-1** [Stock, Ed & Kim])

Comment: If the NRC does not suspend review of the Environmental Report (the scoping process for the EIS), then I call for an extension of the comment period for 120 days. The NRC scheduled a short comment period for 1771 pages - actually much greater than that with referenced materials - and over the Christmas/New Year's holiday when citizens have hefty civic and family responsibilities. The official notice of the only public meetings was made on Christmas Eve. The only public meetings were held in bitter winter weather with snow-covered roads and black ice that made travel treacherous. There were days that documents could not be accessed from the NRC's website, by the NRC's own admission, and those with dial-up computers could not download larger documents. Another public meeting should be scheduled to take the place of the ones that occurred in treacherous weather. (**0051-2** [Cumbow, Kay])

Comment: On behalf of our members in Michigan and Ohio, I am writing to request a 120 day extension to the current Feb. 9, 2009 deadline for public comment on the environmental scoping for the proposed Fermi 3 reactor near Monroe, Michigan. I also request that NRC hold another public meeting, like the one held on Jan. 14th at Monroe County Community College, only this time in the spring, when the weather is more conducive to a large public turn out.

Ever since the Fermi 3 licensing proceeding was first announced in early December, 2008 in the Federal Register, I have had repeated problems utilizing NRC's website and ADAMS system to access relevant documents due to the NRC system's dysfunctionality. Such problems were especially bad during the holiday season between Christmas and New Year's, when preparations for the Jan. 14th meeting were urgently needed to be undertaken. Given the immense size of the documentation -- nearly 2,000 pages for the Environmental Report alone, and around 17,000 pages for the overall Combined Construction and Operating License Application (COLA) -- it is eminently reasonable for NRC to grant a 120 day extension to the current deadline. This is the only way for ordinary citizens concerned about the Fermi 3 proposal to read and analyze such incredibly long and technical documents, and seek expert assistance in their analysis and in the preparation of comments to NRC in response.

NRC's publication of the press release announcing the Jan. 14th public meeting late in the afternoon on Christmas Eve also served to significantly lower public involvement. In fact, the press release was obscured by the fact that it was not posted on the NRC's homepage, but only in its press release archives, even on the initial day of its publication.

This poor public notification was compounded by the extreme winter weather that occurred on Jan. 14th. NRC should have realized that holding a public meeting on Jan. 14 in southeast Michigan on the Great Lakes shore ran a high risk of experiencing severe winter weather that would dramatically lower public turn out. The blowing and drifting snow, and extreme cold, deterred a significant number of persons from venturing forth to the meeting on Jan. 14th. An entire carpool of concerned citizens from Ann Arbor, who oppose the Fermi 3 reactor, phoned to inform me that the extreme winter weather would make it impossible for them to attend either of the day's sessions. The impacts and risk of this extreme cold was made all the more clear by the dead car battery experienced by NRC's Gregory Hatchett that day. The extreme cold was near record breaking, and The Weather Channel on cable television, and other authorities, were explicitly urging vulnerable persons -- such as the elderly -- to remain indoors and not risk outdoor travel given the hazardous road conditions. All of this dramatically reduced what would have been a much larger turn out at the public meeting. By way of comparison, a much larger crowd of participants from the public attended the NRC introductory meeting last August 20th, 2008 at the same location. However, that event was not an official NRC meeting for the acceptance of official public comment into the NEPA record. For these reasons, I request a hearing during more reasonable weather conditions, such as in May or June. This would be made possible by a 120 day extension to the comment period. (**0057-1** [Kamps, Kevin])

Comment: I first want to say that this is being done way too hastily, and that we had 1,771 pages to review over the Christmas and New Year's holiday. And that's when people have a lot of other family and community obligations. This room should be packed, and one reason it isn't is because of those holiday considerations. This is also one of the coldest weeks in the year. And, that happens in January. (**0058-20** [Cumbow, Kay])

Comment: I want to go on record as stating this whole process is premature. I object to being publicly notified on Christmas Eve that there would be a meeting; and I object to the meeting being held in the middle of a Michigan winter, when the probability of people attending this proceeding, this hearing, would likely be diminished. So I am requesting an extension of the comment period for an additional 90 days; and I am requesting that another meeting of this type be held in the spring, when people can come out and they don't have to brave the coldest night of the year, last night, and the weather condition. So I object to this entire process. (**0058-61** [Keegan, Michael])

Comment: And again, one wonders about the timing of these hearings. (**0058-88** [Fischer, Lydia])

Comment: I must say I'm presenting under protest, in that the notification, the public notification occurred on Christmas Eve and the meeting was scheduled in the heart of a Michigan winter, and as you can see the weather is quite inclement. If you were to schedule a meeting where you didn't want the public to be participating, it would be January 14th, in the middle of blizzards and record cold temperatures. (**0059-62** [Keegan, Michael])

Comment: I request an extension of the public comment deadline, 30 days beyond Feb. 9. (**0083-29** [Kaufman, Hedi])

Response: *More than one month prior to receipt of the Fermi 3 COL application, NRC conducted a Public Outreach Meeting in the site vicinity to heighten public awareness of the NRC process for conducting licensing reviews under 10 CFR Part 52. At that meeting, the NRC staff discussed both the safety and environmental reviews that would be conducted. Public involvement and comments are invited and encouraged throughout the environmental review of* *a project, and NRC formally solicits both written and oral comments from members of the public at two different times during the review.*

The scoping process is the public's first opportunity for comment, and is conducted to define the proposed action, determine the scope of the environmental impact statement, and identify significant issues to be analyzed. NRC conducted scoping meetings near the proposed site to facilitate public participation. NRC published the Federal Register notice that informed the public of the times and locations. As outlined at the Public Outreach Meeting, the dates of public scoping meetings were contingent upon when the application was submitted to NRC and the resulting environmental review schedule. NRC also published meeting notices in newspapers in communities near the plant and posted a notice of the meeting on the NRC's website for the project. The website provides addresses for written comments to be submitted in person, by mail, or electronically. The deadline for comments is usually 60 days following the publication in the Federal Register *of the Notice of Intent to conduct scoping.*

The public's second opportunity to comment will occur after the draft EIS is published. NRC will file the draft EIS with the U.S. Environmental Protection Agency (EPA), and the EPA will issue a Notice of Filing in the Federal Register *to formalize the start of the public comment period. The NRC staff places a Notice of Availability in the* Federal Register *and on the NRC website indicating that the draft EIS has been issued, with instructions for the public and other interested parties on how to obtain copies. Those persons already on the mailing list will receive copies of the NRC notice and the draft EIS without further action. The draft EIS will also be available on the NRC website. The notice will request comments on the draft EIS and will provide addresses for delivering or sending the comments to NRC. Usually, a 75-day period is allotted for the public's review and the receipt of comments. During the public comment period, the NRC staff will hold a second set of public meetings in the vicinity of the proposed site to present the results of the draft EIS to the public and to obtain comments, both oral and written, from the public.*

Comment: When do you sponsor open direct public discussion-debates with these experts, rather than the biased, staged dog-and-pony shows which few concerned public citizens attend, partly because of distrust via past experiences, partly because advance notice of such meetings is inadequate, limited and never visibly itemized at the meetings. (**0004-7** [Carey, Corinne])

Response: *It is the policy of NRC to involve the public in the Commission's decision making process; therefore, NRC elects to conduct open public scoping meetings in association with its environmental review process. Meetings are generally held in a location accessible by the largest population that will experience the most direct environmental impact as a result of the proposed action. In the case of the proposed Fermi 3 nuclear plant, this population is located in the area of Monroe County, Michigan. The scoping period was open for 60 days, and during that time, the public and other agencies were welcome to provide verbal comments at scoping meetings or to submit written comments. NRC will hold additional public meetings after the draft*

EIS is published. Separate meetings will be held by NRC in association with the safety review process.

Comment: However, the IJC does have additional responsibilities under the Canada-U.S. Great Lakes Water Quality Agreement and is pleased, therefore, that your environmental assessment will consider the potential impact of the proposed plan on water quality, aquatic biota and their habitat, or other environmental resources. (**0015-1** [Lawson, Ph.D., Charles])

Comment: U.S. Environmental Protection Agency (EPA) staff members were pleased to be a part of the Fermi 3 site audit visit in early February. We have a better understanding of the topics the Nuclear Regulatory Commission (NRC) will cover in its Environmental Impact Statement (EIS) for this project, a new reactor unit associated with the existing Fermi Nuclear Power Plant in Monroe County, Michigan. (**0040-1** [Miller, Anna])

Comment: Thank you for inviting us to participate in the site audit and for considering our comments on the EIS scope. We look forward to working with your staff during the environmental review process. (**0040-4** [Miller, Anna])

Comment: However, the IJC does have additional responsibilities under the Canada-U.S. Great Lakes Water Quality Agreement and is pleased, therefore, that your environmental assessment will consider the potential impact of the proposed plan on water quality, aquatic biota and their habitat, or other environmental resources. (**0071-1** [Lawson, Ph.D., Charles])

Comment: U.S. Environmental Protection Agency (EPA) staff members were pleased to be a part of the Fermi 3 site audit visit in early February. We have a better understanding of the topics the Nuclear Regulatory Commission (NRC) will cover in its Environmental Impact Statement (EIS) for this project, a new reactor unit associated with the existing Fermi Nuclear Power Plant in Monroe County, Michigan. (**0080-1** [Westlake, Kenneth A.])

Comment: Thank you for inviting us to participate in the site audit and for considering our comments on the EIS scope. We look forward to working with your staff during the environmental review process: (**0080-4** [Westlake, Kenneth A.])

Response: *NRC conducts a number of activities during its review that will involve direct interactions with other governmental organizations. The comments are general in nature, provide no new information related to the impacts of construction or operations of the proposed Fermi 3 nuclear plant, and will not be considered in developing the EIS.*

Comment: Please advise me how the Nuclear Regular Commission intends to move on this possibility. Who will be involved in the decision? Will the local community have a voice? (**0021-2** [Hart, Donna])

Response: *The licensing process for COL applications is specified in Title 10 of the Code of Federal Regulations (10 CFR) Part 52. The process includes a detailed review by the NRC of an applicant's COL application to determine the safety and environmental effects of construction and operation of a nuclear power facility. After review of the application against the regulations, a hearing will be conducted to determine whether it is appropriate to issue the license. Both safety issues and environmental issues will be evaluated before a decision on an application is reached. As described in the regulations, based on the finding of its review, NRC can deny issuance of a license if it would not meet the regulatory requirements.*

Public involvement and comments are invited and encouraged throughout the environmental review of major Federal actions; the issuance of a COL would be a major Federal action and, therefore, requires the development of an EIS. NRC formally solicits both written and oral comments from members of the public at two different times during the environmental review, at the beginning of the process during environmental scoping for the EIS and when the draft EIS is issued.

Comment: If is very difficult to change habits. I ask you to be brave in taking action to avoid the possibility of serious or irreversible environmental harm even when scientific knowledge is incomplete or inconclusive. I ask you to be courageous in taking in the information that we are learning and in learning from any mistakes from your field. We humans can now affect the global climate, environment and life by our actions. We can add to the burden of a withering planet or we can bring enormous relief and safety. Please turn all your leadership toward clear energy solutions in favor of long-term care and flourishing Earth's human and ecological communities. Sincerely counting on your openness and determination to support thoughtful energy plans. (**0027-4** [Askwith, Annemarie])

Response: *NRC does not have a role in establishing the energy policy of the United States. NRC does not promote the use of nuclear power as a preferred energy alternative, and it does not regulate alternatives to producing electricity that do not involve nuclear power. Establishing energy policy is the domain of the President, the Congress, and the U.S. Department of Energy. Nevertheless, as part of NRC's environmental review, alternative actions such as the no-action alternative (energy efficiency and demand-side management), new generation alternatives, purchased electrical power, alternative technologies (including renewable energy such as wind and solar), and the combination of alternatives will be considered in Chapter 9 of the EIS.*

Comment: A NEPA document in connection with Fermi 3 will be a vain undertaking unless the Nuclear Regulatory Commission administratively forbids the initiation of any physical construction or preconstruction activities at the Fermi 3 site until the completion and finalization of an Environmental Impact Statement and selection of a preferred alternative.

In 2007 the Nuclear Regulatory Commission promulgated a new, de-regulated definition of construction as that term applies to the building of new nuclear power plants. Under the new 10 C.F.R. 50.10(a)(2), the following activities were relieved of all NRC oversight:
> Site exploration
> Procurement
> Logging, clearing of land, grading
> Excavation for any structure
> Fabrication at other than the final onsite, in-place location (modules)

At the same time, the limited work authorization - the first point at which NRC build authority must be sought - was moved higher/later in the licensing continuum. The new LWA list of allowable activities contained in the revised 10 C.F.R. 50.10(d)(1) includes:
> Driving of pilings
> Subsurface preparation
> Placement of backfill, concrete, or permanent retaining walls
> Installation of foundation

The drastic alteration of the meaning of construction circumvents NEPA. By allowing excavation activity, for example, the utility commences an irretrievable commitment to a nuclear-fired power plant long before the completion of an Environmental Impact Statement which is supposed to seriously consider reasonable alternatives. This manifests an undeniable bias toward central baseload plant construction and precludes substantive consideration of any other alternatives such as wind, solar, geothermal and energy conservation. By de-regulating the nuclear plant construction process from NEPA restrictions, the Commission is handing DTE, as applicant, the sunk costs argument, i.e., that because the utility has incurred expenses for its project, it should not, nay, must not, be denied an NRC license to complete it.

If the Commission were to allow any acts of construction to proceed before the completion of the NEPA process, such is illegal because it is contrary to NEPA. Because such enabling would act to deprive the public of the benefit of the procedural protections of NEPA, the NRC revamping of its definition of construction comprises a denial of due process and is unconstitutional as applied. (**0045-1** [Lodge, Terry])

Comment: The present process allows DTE to, de facto, irretrievably commit to the project and to invest heavily in construction prior to the de jure selection of a preferred alternative. This makes the environmental document into a farce. A project being built while it is being licensed is far more difficult to stop than a project which seeks merely paper approval. Sunk costs significantly undermine the effectiveness of environmental laws. And besides massive investment, the work undertaken prior to a final EIS drastically affects the environment and natural resources - the very resources that should have been protected until more thorough analysis of the project's impact on the environment was conducted. By the time opponents of the project can get a court to consider enjoining the project, the court faces a fait accompli.

The First Circuit Court of Appeals illustrated in Sierra Club v. Marsh the dangers that sunk costs pose in the NEPA context. There, the Court of Appeals vacated a district court ruling denying a preliminary injunction to environmental plaintiffs. The plaintiffs sought to halt the construction of a causeway to an island that the State of Maine wanted to develop into a marine terminal. The district court had denied the preliminary injunction in the belief that the harm to the environment was not irreparable because the causeway always could be removed at a later time.

The Court of Appeals vacated the district court's decision not to issue a preliminary injunction, Sierra Club v. Marsh, 872 F.2d 497, 500-501 (1st Cir. 1989) because setting aside an agency's decision at a later date would not undo environmental harm. Moreover, the commitment of resources already made to the project would influence any re-evaluation of the merits of the project. The appellate panel held that it is far easier to influence an initial choice than to change a mind already made up and that the harm at stake is a harm to the environment, but the harm consists of the added risk to the environment that takes place when governmental decision makers make up their minds without having before them an analysis (with prior public comment) of the likely effects of their decision upon the environment. Id. Hence premature decisions irreparably harm the environment, by increasing the risk to the environment.

Congress promulgated NEPA to ensure that federal projects were not initiated until an accurate assessment of the project's impact on the environment was complete. Vermont Yankee Nuclear Power Corp. v. National Resources Defense Council, Inc., 435 U.S. 519, 558 (1978) (finding Congress passed NEPA to ensure that federal agencies consider the environmental consequences of proposed actions during the decision-making process, thereby insuring fully informed and well-considered decisions); Massachusetts v. Watt, 716 F.2d 946, 953 (1st Cir. 1983) ([NEPA's] purpose is to require consideration of environmental factors before project momentum is irresistible, before options are closed, and before agency commitments are set in concrete. (quoting W. Rogers, <u>Environmental Law</u> 7.7 at 767 (1977)); Arlington Coalition on Transp. v. Volpe, 458 F.2d 1323, 1333 (4th Cir.) (stating that the purpose of NEPA [is] to insure that actions by federal agencies be taken with due consideration of environmental effects), cert. denied sub nom. Fugate v. Arlington Coalition on Transp., 409 U.S. 1000 (1972).

Regulations issued pursuant to NEPA state that until an agency issues a record of decision ... no action concerning the proposal shall be taken which would: (1) have an adverse environmental impact; or (2) limit the choice of reasonable alternatives. 40 C.F.R. 1506.1 (1995); see also 40 C.F.R. 1501.2 (stating that agencies must integrate the NEPA process with other planning at the earliest possible time to insure that planning and decisions reflect environmental values. (**0045-3** [Lodge, Terry])

Comment: In the case of Fermi 3, the Commission should immediately forbid any physical activity at the proposed plant site by DTE or its contractors and subcontractors which is designed to further a build alternative at the proposed site for Fermi 3, pending formal and final completion of an EIS and the selection of a preferred alternative. To allow otherwise violates NEPA and invites a lawsuit. (**0045-4** [Lodge, Terry])

Comment: I call for the NRC to not allow any preconstruction activity until a full EIS is completed and all alternatives are examined in a comprehensive way. Allowing preconstruction activity defeats the purpose of NEPA, as well as not allowing examination or mitigation of preconstruction activity by NEPA. (**0051-3** [Cumbow, Kay])

Comment: I'd like to talk about the integrity of the NEPA process. I appreciate greatly the fact that the Nuclear Regulatory Commission has professional staff who are devoted to ensuring that NEPA's complied with. And it's not the people here today I have problems with. I have problems with the former Commissioner Merrifield, who departed the NRC in 2007 only after he had hand-carried through the process a rule change that deregulated the construction process so that Detroit Edison, and other utilities, are able to undertake serious construction of nuclear power plants before the NEPA process is completed. And to my knowledge it's the only agency that I've ever encountered that is able to -- that has enabled its client population to do that.

When there's a timber cut, Environmental Impact Statement process, the trees don't get cut before the ultimate decision is made and the environmental considerations denominated. When the Department of Energy wants to detonate a test weapon at the Nevada Test Site, they don't set off the bomb before they've completed the NEPA process. When your State Highway Department of Transportation wants to build an interstate through your living room, they don't get to start the bulldozers and knock over houses before they've completed the NEPA process, ruled in or ruled out alternatives. (**0058-116** [Lodge, Terry])

Comment: The other thing that I was concerned about was that these plants, like Fermi, are able to build part of their structure outside the regulation of a permit. In other words, if I want to lay all the concrete that it's going to take to build the plant, I don't have to wait for the permit to be approved to go ahead and start building.

It's kind of a flaw in the law because, as I see it, it looks like the taxpayer is subsidizing the possibility that there will be any kind of a refusal of the NRC to approve the plant. So if the plant has a chance of being refused, then the taxpayer will pick up the cost of all of the structures that are built without the approval.

The only way that I can see that somebody would go ahead and start building structures like these, is if they already knew that the approval would take place. If that's not correct I would like somebody to tell me why someone would spend millions and millions of dollars without having any idea of whether they would be reimbursed. (**0058-43** [Simpson, Robert])

Response: *These comments refer to a 2007 amendment to the Commission's regulations concerning limited work authorizations (72 FR 57416, October 9, 2007). In 10 CFR sections 50.10(a) and 51.4, the definition of construction is limited to activities which are for safety-related structures, systems, or components (SSCs) and certain other SSCs. A limited work authorization, construction permit, or COL is required before performing such activities. Activities that do not fall within NRC's definition of construction, such as clearing and grading, excavating, building transmission lines, and erecting support buildings are considered preconstruction activities that do not require NRC authorization. Most of these activities are regulated by other local, State, Tribal, or Federal agencies and require permits from them to proceed. In its environmental review, NRC must consider preconstruction activities in the context of cumulative impacts. These impacts will be evaluated in Chapters 4 and 7 of the EIS.*

D.1.3 Comments Concerning Land Use – Site and Vicinity

Comment: Ironically the War of 1812 Bicentennial planning process shares the same timeframe as the Environmental Review process for Fermi unit 3. And in accordance the State of Michigan Centers for Regional Excellence Program, groups tourism with energy production as collaborative activities. In fact, the seven-and-a-half mile radius from Fermi unit 3 includes all of the cultural, historical, recreational, and natural sites being considered as bicentennial legacy projects.

The group I represent will be long gone before Fermi unit 3 is operational. However, the Experiential Tourism Task Group War of 1812 Bicentennial Steering Committee in Monroe County was charged with the responsibility of creating bicentennial legacy projects to enhance tourism. Our objective is to marshal all of the heritage resources on the waterfront to make a compelling experience for visitors to the Lake Erie west region. Efforts are underway with the help of the Native American community, to bring back wild rice as an 1812 bicentennial project. Fermi unit 3 has ample areas suitable for the propagation of wild rice. This would be a cultural, economic endeavor that would bridge the gap to future generations. It would start the process of reintroducing missing species that once were abundant in the Lake Erie marshes. The Downriver link, Greenways Initiative, has advocated a non-motorized trail around Fermi unit on North Dixie Highway. The National Park Service promotes the rivers trails, and conservation assistance program that would supplement this effort.

Within the seven-and-a-half radius of Fermi Unit 3, the U.S. Fish and Wildlife Service has established an international wildlife refuge. The National Park Service operates the Motor City's National Heritage area, and is exploring the establishment of a National Battlefield Park, that would connect to the North Country National Scenic Trail near Fort Meigs in Perrysburg, Ohio.

The US Army Corps of Engineers operates a confined disposal facility on the St. Lawrence Seaway at Pointe Mouillee, that is the world's largest freshwater marsh restoration project. This is all exciting news, and the combined license application should be updated to reflect these initiatives, and the application should join in the effort to create a center for regional excellence built on the energy industry in the Lake Erie West region. (**0058-124** [Micka, Richard])

Comment: One of the key elements in the State centers of regional excellence program is energy production. Another element is tourism. Ironically both of these elements have come together on the shores of Lake Erie. All the bicentennial heritage resources, cultural, historic, recreational, and natural, are within the seven-and-a-half mile radius of Fermi Unit 3, proposed Fermi Unit 3.

The planning process for the bicentennial coincides with the environmental review process for Fermi Unit 3. The greatest challenge for the Bicentennial Task Group is achieving center of regional excellence status in capacity building, which is the hallmark of sustainable energy production.

This sphere of influence surrounding the existing Fermi nuclear power plant makes it a prime candidate to become a center of regional excellence under the Governor's transformation initiative. The scoping process for Fermi's Unit 3 comes at a critical time. Achieving center of regional excellence could be a byproduct of the Fermi Unit 3 environmental report and would benefit the entire community.

The Fermi 3 scoping process and environmental report provide a compilation of all the efforts undertaken to date to restore environmental resources on the shore of Lake Erie. So there's an immediate result and benefit from this process that we're taking under our administration here this evening. So have heart and stay with the program. (**0059-87** [Micka, Richard])

Comment: The 7.5 Mile Radius within the Fermi Unit 3 Sphere of Influence can become a Center for Regional Excellence (CRE) under the Governor's Transformation Initiative. It needs to be packaged in such a way that it fulfills the Cultural, Economic, Development Action Strategy proposed by the State of Michigan. An Energy Corridor along the West Shore of Lake Erie would benefit the Community Cultural Economic Development Readiness Initiative. This process uses a prescribed Set of Capacity Building Tools toward attainment of Community Empowerment and Actualization Goals. The COLA already uses these tools in bringing about Sustainable Energy Resources such as Efficiency, Research, Assessment, Evaluation, Consultancy, Training, Mentoring, Planning, Partnerships, Collaborations and Incentives. Fermi Unit 3 can lead by example. As a member of the Community, Fermi Unit 3 should work with Monroe County to implement a Cultural, Economic, Development Action Strategy (copy attached). The entire Electrical Generation Resources of Monroe County should be harnessed to create a Center for Regional Excellence. The Energy Story needs to be told specifically where Stewardship of Natural Resources is concerned. Finally, there are two 1812 Legacies within the 7.5 mile Radius that need to be explored.

Wild Rice. Efforts are under way with the help of the Native American Community to bring back Wild Rice as an 1812 Bicentennial Project. Fermi Unit 3 has ample areas suitable for the propagation of Wild Rice. This would be a cultural, economic endeavor -that would bridge the gap to future generations. It would start the process of reintroducing missing species that once were abundant in the Lake Erie Marshes.

Non-Motorized Transportation. The Downriver Linked Greenways Initiative (Brochure attached) has advocated a non-motorized trail around Fermi Unit 3 on North Dixie Hwy. (Hull's Road). This is a CRE Project and could become a part of the Fermi Unit 3 Evacuation Plan. The NPS promotes the Rivers, Trails and Conservation Assistance (RICA) Program that would supplement this effort. (**0082-31** [Micka, Richard])

Response: *These interdisciplinary comments relate to existing and proposed land use, cultural resources, and ecology in the site vicinity. These aspects of the affected environment will be discussed in Chapter 2 of the EIS. General impacts of the proposed action on land use, including expected permanent and temporary land use changes at the site in the vicinity, in the region, and in offsite areas such as affected transmission corridors, will be evaluated in Chapters 4 and 5 of the EIS. Impacts specifically related to the 1812 Bicentennial Project will be addressed in the cultural resources impact discussions in Chapters 4 and 5 of the EIS. Impacts specifically related to the possible reestablishment of wild rice in the wetlands along Lake Erie will be addressed in the terrestrial ecology impact discussions in those same chapters. Cumulative impacts of the proposed action will be discussed in Chapter 7 of the EIS.*

Comment: if there is some way of better connecting the natural spaces we still have along the shoreline. These power plants, whether they're coal or nuclear, tend to be dead spots for outdoor recreation. Hikers can't access them generally, and fishermen oftentimes have to deal with sometimes water access problems because of security in the age of terrorism. And I guess what I'm asking DTE maybe to do is to do some compensation for the local residents to have some positive environmental and recreational impact in addition to the plant development. (**0059-80** [Ingels, Mike])

Response: *Impacts of construction and operation of the proposed Fermi 3 nuclear plant on recreational opportunities, and a discussion of any possible and appropriate mitigation measures, will be presented in the land use impact discussions in Chapters 4 and 5 of the EIS.*

Comment: Staff of the MDEQ has conducted an initial review of the proposal, which indicates that this project is located within Michigan's coastal management boundary and is subject to Federal Consistency requirements. Before the U.S. Nuclear Regulatory Commission can issue the proposed COL, staff of the LWMD will need to review the proposed project for Federal

Consistency with Michigan's Coastal Management Program (MCMP), as required by Section 307 of the Coastal Zone Management Act, PL 92-583, as amended. This will happen after the final EIS has been submitted to our office with a request for Coastal Zone Management certification of Federal Consistency. A determination of Federal Consistency with the MCMP requires evaluation of a project to determine if it will have an adverse impact on coastal, land, or, water uses or coastal resources. Projects are evaluated using the permitting criteria contained in the regulatory statutes administered by the MDEQ. These statutes constitute the enforceable policies of the MCMP. The statutes that this project will be reviewed against for Federal Consistency are found in Michigan's NREPA. The COL proposes state regulated construction activities which will require state permits and may cause significant impacts, as discussed in more detail below. (**0079-1** [Browne, Elizabeth M.])

Response: *Prior to issuance of a COL for the proposed Fermi 3 nuclear plant, Detroit Edison will be required to demonstrate compliance with all applicable Federal and State laws and regulations including those of the Coastal Zone Management Act.*

Comment: Figure 2.4-6 illustrates the Detroit River International Wildlife Refuge Boundary. The south extent of the Boundary follows 1-75 to the Ohio line. It does not terminate at the River Raisin Federal Navigation Channel (Monroe Harbor) as indicated in Figure 2.4-6.

Paragraph 2.2.1.2.5 (Page 2-18) Natural and Recreational Areas. The ER indicates that the Detroit River International Wildlife Refuge (DRIWR) is not open to the public. There are units within the Refuge such as Humbug Marsh (Trenton, MI) and Erie Marsh (Erie, MI) that are open to the public at certain times of the year. In the future, the Refuge will encourage public visitation. The Fermi Unit 3 Area is not open to the public. (**0082-27** [Micka, Richard])

Response: *This comment provides information on land use categories and restrictions in the vicinity of the Fermi site, particularly as related to the Detroit River International Wildlife Refuge. This information will be considered in Chapter 2 of the EIS.*

Comment: Figure 2.1-2 illustrates a 7.5 mile Radius around the Fermi Unit 3 vicinity. This radius encompasses a number of Heritage Resource Sites in the Coastal Zone of Monroe County, MI.

RECREATIONAL. Sterling State Park and Downriver Linked Greenways Initiative. (Michigan DNRJ National Park Service/Rivers, Trails & Conservation Assistance Program).

NATURAL. Detroit River International Wildlife Refuge -Eagle Island Marsh (US Fish & Wildlife Service/DRIWR). (**0082-30** [Micka, Richard])

Response: *This comment provides information on land use categories and restrictions in the vicinity of the Fermi site, particularly as related to Heritage Resource Sites. This information will be considered in Chapter 2 of the EIS.*

D.1.4 Comments Concerning Meteorology and Air Quality

Comment: Construction of the project would create additional greenhouse gases from the cement required for the project, as well as the transportation used to move materials to the area. (**0039-3** [Mitchell, Rita])

Comment: The proponents should be required to do a complete carbon- footprint analysis involved in the construction of the plant and the preparation of materials and equipment, including the carbon emissions associated with uranium mining, refining, enrichment, and fuel fabrication. (**0048-3** [Edwards, Gordon])

Comment: One cannot read a newspaper or watch a television news program without seeing references to the desire for decreased reliance on carbon-based fuels for national security and environmental reasons, to name a few.

The Fermi 3 project provides a step in the right direction towards achieving this goal. (**0058-120** [Lavelline, Joe])

Response: *The NRC staff will evaluate air quality impacts associated with the construction and operation of the Fermi 3 nuclear power plant (including those from carbon and other greenhouse gas emissions) in Chapters 4 and 5, respectively, of the EIS. Carbon emissions from the uranium fuel cycle will be addressed in Chapter 6 of the EIS.*

Comment: I don't know if the cooling towers are included, but if there are I know some cooling towers use fungicides and algaecides to reduce the buildup of algae within cooling towers. Some of these things are chlorinated chemicals which would also have environmental impacts to the air, to the water, and so forth. (**0058-107** [McArdle, Ed])

Response: *The NRC staff will examine the potential impacts of water treatment chemicals used in cooling towers. Results of the analysis will be presented in Chapter 5 of the EIS.*

D.1.5 Comments Concerning Geology

Comment: We understand the site may have subsurface karst geology. We recommend the EIS address whether there is karst geology and, if present, evaluate how this geologic setting may influence the project's environmental impacts. To facilitate our review, we would appreciate knowing whether karst geology is present, as soon as this information is available. (**0040-3** [Miller, Anna])

Comment: We understand the site may have subsurface karst geology. We recommend the EIS address whether there is karst geology and, if present, evaluate how this geologic setting may influence the project's environmental impacts. To facilitate our review, we would appreciate knowing whether karst geology is present, as soon as this information is available. (**0080-3** [Westlake, Kenneth A.])

Response: *The presence of karst geology in southeastern Michigan will be investigated, and the findings will be presented as background information in Chapter 2 (Affected Environment) of the EIS. If karst is present, it will be evaluated accordingly. Plant safety issues related to karst geology will be addressed in Chapter 2 of NRC's Safety Evaluation Report.*

D.1.6 Comments Concerning Hydrology – Surface Water

Comment: Water implications: Lake Erie is the shallowest of the Great Lakes. Nuclear energy uses a great deal of water. As the effects of global warming are realized, Lake Erie, as the shallowest of the Great Lakes, will be at the greatest risk. Utilization of, and contamination of great quantities of Lake Erie water is not environmentally responsible. The Great Lakes watershed contains a fifth of Earth's fresh water. Protection of the Great Lakes requires that all development projects such as additional nuclear power plants, be considered for long-term generational effects. We cannot replace the Great Lakes, Lake Erie, or the River Raisin, the waters upon which the Fermi(s) depend. We cannot live without water--clean, non-radiated water. (**0016-3** [Rivera, Gloria])

Comment: In addition to releasing radioactive and toxic poisons into Lake Erie, Fermi currently uses the lake to cool the power plant. (**0019-4** [Schemanksi, Sally])

Comment: The EIS should take into account predicted decreases in Lake Erie water levels due to global warming - 3 to 6 feet over the next 60 to 70 years - when considering the implications for water intake and thermal releases.

The analysis should focus on western Lake Erie, the shallowest part of the lake, rather than using the entire lake in its overall analysis.

Data on phosphorous in the application is out of date. Dissolved phosphorous levels have been increasing. (**0028-2** [Shiffler, Nancy L.])

Comment: Are the temporal, special, thermal and volumetric characteristics of the buoyant plume adequately predicted? The Combined License Application (COL) indicates water will be discharged offshore and the plume is expected to be dissipated approximately 1,291 feet from shore. The model predicts a mixing zone of 130 feet long by 226 feet wide, for a total plume area of 0.67 acres. The Department has observed significant direct and indirect negative effects to aquatic resources from power plants discharging to the Michigan waters of the Lake

Erie basin. Based on that experience we request clarification of the following questions: 1. Is there a predicted sinking plume? If so, are the temporal, special, thermal and volumetric characteristics of the buoyant plume adequately predicted? 2. Is the volume, velocity, time of passage and time-temperature information in the intake facilities, through the plant, in the discharge facilities, and in the centerline of the thermal plume adequately predicted? (**0029-2** [Freiburger, Chris])

Comment: The Department would like a better explanation regarding the fate of the chemicals used to treat the cooling water and their potential impacts to water quality in the discharge area. The COL indicates that the levels will be monitored as part of the NPDES permit, but we suggest that a detailed description of how those would be treated or managed within the mixing zone be included. (**0029-7** [Freiburger, Chris])

Comment: Will more nuclear power demand more water for future cooling demands? Will people have less water rights because cooling issues demand more water? (**0031-4** [Rysztak, Robert])

Comment: Lake Erie's shallow western basin cannot tolerate the thermal pollution from yet one more large-scale thermo-electric power plant. Lake Erie already faces major lake level loss and retreat of its waters from the current lakeshore due to climate change. It already has a significantly higher air temperature than the rest of the Great Lakes, which contributes to evaporation of Lake Erie's waters. Such water loss will exacerbate overheating, especially in the shallow waters of Lake Erie's western basin, with a current average depth of just 24 feet. (**0050-18** [Kamps, Kevin])

Comment: Given this massive thermal pollution, Fermi 3 should be required to utilize the best available dry cooling tower technology, to minimize or even eliminate water withdrawals from, and heat discharges, into Lake Erie. In addition, DTE's Monroe Coal Plant should be required to install an additional best-available-technology cooling tower. Fermi 3's intake and outfall is Lake Erie but during at least some conditions the intake and outfall would impact the nearby Maumee Bay estuary, the average depth of which is just five feet, and which is already impacted by the neighboring DTE Monroe coal burning power plant, which uses an average of 1.9 billion gallons of water a day, as well as the adjacent Fermi 2 nuclear plant, which uses an additional tens of millions of gallons a day. Such impacts must be evaluated. (**0050-20** [Kamps, Kevin])

Comment: when we look at the Great Lakes, which have many nuclear plants around us, Michigan is the most exposed of all the states in terms of the Great Lakes waters and the possibility of damaging those waters, because the lower peninsula is surrounded on three sides by water. The upper peninsula is totally surrounded by Great Lakes water.

So protecting the Great Lakes is a great issue for us as Michigan citizens in the development of our economy and the sustainability of our population, (**0058-100** [Holden, Anna])

Comment: Another thing I came across was an article in Waste News about the EPA having a mercury reduction program for the Comanche Nuclear Power Station in Texas. They didn't explain how mercury was used. I don't know if it was part of the process or instrumentation or disposal of old instruments or what. But I think if there's any possibility of mercury contamination that should be looked at also. (**0058-110** [McArdle, Ed])

Comment: If there's going to be any heat transference into the Lake into Brest Bay area, how can we sustain that? You know, we used to have Perch Town Derby. The Lake doesn't freeze anymore. There's been impacts. (**0058-134** [Dyson, Ed])

Comment: I would just like to say further that global warming -- nuclear power plants need cooling water. So if you've got hot water coming in, then you have to shut down your reactors. (**0058-26** [Cumbow, Kay])

Comment: Others have already spoken eloquently of the impact on Lake Erie. Just let me restate and affirm that we cannot replace the Great Lakes, Lake Erie, or the River Raisin, the rivers upon which Fermi depend. We cannot live without water, clean, non-radiated water. (**0058-68** [Weber, Margaret])

Comment: Climate change is predicted to decrease water levels in Lake Erie from a little less than 3' to up to 6' in the next 60 -70 years. Predicted decreases in water levels would literally mean that there would be no water in Maumee Bay which is water that is used by other power plants and proposed for Fermi 3. Climate change projected impacts on Western Lake Erie and projected decreasing Lake Erie water levels should be part of the environmental review. (**0082-11** [Bihn, Sandy])

Comment: a determination should be made on the impacts of the up to 49 million gallons of additional heated discharge waters from the proposed Fermi 3. The application uses all of Lake Erie as the source of water available and impacted when in fact the waters used and needed for the plant lie entirely with the Western Basin of Lake Erie. The assessment needs to look at water quantities in Western Lake Erie and Maumee Bay -not all of Lake Erie. Western Lake Erie holds only 5% of the volume of Lake Erie. (**0082-14** [Bihn, Sandy])

Comment: The application talks about the influence of the Detroit River on Toledo's water intake and then fails to include the Toledo water intake in its environmental analysis. This analysis needs to be conducted as part of the environmental assessment. (**0082-18** [Bihn, Sandy])

Comment: Water implications: Lake Erie is the shallowest of the Great Lakes. Nuclear energy uses a great deal of water. As the effects of global warming are realized, Lake Erie, as the shallowest of the Great Lakes, will be at the greatest risk. Utilization of, and contamination of great quantities of Lake Erie water is not environmentally responsible. The Great Lakes watershed contains a fifth of Earth's freshwater. Protection of the Great Lakes requires that all development projects such as additional nuclear power plants, be considered for long-term generational effects. We cannot replace the Great Lakes, Lake Erie, or the River Raisin, the waters upon which the Fermi(s) depend. We cannot live without water-clean, non-radiated water. (**0082-34** [Weber, Margaret])

Response: *The construction and operation of a nuclear power plant involves the consumption of water. While NRC does not regulate or manage water resources, it does have the responsibility under NEPA to assess and disclose the impacts of the proposed plant on water resources. In Chapters 4 and 5 of the EIS, the NRC staff will independently evaluate impacts of the use of water from Lake Erie on the lake, and will evaluate the effects of the thermal and effluent discharges on the western Lake Erie basin, as well as on other parts of the lake, as appropriate. This evaluation will consider lake conditions during construction and operation of the proposed plant.*

Comment: Also, the surface water analysis seems to only include Monroe, Michigan. It should include all the counties. (**0058-53** [Bihn, Sandy])

Comment: The application only looks at Monroe County for Surface Water -the surface water analysis should include Lucas (Ohio), Ottawa (Ohio), Monroe(Michigan) and Wayne (Michigan). (**0082-22** [Bihn, Sandy])

Response: *The analysis of surface water issues to be presented in Chapters 4 and 5 of the EIS will include all of the western basin of Lake Erie and the rest of the lake, as appropriate. Surface water reviews addressed in the analysis will pay particular attention to counties where the water resource is being impacted. Thus, all counties adjacent to the lake will be covered by the analysis. More detailed attention will be paid to those counties, such as Monroe County, where particular issues can be identified.*

Comment: Also the short and long range Great Lakes levels I'm sure should be addressed, and I'm thinking of not just the water depletion because of global warming, but also the short term seiche events -- if I pronounce that right -- when wind blows the water back and forth, and the winds are supposed to be increasing. (**0058-108** [McArdle, Ed])

Response: *The comment refers to the effects of seiches on lake water levels. The effects of seiches on water availability during operations will be discussed in Chapter 5 of the EIS. Seiches also relate to plant safety, which will be addressed in the NRC staff's Safety Evaluation Report for Fermi 3.*

Comment: It appears that at least one stream flows through the DEC property, regulated under Part 301 of the NREPA. We recommend that all stream areas be identified and that any potential impacts be avoided and minimized in the planning process. Stream impacts that can not be avoided in the construction process may require stream mitigation. Typical mitigation for stream impacts include stream restoration using natural channel design principals, maintaining and/or establishing streamside buffers, and installing stream crossings that clear span the stream to bankfull width. (**0079-4** [Browne, Elizabeth M.])

Response: *Swan Creek is the only stream in the vicinity of the Fermi site. Water from the creek would not be used by Fermi 3. However, environmental effects of work on and along the stream, if this occurs, will be evaluated in the EIS.*

Comment: The application does not mention the practice of open lake dumping up to 800,000 cubic yards of sediments by the Army Corps of Engineers for the Toledo shipping channel. The turbidity from the open lake dumping would impact the intake of Fermi 3 and should be reviewed. (**0082-19** [Bihn, Sandy])

Response: *The open lake dumping mentioned in the comment occurred in Maumee Bay, about 3.5 mi northwest of Toledo Harbor Light, and more than 10 mi from the proposed Fermi 3 nuclear plant. The impacts of open dumping projects are addressed by the U.S. Army Corps of Engineers. However, the effects of such dumping, if any, will be evaluated as appropriate in Chapter 7 (Cumulative Impacts) of the EIS.*

Comment: Is the water intake for Frenchtown and Monroe considered in the environmental review? (**0083-30** [Kaufman, Hedwig])

Response: *The effects of Fermi 3 operations on water quality and availability at the water intake structures for Frenchtown and Monroe will be discussed in Chapter 5 of the EIS.*

Comment: The drainage area for the unnamed tributary to Lake Erie at the site is less than two square miles, and does not fall under the state's Floodplain Regulatory Authority, found in Part 31 of the NREPA. A state floodplain permit will not be required from the LWMD at this site.

While Part 31 does not regulate the floodplains of the Great Lakes, it should be noted that the floodplain for Lake Erie affects the project site. The floodplain limits are shown on the Monroe County Flood Insurance Rate Map (FIRM) panel 26115C0259 D, dated April 20, 2000. The 1 percent annual chance (100-year) flood elevation and the 0.2 percent annual chance (500-year) flood elevation for Lake Erie have been computed to be 578.8 feet, National Geodetic Vertical Datum of 1929 (NGVD 29) and 579.7 feet, NGVD 29, respectively. The State building code requires that a critical facility (such as a power plant) constructed in the floodplain, be elevated or flood-proofed one foot above the 0.2 percent annual chance flood elevation.

Frenchtown Township is also designated as a Flood Risk Area (FRA) under Part 323, of the NREPA. Construction standards in the FRA program are similar to those found in the State building code and the National Flood Insurance Program (NFIP). Frenchtown Township has local permitting authority under the FRA Program and the building inspector should be closely involved in review throughout this project. (**0079-2** [Browne, Elizabeth M.])

Response: *The environmental impacts of construction and operation of Fermi 3 on the floodplains for Lake Erie and for Swan Creek will be evaluated in Chapters 4 and 5 of the EIS. Safety issues related to potential floods are outside the scope of the environmental review, but will be evaluated by the NRC staff in its Safety Evaluation Report.*

D.1.7 Comments Concerning Hydrology – Groundwater

Comment: They [nuclear reactors] also can leak elements such as tritium into the groundwater. (**0059-17** [Barnes, Kathryn])

Comment: They also can leak elements such as tritium into the groundwater. Radioactive elements cause cancer. (**0083-32** [Barnes, Kathryn])

Response: *Groundwater monitoring systems will be installed to detect releases to the subsurface if they occur. The movement of groundwater under the Fermi site, as well as the monitoring systems, will be evaluated in Chapters 4 and 5 of the EIS. The NRC staff will also review the consequences of an accidental release of radionuclides into groundwater in its Safety Evaluation Report.*

D.1.8 Comments Concerning Ecology – Terrestrial

Comment: The COL includes more recent data on the terrestrial/wetland resources near the project which highlights the very high diversity of plants and organisms in the coastal wetlands of Lake Erie. The COL describes the significant loss of these wetland complexes in the Michigan waters of Lake Erie. Given the diversity of habitats, and the high level of loss of these habitats, the Department opposes any net loss of wetlands for this project. The COL indicates the 126-acres of fill is small based on the U.S. Nuclear Regulatory Commission (NRC) criteria and should not require mitigation. The Department strongly disagrees. All wetland fill must be mitigated, especially in areas of high value habitat that is already incredibly rare in this basin. This is required pursuant to State law and cannot be waived. A complete description of the wetland mitigation project to offset impacts at the site must be included. The following information should be of use to you in developing appropriate wetland mitigation sites and design.

The diverse coastal wetlands in association with the secluded uplands on the property proposed for development provide good habitat for a variety of wildlife species. Lake Erie is a traditional migration route for waterfowl, marsh birds, wading birds, neotropicals and raptors. Birds such as Great Blue Herons and Great Egrets rest in the trees. They feed in the shallow waters near the shorelines and in the wetlands of the wildlife refuge. Ospreys and Bald Eagles have been observed feeding within the shallow waters of the Fermi 2 Nuclear Power Plant (Department staff personal observations).

Historically the coastal marshes of the western Lake Erie area are important spring, fall and winter, staging, feeding and resting areas for waterfowl. The insects, invertebrates, crustaceans and mollusks that are supported within these wetland communities are also an important source of food for various fish and wildlife species. The emergent and shoreline habitats also provide opportunities for nesting and brood cover for both game birds and non-game birds. No net loss of undisturbed coastal wetland in the Western Lake Erie area is very crucial to this area. (**0029-8** [Freiburger, Chris])

Response: *The NRC staff will address potential impacts to terrestrial and wetland species and habitats, including wetlands in coastal and inland areas, in Chapters 4 and 5 of the EIS. The EIS will document how Detroit Edison has avoided or minimized impacts on wetlands and other waters of the United States. Potential mitigation measures will also be addressed in Chapters 4 and 5 of the EIS.*

Comment: The environmental section indicates a diverse population of amphibians and reptiles utilizing the variety of habitats located at the FERMI 3 site. Many of these species are dependent on the land/water interface for various life stages, foraging, reproduction, and hibernation. These special needs require minimal disturbance of the wetland areas and also emphasize the need for mitigation for any proposed wetland losses in the vicinity of the project. The environmental analysis must address specific impacts to these organisms as a result of proposed actions. (**0029-9** [Freiburger, Chris])

Response: *The NRC staff will address potential impacts to amphibians and reptiles as well as potential mitigation measures for these animals in Chapters 4 and 5 of the EIS.*

Comment: The western Lake Erie basin has historically been an important area for duck hunting. Duck hunting parties have continued using marshes and shorelines of this area. Because the area falls within important bird migration corridors it is critical to minimize any habitat loss or impart any activity that would unnecessarily disturb wildlife.

For current project operation, buoyed areas limit fishing and boating access in the vicinity of the plant. The Department acknowledges the importance of protecting the facilities and believes that current standards seem appropriate. Please address any proposed changes in current practices. (**0029-11** [Freiburger, Chris])

Comment: One of Wildlife Habitat Council's core activities is our certification of those corporate locations that maintain wildlife management programs. About 500 corporate habitat programs in 17 countries are now certified by Wildlife Habitat Council, including the one at DTE Energy's Fermi 2 Power Plant. That is how I am acquainted with the history of land stewardship at Fermi 2.

Certification of a program by Wildlife Habitat Council requires substantial documentation of valid habitat enhancement activities, which DTE Energy's Fermi 2 plant has provided regularly since the year 2000. Plant employees help maintain about 650 acres of wildlife habitat. They have built nesting platforms for raptors and planted native plant meadows. The Fermi 2 wildlife team helps conserve 48 acres of vital coastal wetlands by battling invasive plants like purple loosestrife and phragmites; in so doing they preserve rare wetland plants as well as important stopover and over-wintering habitats for migrating waterfowl and raptors.

Fermi 2's location makes these actions all the more important. The plant is located along major migratory flyways for songbirds and raptors, which pass through by the millions each spring and fall. Migratory bird populations are threatened by habitat loss not only on each end of their journey, but also along the way as they seek necessary stop-over sites to rest and re-fuel.

At the same time, the Fermi 2 plant property includes coastal marsh wetlands, which have nearly disappeared from the southern Great Lakes. Wetlands are the most productive and diverse temperate zone ecosystems, and their loss means the loss of many species. So Fermi 2's stewardship has regionwide impact. (**0082-1** [Gruelle, Martha])

Response: *The NRC staff will address potential impacts to wetlands (including coastal marshes) and to shorelines with respect to their use as waterfowl and other migratory bird habitat in Chapters 4 and 5 of the EIS.*

Comment: A response to a threatened/endangered species review of the Fermi 3 proposed project in Wayne County, Michigan was sent from this office to the Black & Veatch Corporation November 28, 2007. In that response four endangered or threatened animal species were listed as being present in the area as were three species of threatened plants. Upon review of this report I noticed some discrepancies and causes for concern in regard to threatened species protection.

One animal species that is of primary concern in the area is the Eastern fox snake (*Pantherophis gloydi*). On page 2-333 of the Environmental Report it states that "nine occurrences were reported in Monroe County... the snake was sighted two times on the Fermi property in June 2008." There is a discrepancy to this statement on page 4-45 where it states "The eastern fox snake (a Michigan threatened species) has not been observed on the Fermi property, but the potential for its occurrence on the property does exist."

According to our records there is a viable population of Eastern fox snake at the site of the proposed project. We believe that going forward with the construction would not only kill snakes but destroy the habitat in which they live and possibly exterminate the species from the area. We would like to see a plan for protection of this rare species with regard to this new reactor project. (**0037-1** [Sargent, Lori])

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According to our records there is a viable population of Eastern fox snake at the site of the proposed project. We believe that going forward with the construction would not only kill snakes but destroy the habitat in which they live and possibly exterminate the species from the area. We would like to see a plan for protection of this rare species with regard to this new reactor project. (**0086-1** [Sargent, Lori])

Response: *The presence of the eastern fox snake on the site will be acknowledged in Chapter 2 of the EIS. The NRC staff will address potential impacts to the eastern fox snake and its habitat and describe potential mitigation in Chapters 4 and 5 of the EIS.*

Comment: EPA encourages selection of alternatives with the least impact to wetlands. Therefore, we recommend a complete evaluation of the wetlands impacted by each feasible alternative site. We also encourage facility footprints within the plant site that will avoid or minimize wetlands impacts. If there are wetlands impacts, we recommend characterization and mitigation information be included in the EIS and not deferred to the permit stage. (**0040-2** [Miller, Anna])

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Response: *In Chapter 9 of the EIS, the NRC staff will describe the potential environmental impacts (including potential impacts to wetlands) of siting the project at alternative sites. Chapter 4 of the EIS will describe how ground-disturbing activities at the proposed site were planned to minimize wetland impacts, characterize unavoidable wetland impacts, and discuss possible wetland mitigation measures.*

Comment: We are committed, Detroit Edison, DTE Energy is committed to environmental stewardship. We've done that at Fermi site specifically in the form of the Wildlife Habitat Council certification, Clean Corporate Citizen designations, and the Michigan Department of Environmental Quality. We've set aside more than 600 acres of that site for inclusion in the Detroit River International Wildlife Refuge. We feel that the environment is not only crucial to this particular site, but it's a motto that we have throughout our company in terms of respect that's a core value, and to respect our community and our environment is really important to us. (**0058-10** [May, Ron])

Comment: It should also be noted during the development of the EIS that DTE and the US Fish and Wildlife Service have entered into a cooperative management agreement for 656 acres at the Fermi Power plant for the Detroit River International Wildlife Refuge. Refuge staff work closely with DTE on wildlife management activities. The Refuge has also acquired 65 acres (i.e., Fix Unit) at the mouth of Swan Creek immediately adjacent to the Fermi site. Refuge staff will continue to be actively involved in wildlife management throughout the planning process. (**0087-1** [Czarnecki, Craig A.])

Response: *The NRC staff will review and evaluate habitat loss and associated impacts, including areas currently within the Detroit River International Wildlife Refuge, in Chapters 2, 4, and 5 of the EIS.*

Comment: The wetlands on the property have been identified by DEC consultants and reviewed by MDEQ staff under MDEQ Wetland Identification Program (WIP) File 08-58-0003-WA. The WIP report dated November 7, 2008, identified the location and regulatory status of each wetland area under the authority of Part 303 of the NREPA. Based on the WIP report, a significant portion of the DEC property contains regulated wetlands, with most of the wetlands on the site being Great Lakes coastal wetlands. With historic losses of greater than 95 percent of the coastal wetlands of western Lake Erie, the wetlands on site represent a very important and rare natural resource for the State of Michigan. The Environmental Report describes the wetland impacts as moderate. In fact, it appears that the project as proposed would be one of the largest impacts to coastal wetlands in the history of Michigan's wetland statute.

Under Part 303, permits are required for any wetland dredging, filling, draining, and/or maintaining a use or development in a wetland. The location, type, function, and value of the wetlands on site should be considered during design and any impacts avoided and minimized to the greatest extent possible. Any proposed impact areas should be identified (including impacts from temporary and permanent parking, construction activities, and transmission lines) and reviewed through an environmental assessment of the site that evaluates plant and animal species and habitat diversity, water quality functions, fish and wildlife habitat, the location of rare or imperiled communities, threatened and endangered species, and any other important features of the wetland areas. All feasible and prudent alternatives to temporary and permanent impacts should be considered (including alternative configurations, acquiring adjacent properties, etc.). If the project will be phased, an overall site plan will be needed and reviewed as part of the alternatives analysis for the first permit application. Wetland impacts will require wetland mitigation and a combination of wetland restoration and preservation of on-site or off-site rare wetland communities (e.g., Lake Erie coastal wetlands, lake plain prairies, etc.) should be considered. (**0079-3** [Browne, Elizabeth M.])

Response: *The NRC staff will address potential impacts to wetlands in Chapters 4 and 5 of the EIS. The EIS will also include a cumulative analysis of wetland losses on the western shore of Lake Erie resulting from the Fermi 3 project combined with past and reasonably foreseeable future activities.*

Comment: Part 325, of the NREPA, regulates construction activities such as fills, docks, seawalls, dredging, outfall/intake pipes etc. and occupations of Great Lakes public trust bottomlands and waters. Part 325 requires the DEQ to protect the natural resources, public trust, and riparian rights of property owners when issuing a permit for construction activities in the Great Lakes.

An application for a permit will be required pursuant to Part 325 for any construction activity in Lake Erie below the natural ordinary high water mark at the site, including the wetlands connected to Lake Erie north and south of the power plant complex. (**0079-5** [Browne, Elizabeth M.])

Comment: Stream crossings and wetlands will be affected by the construction of Fermi 3 and the associated transmission lines. The Michigan Department of Environmental Quality (MDEQ) should be contacted to determine if permits are required for this activity in wetlands and stream crossings. Pursuant to the Natural Resources and Environmental Protection Act, the State of Michigan regulates certain activities in wetlands and inland lakes and streams. Development that would impact wetlands may require a permit for which this office may have review authority under the FWCA. In the review of these permit applications, we may concur with or without conditions or object to permit issuance depending on whether the proposed work may impact the Service's trust fish and wildlife resources. We recommend you contact the MDEQ, Land

and Water Management Division, Southeast Michigan District Office in Warren at 586/753-3700 for information concerning the need for permits under State law.

Wetland impacts should be avoided or minimized to the maximum extent possible. Any wetlands unavoidably destroyed during power plant and transmission line construction should be compensated by enhancing existing low quality wetlands or creating wetlands equivalent to those destroyed adjacent and/or contiguous with those wetlands impacted. This approach is consistent with the Service's mitigation policy. (**0087-3** [Czarnecki, Craig A.])

Response: *The NRC staff will address impacts to wetlands, waterways, and other natural resources, including possible mitigation measures, in Chapters 4 and 5 of the EIS. The EIS will note each Federal and State environmental permit required for the project, but Detroit Edison will apply for the permits independently of the EIS.*

Comment: Paragraph 2.4 Ecology (Page 2-321) and Table 2.4-2 (Page 2-888). 216 Plant Species are listed as found on the property. This is an impressive list, but does not include plants that should be present but are not. Industrial activity has disturbed this wetland ecosystem (the estuary of Swan Creek). Some plant species such as wild rice (*Zizania*) and Native Reed Grass or Cane (*Phragmites Communis*) have been extirpated (re: Michigan Waterfowl Management, Miles Pirnie, 1935). (**0082-28** [Micka, Richard])

Response: *The comment presents information about the site prior to development that will be included in the affected environment discussion in Chapter 2 of the EIS. The cumulative loss of rare plants and their habitat along the western shore of Lake Erie will be considered in Chapter 7 of the EIS.*

Comment: There are no specific locations for the proposed action. Therefore, the following list provides federally listed or candidate species information at the county level.

St. Clair: Indiana bat, rayed bean, Eastern prairie fringed orchid

Washtenaw: Indiana bat, Eastern massasauga, Mitchell's satyr butterfly, Eastern fringed prairie orchid

Wayne: Indiana bat, Eastern massasauga, Northern riffleshell, rayed bean, Eastern prairie fringed orchid

Lenawee: Indiana bat, Eastern massasauga, rayed bean

Monroe: Indiana bat, Kamer blue butterfly, Northern riffleshell, rayed bean, Eastern prairie fringed orchid.

For future endangered and threatened species list requests and consultations with the Service, refer to our endangered species and technical assistance website at http://www.fws.gov/midwest!endangered/section7/s7process/index.htm.

Further, please contact the Michigan Department of Natural Resources Endangered Species Assessment website, www.mcgi.state.mi.us/esa and contact Lori Sargent at sargentl2@michigan.gov or 517/373-1263 for information regarding the protection of threatened and endangered species under state law. State law requires a permit in advance if any work that could potentially damage, destroy or displace State listed species. (**0087-2** [Czarnecki, Craig A.])

Response: *The NRC staff will address potential impacts to Federal and State rare, threatened, and endangered species and habitats in Chapters 4 and 5 of the EIS. NRC will also comply with Section 7 of the Endangered Species Act by preparing a biological assessment of potential impacts to Federally listed species and completing any necessary formal consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service. Any permits needed to comply with laws that protect State-listed threatened and endangered species would be listed in the EIS, but, as noted above, Detroit Edison will apply for the permits independently of the EIS.*

Comment: We recommend that the proposed transmission line corridors follow established right-of-ways to the maximum extent possible and to avoid large, contiguous tracts of forests. Utilizing existing footprints will diminish forest fragmentation and unnecessary habitat destruction. Studies indicate forest fragmentation has resulted in declining populations of several species of neotropical passerines. If NRC presently knows or when they know the total acreage of impacts to forested and wetland habitats, we request this information be sent to us. (**0087-4** [Czarnecki, Craig A.])

Response: *In Chapter 4 of the EIS, the NRC staff will address impacts to forest habitats, including forest fragmentation impacts and impacts to neotropical passerines and other forest-interior species, resulting from transmission line construction.*

Comment: The following references in the Environmental Report Highlight Lotus Ecology: Appendix 2A, Flora, page 2-877. Appendix 2-B, Life Histories of Threatened and Endangered Species, pages 2-888. Table 2.4-2, page 2-373, page 2-321, paragraph 2.4. Ecology, page 2.333, paragraph 2.4.1.2.2.2 really, American Lotus. Page 2-395, Table 2.4-6, Wildlife Habitat Council for July 2000, page 2-432, figure 2.4-17, important species transmission corridor.

These references to Michigan symbol for clean water of the American Lotus, are clearly indicative that the applicant has conducted due diligence in the COLA process. We appreciate that.

The Lotus Garden Club conducts tours of the Lotus beds in mid summer. Through the generosity of local utilities, the public is able to see their floral heritage on our waterfront. These tours take place after coordination with the utilities and in keeping with the requirements of Homeland Security.

Fermi unit 3 is situated in Laguna Beach, which is noted for extensive beds of American Lotus, *Nelumbo lutea*. This circumstance provides a much needed sanctuary for this threatened species. The Nuclear Regulatory Commission needs to know that the utilities have expended themselves well beyond the call of duty to host Lotus tours in those areas that are not off limits. This allows citizens of Monroe and areas to enjoy their rich heritage without compromising the integrity of any sensitive areas. But more importantly it has brought all of the utilities together in a cooperative spirit to promote biodiversity on their private holdings. The community benefits from this cooperation.

At one point in time the American Lotus was nearly extinct on the western shores of Lake Erie. Thanks to the likes of DTE Energy and other industrial concerns, the Lotus have come back. This provides an excellent model for restoration of other species that have been displaced by development over the recent years. We encourage you to make a list of those missing plants to see if they can be restored.

And I'd like to add to that. This brochure that was out front says it all. Every time you look at a brochure from Detroit Edison, or Fermi, or the International Wildlife Refuge, or the City or County of Monroe, you see the American Lotus. And the utilities were very influential with the Chamber of Commerce and the community as a whole to appear before the State of Michigan, and it took a three year process, to have the American Lotus listed as American's symbol for clean water. And we thank you for your assistance and success in this.

And the Lotus is rather like the canary in the marsh. Lotus clean the wetlands and they are a symbol of rebirth and life. They show that the water and the air is reasonably clean, and it gives habitat to flora and fauna of all types. The sturgeon are coming back, there's a lot of good signs. Look how well our eagles are doing. And each year when we have our Lotus tour, we give away a bag, or some similar gift like this, to all of our esteemed visitors. (**0058-123** [Micka, Jeanne])

Comment: These references to Michigan's Symbol for Clean Water (American Lotus) are clearly indicative that the Applicant has conducted due diligence in the COLA Process. We appreciate that.

The Lotus Garden Club conducts tours of the Lotus Beds in mid-summer. Through the generosity of local Utilities, the Public are able to see their Floral Heritage on the waterfront.

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At one point in time, the American Lotus were nearly extinct on the West Shore of Lake Erie. Thanks to the likes of DTE Energy and other industrial concerns, the Lotus have come back. This provides an excellent model for restoration of other species that have been displaced by development over the years. We encourage you to make a list of those missing plants to see if they can be restored. (**0082-26** [Micka, Jeanne])

Response: *The NRC staff will address impacts to American lotus and other rare, threatened, and endangered species in Chapters 4 and 5 of the EIS. The EIS will also consider the cumulative loss of rare plants and their habitat along the western shore of Lake Erie.*

D.1.9 Comments Concerning Ecology – Aquatic

Comment: Billions of fish and larvae are sucked into the station's cooling condensers and killed upon discharge with the heated water, hotter than the intake temperature. These discharges include major reductions of fish species and habitat. (**0019-5** [Schemanksi, Sally])

Comment: My concern is thermal pollution of our Great Lakes, specifically, Lake Erie.

Already several energy plants on shores of Lake Erie are polluting the waters in the western basin (which is about 24 feet deep). Trenton Channel coal plant, Monroe coal fire Plant (part of the Detroit Edison complex); Whiting coal plant at Luna Pier; Davis Besse nuclear plant at Oak Harbor and Bay Shore coal plant at Maumee Bay all send hot water into the Lake to the detriment and even destruction of fish and algae blooms and are creating a dead zone in the Lake.

My request is for cooling towers to mitigate the thermal load. The plans for Fermi 3 include only one cooling tower. More are needed. New environmental study is needed to assess real needs. NRC inspection needs to be increased in this regard. (**0024-1** [Hungerman, Marie Gabriel])

Comment: Of primary concern are issues related to fish entrainment and impingement, water quality, and wetlands. The application includes lengthy discussions of species of concern which do require special attention, but the EIS must include monitoring for all species within the area of impact. Many wildlife species that utilize the refuge and fish species in the vicinity of the project are important game and non-game animals and fish. This includes species that perform a vital role in the ecosystem as forage. (**0029-1** [Freiburger, Chris])

Comment: The environmental report utilized phytoplankton and icthyoplankton results from studies conducted for the FERMI 2 project. While the vicinity is most likely acceptable for use, the most recent of this data is from the early 1990s. This data is probably not current enough to evaluate the potential effect of the FERMI 3 project when it goes on line. The report describes the significant improvements in water quality in Lake Erie, and it continues to improve. This may have changed the composition and abundance of these organisms. Therefore:

Are the seasonal phytoplankton populations by number and species known sufficiently well to detect possible changes in the receiving waterbody?

Are the seasonal phytoplankton populations by number and species known sufficiently well to detect possible changes in the discharge area and adjacent waters?

Relative to phytoplankton of the discharge area adjacent waters and the receiving waterbody, is it known or predicted what proportions of the populations are exposed to stresses caused by plant operation?

Are the effects of such exposures on phytoplankton populations (e.g., impairment or stimulation of productivity, time-temperature tolerances, population shifts both local and waterbody-wide, etc.) known or predicted?

Are the seasonal populations of benthic and attached algae in the discharge area and adjacent waters known sufficiently well to detect possible changes?

Are the effects of the plan operation on populations of benthic and attached algae considered, known or predicted? (**0029-3** [Freiburger, Chris])

Comment: The COL has a fairly comprehensive review of the aquatic invertebrate populations in the vicinity of the proposed project. However, given the current changes in water quality and the effects of invasive macro invertebrates such as dreissenid mussels (zebra and quagga), this composition can change significantly between the current review and the start up of the proposed project. Therefore:

Are the macro invertebrate populations in the discharge area and adjacent waters know sufficiently well to detect possible changes?

Are effects of plant operation on the macroinvertebrate populations considered, known or predicted?

Are the aquatic macrophyte populations in the discharge area and adjacent waters known sufficiently well to detect possible changes?
Are effects of plant operations on aquatic macrophyte populations considered, known or predicted? (**0029-4** [Freiburger, Chris])

Comment: The report includes data from joint MDNR and U.S. Fish and Wildlife Service (USFWS) fish surveys from 2004. This information is the most current public information on these fish populations. The COL reviewed substantial improvements to fish populations in the Lake Erie basin and the significance of those populations to the economy of the vicinity. Both commercial and recreational fisheries in the western basin of Lake Erie are sources of revenue for the local economies. This data will be 15-years old however by the time the proposed project goes on line. Therefore:

Is the seasonal abundance of fish eggs and larvae by species known sufficiently well to detect possible changes in the discharge area and adjacent waters?

Is it known or predicted what portion of the populations of fish eggs and larvae are exposed to stresses caused by plant operation?

Are the effects of such exposures on fish eggs and larvae considered known or predicted?

Is it known or predicted what impact such effects will have on fish populations in the discharge area, adjacent waters and the receiving waterbody?

Are the seasonal abundance and habits of adult fish by species known sufficiently well to detect possible changes in the discharge area and adjacent waters?

Is it considered, known or predicted what effect operation of the facility will have on these fish and their activities? (**0029-5** [Freiburger, Chris])

Comment: Use of Lake Erie, our warmest Great Lake, to assist with cooling water from the proposed new plant will have a detrimental effect on the wildlife of Lake Erie, a source of fresh water that is still recovering from significant pollution from the mid-20th century. (**0039-6** [Mitchell, Rita])

Comment: The environmental impact on Lake Erie with thermal and radiation to the Lake water, fish, and wildlife in the region is extremely objectionable. (**0041-4** [Englund, Lance])

Comment: Detroit Edison's Environmental Report holds that there are currently no problems with phosphorus contamination or algae in Lake Erie, which is false. NRC should address these issues, and the cumulative impacts that can be expected from adding yet another reactor at the Fermi power plant site. (**0050-17** [Kamps, Kevin])

Comment: Fermi 3 would harm Lake Erie's remarkably productive fisheries. Fermi 3's water usage would worsen the impingement and entrainment of Lake Erie biota already occurring at the numerous large-scale thermo-electric power plants sited on its shores. Negative impacts, including fish kills, must be prevented, to protect sports fisheries as well as Native American fishing rights recognized by legally-binding treaties signed by the U.S. federal government. Harm to all life stages of Lake Erie biota must be analyzed by NRC, and mitigated by DTE at Fermi 3. (**0050-21** [Kamps, Kevin])

Comment: If you've got too hot of water going out, you also have to shut your reactors because it ruins habitat for fish, for other macro-invertebrates. And this happened recently in Europe and also in the United States, when they had heat waves, that they had to shut down reactors because either the water coming in was too hot or going out was too hot.

Up at the Bruce, there normally is ice that covers Lake Huron up by there. But since the Bruce has been online, ice doesn't form around the Bruce. That ice further -- it serves to reflect the sun's radiation. If you've got too hot of water everywhere, you're not going to have that ice reflecting the sun's rays. (**0058-27** [Cumbow, Kay])

Comment: When Davis Besse was built, the permit was granted in 1989 -- or 1979, excuse me -- the Ohio Sea Grant people made the following statement: No new plants, and they were referring to power plants, should be constructed anywhere in the western basin of Lake Erie. If these suggestions are followed, new plants can be constructed on Lake Erie, and they meant the central and the eastern basin, without harming the valuable and growing fishery.

This statement was made by Drs. Reutter and Herrndoff from Ohio State University's Sea Grant program. Since the statement clearly says that no new power plant should be constructed here in the western basin, and the only place that they should be constructed, if in Lake Erie, is the central and eastern basin.

Fermi 3 is planned to be located in the shallowest, fishiest, most vulnerable waters of the Great Lakes, and they would combine with five other power plants that currently draw over 3 billion gallons of water in this area a day. These are the shallowest 24-foot of water in the Great Lakes. (**0058-45** [Bihn, Sandy])

Comment: And I wish that the Environmental Impact Statement would include the following considerations, which when I reviewed it [Environmental Report], it did not.

Also, there would be additional heated discharge waters from this plant, 49 million gallons of water in addition to the 3 billion. I think there should be an assessment of all the five plants and the cumulative impacts they're currently having. And then the additional impact on all these factors with the new plant. (**0058-48** [Bihn, Sandy])

Comment: the impingement and entrainment estimates need to be updated. (**0058-54** [Bihn, Sandy])

Comment: Nuclear reactors cause thermal pollution and kill fish. (**0059-16** [Barnes, Kathryn])

Comment: The application uses phosphorous data from 1997 -2003 and says phosphorous (algal blooms) is not a problem. Not true. Research clearly shows that since 1995 dissolved phosphorous and algal blooms including microcystis, in the Maumee River and Western Lake Erie are increasing. Ohio EPA has a Phosphorous Task Force trying to find ways to reduce the increasing green waters. The Lake Erie Protection Fund and the USEPA Great Lake's office are currently seeking grant proposals to find ways to reduce phosphorous and algal blooms in Western Lake Erie. The environmental assessment needs to include impacts on phosphorous and nutrient growth and algal blooms from the thermal use of up to 49 million gallons a day. (**0082-20** [Bihn, Sandy])

Comment: The fish impingement/entrainment discussion needs to be updated from Fermi 2 estimates. The assessment needs to look at the cumulative impact of adding one more fish killing source.. and the decreasing yellow perch populations and the increased controls on commercial fishermen in Ohio. The environmental assessment should include these factors. (**0082-23** [Bihn, Sandy])

Comment: Nuclear reactors cause thermal pollution, and kill fish. (**0083-31** [Barnes, Kathryn])

Response: *The EIS analysis will use the most recently available information to characterize the existing ecological conditions in the vicinity of the Fermi site and to analyze potential impacts from the project on aquatic ecosystems. The NRC staff will evaluate the impacts related to construction and operation, including impingement, entrainment, chronic and acute thermal impacts, and water quality (including phosphorus levels). The NRC staff will also address cumulative impacts to the aquatic environment in the vicinity of the Fermi site. The NRC staff recognizes the dynamic nature of Lake Erie and the Great Lakes, and will consider the possibility of continued change in the ecosystem in its assessment. Existing conditions will be described in Chapter 2 of the EIS. The impacts of construction and operation on aquatic ecosystems and water quality will be discussed in Chapters 4 and 5 of the EIS. The cumulative impacts of construction and operation will be presented in Chapter 7 of the EIS.*

Comment: Western Lake Erie and its shallow waters provide among the best habitat for walleye fishing in the world. The thermal load of a new reactor sited at Fermi (as well as existing facilities at Fermi and Davis-Besse east of Toledo, Ohio) would have a detrimental effect on this habitat. This can be mitigated by the construction of new cooling tower at the Fermi facility. However, the current plans for Fermi do not envision this construction, and would perhaps make the construction of this new facility cost-prohibitive. (**0038-2** [D'Amour, James Carl])

Response: *The proposed design for the Fermi 3 nuclear plant identifies the construction of a new cooling tower on the Fermi site. The NRC staff will assess potential impacts to aquatic biota in Lake Erie, including the walleye and other fish species, from thermal discharge of the proposed Fermi 3 nuclear plant in Chapter 5 of the EIS. The cumulative impacts of construction and operation will be presented in Chapter 7 of the EIS.*

Comment: And I wish that the Environmental Impact Statement would include the following considerations, which when I reviewed it [Environmental Report], it did not.

Also, the Maumee Bay estuary was not delineated in the Environmental Impact Statement. The impact statement used Fermi 2 data, which are very outdated, for accumulative fish impingement and entrainment impacts from the plant. (**0058-47** [Bihn, Sandy])

Comment: When the permit for Davis Bess was granted, the Ohio Sea Grant people made the following statement: No new plants (power) should be constructed anywhere in the Western Basin of the Lake (Erie). If these suggestions are followed, new plants can be constructed on Lake Erie Without harming the valuable and growing fishery. J.M. Reutter and C.E. Herdendorf, Environmental Impact Appraisal of the Davis Besse Nuclear Power Plant 1979

Since the statement clearly says that no new power plants should be constructed in Western Lake Erie, then the only place that new power plants should be considered would be in the Central and Eastern Basins of Lake Erie. The Fermi 3 nuclear power plant is planned to be located in the shallowest, fishiest waters of Lake Erie and the Great Lakes. Lake Erie has more consumable fish than all the other Great Lakes combined and a majority of Lake Erie's fish are in the Western Basin of Lake Erie(which includes Maumee Bay and the Maumee River). The average depth of Lake Erie in the area of the plant is but 24' and the average depth of the Maumee Bay estuary is only 5'. The proposed Fermi 3 nuclear power plant would draw up to 49 million gallons of water a day from Lake Erie and Maumee Bay and kill millions more fish. Fermi 3 would be the 6th power plant killing more fish and heating more water causing Western Lake Erie Waterkeeper Western Lake Erie Association westernlakeerie.org added ecological impacts on already stressed green waters. When I was driving down traveling on Bayshore Rd. last night, I could visibly see the Consumer's Whiting Plant, the DTE Monroe Plant, Fermi 2, First Energy Bayshore and the smoke from Davis Besse. Obviously, the plants are within a 20 mile radius and the use of the water, fish kills and thermal plumes from the power plants impact the shallow waters of Lake Erie and Maumee Bay. (**0082-10** [Bihn, Sandy])

Comment: The application says there are no estuaries near the plant. This is not true. The shallow fishy average 5' depth Maumee Bay estuary exists west of the plant and needs to be assessed as part of the environmental impact study. (**0082-12** [Bihn, Sandy])

Response: *The EIS analysis will use the most recently available information about aquatic biota and water quality to characterize the existing conditions in the vicinity of the Fermi site and to analyze potential impacts from the project on the aquatic ecosystem. The staff will also review historical data, including past recommendations related to power development in the western basin of Lake Erie, in its review. Existing conditions will be described in Chapter 2 of the EIS. The impacts of construction and operation (including impacts associated with impingement, entrainment, and thermal discharge) will be discussed in Chapters 4 and 5, respectively. The cumulative impacts of construction and operation will be presented in Chapter 7 of the EIS. Information about the conditions in Maumee Bay and potential impacts to Maumee Bay from the proposed project will be evaluated, as appropriate, in the EIS.*

Comment: One statement in the Environmental Impact Statement [sic - Environmental Report] that really stood out to me was that there is no phosphorus problem in Western Lake Erie, and we have no algae problem. Let me tell you folks, go out there in the summer. Last year researchers tell me that the microcystis in the algae was the worst that they've ever seen. We're going back to the `70s in terms of warm water, decreasing water caused by decreasing water level and increased nutrients in the water, the impact of lower water levels and increased nutrients. And what would happen from this plant doing more warming of the water to those factors needs to be considered.

There is a new algae out there called *Lyngbya wollei* that seems to be harbored here in the Monroe area. And we need to look at what the impact of that is and why it came, and then how this new plant might contribute more to those type of algae. (**0058-52** [Bihn, Sandy])

Comment: A new form of algae - *Lyngbya wollei* - is in Maumee Bay and Western Lake Erie. This benthic algae is spreading in Maumee Bay and Western Lake Erie. It appears that the *Lyngbya* thrives in what is known at Warm Water Bay at DTE's Monroe coal fired 1.9 billion gallons per day warm water discharge. The warm water combined with the sewage from the River Raisin appear to provide the ideal environment for *Lyngbya* to thrive. What will the impact of Fermi 3 be on the spread of *Lyngbya*? Should DTE be required to do mitigation at the Monroe coal fired plant because of the *Lyngbya* problem? (**0082-21** [Bihn, Sandy])

Response: *The NRC staff will consider potential effects of the proposed facility on water quality in Lake Erie and the potential influences of construction and operation of the proposed facility on the spread of Lyngbya wollei. These topics will be discussed in Chapters 4 and 5 of the EIS.*

Comment: The environmental assessment must address the effects on the Lake and ecosystem of the water cooling needs of the reactor. The current report does not address the projected scientific reality of dramatically lower water levels in Lake Erie. (**0059-49** [Wolfe, Joan])

Comment: The environmental assessment must address the effects on the lake and ecosystem of the water cooling needs of the reactor. The current report does not address the projected scientific reality of dramatically lower water levels in Lake Erie. (**0083-3** [Wolfe, Joan])

Response: *The NRC staff will consider water use (including consumptive water use) relative to the inflow and volume of water for Lake Erie and the western basin. The effects of water levels in Lake Erie will also be considered in the analysis. Existing conditions will be described in Chapter 2 of the EIS. The impacts of construction and operation will be discussed in Chapters 4 and 5, respectively. The cumulative impacts of construction and operation will be presented in Chapter 7 of the EIS.*

Comment: Endangered Species Act: No species listed by NMFS as threatened or endangered, or species proposed for listing occur in Lake Erie. Additionally, there is no critical habitat designated by NMFS in the area and no proposed critical habitat in the area. There are also no candidate species under NMFS jurisdiction that occur in the project area. As such, no further coordination with NMFS on the effects of the action on listed species or their critical habitat is necessary and NMFS does not anticipate the need for consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended, for the subject Federal action. (**0085-1** [Colligan, Mary A.])

Comment: As noted above, as no species listed as threatened or endangered by NMFS occur in the action area, no consultation pursuant to Section 7 of the ESA is necessary for the NRC's proposed action. Based on the information provided herein, NMFS does not anticipate participating in the public meeting or site audit. Additionally, we do not anticipate providing further scoping comments or comments on any draft or final EIS related to this action. NMFS appreciates the opportunity to provide the NRC with information on our trust resources and we look forward to continuing to work cooperatively with you on minimizing impacts of NRC actions to NMFS trust resources. (**0085-3** [Colligan, Mary A.])

Response: *The NRC staff will evaluate the potential impacts on threatened and endangered species from construction and operation of the proposed Fermi 3 nuclear plant in Chapters 4 and 5 of the EIS. As stated in the comment, no species listed as threatened or endangered by the National Marine Fisheries Service (NMFS) occur in the action area, and no consultation with the NMFS pursuant to Section 7 of the Endangered Species Act (ESA) will be necessary for the proposed action.*

Comment: Essential Fish Habitat and Fish and Wildlife Coordination Act: The Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife

Coordination Act require Federal agencies to consult with one another on activities that may adversely impact fisheries resources and their habitats. Since Essential Fish Habitat has not been designated, pursuant to the MSA, for species in Lake Erie or other Great Lakes there is no requirement to consult under that authority. Although anadromous fish resources and their habitats may be impacted by the activity, NMFS does not have sufficient staff resources to engage in the review or consultation on this activity pursuant to the Fish and Wildlife Coordination Act. (**0085-2** [Colligan, Mary A.])

Response: *As stated in the comment, Essential Fish Habitat has not been designated, pursuant to the Magnuson-Stevens Fishery Conservation and Management Act, for species in Lake Erie or other Great Lakes. Therefore, no consultation on Essential Fish Habitat will be conducted for the Fermi 3 project.*

Comment: Toxic discharges from Fermi 3 would threaten Lake Erie's fragile ecosystem. Biocides, such as chemicals used to control zebra mussels, would be used in significant quantities and then released into Lake Erie. Cleaning solvents, heavy metals, and even fossil fuels integral to Fermi 3's operations would also be released into Lake Erie. Over a decade ago, the U.S.-Canadian International Joint Commission called for the virtual elimination of toxic chemicals into the Great Lakes, a goal Fermi 3 would not meet. Lake Erie, already suffering from phosphorus contamination and risking a return of algal blooms and consequent dead zones, is too fragile for yet another large-scale source of significant toxic contamination. (**0050-15** [Kamps, Kevin])

Comment: Also in the chemical area, the Zebra Mussel control and how's that accomplished. I presume there's chemicals involved in that. Zebra Mussels have shut down nuclear plants. I'm thinking of one article I read about in New York. (**0058-109** [McArdle, Ed])

Response: *Potential effects of chemical releases on aquatic resources, including biocides used to control organisms such as zebra mussels that can foul cooling water systems, will be evaluated in Chapter 5 of the EIS.*

D.1.10 Comments Concerning Socioeconomics

Comment: In addition to being a good corporate citizen, DTE Energy is a very substantial piece in the Michigan economic puzzle. As noted earlier in this text, I am the Chair of the SEMCA Workforce Board. SEMCA is officially designated by the State of Michigan to serve as the Michigan Works Agency for Monroe and Wayne Counties, excluding the city of Detroit, under the Federal Workforce Investment Act (WIA). As a Michigan Works Agency, our primary responsibility is to assist the residents of our region with obtaining employment. To help them achieve employment in high demand occupations and/or growing industries, we utilize State and Federal resources to provide them with the funding for relevant training. In the current changing economy, our workforce has experienced a substantial loss of jobs and we find that their current skills may not match those needed in the jobs that are currently available. Consequently, the unemployment rate in our region is at a 20 year high, with Monroe Co. at 9.6%. Wayne Co. incl. Detroit at 10.6% and Lucas Co. Ohio, incl. Toledo at 9.2%. It is in this context that I provide the following to you today. I am strongly urging the NRC to include in the scope of the Environmental Impact Statement for the Fermi 3 Nuclear Power Plant a full analysis of the economic benefits of constructing and operating such a plant in our region. (**0010-2** [Mahoney, Charlie])

Comment: The jobs created by Fermi 3 would be a significant boost to this region and state during the construction phase, the Nuclear Energy Institute estimates that 2,400 construction jobs would be created. And they say a plant of this size would require DTE to add 700 permanent employees. And we know how real these jobs are: DTE currently has about 2,000 employees in Monroe Co. alone. None of these figures speak to the tremendous # of spin-off jobs created by the businesses that would serve the plant and its employees. Before I close, let me reassure you that this region knows the importance of providing our workforce with the skills necessary to obtain employment in the energy industry. Many of our laid-off workers have work experience or skills that make them ideal candidates for retraining in energy industry occupations. As I am sure you will hear in the testimony of others, Monroe Community College and other institutions are involved in energy occupation training and continue to work with DTE and others to assure their programs are responsive to the specific current and future needs of the energy industry. To this end DTE Energy and Monroe Community College have joined to create a program for a Nuclear Engineering Technology Associates Degree which began this month. And we at SEMCA place a high priority on encouraging careers in the energy field and providing training funding for appropriate candidates. (**0010-4** [Mahoney, Charlie])

Comment: Now that there's a proposal for a Fermi 3 to be built, this will open many job opportunities for our community. (**0058-112** [Ellison, Jacob])

Comment: If the plant comes to fruition it will add jobs and further economic enhancement in all areas of distress in the County. (**0058-113** [Smolinski, Myron])

Comment: The construction of another unit at Fermi would benefit the whole community, with hundreds of good paying jobs. These jobs contribute millions of dollars to the local economy. And a badly needed revenue source for our local and state governments, so that they may continue to provide the services that we have come to expect. This will affect all business, from the grocery store, restaurant, the gas station, the car dealer, and the landlords with housing to rent. Building another unit at Fermi would be a win for everyone in the community. (**0058-146** [Sweat, Ron])

Comment: A new nuclear plant would benefit the economy with an influx of good paying jobs for skilled workers and well educated professionals. The five-year construction phase would alone create as many as 2,400 jobs. Then when the plant begins operation, 400 to

700 permanent high-tech jobs would be produced, many of which require professional degrees.

In addition, a new nuclear plant would create another 400 to 700 jobs and businesses that supply goods and services to support the plant. Many of these businesses would be the high-tech that we would need, and they're going to attract the bright, young professionals who are at the core of the most vibrant economics in the County today. (**0058-15** [Mentel, Floreine])

Comment: Finally, Detroit Edison's significant investment in a new nuclear plant would stabilize the local tax base, which has been battered by falling home prices and industrial losses. The average nuclear plant generates total state and local tax revenue of almost $20 million each year. (**0058-16** [Mentel, Floreine])

Comment: The other thing, certainly we all support here in this community, regardless of our views about the types of energy production we would like to see in this country, are the long term, sustainable jobs, and the continued community participation that the development of this additional facility would bring to this community. (**0058-2** [Brown, George])

Comment: The economic values of such a project will benefit the entire State of Michigan that is enduring the worst economic conditions in the nation. This project, as did the Fermi 2 project, will inject a much needed infusion into our economy that will provide construction and operating employment; off premise support business; and employment opportunities. A much needed new industrial tax base that will provide for public services -- all important ingredients to better quality of life in Michigan and Monroe County. (**0059-1** [Zorn, Dale])

Comment: In the current transitioning economy our workforce has experienced a substantial loss of jobs, and finding that their current skills may not match those needed. Consequently the unemployment rate in our region is at 20-year highs with Monroe County at 9.6 percent, Wayne County, including Detroit, at 10.6 percent, and Lucas County, Ohio, including Toledo, at 9.2 percent. It is in this context that I appear before you today. I'm strongly urging the NRC to include in the scope of the Environmental Impact Statement for Fermi 3 nuclear power plant, a full analysis of the economic benefits of constructing such a plant in our region. From an energy perspective the proposed new plant would help assure that the energy needs of our region will be met for decades to come, and economic growth clearly cannot be sustained unless an adequate, reasonably priced energy supply is available.

Equally important, the jobs created by Fermi 3 would be a significant boost to this region and state. During the construction phase the Nuclear Energy Institute estimates that 2400 construction jobs would be created. And they say a plant of this size would require DTE to add 700 permanent employees. And we know how real these jobs are. DTE is a highly respected employer who currently has about 2,000 employees in Monroe County alone. None of these figures speak to the tremendous number of spinoff jobs created by the businesses that would serve the plant and its employees.

Before I close, let me reassure you that this region knows the importance of providing our workforce with the skills necessary to obtain employment in the energy industry. Many of our laid off workers have work experience or skills that make them ideal candidates for retraining in energy industry occupations. As I am sure you will hear in testimony of others, Monroe Community College and other institutions, are already heavily committed to energy industry occupation training, and continue to work with DTE and others to assure their programs are responsive to the specific current and future needs of the energy industry. And we at SEMCA place a very high priority on encouraging careers in the energy field and providing training funding for appropriate candidates. In conclusion, as the NRC proceeds with the environmental impact analysis for this proposed plant, I implore you to include a comprehensive analysis of the potential economic benefits it will generate for Michigan and our region. This is clearly an essential component to assure balance in your final conclusions on the costs and benefits of the proposed plant. (**0059-23** [Pitoniak, Gregory])

Comment: Construction of another unit would provide hundreds of good paying jobs. These jobs contribute millions of dollars to the local economy, and provide a badly needed revenue source for our local and state governments, which in turn helps these government entities provide the services that we have come to rely on. Construction of another unit would affect all businesses in the community, from the grocery store to the restaurant to the gas station to the car dealers to the landlords that have vacancies to rent. (**0059-32** [Sweat, Ron])

Comment: A new nuclear power plant would benefit the economy with an influx of good paying jobs for skilled workers and well educated professionals. The five year construction phase would allow and create as many as 2400 jobs. Then when the plant begins operation, 400 to 700 permanent high tech jobs would be produced, many of which require professional degrees. And I know many people here have asked, my child can't find a job after they graduate from college. Here's the chance that they can stay in their hometown of Monroe, and find a job that pays well.

In addition, a new nuclear plant, with those 4 to 700 jobs and businesses that supply goods and services to support the plant. Many of these businesses would be the high tech ventures that are attractive to the bright, young professionals, who are at the core of the most vibrant economics in the County today.

Finally, Detroit Edison, with their investments in a new nuclear plant, would stabilize the local tax base, which has been battered by failing home prices and industrial losses. The average nuclear plant generates total state and local tax revenue of almost 20 million each year. (**0059-7** [Mentel, Floreine])

Comment: As the events of recent months have shown us all too clearly, the economy of southeast Michigan is suffering. Unemployment is nearing double digits, home foreclosures are at historic levels, property values declined by twenty (20) percent in 2008 and the Detroit auto companies, along with their suppliers, are struggling to survive.

The impacts are being deeply felt in the Monroe County area, which is reeling from announced job cuts at several of area industries and businesses, both large and small. Automotive Components Holdings is closing its Monroe operation, resulting in the elimination of 480 jobs. La-Z-Boy Incorporated has cut 60 jobs at its world headquarters. Holcim has announced the closing of its cement-making plant by mid-2009, eliminating 163 jobs, and most recently announced additional job reductions at the regional headquarters in the Village of Dundee. Another 140 people will be left jobless with the closing of International Paper operations in Monroe and Brownstown Township. Several smaller manufacturing companies have had to reduce their workforce due to cutbacks in the automobile industry and the local economic conditions.

Due to conditions such as these, many of our young people have to leave home to start out their careers in other areas of the country that are enjoying more robust economies. Our brightest and most earnest workers may well become Monroe County's largest export!

A new nuclear power plant would benefit our local economy with an influx of good paying jobs for skilled workers and well educated professionals. These new employment opportunities would assist us to keep our young people right here in Monroe County and strengthen our family units. The five (5) year construction phase would alone create as many as 2,400 jobs and when the plant is in operation 400-700 permanent high-tech jobs would be created, many of which require professional degrees.

In addition, a new nuclear plant would generate another 400-700 jobs in businesses that supply goods and services to support the plant. Many of these businesses would be the high-tech, entrepreneurial ventures that are attractive to the bright, young professionals who are at the core of the most vibrant economies in the country today.

Monroe County must change and adapt to these economic realities by developing new industry and business opportunities that grow out of innovation and new technology. Bringing to fruition the potential plans by Detroit Edison to pursue the construction of a new nuclear power plant on the site of Fermi 2 may well be a bridge to that future.

Finally, the possibility of Detroit Edison making a significant investment in a new nuclear plant would help stabilize the local tax base, which has been battered by falling home prices and losses of local industries and businesses. A new nuclear power plant would help our municipalities sustain, and in some cases restore, the level of services expected by their constituents. Providing these new employment opportunities may well serve to help preserve our family unity. (**0082-36** [Morris, William P.])

Comment: Should the licensing process lead to a decision of building another nuclear plant, our local and state economy will benefit by some $430 million annually through the increased sales of goods and services from the plant's operation as it filters through our local economy. It will also add an additional $40 million annually in total labor income that will be spent in our communities. The EDC recognizes that this is a rare and unique opportunity that other communities could only dream about. We therefore fully support DTE's license application and stand ready with anticipation to assist the process in any way possible. (**0082-42** [Oberleiter, Tracy])

Comment: In the current changing economy, our workforce has experienced a substantial loss of jobs and find that their current skills may not match those needed in the jobs that are currently available. Consequently, the unemployment rate in our region is at 20 year highs, with Monroe Co. at 9.6%. Wayne Co. incl. Detroit at 10.6% and Lucas Co. Ohio, incl. Toledo at 9.2%. It is in this context that I provide the following to you today. I am strongly urging the NRC to include in the scope of the Environmental Impact Statement for the Fermi 3 Nuclear Power Plant a full analysis of the economic benefits of constructing and operating such a plant in our region. (**0083-18** [Pitoniak, Gregory])

Comment: The jobs created by Fermi 3 would be a significant boost to this region and state during the construction phase, the Nuclear Energy Institute estimates that 2,400 construction jobs would be created. And they say a plant of this size would require DTE to add 700 permanent employees. And we know how real these jobs are: DTE currently has about 2,000 employees in Monroe Co. alone. None of these figures speak to the tremendous # of spin-off jobs created by the businesses that would serve the plant and its employees.

Before I close, let me reassure you that this region knows the importance of providing our workforce with the skills necessary to obtain employment in the energy industry. Many of our laid-off workers have work experience or skills that make them ideal candidates for retraining in energy industry occupations. As I am sure you will hear in the testimony of others, Monroe Community College and other institutions are already heavily into energy occupation training and continue to work with DTE and others to assure their programs are responsive to the specific current and future needs of the energy industry. And we at SEMCA place a high priority on encouraging careers in the energy field and providing training funding for appropriate candidates. (**0083-20** [Pitoniak, Gregory])

Response: *The EIS will evaluate the expected economic impacts of construction and operation activities including any local purchasing of construction and production inputs, local and in-migrating labor, local spending of earnings, and tax revenues generated by local purchasing activities or from real property assessments. This information will be presented in Chapters 4 and 5 of the EIS.*

Comment: It was recently reported that a new Wind Turbine manufacturing plant will be locating to the Monroe County area adding new jobs. Many new Solar panel plants are moving to Michigan for alternate energy production, which could also locate in the Monroe area. Also, the job requirements for running a nuclear power plant are for very highly skilled workers with special training from outside the area which would do nothing to the advantage of the unemployed and displaced auto workers. (**0041-6** [Englund, Lance])

Response: *The comment refers to other energy-related activities that are proposed for Michigan and Monroe County and that could contribute to cumulative socioeconomic impacts. Potential cumulative impacts will be discussed in Chapter 7 of the EIS. In addition, the EIS will evaluate the economic impacts of construction and operation of the proposed Fermi 3 plant, including local and in-migrating labor, in Chapters 4 and 5 of the EIS.*

Comment: And also the fact sheet from GE Hitachi. Notice that GE is headquartered in Schenectady, New York. The Hitachi is in Japan, and so how many local jobs does that mean? I don't know.

Also, keep in mind that there's only one manufacturer in the world that makes a reactor vessel, and that is Japan Steel. They can only make, according to Blumberg News, four per year, and they have a multi-year backlog, and a company has to plunk down $100 million to get in the line. So even if this is approved, it could be a long time coming, and in the meantime we could all be out of a job, so. (**0058-104** [McArdle, Ed])

Comment: In terms of jobs, where would those jobs actually be associated with Fermi 3? GE Hitachi, the originator of the ESBWR design, is a Japanese corporation. Fermi 3's reactor pressure vessel, and other large components, would likely be manufactured at Japan Steelworks, which is one of the only facilities on the planet that can make such large nuclear components. (**0059-75** [Kamps, Kevin])

Response: *The EIS will evaluate the expected economic impacts of construction and operation activities including local and in-migrating labor and any local purchasing of construction and production inputs. This information will be presented in Chapters 4 and 5 of the EIS. Some purchases of construction and production inputs will be outside the local area, and these inputs will be identified in Chapter 4.*

Comment: I love to hike and spend most of my free time in the outdoors, and I guess I'd ask the NRC to consider the needs of outdoor recreationalists in the environmental impact review. One of the aspects that I don't think has been mentioned tonight is the aesthetic issue with nuclear power plants. These things, however clean they may be, they look pretty jarring when you see them. If you grew up in Monroe you know what it's like to navigate by power plant stacks and cooling towers, and I'm just wondering if there's a way to make the nuke plant, Fermi 3, look better and more in line with the green aspects of the shoreline. (**0059-79** [Ingels, Mike])

Comment: One other aspect is social justice. Monroe County provides a lot of the power for Southeast Michigan. It's a working class town. We do a lot of things here. We work hard and we provide power to places like Ann Arbor and Bloomfield Hills and all these great places that don't have power plants. And I'd ask that something be given to Monroe to really soften the impact of that, because, you know, again, our shoreline I really think is our future, and I think every power plant we put there is a little bit of an obstacle to presenting our County as a green place and I think maybe some people don't live here and don't site their businesses here because they see the brown streak across the sky. (**0059-81** [Ingels, Mike])

Response: *The EIS will evaluate the physical impacts of the construction and operation of the proposed plant on the visual aesthetics of the area in Chapters 4 and 5 of the EIS. Measures to mitigate the physical impacts will also be discussed in those chapters.*

Comment: I live directly across Swan Creek from DTE Energy Fermi II Nuclear Power Plant and have a full view of one cooling tower staring me in the face every day. If DTE Energy builds another cooling tower where proposed, I will have two cooling towers staring me in the face. This additional cooling tower will have a negative impact on my residential property value. Also, if DTE Energy adds a third nuclear reactor, that means they have increased the size of the plant by 33%, adding a 33% increase for potential accident, further having a negative impact on residential property value. I feel DTE Energy should be required to conduct a near-plant property value impact study in an attempt to determine property value declines as a result of the plant expansion. (**0074-1** [Scobie, Randall])

Response: *The NRC staff will evaluate the effects of the construction and operation of the proposed Fermi 3 plant on local property values in Chapters 4 and 5 of the EIS, based on an analysis of existing studies.*

D.1.11 Comments Concerning Historic and Cultural Resources

Comment: On January 8, 2009, the Advisory Council on Historic Preservation (ACHP) received from the Nuclear Regulatory Commission (NRC) a notification pursuant to Section 800.8(c) of the ACHP 's regulations, Protection of Historic Properties (36 CFR 800), regarding the referenced project. We appreciate receiving your notification. which establishes that NRC will use the process and documentation required for the preparation of an EA/FONSI or an EIS/ROD to comply with Section 106 of the National Historic Preservation Act in lieu of the procedures set forth in 36 CFR 800.3 through 800.6.

In addition to notification to the ACHP, NRC must also notify the Michigan State Historic Preservation Officer and meet the standards in Section 800.8(c)(I)(i)through (v) for the following:

identifying consulting parties;

involving the public;

identifying historic properties and assessing the undertaking's effects on historic properties: and consulting regarding the effects of the undertaking on historic properties with the SHPO/THPO, Indian tribes and Native Hawaiian organizations that might attach religious and cultural significance to affected historic properties, other consulting parties, and the ACHP, where appropriate during NEPA scoping, environmental analysis, and the preparation of NEPA documents.

To meet the requirement to consult with the ACHP as appropriate, the NRC should notify the ACHP in the event NRC determines, in consultation with the SHPO/THPO and other consulting parties, that the proposed undertaking(s) may adversely affect properties listed, or eligible for listing, on the National Register of Historic Places (historic properties). In addition, Section 800.8(c)(2)(i) requires that you submit to the ACHP any DEIS or EIS you prepare. Inclusion of your adverse effect determination in both the DEIS/EIS and in your cover letter transmitting the DEIS/EIS to the ACHP will help ensure a timely response from the ACHP regarding its decision to participate in consultation. Please indicate in your cover letter the schedule for Section 106 consultation and a date by which you require a response by the ACHP.

The regulations do not specifically require that an agency submit an EA to the ACHP. However, keep in mind that, in the case of an objection from the ACHP or another consulting party, Sections 800.8(c)(2)(ii) and (c)(3) provide for ACHP review of an EA (in addition to a DEIS or EIS) to determine whether preparation of the EA, DEIS or EIS has met the standards set forth in Section800.8(c)(l)and/or to evaluate whether the substantive resolution of the effects on historic properties proposed in an EA, DEIS or EIS is adequate.

If NRC's determination of adverse effect will be documented in an EA, we request that you notify us of the adverse effect and provide adequate documentation for its review. The ACHP's decision to review an EA, DEIS or EIS will be based on the applicability of the criteria in Appendix A of the ACHP's regulations. Thank you for your notification pursuant to Section 800.8(c). (**0044-1** [Vaughn, Charlene Dwin])

Response: *Consultation in compliance with the Advisory Council on Historic Preservation's (ACHP's) regulations, Protection of Historic Properties (36 CFR Part 800), will be discussed in Chapter 2 of the EIS. Historic and cultural resources, including historic properties as defined in 36 CFR 800.16(1), will be discussed in Chapter 2 of the EIS. Impacts to and mitigation measures for historic and cultural resources, including historic properties as defined in 36 CFR 800.16(1), will be discussed in Chapters 4 and 5 of the EIS.*

Comment: Figure 2.1-2 illustrates a 7.5 mile Radius around the Fermi Unit 3 vicinity. This radius encompasses a number of Heritage Resource Sites in the Coastal Zone of Monroe County, MI.

CULTURAL. Monroe Harbor is classified as a Working Waterfront (US Army Corps of Engineers).

HISTORICAL. River Raisin Battlefield (National Park Service). (**0082-29** [Micka, Richard])

Comment: Within the 7.5 miles Radius of Fermi Unit 3, the US Fish & Wildlife Service has established an International Wildlife Refuge, the NPS operates the Motor Cities National Heritage Area (Map attached) and is exploring the establishment of a National Battlefield that would be connected to the North Country National Scenic Trail near Fort Meigs in Perrysburg, Ohio. The US Army Corps of Engineers, Detroit District, operates a Confined Disposal Facility on the St. Lawrence Seaway at Pie-Movillee. This is exciting news. The COLA (ER) should be updated to reflect these initiatives and the Applicant should join in the effort to create a Center for Regional Excellence built on the Energy Industry in the Lake Erie West Region! (**0082-32** [Micka, Richard])

Response: *Historic and cultural resources, including historic properties as defined in 36 CFR 800.16(1), will be discussed in Chapter 2 of the EIS. Impacts to and mitigation measures for historic and cultural resources, including historic properties as defined in 36 CFR 800.16(1), will be discussed in Chapters 4 and 5 of the EIS.*

D.1.12 Comments Concerning Health – Non-Radiological

Comment: In regards to health issues: ...cooling tower reservoirs and thermal discharges can act to harbor or accelerate some etiologic agents that ultimately affect human health once released into the environment. These etiological agents include, but are not limited to, the enteric pathogens Salmonella spp., Vibrio spp. and Shigella spp., and Plesiomonas shigelloides, as well as Pseudomonas spp., toxin-producing algae such as Karenia brevis, noroviruses, and thermophilic fungi. Etiological agents also include the bacteria Legionella spp., which causes Legionnaires' disease, and free-living amoebae of the genera Naegleria, Acanthamoeba, and Cryptosporidium. Exposure to these microorganisms, or in some cases the endotoxins or exotoxins produced by the organisms, can cause illness or death. Thermo-stable viruses are also considered etiological agents and are subject to review for this impact analysis.

These etiological agents could prove very costly to human health if there were an inversion and there was a mix of smog and fog. This needs to be examined. (**0051-5** [Cumbow, Kay])

Response: *The health impacts of etiological agents as related to Fermi 3 operations will be addressed in Chapter 5 of the EIS.*

D.1.13 Comments Concerning Health – Radiological

Comment: In this regard, you may wish to take note of a number of reports issued by the IJC that touch on these matters. For your convenience, these are identified below:

Reports in 1977, 1983 and 1987 reviewed radioactivity in the Great Lakes Basin.

In 1994, the Seventh Biennial Report on Great Lakes Water Quality recommended that radionuclides which meet the definition of persistent toxic substance be included in the governments' strategy for virtual elimination.

In 1996, the Eighth Biennial Report on Great Lakes Water Quality devoted a section to radioactive substances and recommended that the use and storage of radioactive materials and nuclear wastes be addressed under the Great Lakes Water Quality Agreement.

In 1997, the Nuclear Task Force established by the DC in 1995 to review and assess the status of radioactivity in the Great Lakes issued a report on the sources of various radioactive isotopes as well as the movement and distribution of radionuclides.

Also in 1997, a report entitled The IJC and the 21st Century devoted a section to nuclear issues.

In 1998, the Ninth Biennial Report on Great Lakes Water Quality included three recommendations with respect to radioactivity.

In 2002, the Eleventh Biennial Report had a full chapter entitled Nuclear Issues.

The foregoing reports and others may be accessed on the IJC's website at www.ijc.org. If assistance is required, your staff is invited to contact Frank Bevacqua, IJC Public Information Officer, who may be reached at: bevacquaf@washington.ijc.org or 202-736-9024. (**0015-2** [Lawson, Charles, Ph.D.])

Comment: The IJC, the International Joint Commission for the Great Lakes for the U.S. and Canada said in 1978, that there are some substances that are so toxic that they should not be produced in the Great Lakes basin. In the early 1990's, the IJC acknowledged that there are radionuclides that meet the definition of persistent toxins, and that they recommended to the governments of the U.S. and Canada that they phase out all of those radionuclides that met that definition. And the definition is, any toxin that bioaccumulates and has at least a half life of eight weeks in water. That would shut down every single nuclear power plant in the Great Lakes basin. (**0058-19** [Cumbow, Kay])

Comment: In this regard, you may wish to take note of a number of reports issued by the IJC that touch on these matters. For your convenience, these are identified below:

-Reports in 1977, 1983 and 1987 reviewed radioactivity in the Great Lakes Basin.

-In 1994, the Seventh Biennial Report on Great Lakes Water Quality recommended that radionuclides which meet the definition of persistent toxic substance be included in the governments' strategy for virtual elimination.

-In 1996, the Eighth Biennial Report on Great Lakes Water Quality devoted a section to radioactive substances and recommended that the use and storage of radioactive materials and nuclear wastes be addressed under the Great Lakes Water Quality Agreement.

-In 1997, the Nuclear Task Force established by the IJC in 1995 to review' and assess the status of radioactivity in the Great Lakes issued a report on the sources of various radioactive isotopes as well as the movement and distribution of radionuclides.

-Also in 1997, a report entitled The IJC and the 21st Century, devoted a section to nuclear issues.

In 1998, the Ninth Biennial Report on Great Lakes Water Quality included three recommendations with respect to radioactivity. In 2002, the Eleventh Biennial Report had a full chapter entitled Nuclear Issues." (**0071-2** [Lawson, Ph.D., Charles])

Response: *The comments refer to a number of reports issued by the IJC on the water quality of the Great Lakes Basin. These reports will be considered when evaluating the health impacts of Fermi 3 operations in Chapter 5 of the EIS.*

Comment: Nuclear reactors routinely release millions of curies of radioactive isotopes into the air and water each year unreported and unmonitored. The Nuclear industry does not regulate these radioactive elements because they consider them biologically inconsequential. These radioactive releases include the noble gases Krypton, Xenon and Argon. They emit gamma radiation, which can mutate the genes in the eggs and sperm and cause genetic mutations. (**0019-3** [Schemanksi, Sally])

Comment: In the areas around nuclear power plants are the people monitored through doctors for health effects of the nuclear releases? Nuclear power never was too cheap to meter was always so very dangerous to life and will outlive all generations of humanity. (**0031-5** [Rysztak, Robert])

Comment: Even the regular releases of nuclear power plants, radio-active isotopes, have ill effects on the fish, the animals and the people. High cancer rates run nationwide. (**0032-3** [Rysztak, Robert])

Comment: Who studies the effects of radiation in the Great Lakes region? Who studies the health of the people in the cities of the nuclear power plants? Are they monitored in comparison to people in non-nuclear power plant areas? (**0032-5** [Rysztak, Robert])

Comment: The pollution resulting from a nuclear power plant is unacceptable and is dangerous to the health of too many citizens. (**0034-2** [Nett, Ann C.])

Comment: The geographic region is the state's most-populated, and the proposed Fermi III project would be placing residents of two states and Canada in jeopardy, in the immediate region, from the potential of uncontrolled nuclear reactions, as well as proximity to storage of spent radioactive waste. (**0039-2** [Mitchell, Rita])

Comment: Routine radioactivity releases from Fermi 3 would harm human health. Even new reactors like Fermi 3 will release significant amounts of radioactivity directly into the environment. These would include so-called planned and permitted releases from the reactor's routine operations, as well as unplanned releases from leaks and accidents. Atomic reactors are designed to release radioactive liquids and gases into the air, water, and soil, which can then bio-concentrate in the ecosystem and human bodies. Liquid releases, which at Fermi are discharged into Lake Erie, include tritium, which can incorporate into the human biological system, even down to the DNA level. Once organically bound, tritium can persist in the human body for long periods, emitting damaging radioactive doses. Tritium can cross the placenta from mother to fetus. Current radiation health standards are not protective of women, children, nor fetuses. The Institute for Energy and Environmental Research has launched a campaign called Healthy from the Start, which urges NRC, EPA, and other agencies to protect the more vulnerable Reference Pregnant Woman from such radioactive hazards as tritium, rather than Reference Man as is currently done. The State of Colorado has instituted a tritium regulation 40 times stronger than the federal standard; California has a 50-fold stronger standard. Michiganders deserve equally strong protection. (**0050-6** [Kamps, Kevin])

Comment: Many radionuclides released routinely by nuclear plants bioaccumulate and bioconcentrate in the food chain, and these should all be accounted for. (**0051-7** [Cumbow, Kay])

Comment: Tritium is a very important isotope that is routinely emitted in large quantities into the air and waste water from nuclear power plants. Tritium, which is radioactive for 248 years is released continuously from reactors into the air and into lakes, rivers, or seas - depending upon reactor location. There is vast literature on the biological effects of tritium demonstrating that it causes chromosomal breaks and aberrations. (Helen Caldicott, Nuclear Power Is Not the Answer). What studies are being done on the long term effects of tritium which cannot be filtered out and is released in the form of radioactive water vapor or water. What are the levels of tritium in the air and the drinking water of Monroe County? (**0055-2** [Guthrie, Patricia])

Comment: All nuclear power plants release radionuclides into the air and into the water. Some are planned releases; some are not planned by either leaks or accidents. Radioactive emissions are quite insidious because normally, under normal circumstances, people cannot sense them with their senses. They can't smell them, they can't taste them, they can't -- you need expensive equipment to detect them, and nuclear power plants do not have to have to keep -- they don't do monitoring on a 24/7 basis. They don't monitor through all their vents. There's a lot of ways that radioactive waste can get out. (**0058-24** [Cumbow, Kay])

Comment: Atomic reactors are designed to release radioactive liquids and gases into the air, water, and soil. Gaseous releases include Xenon 135, a noble gas which quickly decays into Cesium 135, which then falls out onto the soil and surface waters. Cesium is readily taken up by the human body, where it lodges in muscle tissue such as the heart. (**0058-34** [Yascolt, Stas])

Comment: I have taught radiation science in college, and I'm on the National Radiation Committee for the Sierra Club. But that's not really the reason that I am here today, because I think everybody knows that radiation exposure is bad for us. I have all the --even though I was very careful when I was working, I have all the medical problems that are associated with excess radiation. (**0058-40** [Simpson, Robert])

Comment: I know the horrible nightmare of a cancer diagnosis. Living under the shadow of that debilitating, painful, and life threatening disease, it is becoming an epidemic. To expose a population to the threat of that disease is a crime. Dr. Sternblast, who is doing a large project to analyze radioactive elements stored in baby teeth, is convinced that more than any other factor, radiation is the cause of the cancer epidemic. Main radiation factors include fallout and nuclear reactor emissions. Nuclear reactors create radiation. The worst scenario is a large explosion such as Chernobyl. However, nuclear reactors routinely omit radiation into the atmosphere by way of releases that is gaseous and thermal. Since, like pesticides, radiation is bio accumulative, and enviro accumulative, there is no safe measure for repeated emissions and exposures. Like pesticides, radiation is carcinogenic and mutagenic. It is also teratogenic, and it is a feticide. (**0059-12** [Barnes, Kathryn])

Comment: Radioactive elements cause cancer. (**0059-18** [Barnes, Kathryn])

Comment: The environmental assessment must address the well known health effects of both low level and catastrophic radioactive emissions from nuclear power plant operation. (**0059-48** [Wolfe, Joan])

Comment: we would not have the environmental problems that we have today with -- wait, I thought everybody said the deer were nice on that park. Well, deer don't know that they are dying and getting cancer. They do. There are environmental costs that are largely unseen, they are very quiet. But because there are deer walking around in a park doesn't mean that it's benign. We know from study after study. The very first ones which were done were really done in Hiroshima and Nagasaki. The results of radiation are dramatic, life-ending, and terrible. (**0059-58** [Wolfe, Robert])

Comment: I have become aware of the dangers of radioactive gases (Iodine 131) that are regularly flushed into the atmosphere by the Nuclear Power Plant yet permitted by NRC, and dismissed as noble gases and therefore chemically inert. However, scientists have indicated that they actively decay to daughter isotopes. Does living near a nuclear power plant increase the exposure to Iodine-131? Would this risk increase with an added nuclear plant? Are the annual Fermi II Iodine-131 releases still among the highest among US reactors? Are there any recent studies in this regard available? (**0065-1** [Diederichs, Dorothy])

Comment: I am concerned about the radioactive gases which are actively flushed into the atmosphere. Planned Purges are officially permitted by the NRC so that utility operators can decrease the intensely radioactive environment into which maintenance workers must enter. Older reactors are allowed twenty-two purges per year during cold shutdown.

What studies have been done on the impact of these planned purges on pregnant women and children and the elderly, many of whom have a weakened immune system? Will construction of Fermi III increase the risk of exposure to harmful radioactive substances? (**0068-1** [Walby, Charlotte])

Comment: Dr. Helen Caldicott lists numerous dangerous, carcinogenic elements produced by nuclear power plants:
-Iodine 131, which bio-concentrates in leafy vegetables and milk and can induce thyroid cancer
-Strontium 90, which bio-concentrates in milk and bone, and can induce breast cancer, bone cancer and leukemia
-Cesium 137, which bio-concentrates in meat, and can induce a malignant muscle cancer called a sarcoma
-Plutonium 239, which can cause liver cancer, bone cancer, lung cancer, testicular cancer and birth defects. (**0081-1** [Ryan, Janet])

Comment: What are the health impacts of adding another nuclear power plant to our community? (**0081-4** [Ryan, Janet])

Comment: The environmental assessment must address the well-known health effects of both low-level and catastrophic radioactive emissions from nuclear power plant operation. (**0083-2** [Wolfe, Joan])

Comment: I know the horrible nightmare of a cancer diagnosis. Living under the shadow of that debilitating, painful, and life threatening disease is becoming an epidemic. To expose a population to the threat of that disease is a crime. Dr. Sternglass, who is doing a large project to analyze radioactive elements stored in baby teeth, is convinced that more than any other factor, radiation is the cause of the cancer epidemic. Main radiation factors include fallout and nuclear reactor emissions. Nuclear reactors create radiation. The worst scenario is a large explosion such as Chernobyl. However, nuclear reactors routinely emit radiation into the atmosphere by way of releases -- i.e. gaseous and thermal. Since, like pesticides, radiation is bio accumulative, and enviro accumulative, there is no safe measure for repeated emissions and exposures. Like pesticides, radiation is carcinogenic and mutagenic. It is also tetrogenic and is a feticide. (**0083-22** [Barnes, Kathryn])

Response: *The comments refer to human health effects of radiological releases from nuclear power plants. In Chapter 5 of the EIS, the NRC staff will evaluate human health impacts of effluent releases from the operation of the proposed Fermi 3 plant.*

Comment: The 1993 accident at Fermi 2 and subsequent release of radio-active water into Lake Erie in 1994 was not a good thing. How many similar releases of radiation can our waterways stand before they become radio-active? (**0032-4** [Rysztak, Robert])

Comment: Large-scale accidental tritium leaks into groundwater in Illinois, that had been covered up for a decade by the nuclear utility and state environmental agency, were uncovered in early 2006 by a concerned mother whose daughter had contracted brain cancer at age 7. A cluster of rare childhood brain cancers were then documented in the community of Morris, Illinois, home to three atomic reactors and a high-level radioactive waste storage facility. The scandal led to the revelation of widespread accidental tritium releases nationwide at almost all atomic reactors. (**0050-7** [Kamps, Kevin])

Comment: Incredibly, Fermi 1 experienced an accidental release of thousands of gallons of tritium-contaminated water in 2007, 35 years after the reactor had been permanently shut down! The nearby Davis-Besse reactor also recently admitted tritium leaks into the environment. (**0050-9** [Kamps, Kevin])

Comment: Liquid releases, which at Fermi are discharged into Lake Erie, include tritium, which is radioactive hydrogen. Tritium flows wherever water flows. It is prohibitively expensive to filter out. So, NRC allows it to be released into the environment. Tritium can incorporate into the human biological system even down to the DNA level. Once organically bound, tritium can persist in the human body for long periods, emitting dangerous, damaging, radioactive doses. Tritium can cross the placenta from mother to fetus. (**0058-35** [Yascolt, Stas])

Comment: Large scale accidental tritium leaks into groundwater in Illinois have been covered up for a decade by the nuclear utility and state environmental agency. They were uncovered in early 2006 by a concerned mother, whose daughter had contracted brain cancer at age 7. A cluster of rare childhood brain cancers were then documented in the community of Morris, Illinois, home to three nuclear reactors and a high level radioactive waste storage facility. The scandal led to a revelation of widespread accidental tritium releases nationwide at almost all atomic reactors. These are the documented ones. We don't know about the undocumented ones. (**0058-36** [Yascolt, Stas])

Comment: Accidents at atomic reactors can lead to a large scale release of harmful radioactivity into the environment. For instance, right here at the poster child for anti-nuke, right here at Fermi, we had the Fermi 2 turbine disintegrated in 2007. Now, it seems incredible that it could happen, but actually this brought about a release of radioactive water.

I can't believe that it happens, as many safeguards that are built in, but these things do happen. It seems impossible, but it did happen, right here. On top of that, this also happens to be the place, the site that we have the example of Fermi 1, the sodium reactor. And there actually was a release, believe it or not, in 2007, of water on the decommissioning of Fermi 1. I believed for years and years that it was a problem that was long solved. It continues on, the legacy. We are to leave this to our children, our grandchildren, our great-grandchildren, for generations, for thousands of years. (**0058-37** [Yascolt, Stas])

Response: *The comments refer to potential accidental radiological releases. In Chapter 5 of the EIS, the NRC staff will evaluate human health impacts from radiation exposure during operation of the proposed Fermi 3 unit, including unanticipated operational occurrences. Chapter 5 also will evaluate the risks associated with postulated reactor accidents.*

Comment: They will be dangerous virtually forever. In June 2005, the National Research Council found that scientific evidence shows that exposure to radiation at even barely detectable doses can cause DNA damage that leads to cancer. There is no safe dose of exposure to radiation, no matter how small. In Monroe County, the cancer death rate has jumped from 2% above the U.S. in the early 1980s [when no reactors operated] to 10% above the U.S. in this decade. Cancer mortality in children who are most susceptible to radiation soared from 39% below the U.S. to 58% above the U.S.

Dr. John Gofman, one of the world's foremost radiation researcher has spent over fifty years on the study of low-level radiation. A physician and doctor of nuclear/physical chemistry, Dr. Gofman co-discovered uranium-233 and isolated the world's first workable plutonium for the Manhattan Project. . He concludes: There is no safe dose or dose-rate of ionizing radiation with respect to the induction of human cancer. It would be impossible for low total doses of ionizing radiation, received slowly from routine occupational environmental sources, to be less carcinogenic than the same total doses received acutely. There is very strong support in the direct human evidence for recognizing that the cancer risk is probably more severe per dose unit at low doses than at moderate and high doses.

The nuclear industry does not have the technical ability to keep exposure to zero. They allow workers to be irradiated at so called allowable levels and the public to be poisoned at allowable levels. They continue to spread the myth that there is a safe dosage. Past estimates of safe levels have been continuously underestimated. In 1910, safe allowable exposure was thought to be 100 rems per year for workers; today it is 5 rems per year. The British National Radiological Board has lowered its permissible levels to 2 rems. A study published in 1991, in the Journal of the American Medical Association reveals the occurrence of leukemia is 63% higher among white male atomic workers at Oak Ridge National Laboratory than among all U.S. white males. Most of the workers in the study received total radiation doses of less than 1 rem total exposure throughout their entire employment. (**0019-8** [Schemanksi, Sally])

Comment: I am concerned about the potential long-term health risks (specifically for children) posed by living close to two nuclear power plants. When the nuclear industry calculates "acceptable" radiation exposure for the public, it uses a model of a standard, healthy 150 pound man. But the population is far from homogeneous. Old people, immuno-depressed patients, normal children and some with specific, inherited diseases are many times more susceptible to the deleterious effects of radiation than normal adults. (Helen Caldicott, Nuclear Power Is Not the Answer)

In the only attempt federal officials have made to examine cancer rates near U.S. nuclear plants, a study published in the European Journal of Cancer Care found that Leukemia death rates in U.S. children near nuclear reactors rose sharply (vs. the national trend) in the past two decades. The greatest mortality increases occurred near the oldest nuclear plants, while declines were observed near plants that closed permanently in the 1980s and 1990s. (European Journal of Cancer Care. 17(4):416-418, July 2008. MANGANO, JOSEPH; SHERMAN, JANETTE D.)

Given these factors, how can we be assured that increasing nuclear power generation in Monroe County does not put our children at risk? Does the Nuclear Regulatory Commission have any processes in place to assess this risk?
(**0036-1** [Nash, Sarah])

Comment: As confirmed for the seventh time by the U.S. National Academy of Sciences in 2006 in its Biological Effects of Ionizing Radiation report (BEIR VII), every exposure to radiation increases the risk to human health. Radioactivity can damage tissues, cells, DNA and other vital molecules, potentially causing programmed cell death (apoptosis), genetic mutations, cancers, leukemias, birth defects, and reproductive, immune, cardiovascular and endocrine system disorders. (**0050-11** [Kamps, Kevin])

Comment: the first thing that comes to mind is a baseline for radiation and other pollution exposure to air, land, water, sediment, fish, wildlife, and incorporating not just the Great Lakes, but the Detroit River, Raisin River, Swan Creek, where there is potential for plant uptake or food chain bioaccumulation of radiation or other pollutants that has already occurred from Fermi 1, Fermi 2. And before you can make an estimate of a modeling of how much would occur from a potential Fermi 3. (**0058-106** [McArdle, Ed])

Comment: BEIR 7, which was published in 2005 by the National Academy of Sciences, they reconfirmed that there is no safe threshold for human health for exposure to radiation. In the fall of this year, the Committee to Bridge the Gap, they discovered that EPA was in the process of gutting, secretly, radiological protections standards for the U.S. (**0058-22** [Cumbow, Kay])

Comment: As confirmed for the seventh time by the U.S. National Academy of Sciences in 2006, every exposure to radiation increases the risk to human health. Radioactivity can damage tissues, cells, DNA, and other vital molecules, potentially causing program cell death, apoptosis, genetic mutations, cancers, leukemias, birth defects, and reproductive immune cardiovascular and endocrine system disorders.

Among the many environmental concerns surrounding nuclear power plants, there is one that provokes public anxiety like no other, the fear that children living near nuclear facilities face an increased risk of cancer. The carcinogenic effects of radioactive exposure are most severe among infants and children. Leukemia is the type of childhood cancer most closely associated with exposures to toxic agents, such as radiation, and has been most frequently studied by scientists.

In the U.S., childhood leukemia incidents has risen 28.7 percent from 1975 to 2004. According to CDC data, suggesting that more detailed studies on causes are warranted. I would like to bring several of the recent studies as short as possible. The first one I am referring to is the one done by epidemiologist Joseph Mangano, Director of the Radiation and Public Health Project, and toxicologist Jeannette Sherman, who is a Medical Doctor of the Environmental Institute at Western Michigan University. They analyzed leukemia deaths in children under 19 years of age. In the 67 counties located near 51 nuclear power plants, starting from 1957 until 1981, so from `57 to `81 it's referring when the nuclear power plants were started.

The same counties have been also studied in a NCI study. About 25 million people live in these 67 counties, and the 51 plants represent nearly half of the U.S. total. Using mortality statistics from the U.S. Centers for Disease Control and Prevention, Mangano and Sherman found that in 1985 to 2004, the change in local child leukemia mortality versus the U.S. average, compared to the earliest years of reactor operations were as follows: An increase of 13.9 percent near nuclear plants started in the year `57 until 1970, so-called oldest plants, so an increase of almost 14 percent near oldest nuclear plants. I'm talking about children leukemia death rates.

An increase of 9.4 percent near nuclear plants started in `71 until `81, an increase of 9.4 percent in children living near newer nuclear power plants. And a decrease of 5.5 percent near nuclear plants started in `57 until `81 and later shut down. So we have a decrease in children leukemia deaths, 5.5 percent of decrease if the children were living nearby to a shutdown nuclear plant.

The conclusion that the author made is the13.9 percent rise near the older plant suggests a potential of great effect of greater radioactive contamination near aging reactors, while the 5.5 percent decline near closed reactors suggest a link between less contamination and lower leukemia rates. The large number of child leukemia deaths in the study, like there were 1,292 children who died of leukemia during the study, makes many of the results of the study statistically significant. (**0058-28** [Pfeiffer, Jelica B.])

Comment: So there are valuable studies that can support our study that I just presented, and reaction of German government and British government, how seriously they are taking those U.S. studies now. And based on it I'm calling for a moratorium of not issuing more permits for new nuclear reactors because there's still too many questions to be answered and more studies to be done.

Another point, reason for moratorium, is the fact that EPA has no regulations in place limiting the presence of radioactive elements in our air, water, and soil. So we want to give a bit of time to EPA to come to those standards.

Third point: Considering the high vulnerability to radiation in our children and pregnant women, the reference, man, should be changed to reference, pregnant woman. (**0058-29** [Pfeiffer, Jelica B.])

Comment: I am concerned about the impact that another nuclear power plant would have on those with compromised immune systems. What studies have been done on the cumulative low levels of radiation on pregnant women, children and the elderly? Can you assure us that the construction of Fermi III will not effect the health of those with compromised immune system? (**0060-1** [Petrak, IHM, Genevieve])

Comment: I am particularly concerned about the health risks of nuclear power. How can you assure us that building of Fermi III is safe for us and especially for our pregnant mothers and their unborn children? Scientific research tells us that there are no safe levels of exposure to radioactive substances. Can you assure us that the building of a new nuclear power plant will not impact in a negative way the health of our citizens. (**0063-1** [Bell, Mary Faith])

Comment: The thing about radiation is you can't see it or smell it so it is difficult to provide evidence of its presence as a pollutant. But it does accumulate in body tissue and may cause damage to the structure of DNA.

The National Academy of Science's National Research Council in its report on the health effects of radiation exposure, states that the preponderance of scientific evidence shows that exposure to radiation, at even barely detectable doses, can cause DNA damage that leads to cancers, especially in fetuses and children. There is no threshold of exposure below which low levels of ionizing radiation can be demonstrated to be harmless or beneficial. The health risks, particularly the development of solid cancers in organs, rise proportionately with exposure?[2]

What is not fully appreciated is that these chemicals do not do their worst damage by exposing people to radiation in the environment. Rather the real damage is done through ingesting them through breathing, drinking and through the food chain, especially through fresh milk and other dairy products, concentrating in key organs like the lung, thyroid, bone marrow and the female breast. These internal radiation doses are especially harmful to infants in the womb, children and older people with weaker immune systems.

[2] BEIRVII: Health Risks from Exposure to Low Levels of Ionizing Radiation , National Academies Press, 500 Fifth Street, NW, Washington, DC 20001; (**0083-13** [Mumaw, Joan])

Response: *The comments refer to the health effects of exposure to low levels of radiation, the BEIR VII report (Health Risks from Exposure to Low Levels of Ionizing Radiation), and the cancer statistics in the areas surrounding nuclear power plants. The NRC staff will evaluate human health impacts of radiation exposure from the operation of the proposed Fermi 3 nuclear plant in Chapter 5 of the EIS. The NRC staff will also discuss the dose standards used in the assessment.*

Comment: Given Fermi 3's inevitable radiological and toxic releases, drinking water intakes from Lake Erie must be required to constantly monitor contaminants in order to adequately protect public health. NRC should address the synergistically harmful health impacts due to human exposures to radioactivity and toxic chemicals. (**0050-16** [Kamps, Kevin])

Response: *This comment relates to the possible synergistic effect of chemicals and radiation and the cumulative impacts of the proposed Fermi 3 plant. The NRC staff will evaluate cumulative impacts from the operation of the proposed Fermi 3 plant in Chapter 7 of the EIS.*

Comment: **T**he rising cancer death rate in Monroe County is 45% above the U.S. average. Apparently there is a link to the fact that all reactors routinely emit over 100 radioactive chemicals into air and water that are known carcinogens. (**0047-5** [Bettega, Gayle])

Comment: Fermi 2's operations are correlated with local increases in cancer rates and other diseases, a radioactive health risk that Fermi 3 would make even worse. Janette Sherman, MD of the Environmental Institute at Western Michigan University published Childhood Leukaemia Near Nuclear Installations in a recent edition of the European Journal of Cancer Care. Using mortality statistics from the U.S. Centers for Disease Control and Prevention, Sherman examined data from 1985-2004 and determined that when measured against background levels in the rest of the U.S., leukemia rates have increased for children that live near nuclear reactors. She found an increase of 13.9% near nuclear plants started up between 1957-1970 (oldest plants); an increase of 9.4% near nuclear plants started up between 1971-1981 (newer plants); and a decrease of 5.5% near nuclear plants started up between 1957-1981 and later shut down.

Joe Mangano of the Radiation and Public Health Project has documented that in the early 1980s, before Fermi 2 began operating in 1988, the Monroe County cancer death rate was 36th highest of 83 Michigan counties. But by the early 2000s, it had moved up to 13th highest. From 1979-1988, the cancer death rate among Monroe County residents under age 25 was 21.2% below the U.S. rate. But from 1989-2005, when Fermi 2 was fully operational, the local rate was 45.5% above the U.S. rate. The energy efficiency and renewable alternatives to Fermi 3 do not involve such radioactive health risks. (**0050-13** [Kamps, Kevin])

Comment: Fermi 1 was a fast breeder reactor, which was supposed to produce more fuel in the form of Plutoniuum-239 (Pu-239) than it used of Uranium-235. Glenn Seaborg, co-discoverer of Pu-239, described it as "fiendishly toxic".

The nuclear industry promotes reprocessing (they like to call it "recycling") high level radioactive "spent" fuel to extract Pu-239 for more fuel. Pu-239 has a radioactive half-life of 24,000 years and a hazardous-to-health life of 240,000 years.

Many years ago experiments were done on young adult beagles. They were injected with small doses of Pu-239. They died from bone cancer. If they inhaled Pu-239 the dogs died of lung cancer (Science, February 22, 1974). Extrapolating to humans, a millionth of an ounce would have the same effect.

The British Ministry of Health has reported finding Pu-239 in children's deciduous (baby) teeth. The concentration increased the closer they lived to the Sellafield reprocessing plant indicating that the plant was the source of Pu-239.

In France Pu-239 has been found on the Normandy beach. A reprocessing plant is located on the English Channel upstream at LaHague. An increase in childhood cancer has been reported in children who visited the beach frequently (British Medical Journal, January 11, 1997).

The German Federal Radiation Protection Agency, the government's advisor on nuclear health, concluded that children under the age of 5 years were more likely to develop leukemia if they lived near a nuclear power plant. Germany plans to close all 16 nuclear power plants by 2020. (**0054-3** [Drake, Gerald A.])

Comment: I am concerned about the impact that Fermi III will have on the health of residents of Monroe County and environs, especially those whose immune system would make them susceptible to a variety of damaging effects.

The elderly, immuno-depressed patients, normal children, and some with specific, inherited diseases are many times more susceptible to the deleterious effects of radiation than normal adults. Overall, about forty-two people out of a hundred are expected to develop cancer in their lifetimes from all causes. (Helen Caldicott, Nuclear Power Is Not the Answer) (**0055-1** [Guthrie, Patricia])

Comment: We have radioactive releases from nuclear power plants in the Great Lakes Basin handout that anyone who lives in this area should see. Do you really want your kids to have brain tumors, birth defects, cancers, leukemia, and reproductive immune, cardiovascular and endocrine system disorders? I hope not. (**0058-86** [Anderson, Alan])

Comment: My concerns regarding the impact of the building of a new nuclear power plant on the site at Fermi 2 focus on the environment and the health of the community of Monroe. While DTE intends to minimize environmental impacts, routine releases will occur in both liquid and air emissions. Current radiation health standards, as used by the EPA and the NRC are referenced to healthy men. The reference man is a statistical model. He dates to 1974, but he's perpetually aged between 20 and 30 years old. He weighs 170 pounds, stands 5 feet 7 inches, and hails from Western Europe or North America. And, he represents everyone in the US when it comes to setting regulations for acceptable standards of exposure to ionizing radiation.

What about pregnant women, children, and the frail elderly? What studies have been done on the effect of sustained low level radiation in fetuses, children, and the elderly, who have weakened immune systems? This is of special concern to us because we have 180 elderly residents at the IHM Sisters Mother House which is within the Fermi environmental zone, the 10 miles.

Routine radioactive discharges by nuclear power plants are deemed legal and judged to be safe by the NRC and the industry. Some of this is so radioactive it is stored onsite. Any loss of cooling water from mechanical failure or terrorist attack would cause a catastrophe. Routine releases of lower level radioactive chemicals into the water are done in order to relieve pressure in the containment area and to limit the presence of radioactive and corrosive chemicals that damage reactor parts. The discharge for Fermi is very close to the water supply for the City, and for Frenchtown Township. Not all radioactive isotopes can be filtered from the water prior to its release.

Fermi 2, after an accident on Christmas Day in 1993, released over a million gallons of radioactively contaminated water into Lake Erie. Other chemical releases are made into the air. By breathing in radiation from the air or drinking water that is contaminated, we ingest these chemicals. They in turn release fast moving subatomic particles into our bodies that smash into and break molecules causing cancer, birth defects and genetic mutations. Radioactive iodine aims for the thyroid. Strontium goes for the bones, and tritium behaves like water, dispersing throughout the body and entering cells where it can disrupt the DNA. Tritium cannot be filtered out. What studies have been done on the long term effect of tritium, which is released into the air and water by nuclear power plants? (**0059-41** [Mumaw, Joan])

Comment: The thing about radiation is you don't see it or smell it, so it's difficult to provide evidence of its presence as a pollutant. But it does accumulate in body tissue and may cause damage to the structure of DNA. The National Academy of Sciences National Research Council, on its report on health effects of radiation exposure, states that the preponderance of scientific evidence shows that exposure to radiation at even barely detectible doses over long periods of time, can cause DNA damage that leads to cancer, especially in fetuses and children.

What is not fully appreciated is that chemicals do not do their worst damage by exposing people to radiation in the environment. Rather, the real damage is done through ingesting them through breathing, drinking, and through the food chain, especially through fresh milk and other dairy products, concentrating in organs like the lung, thyroid, bone marrow, and the female breast. These internal radiation doses are especially harmful to infants in the womb, children, and older people with weaker immune systems.

In Monroe County the cancer death rate is 10 percent above the national average. Cancer mortality in children, who are most susceptible to radiation, soared from 21 percent, the average in the 1980's, to 45 percent above the national average in 2005. What studies have been done in Monroe County on the incidences of cancer, especially in children, and its possible causes? This is of concern to us as Sisters, many of whom have spent several years in Monroe studying and teaching in local schools. And several of our women are currently undergoing treatment for cancer.

Health and the environmental policies have long observed the precautionary principle. The principle developed at the Wingspread conference in 1998 asserts that before using a new technology or starting a new activity, there is a duty to take anticipatory action to prevent harm. It also declares that responsibility for the proof of harmlessness rests with the proponent rather than the public. Can you, DTE, and the NRC, assure us that Fermi 3 will be safe? Can you assure us that the health of the community is not being and will not be compromised by the inevitable release of radioactive contaminants into air and water?

Please do not rush to build an expensive and quite possibly harmful nuclear reactor until all the heath issues are studied by independent researchers and the public is informed of any risk. (**0059-43** [Mumaw, Joan])

Comment: I've been in contact with an eminent epidemiologist, Joseph Mangano. He works with the Radiation and Public Health project. His work is reviewed by several MDs, several PhDs, biostatisticians.

The following is a statement by Joseph J. Mangano. Joseph Mangano, Masters Public Health, Masters of Business Administration, is Director, Secretary, and Executive Director of the Radiation and Public Health Project. Mr. Mangano is a public health administrator and researcher and has studied the connection between low dose radiation exposure and subsequent risk of disease, such as cancer, and damage to newborns. He has published numerous articles and letters in medical journals in addition to books, including low level radiation and immune systems disorders, and atomic air legacy. Here he examines the connection between radiation exposure and current widespread health problems. He cites the rising local cancer rates, suggests a link between the Fermi 2 reactor and cancers. January 14th, 2009, the cancer death rate in Monroe County has been rising since the late 1980's when the Fermi 2 nuclear reactor began operating according to this new analysis. The rising cancer has been sharpest among children and adolescents who are most susceptible to the harmful effects of radiation exposure. The analysis uses official data from the US Centers for Disease Control and Prevention. The increasing cancer rate death among Monroe County residents, especially young people, suggest a link with radioactive chemicals emitted from the Fermi reactor, says Joseph J. Mangano, MPH, MPA, Executive Director of the Radiation Public Health Project.

Because Monroe County has a low risk population that is well educated, high income, and has few language barriers, rising cancers are unexpected and all potential causes should be investigated by health officials.

Fermi 2 reactor began operating June 21st, 1985, and went commercial January 1988. However, it ran very little after the initial low power startup. The 1998 startup was the full commercial operation. In the early 1980's the Monroe County cancer death rate was 36th highest of 83 Michigan counties. By early 2000 it had moved up to 13th highest. From 1979 to 1988, pre-Fermi, the cancer death rate for Monroe County residents under 25 years of age was 21 percent below the US rate. But from 1989 to 2005, when Fermi 2 was fully operational, the local rate was 45.5 percent above the US national average.

All nuclear reactors produce electricity by splitting uranium atoms which creates high energy needed to heat water. This process all creates over 100 radioactive chemicals not found in nature, including strontium 90, cesium 137 and iodine 131. While most of these chemicals are retained in reactors and stored as waste, a portion is routinely released in the local air and water. They enter human bodies through breathing and the food chain, and raise cancer risk by killing and injuring cells in various parts of the body. They are especially harmful to children.

The findings come at a time when a new reactor has been proposed at the Fermi plant. The original Fermi 1 reactor, which was a site of a partial core meltdown accident in 1966, shut down permanently in 1972, and I might add, was taken apart by the pipefitters of Local 671. Of a work force of 39, 35 died within a few years of taking it apart, from cancers of the organ. Please check your data and go back to your records. Data on cancer risk from Fermi radioactive emissions. The Fermi 2 reactor is located in Monroe County and started in 1985, now commercial in '88. Monroe County has no obvious cancer risk. It has high income, low poverty, well-educated population with few language barriers and access to excellent healthcare in nearby major cities. Thus, an increase in cancer is unexpected. This change should be investigated and one potential cause should be ruled out from radioactive emissions fr (**0059-64** [Keegan, Michael])

Comment: I'm just amazed that after listening to Michael Keegan talk about the higher cancer rates since Fermi's been running -- I mean we're talking cancer, we're talking people dying. I heard people talk about babies dying and pregnant women losing their babies. And then other people talk about they are supporting Fermi 3 because Detroit Edison helps with the Science Fair. And I don't mean to be rude, but we're talking cancer. We're talking waste that is deadly for two millenniums plus. And they don't know what to do with it. They're talking cancer. And then other people have come up shown that there's more jobs if we chose alternative energy. So I don't understand any of the reasoning to support Fermi 3, causes cancer and not as many jobs. So I guess -- you know, I've come to a million anti-Fermi meetings and I rarely talk. But it's like, come on, think about it. We're talking cancer, high rates of cancer in Monroe County. You know? Yeah, we're a company town. They've done a good job of selling their plant and supporting the Red Cross and the United Way and the schools. We're talking cancer. (**0059-88** [Meyers, Marcie])

Comment: I am concerned about the impact of radiation exposure on the elderly, immunosupressed persons, children, and the population in general in Monroe County. It seems quite peculiar that Monroe's mortality rate is above that of Michigan for the years 2000-2005, all cancers combined (ICD-10 codes COO-D48.9). Will the NRC be asking the Health Department to investigate this discrepancy? And how can we be assured that increasing nuclear power generation does not put our citizens, especially children and young adults at risk? Thank you for giving serious consideration to these issues before moving forward with plans to build Fermi 3. (**0067-1** [Duggan, Marion])

Comment: The people of Monroe do not need more risks to healthy living. (**0070-3** [Karas, Josephine])

Comment: I. Recent Essential Facts on Health Hazards of Nuclear Generating Reactors

1. Thus U.S. National Academy of Sciences has confirmed in 2006, for the seventh time, conclusive evidence that every exposure to radiation increases the risk to human health. Radioactivity can damage tissues, cells, DNA and other vital molecules, potentially causing programmed cell death (apoptosis), genetic mutations, cancers, leukemias, birth defects and reproductive, immune, cardiovascular and endocrine system disorders.

2. Among the many environmental concerns surrounding nuclear power plants, there is one that provokes public anxiety like no other: the fear that children living hear nuclear facilities face an increased risk of cancer. In fact, the carcinogenic effects of radiation exposure are most severe among infants and children. Leukemia is most closely associated with exposures to toxic agents such as radiation, and has been most conclusively studied by scientists. In the U.S., childhood leukemia incidence has risen 28.7% from 1975 to 2004, according to CDC data, suggesting that more detailed studies on causes are warranted.

3. The November, 2008 issue of the European Journal of Cancer Care published a US study of children living near nuclear plants. The authors are epidemiologist Joseph Mangano, MPH MBA, Director of the Radiation and Public Health Project and Janette Sherman, MD, of the Environmental Institute at Western Michigan University. They analyzed leukemia deaths in children ages 0-19 in the 67 counties near 51 nuclear plants from 1957-1981. Nearly 25 million people live in these counties, and the 51 plants represent nearly half of the U.S. total. Using mortality statistics from the U.S. Centers for Disease Control and Prevention, Mangano and Sherman found that in 1985-2004, the change in local child leukemia mortality (v. the US) compared to the earliest years of reactor operations were:

-An increase of 13.9% near nuclear plants started 1957-1970 (the oldest plants, still operational).

-An increase of 9.4% near nuclear plants started 1971-1981 (newer plants).
-A decrease of 5.5% near nuclear plants started 1957-1981 and later decommissioned.

The 13.9% rise in mortality rates near the older plants suggests a potential effect of greater radioactive contamination near aging reactors, while the 5.5% decline near closed reactors suggests a link between less contamination and lower leukemia rates. The large number of child leukemia deaths in the study (1292) make the results statistically significant.

4. Before Mangano and Sherman's study, a 2007 meta-analysis was published in the European Journal of Cancer Care by researchers from the Medical University of South Carolina. That report reviewed 17 medical journal articles on child leukemia rates near 136 reactors, and found that all 17 detected elevated rates. These were nuclear sites in the UK, Canada, France,

Germany, Japan, Spain and the USA. The incidence of leukemia in children under 9 living close to the sites showed an increase of 14 to 21 per cent, while death rates from leukemia were raised by 5 to 24 percent, depending on their proximity to the nuclear facilities (European Journal of Cancer Care, vol 16,p 355). This study updates, with largely consistent findings, an analysis conducted in the late 1980s by the National Cancer Institute (NCI). That analysis, mandated by Senator Edward M. Kennedy (D-MA), is the only attempt that US federal officials have made to examine cancer rates near US nuclear plants.

5. In addition are two new KiKK studies conducted by German researchers of the University of Mainz (KiKK is a German acronym for Childhood Cancer in the Vicinity of Nuclear Power Plants), whose results were published in 2008 in the International Journal of Cancer (vol 122, p 721) and the European Journal of Cancer (vol 44, p 275). These found higher incidences of cancers and a stronger association with nuclear installations than all previous reports. The main findings reported a 60 percent increase in solid cancers and a 117 percent increase in leukemia among young children living near all 16 large German nuclear facilities between 1980 and 2003. The most striking finding was that those who developed cancer lived closer to nuclear power plants than randomly selected controls. Children living within 5 kilometers of the plants were more than twice as likely to contract cancer as those living farther away. This finding has been accepted by the German government as definitive. This indicates twice as many cases of leukemia among children living near nuclear power plants.

The German federal agency for irradiation protection has called the study a significant argument against nuclear power. “Given the particularly high risk of nuclear radiation for children, and the inadequacy of data on the emissions of nuclear power plants, we must take the correlation between distance of residence and high risk of leukemia very seriously,” Wolfram Koenig, director of the agency, stated at a press conference.

The Mainz findings are consistent with others in France and Britain. In France, one such study in 1997, and another in 2001, showed a higher incidence of leukemia among children living near nuclear power plants.

6. The 1997 French study, led by Jean Francois Viel, Professor of public health at the France Comte University, 300 km east of Paris, found that children frequenting the beaches at Cotentin on the Atlantic coast near the nuclear power plant of La Hague, or living within a radius of 35 km of the plant, suffered leukemia well above the national average.

Another French study from 2001 by Alfred Spira, of the National Institute of Health and medical Research, confirmed Viel’s results. Spira, who had first rejected the results of Viel’s study, later changed his opinion when he found a disproportionately high number of cases of leukemia among people below 25 years old and living within 35 km of La Hague. When the sample studied was narrowed to children ranging from 5 to 9 years old, living within 10 km of the nuclear facility, the cases of leukemia were 6.38 times the national average.

7. A British study from 2002 confirmed an older one from 1990 showing that the incidence of leukemia among children of workers at the Sellafield nuclear power 400 km north of London was twice the national average. Investigation by Heather Dickinson and Louise Parker from the Children's Cancer Research Unit at the University of Newcastle confirmed the earlier results. Using data from 1957 to 1991, the researchers found that children of workers at Sellafield were more likely to suffer leukemia and non-Hodgkins lymphoma (NHL, a group of cancers affecting the white blood cells) that the national average. In their study, Dickinson and Parker conclude that the Sellafield workers' children born in Seascale (the village near the Sellafield nuclear reprocessing plant) ran on average 15 times higher risk of developing leukemia and NHL, and that the Sellafield workers' children outside Seascale ran twice the risk.

II. Discussion of Further Considerations

The findings reported in the 1980s and 1990s regarding leukemia clusters are again being repeated. A Report in 2004 by the Committee Examining Radiation Risks of Internal Emitters - 79 - set up by the UK government points out that the models used to estimate radiation doses from sources emitted from nuclear facilities are riddled with uncertainty. For example, assumptions about how radioactive material is transported through the environment or taken up and retained by local residents may be faulty.

If radiation is indeed the cause of the cancers detected, how might local residents have been exposed? Most of the reactors in the KiKK study were pressurized water designs notable for their high emissions of tritium, the radioactive isotope of hydrogen. Last year, the UK government published a report on tritium that concluded that its hazard risk should be doubled. Tritium is most commonly found incorporated into water molecules, a factor not fully taken into account in the report. So this could make it even more hazardous.

As we begin to pin down the likely causes of elevated cancer rates, the new evidence of an association between increased cancers and proximity to nuclear facilities support the following: Pregnant women and young children should be advised to move away from them. Local residents should be advised not to eat vegetables from their gardens. (**0078-1** [Pfeiffer, Jelica B.])

Comment: In Monroe County, the cancer death rate is 10% above the national average. Cancer mortality in children, who are most susceptible to radiation, soared from 21% below the US average in the 1980s to 45% above the national average in 2005!3 What studies have been done in Monroe County on the incidence of cancer, especially in children, and possible causes? This is of concern to IHM Sisters, many of whom spent several years in Monroe studying and teaching in local schools. Several of these women are undergoing treatment for cancer.

3 US Centers for Disease Control and Prevention, http://cdc.wonder.gov, underlying cause of death (**0083-14** [Mumaw, Joan])

Comment: My concerns regarding the impact of the building of a new nuclear power plant on the site of Fermi II focus on the environment and the health of the community of Monroe. While DTE intends to minimize environmental impacts, routine releases will occur in both liquid and air emissions.

Current radiation health standards as used by the EPA and NRC are referenced to healthy men. The reference man is a statistical model. He dates to 1974, but he's perpetually aged between 20 and 30 years old. He weighs 170 pounds, stands 5 feet 7 inches and hails from Western Europe or North America. And he represents everyone in the United States when it comes to setting regulations for acceptable standards of exposure to ionizing radiation.1

What about pregnant women, children and the frail elderly? What studies have been done on the effect of sustained low-level radiation in fetuses, children and the elderly who have weakened immune systems? This is of special concern to us as there are 180 elderly residents at the IHM Sisters Motherhouse which is within the Fermi EPZ.

Routine radioactive discharges by nuclear power plants are deemed legal and judged to be safe by the NRC and the industry. These releases can include more than 100 different chemicals, including cesium-137, iodine-l31, strontium-90 and tritium. Some of this is so radioactive it is stored on site. Any loss of cooling water from mechanical failure or terrorist attack would cause a catastrophe. Routine releases of lower level radioactive chemicals into the water are done in order to relieve pressure in the containment area and to limit the presence of radioactive and corrosive chemicals that damage reactor parts. The discharge for Fermi is very close to the water supply for the county. Not all radioactive isotopes can be filtered from the water prior to its release.

Fermi II, after an accident at the reactor on Christmas Day, 1993, released over a million gallons of radioactively contaminated water into Lake Erie. Other chemical releases are made into the air. By breathing in radiation from the air, or drinking water that is contaminated, we ingest these chemicals. They in turn release fast moving sub-atomic particles into our bodies that smash into and break molecules causing cancer, birth defects, and genetic mutations. Radioactive iodine aims for the thyroid, strontium goes for the bones and tritium behaves like water dispersing throughout the body and entering cells where it can disrupt DNA. Tritium cannot be filtered. What studies have been done on the long term effect of tritium which is released into the air and water by nuclear power plants?

1 Enszer, Julie R., 'Reference Man' May Lose Radioactivity Modeling Job, Women's E News, November 13, 2007. (**0083-8** [Mumaw, Joan])

Comment: The cancer death rate in Monroe County has been rising since the late 1980s, when the Fermi 2 nuclear reactor began operating, according to a new analysis. The rise in cancer has been sharpest among children and adolescents, who are most susceptible to the harmful effects of radiation exposure. The analysis uses official data from the U.S. Centers for Disease Control and Prevention.

The increasing cancer death rate among Monroe County residents, especially young people, suggests a link with the radioactive chemicals emitted from the Fermi reactor, says Joseph J. Mangano MPH MBA, Executive Director of the Radiation and Public Health Project research group. Because Monroe County has a low risk population that is well educated, high income, and has few language barriers, rising cancer rates are unexpected, and all potential causes should be investigated by health officials.

Fermi 2 reactor began operating June 21, 1985. However, it ran very little after the initial low-power start-up until a warranty run in January of 1988, marking the commercial start-up of the reactor. In the early 1980s, the Monroe County cancer death rate was 36th highest of 83 Michigan counties, but by the early 20005, it had moved up to 13th highest. From 1979-1988, the cancer death rate among Monroe County residents Sources:

Fermi 2 incurred near miss accidents on March 28, 2001 (emergency diesel generator was inoperable for over 7 days) and August 14, 2003 (loss of offsite power due to northeast blackout). Source: Greenpeace USA. An American Chernobyl: Nuclear Near Misses at U.S. Reactors Since 1986. www.greenpeace.org, April 26, 2006.

U.S. Centers for Disease Control and Prevention, http://cdc.wonder.gov, underlying cause of death. Death rates are adjusted to 2000 U.S. standard population. Includes ICD9 codes 140.0-239.9 (1979-1983) and ICD-IO codes COO-D48.9 (2000-2005). Whites account for over 95% of Monroe residents.

Cancer Death Rates, Monroe County vs. U.S. 1979-1988 and 1989-2005, age 0-24

	Monroe County		**Deaths/100,000 Pop.**		
Period	**Cancer Deaths**	**Avg. Pop.**	**Monroe**	**U.S.**	**%vs. US**
1979-1988	22	56,234	3.91	4.96	**-21.2%**
1989-2005	42	51,407	4.86	3.79	**+45.5%**

(**0084-1** [Mangano, Joseph])

Response: *The comments refer to the cancer statistics in the area surrounding the Fermi site and the health effects of radiation exposure. The NRC staff will evaluate human health impacts* *from radiation exposure from the operation of the proposed Fermi 3 plant in Chapter 5 of the EIS. Chapter 5 will also discuss the dose standards used in the assessment.*

D.1.14 Comments Concerning Accidents – Design Basis

Comment: The things that cannot be predicted are the only things that seemed to have happened that cause of grief. The turbine generator set at Fermi, when that happened and spilled a lot of water. I attended the St. Mary's meeting there with the water purification engineer for the plant, and it was very difficult to get across that this water, when it was to be discharged to the Lake, would be purer than the water of the Lake itself. I have been at Prairie Island, Donald C. Cook, Fermi 2, Prairie plant, over on the far end of the Lake, Marble Hill, the Clinton project. I was INPO Representative for Indiana Public Service. I've been at Three Mile Island two times after the accident writing procedures for those people, including radiological control and administrative procedures that had to do with control of chemicals and estimating. (**0058-125** [Meyer, Richard])

Comment: How many radioactive spills and shutdowns have taken place in U.S. nuclear power plants over the past 30 years? How likely or unlikely would new nuclear plants be to have such an accident? What would be the result? (**0081-2** [Ryan, Janet])

Response: *The comments refer to nuclear accidents and their consequences. The environmental impacts of postulated accidents will be evaluated, and the results of this analysis will be presented in Chapter 5 of the EIS. The impacts of past operation of Fermi 1 and 2, including accidental releases of radiologically contaminated materials, will be considered in Chapter 7 of the EIS.*

D.1.15 Comments Concerning Accidents – Severe

Comment: How do we stay safe? I live in the 1 mile red zone of that plant, I would hate to become a statistic. I can see the Davis Bessie plant across the lake on a clear day - I believe the people who live it that area have to take iodine tablets, because of problems that have been discovered at the plant. Now every isn't 100% safe, but when something goes wrong at a nuclear plant it can have a wide range of health problems, environmental problems that can last for years and decades beyond the occurrence - Chernobyl. (**0013-2** [Sanchez, Mira])

Response: *The environmental impacts of postulated accidents (i.e., design basis and severe accidents) will be evaluated, and the results of this analysis will be presented in Chapter 5 of the EIS.*

Comment: The inevitable safety risks of accidents associated with Fermi 3 favor efficiency and renewables as safer alternatives. A 1982 NRC report showed that a major accident at Fermi 2 releasing catastrophic amounts of radioactivity could cause 8,000 peak early fatalities, 340,000 peak early injuries, 13,000 peak cancer deaths, and $136 billion in property damage. Given population growth since, casualties would be even worse in the present day. And when adjusted for inflation, such damages would now top $288 billion. Similar or even worse casualties and damages could result from an accident at the larger Fermi 3 reactor. In fact, untested new reactors with undetected technical glitches are at significantly increased risk of suffering a major accident. Fermi 1, Three Mile Island and Chernobyl were new reactors when they suffered their infamous accidents. Old reactors are also at elevated accident risk due to age-related breakdown of safety significant systems, as occurred at Davis-Besse nuclear plant near Toledo in 2002. Thus, the geriatric Fermi 2 and the brand new Fermi 3, immediately adjacent to one another, would represent the worst of both worlds, the extremes of atomic reactor risks. An accident at one could even spread to the other. (**0050-3** [Kamps, Kevin])

Response: *The EIS will include an evaluation of the risks associated with potential severe accidents including accidents that involve reactor core melts. The potential consequences of postulated design basis and severe accidents will be discussed in Chapter 5 of the EIS. The evaluation in the EIS will include an estimate of the cumulative risk of severe accidents for all units at the Fermi site.*

Comment: Accidents at atomic reactors can lead to the large-scale release of harmful radioactivity into the environment. For example, the turbine explosion at Fermi 2 reactor on Christmas Day, 1993 led to DTE's release of two million gallons of radioactively contaminated water into Lake Erie. A new reactor at Fermi will effectively double such accident risks: break in phase accident risks at the new Fermi 3 reactor, and break down phase accident risks at the deteriorated, old Fermi 2 reactor. (**0050-8** [Kamps, Kevin])

Response: *This comment refers to nuclear accidents and their consequences. The environmental impacts of postulated accidents will be evaluated, and the results of this analysis will be presented in Chapter 5 of the EIS. In addition, the evaluation will include an estimate of the cumulative risk of severe accidents for all units at the Fermi site.*

Comment: Even Fermi 1's melted down fuel from its 1966-we-almost-lost-Detroit accident, still sits in so-called temporary storage in Idaho. I thought I'd mention the Fermi 1 meltdown because John McCain didn't seem to know about it when he visited Fermi last August, and the Nuclear Energy Institute's top lobbyist in Washington, DC, in an interview on NPR radio, seemed to not know about that meltdown either. (**0058-71** [Kamps, Kevin])

Comment: The children of Hiroshima and Chernobyl are a tragic testament of the destruction of DNA by radiation. Workers at nuclear power plants face increased risks of exposure to radiation, especially when there are accidents.

Recent accidents have been the collapse of a road in Covert. A car fell through the road, broke cables, then washed downstream in the flooded Brandywine Creek. Embattled Palisades was left without communications while Verizon workers tried to sift through the ice, mud, and water to fix the severed cables. At DC Cook a rotor blade spun off, spilling fuel and causing a fire. Firemen spent hours trying to stop the blaze. That facility is shutdown and over 300 engineers are reportedly working on the problem. In Vermont a cooling tower collapsed.

The list of nuclear reactor problems is endless. Internal sabotage may be another issue. Palisades has had repeated incidents over the decade. Safety levers are glued down, and recently workers were locked in the reactor until the next shift arrived. Workers were unable to phone out for help. This is before the flooding incident. Fermi 3, and any other new nuclear reactors, may face internal problems. Even with employee screenings things can happen.

In the 1990's, the day they almost lost Detroit, Fermi had a near meltdown, and the plant was flooded with water to cool it. The contaminated water was released into Lake Erie, despite efforts to stop it. We are always a heartbeat away from Chernobyl. To think that cannot happen here is ignorance and arrogance.

At an environmental conference I attended, Dr. Helen Caldicott gave a dramatic slide show of the results of Three Mile Island. Nature has mutated. In the area surrounding the nuclear power plant, dandelions have three heads, animals were born with extra appendages, women miscarried. Nothing will ever be the same there. (**0059-13** [Barnes, Kathryn])

Comment: The children of Hiroshima and Chernobyl are a tragic testament to the destruction of DNA by radiation. Workers at nuclear power plants face increased risks of exposures to radiation, especially when there are accidents." Recent accidents have been the collapse of a road in Covert. A car fell through the road, broke cables, then washed downstream in the flooded Brandy-wine Creek. Embrittled Palisades was left (**0083-23** [Barnes, Kathryn])

Response: *These comments refer to nuclear accidents and their consequences. The environmental impacts of postulated accidents will be evaluated, and the results of this analysis will be presented in Chapter 5 of the EIS. The reference to Hiroshima is beyond the scope of the analysis in this EIS, and it will not be addressed in the EIS.*

Comment: The 50 mile plume, which is considered to be the area of greatest impact, is much shorter than what I perceive as the hazard zone for the reactor planned to be built, and this is true in several ways. First off, it's obvious that winds and waterways carrying fallout from a supposed meltdown or military strike explosion are going to keep carrying radioactive materials far beyond 50 miles.

In the case of Chernobyl, as for any reactor meltdown, people, animals, and agriculture, air, water and soil, beyond 300 miles were and are directly adversely affected. To arbitrarily set the limits at 50 miles must be slightly convenient for both the Nuclear Regulatory Commission and industry, in this case DTE. But it dramatically shorts the public commons. Actually wind currents from Chernobyl have spread all around the world, and much may have precipitated into the Great Lakes. Any meltdown or blast from any one of the Fermi's would likely take out the other two nearby facilities, causing even greater calamities. There is much more to be considered regarding physical distance. (**0058-81** [Newnan, Hal])

Response: *Chapter 5 of the EIS will include an evaluation of the risks associated with potential severe accidents including accidents that involve reactor core melts. The evaluation will include estimates of health and economic risks to a distance of 50 mi from exposure to the plume and from exposure to contaminated land and water. These risks will be compared with risks associated with the existing units. The NRC staff has determined that consequences beyond 50 mi are very small. In addition, the severe accident consequence analysis assumes a complete wash down of the contaminated plume between 40 and 50 mi of the accident.*

Comment: If a major waste leakage or a meltdown were to occur, a water source critical to millions would be in jeopardy. Pure water on planet Earth is a major concern now. Who knows how costly, pervasive and long-lasting that destruction would be? (**0072-2** [Timmer, Marilyn])

Response: *The potential consequences of postulated design basis and severe accidents will be discussed in Chapter 5 of the EIS.*

D.1.16 Comments Concerning the Uranium Fuel Cycle

Comment: Where do you present a thoroughly responsible management method for the full cycle of radioactive materials, front to back end, including its risks during transport, storage and management? (**0004-6** [Carey, Corinne])

Comment: Now Fermi has been there and running for quite some time and knock on wood will continue to do so safely. But my major concern to this what is going to happen to the waste produced at the plant? Yucca mountain was discussed and it still hasn't be approved for depository purposes of nuclear waste. So what happens, where does this go? I would like to think that nuclear energy is one of our future sources of power, but where does the waste go? (**0013-1** [Sanchez, Mira])

Comment: Nuclear Waste: first and foremost, there is nothing environmentally responsible or sustainable in nuclear waste. High level radioactive waste will be with us for thousands of years. We do not have any depository for the waste even after decades of analysis and debate. Even if the proposed Yucca site were opened today it would be filled by the time the waste of Fermi 3 and other proposed nuclear plants are operating. Given this reality, there is no foundation for assuming that there will be a political or technological solution to this highly toxic material. Creating more nuclear waste when there is no place to put what we already have is akin to financial institutions creating investment vehicles when they had no understanding of the financial risk or financial assets unpinning the offerings. We are all realizing the folly of that attempt. Simply put, creating more nuclear waste is an additional fouling of our home, our nest, our earth. (**0016-2** [Rivera, Gloria])

Comment: The nuclear fuel chain is complex, impossible to monitor, usually effects poor and indigenous communities, produces substantial amounts of toxic and radioactive waste and has tragic consequences for human health and the environment. It is a cycle of destruction at every step.

Environmental concerns must start at the beginning of the cycle and not at the power plant. In terms of radiation doses and number of people affected, uranium mining is one of the very hazardous steps in the cycle. Mining is one of the most CO2 intensive industrial operations. Mining contaminates drinking water from aquifers, rivers, lakes and streams with arsenic, radium, thorium and other heavy metals. Tailings, which become hills of fine sand-like solids, retain 80-90 % of the radioactivity of the ore that is left in piles to blow in the wind. Thorium 230 in tailings decays into radium-226, which in turn decays into radon-222, which can cause lung cancer. The radioactive hazards of tailings will persist for over 100,000 years.

The conversion of yellowcake to Uranium Hexafluoride UF6 creates airborne and waterborne uranium and chemicals such as hydrofluoric acid, nitric acid and fluorine gas. Uranium is an alpha emitter and is extremely hazardous to ingest or inhale.

The enrichment process includes discharges of polychlorinated biphenyls [PCB'S], chlorine, ammonia, nitrates, zinc and arsenic. The two enrichment plants in Portsmouth, Ohio and Paducah, Kentucky released 818,000 pounds of Freon in 1999. There are over 700,000 tons of uranium hexafluoride in decaying metal canisters at Ohio, Kentucky and Tennessee sites. (**0019-2** [Schemanksi, Sally])

Comment: The fission process at a nuclear power plant creates over 240 dangerous fission products. Some of these radioactive wastes have hazardous lives of tens of thousands of years. The NRC, in evaluating these hazardous radioactive compounds, stated they will remain well above unrestricted release levels for a period of time far exceeding the known lifetime of any manmade structure. (**0019-7** [Schemanksi, Sally])

Comment: Theoretical hypotheses that conclude that radioactive substances can be handled and stored safely, without incident, do not match up with reality. No substantial proof has ever been presented through past experiences or through extensive testing that it is even possible to build a safe, leak proof dump. Any construction worker will tell you control of the movement of water is impossible. We have no control over the movement of a substance through the surface and subsurface of the earth. We cannot predict a stable society for hundreds, less thousands of years, nor can we prevent earthquakes, tornadoes, wars, terrorism, human error or common traffic accidents involving transport of radioactive waste.

The nuclear industry has created an elaborate scheme to divert responsibility for this dangerous radioactive waste. If these wastes were so harmless and a safe technology existed to handle them, the generators would remain titleholders. The nuclear industry has billions of dollars and a slate of experts. Their conclusions are very clear: They do not want title to this waste. There is no safe technology. (**0019-9** [Schemanksi, Sally])

Comment: I am very concerned about the nuclear waste - both high and low levels of radioactive nuclear waste that's already existent. The possibility of adding more is frightening. There are currently 104 nuclear powerplants in the U.S. To add to that number, with no long-term plan in sight flies in the face of good judgment. The possibility of an additional plant in this area (Monroe Michigan) could be a threat to the common good. (**0021-1** [Hart, Donna])

Comment: For some time, I have been aware of a movement toward building a third Fermi Nuclear Power Plant. Having studied issues regarding nuclear power, I feel great concern over such a possibility.

This concern focuses especially on what I perceive as an inability of the industry and the DOE to safely store nuclear waste. The efforts at Yucca Mountain have proved unsuccessful. Some nuclear waste has a half life of thousands or millions of years. Producing it without a plan for its safe storage seems extremely irresponsible. The current practice of temporarily storing the waste at the nuclear power plant site is not a satisfactory solution.

We place a heavy burden on our generation and on the generations to come when we produce such a dangerous product which we do not know how to safely store. Decisions made about this issue bear heavy responsibility.

I am relying on you to carry out your duty as a government agency responsible for enforcing EPA regulations and for granting or denying a license to operate a nuclear power plant. Please advise me how the NRC is going to deal with the issue of nuclear waste and what impact the reality of its dangers will have on the licensing decision. (**0022-1** [Rabaut, Martha])

Comment: I am concerned about the issue of the storage of radioactive waste, which should be a major consideration in the construction of the proposed nuclear power plant: Fermi III.

First, although nuclear power plants supply almost 20 percent of the electricity in the United States, the dangers of nuclear waste far outweigh the advantages. There is no safe place for storage in our country. Yucca Mountain is an unstable geologic location. (**0023-1** [Mechtenberg, Marilynn])

Comment: Finally, what about the waste sites? In a geologic repository, isn't seepage a possibility? If the waste got into the soil, vegetation growing from it, if eaten, could harm individuals. Also, radionuclides are carcinogenic. (**0023-3** [Mechtenberg, Marilynn])

Comment: My concern is that thus far U.S. has not yet successfully provided sites for the existing radioactive nuclear waste from its 104 nuclear plants. The effort of the Yucca Mountain, Nevada site is failing. There are millions of gallons of radioactive waste, thousands of tons of spent nuclear fuel and materials and huge quantities of contaminated soil and water at 108 sites throughout U.S. These wastes are endangering plant, animals and humans who inhale, ingest and absorb them. I am asking the U.S. Nuclear Regulatory Commission and the DOE to address this serious deficiency before any plans are proposed for any new construction of nuclear power plants. (**0025-1** [Van Ooteghem, Rose Bernadette])

Comment: My concern is the Storage of the Spent Rods since nothing has been determined as yet of where or how this problem will be solved. We now know that President Obama will withdraw the License Application for Yucca Mountain site.

Since I reside on the shores of Lake Erie, I have a real concern of storing the waste in cement casks for an unlimited number of years without any data on file for safety of leaching and seeping... I am requesting a reply from the NRC to inform me of how these problems will be addressed. (**0030-1** [Conner, Mary V.])

Comment: The nuclear waste issue is still unresolved. Yucca Mountain is above the water table while Canada plans to put mid-level waste under Lake Huron, so it all seems like a big guess as to which is the safest disposal method. The transportation routes to Yucca Mountain endanger every American home. With worst case scenarios to consider with every shipment, thousands planned, too risky. If on site storage becomes the future of the waste issue instead of Yucca Mountain, then how will that affect the water rights of the Great Lakes region? (**0031-3** [Rysztak, Robert])

Comment: The nuclear waste issue is still unresolved. Not only is Yucca Mountain a bad idea, all the transportation routes to get the waste to Nevada is even worse, as ideas go. (**0032-6** [Rysztak, Robert])

Comment: There is also the "on the ground" literally storage of onsite radioactive waste, awaiting final resolution of the Yucca Mountain question in terms of national storage of waste. How will construction and operation of the new facility compound this situation as it appears as I write this, the question of Yucca Mountain remains unresolved in the permanence of the decision to build the Nevada facility, as well as transportation of these materials to the facility. (**0038-3** [D'Amour, James Carl])

Comment: Reliance on nuclear energy will result in creation of mining waste at whatever is the source of nuclear fuel. I believe that we should minimize mining impact on our planet. (**0039-5** [Mitchell, Rita])

Comment: The NRC does not regulate the disposition of the nuclear waste rods from the new proposed plants. It was noted in the last NRC Meeting that I attended, that there are some 101 Nuclear Power plants now operation in the US, and that by 2020 or sooner, if all the waste rods from these plants were shipped to Yucca Mt in Nevada, it would be filled to capacity. To date, no state has allowed moving these waste rods across their borders to be moved to the proposed Yucca Mt site. I was also recently advised that Yucca Mt. is in an earthquake region with possible ground water contamination and exposure to the waste rod radiation. (**0041-3** [Englund, Lance])

Comment: There is still no final storage solution for nuclear waste that remains deadly for 100,000 years. How crazy can we be to risk the possibility of destroying every living thing in this region should the temporary cement casks leak. Until there is a permanent storage solution, a permit should be denied. Even then, the danger of transporting such dangerous waste negates any possible benefit from such a plant. (**0047-2** [Bettega, Gayle])

Comment: Even more alarming is the fact that Fermi 2 has nowhere to store it's low level radioactive wastes at this time. That issue must be solved before there is even a consideration of Fermi 3. (**0047-4** [Bettega, Gayle])

Comment: When reactors were originally built, nuclear proponents optimistically hoped that the nuclear waste problem would somehow be solved in a timely fashion. Now we know better. Wherever a reactor is built, the high-level waste that it produces will stay on site for decades, and possibly even in perpetuity. The proponent should be required to justify siting a nuclear reactor near one of the largest and most important bodies of fresh water on the North American continent, given the fact that these wastes may remain there indefinitely. Would NRC willingly approve a high-level waste repository right on the edge of the Great Lakes? (**0048-5** [Edwards, Gordon])

Comment: The proponent should be required to examine the life-cycle environmental impacts of the reactor, including the steps in the uranium fuel chain: perpetual management of radioactive tailings, total reclamation of uranium mining areas, health and environmental impacts of enrichment facilities, as well as eventual reprocessing of irradiated nuclear fuel at some future time. This proponent should be required to include in this examination an accurate summary of the environmental impacts to date of such activities in various locales throughout the USA and elsewhere in the world. (**0048-6** [Edwards, Gordon])

Comment: Radioactivity releases occur not only at reactors, but at every step of the nuclear fuel chain. Accurate accounting of all radioactive wastes released to the air, water and soil from the entire reactor fuel production system is simply not available. The nuclear fuel chain includes uranium mines and mills (often located near indigenous peoples communities), chemical conversion, enrichment and fuel fabrication plants, reactors, and radioactive waste storage pools, casks, trenches and other dumps. Fermi 3 would increase the risk that new uranium mining in the Great Lakes basin, such as at Eagle Rock near Marquette and the Keweenaw Bay Indian Community in Michigan's Upper Peninsula, would go ahead. (**0050-10** [Kamps, Kevin])

Comment: There are no safe, sound solutions for the deadly radioactive wastes that Fermi 3 would generate. The Obama administration has pledged to cancel the proposed Yucca Mountain dumpsite in Nevada, due to its geologic unsuitability. Reprocessing irradiated nuclear fuel, to extract plutonium for supposed re-use, risks nuclear weapons proliferation and disastrous radioactive contamination of the air and water, and would cost taxpayers hundreds of billions of dollars. On-site storage in indoor pools or outdoor dry casks, as currently done at Fermi 2, risks catastrophic radioactivity releases due to accident or attack, as well as eventual leakage due to breakdown of the storage containers. A 2001 NRC report, for example, revealed that 25,000 fatal cancers could result downwind of a waste pool fire. A 1998 anti-tank missile test at the U.S. Army's Aberdeen Proving Ground showed dry casks vulnerable to attack. Even consolidating wastes at centralized interim storage centers would leave them vulnerable to accidents or attacks, and risks environmental injustice, as low income communities of color are most often targeted. All away-from-reactor storage proposals would risk severe accidents or attacks upon shipping containers on the roads, rails, or waterways, including the Great Lakes. Even Fermi 3's so-called low level radioactive wastes have nowhere to go. Barnwell, South Carolina has closed its dumpsite to Michigan wastes. Every low level dump opened in the U.S. has leaked, and most have had to be closed. An imminent Texas dump may be licensed to accept wastes from Fermi 3 sometime in the future, but puts the underlying Ogallala Aquifer at risk of radioactive contamination. Especially considering cleaner alternatives, such as efficiency and renewables, it is a moral transgression against future generations to create a forever deadly hazard like radioactive waste, just to generate 40 to 60 years of electricity. Fermi 3 would increase the risk that Michigan would be targeted for a national high-level radioactive waste dumpsite, and/or a regional low level dump, as has occurred in the past. (**0050-2** [Kamps, Kevin])

Comment: I am not as confident that we will learn how to dispose of nuclear waste and we already have 2 plants here in Monroe, whose waste is waiting for someone to figure out how to dispose of it. (**0052-2** [Fedorowicz, Meg])

Comment: How we will be storing the radioactive waste. (**0052-4** [Fedorowicz, Meg])

Comment: The US has had since the 1940s to solve the problem of safely storing radioactive waste from nuclear power plants. It is still not solved. And so much of it sits, in temporary storage arrangements. Some has been moved from place to place, hoping for a final resting place, but it has found no welcome. Until this issue is solved for the already spent fuel, <u>the NRC should not approve any licenses for new facilities</u>. (**0053-4** [Nordness, Dorothy])

Comment: It is unacceptable to dispose of this lethal waste in a water-soluble medium, rock salt, in a State practically surrounded by one of the largest bodies of fresh water on Earth. (**0054-2** [Drake, Gerald A.])

Comment: Dr. James Watson, Professor of Molecular Biology, Harvard University, and winner of the 1962 Nobel Prize for Medicine stated "an increasing number of our most informed scientific minds have very deep qualms about the widespread introduction of more nuclear power... I fear that when the history of this century is written, the greatest debacle of our nation will be... our creation of vast armadas of plutonium, whose safe containment will represent a major precondition for human survival, not for a few decades, or hundreds of years, but for thousands of years more than human civilization has so far existed." (**0054-5** [Drake, Gerald A.])

Comment: I would urge the scoping study to take a very hard look and examination of the risks that are involved in not having a safe way of disposing nuclear waste. (**0058-101** [Holden, Anna])

Comment: Uranium mining: And uranium mining is brought up in the Environmental Review. Uranium mining, the milling, the refining, the conversion, the enrichment, the transport, all carry a hefty carbon footprint. You cannot separate uranium from nuclear power plants. These processes, especially mining, is extremely toxic radioactive waste that affect the health of local communities and local watersheds.

Fish do not live in the Serpent River near where the uranium tailing piles are piled up there. These radioactive wastes last virtually forever. The lethal irradiated fuel that is produced has to be kept isolated from the food chain and our watersheds for over a million years, and the U.S. Government acknowledges that. We don't have containers that will last that long. So what we have essentially done is condemn every generation following us to guarding these wastes from terrorists, to watching these wastes for leaks, and then repackaging them when they leak -- a dangerous, expensive, and maybe impossible job. (**0058-21** [Cumbow, Kay])

Comment: Then we want to address the problem of our long term costs, and we're talking thousands, tens of thousands, millions of years of exposure to radioactives. I don't think there's a proponent of nuclear energy here today that will say both permitted and accidental releases do not happen. And they do not happen only at reactors. They happen at every step of the fuel change. Accurate accounting of all radioactive wastes, released to the air, water, soil, from the entire reactor fuel production system, is simply not available.

The nuclear fuel chain includes uranium mines and mills, chemical conversions, enrichment, and fuel fabrication plants, reactors and radioactive waste storage ponds, casks, trenches, and other dumps.

Even new reactors like Fermi 3 will release significant amounts of radioactivity directly into the environment. These would include so-called planned and permitted releases from the reactor's routine operations, as well as unplanned releases from leaks and accidents. (**0058-33** [Yascolt, Stas])

Comment: The low level radioactive wastes generated at the Fermi nuclear power plant are piling up and piling up and piling up. There's no place for them to go. Fermi is actually adding to our problems, and we're to build yet another one? (**0058-38** [Yascolt, Stas])

Comment: there is nothing environmentally responsible or sustainable in nuclear waste. High level radioactive waste will be with us for thousands of years. We do not have any depository, even after decades of analysis and debate. As we all know, even if Yucca were to be approved today, it would be filled by the time the waste from Fermi 3 and other proposed nuclear reactors would be online.

Given this reality, there is no foundation for assuming that there will be a political or technological solution to this highly toxic material. Creating more nuclear waste when there is no place to put what we already have, is akin to the financial institutions creating, investment vehicles when they had no understanding of the financial risk or the financial assets underpinning the offerings that they were giving.

We are all today realizing the folly of that attempt in the financial world. Simply put, creating more nuclear waste is an additional fowling of our home, our nest, our earth. (**0058-67** [Weber, Margaret])

Comment: my comments today are about the radioactive waste impacts of the proposed Fermi 3 reactor. Previous speakers in favor of this proposal spoke of Fermi 3 as environmental friendly, emissions free and clean. I would say that it is none of those things, based upon the radioactive waste generation alone. Electricity is about the fleeting byproducts of atomic reactors. The actual product is forever deadly radioactive waste.

There is no safe, sound solution for these radioactive wastes that would be generated by Fermi 3. Over 65 years after Enrico Fermi first split the atom during the Manhattan Project in Chicago to create the bomb, and over 50 years since commercial nuclear power began in the United States, we still do not have a geologic repository for permanent disposal of high level radioactive waste. No country on the planet that has nuclear power has a geologic repository. (**0058-70** [Kamps, Kevin])

Comment: The proposed dump site at Yucca Mountain, Nevada, looks very doubtful to ever open. President Elect Barack Obama has indicated he will withdraw the US Department of Energy's license application to the NRC to construct and operate the dump, due to the site's geologic unsuitability. Yucca's earthquake plagued rock formations are so fractures and fissured, that they leak water like a sieve. Any radioactive waste buried there would eventually escape into the environment, massively contaminating the drinking water supply for a farming community downstream, as well as for the Timbisha Shoshone Indian Reservation, for Death Valley National Park, and the National Wildlife Refuge, containing rare, endangered, and unique desert species.

Besides it geologic and hydrologic unsuitability, Yucca should never have been targeted in the first place. It is sacred Western Shoshone Indian land, as recognized by the so-called Peace and Friendship Treaty of Ruby Valley signed by the US Government in 1863. To the present day the Western Shoshone still conduct ceremonies at Yucca.

This environmental injustice, or radioactive racism, has also taken the form of so-called interim storage sites for high level radioactive waste, also known as parking lots dumps. The Department of Energy, the Nuclear Regulatory Commission, and the nuclear industry have targeted the Mescalero Apache in New Mexico, the Skull Valley Goshutes in Utah, and dozens of additional tribes. Although they have yet to open such a dump, such environmentally racist targeting continues still.

In December, the Department of Energy reported to Congress and the President, that a second national radioactive waste dump will be needed if new reactors, such as Fermi 3, are built. DOE reports that Michigan had previously been considered as a national dump site due to granite formations, and is now being considered again.

In addition, shale deposits are being considered for dump sites, including in Michigan and Ohio. In fact, every single Great Lakes state is on DOE's target list. The construction and operation of Fermi 3 would increase the risk that Michigan or Ohio would be targeted for a national high level radioactive waste dump. And I should add that in 1957 the National Academy of Science targeted Michigan for the salt formations in the Detroit area for this national dump site.

Other illusions of solutions are also dangerously flawed. Reprocessing or plutonium extraction from high level radioactive waste is disastrously polluting, astronomically expensive to taxpayers, and risks nuclear weapons proliferation. So-called regional interim storage, consolidating wastes at DOE sites or reactor sites such as Fermi, would simply create a radioactive waste shell game. The wastes would have to be moved again someday, effectively doubling the radioactive Russian roulette of shipping risks, or accidents or attacks on the highways, railways, and waterways, including the Great Lakes. (**0058-72** [Kamps, Kevin])

Comment: The lack of solutions means that radioactive wastes will continue to pile up at the Fermi site, vulnerable not only to accidents and attacks, but even eventual leakage to the environment as the containers degrade and fail. There is so much radioactivity in the wastes currently stored at Fermi, that releases to the environment could spell catastrophe for the entire region. A new reactor at Fermi would make this crisis much worse. Adding to the risks of eventual leakage is the fact that the hold-tight containers for dry cask storage chosen by DTE at Fermi are known to be flawed.

An industry whistle-blower, supported by an NRC dry cask storage inspector in this Midwest region, have discovered and made known that quality assurance violations on the hold-tight casks are wide spread. They question the structural integrity of the casks sitting still, let alone being transported. (**0058-73** [Kamps, Kevin])

Comment: The only real solution to the radioactive waste problem is to stop making it in the first place. Fermi 3 should be stopped because of the deadly radioactive wastes it would generate, which would remain hazardous to all life forever after. (**0058-74** [Kamps, Kevin])

Comment: The NRC's nuclear waste confidence decision is more of a con game. It's a confidence game. It's an absurd policy.

I would like to conclude by mentioning that in addition so-called low level radioactive wastes generated at the Fermi 3 and Fermi 2 are already piling up with nowhere to go at Fermi 2. Some of these wastes can deliver a lethal, fatal radiation dose within 20 minutes, and must be handled remotely and encased in radiation shielding.

The national so-called low level radioactive waste dump at Barnwell, South Carolina, closed its doors to Michigan on July 1st, 2008. Fermi 3 would increase the mounting low level radioactive waste problem for which there is no solution. It would put Michigan back on the target list for a low level radioactive waste dump.

In the 1980's seven other Midwestern states had targeted several sites in Michigan, including Riga, St. Clair County, and Ontonagon, for a regional low level radioactive waste dump, a threat that was staved off by a groundswell of grass roots citizen opposition, the same thing that will stop Fermi 3.

Currently the most likely place Fermi 3's low level radioactive wastes would be dumped is at Waste Control Specialists in Andrews County, Texas, a new dump right on the New Mexico border. This dump site risks radiological contamination of the precious Ogallala Aquifer that spans numerous Great Plains states. (**0058-75** [Kamps, Kevin])

Comment: Next is the consideration of time. It is sheer hubris, pride, to consider guarding and safekeeping all the radioactive materials for the millions of years they will remain hazardous. And I'd like to just point out that that's against the short term economic impact that I, in Warren, will experience if this plant doesn't possibly go through, as well as the people in Monroe.

Is our short term interest like the next 50, 60, 70 years really the crucial thing here? I say, no, it's not. We are dealing -- when we consider building a Fermi 3, we're acting like young boys with a science kit they don't know how to use. Any kind of toxic material, except for radioactive probably, will probably come out of that experiment. Do we really want to mess with that? No.

Okay. For one thing the proposed Fermi 3 project is a commercial industrial one, whose useful life will end in 20 to 60 years, if they're lucky. But where and how is the money for safeguarding being given to be accumulated. It's not. Right? You need to have a plan to safeguard this stuff for millions of years. And how effective can that be? 2000 years ago Jesus was born, right? How likely is that? And how effective can that be over eons involved. (**0058-82** [Newnan, Hal])

Comment: The other issue that I would like for the scoping process to focus on is the risk associated with the disposal of nuclear waste. And this, again, has already been stated by several of the speakers. We know that there is no safe disposal process at this time. This goes back to the first nuclear activity that took place in World War II. We go back that far, and there is still no clue as to how we can have any kind of protection against the radioactivity as it's involved with the nuclear waste (**0058-99** [Holden, Anna])

Comment: Lastly, my question is, where will the nuclear waste go? So far there has been no answer to that. It is not right to dump nuclear waste on Indian land. It is not safe to transport it. It is not safe to store it. There are a multitude of unsolved problems in this huge topic. That is, Cask 4 with bad welds at Palisades; beach contamination in Wisconsin where a cask blew its lid off; Yucca Mountain earthquake; fisheries flooding; overturned semis spilling radioactive waste in Arizona; et cetera. An individual in Kalamazoo County stored barrels of radioactive materials and other toxins on his land. Now authorities are trying to clean up the mess. (**0059-21** [Barnes, Kathryn])

Comment: the questions that I asked regarding the amount of spent fuel being kept at Fermi are part of my main concern that the disposal of nuclear waste, the problem of disposal of nuclear waste is a huge problem in the world, not just in the United States.

I can't argue that the Detroit Edison site is a clean site, that there are beautiful plants and animals, beautiful plants going there and animals running around, that Detroit Edison is a good neighbor. No argument against that. And I can't argue that atomic energy doesn't release carbon dioxide, it doesn't contribute to the problems that coal fired plants do. But the problem is that the waste product has not been taken care of. We've got it piled up all over the world.

I didn't attend the meeting in September, or this fall, when a group of people was here and talked about the reprocessing of spent nuclear fuel. I'm not a scientist, I don't know a whole lot about it. But from what I've read about the reprocessing of spent nuclear fuel, it is not the solution to the nuclear waste problem. It's dirty; it's done in France at a place called La Hague, that's one of the biggest places where they do it. And radioactive water is poured into the Atlantic Ocean. (**0059-44** [Kaufman, Hedwig])

Comment: There's an outfit called Clean and Safe Energy, which is a proponent of reprocessing of spent nuclear fuel. The GNEP -- what's it called? The Global Nuclear Enrichment Partnership is an agency that was formed by the federal government a couple of years ago, in which countries are invited to join this partnership and they will be the exclusive providers of the reprocessing for spent nuclear fuel. If the problem of the disposal of nuclear spent fuel would go away I'd feel more comfortable about nuclear energy. But, I don't because it hasn't gone away. (**0059-46** [Kaufman, Hedwig])

Comment: The assessment must address the unsolved problem of long term storage of radioactive waste from operation of the proposed nuclear reactor. (**0059-51** [Wolfe, Joan])

Comment: I would like to leave you with one comment by E.F. Schumacher, author of Small Is Beautiful. It is a book that was popular in the late `60s, `70s, and he's referring to nuclear power.

"No degree of prosperity could justify the accumulation of large amounts of highly toxic substances which nobody knows how to make safe and which remain incalculable danger to the whole of creation for historical or even geological ages. To do such a thing is a transgression against life itself, a transgression infinitely more serious than any crime perpetrated by man. The idea that a transgression is an ethical, spiritual, and metaphysical monstrosity, it means conducting the economical affairs of a man as if people did not matter at all." (**0059-65** [Keegan, Michael])

Comment: The proponents of nuclear energy are willing to trade two generations of electricity for hundreds of thousands of years of deadly waste. Just 10,000 years ago where we are sitting tonight, there was a sheet of ice a mile thick. And who can predict what the earth is going to be like a short thousand years from now? (**0059-68** [Farris, Mark])

Comment: I am terribly concerned about nuclear waste. There is no long term solution for its storage.. There are over 100 nuclear power plants in operation today which are temporarily storing the waste on site. Until we can find or create a long term solution for such waste, we should not construct a new nuclear power plant. We are poisoning our environment, and ourselves. Radionuclides are carcinogenic... I am asking that you let me know what you know about permanent storage of nuclear waste. (**0061-1** [Richmond, Roberta])

Comment: I am concerned about the ongoing problem of storing nuclear waste. President Obama has indicated that he will withdraw the license to operate the facility at Yucca Mountain. How will the industry and the Department of Energy deal with the safe long-term storage of nuclear waste? Temporary storage of the waste on site is unacceptable. Unless there is a fail-proof facility to store thousands of tons of waste that has already been generated, building a new nuclear power plant would be a waste of money. This issue is not only a concern to me. It is a concern to the people in Monroe and all of Michigan for years to come. I hope that as a government agency, you will carry out your responsibility for enforcing regulations in this manner. (**0069-1** [Eddy, Dorothy])

Comment: I am deeply concerned about the potential risks to future generations of the deadly nuclear waste that is stored at the Fermi II site. The idea of building a Fermi III before dealing with this major concern is most confounding to me. (**0072-1** [Timmer, Marilyn])

Comment: We have no business building a second nuclear power plant in Monroe County Michigan until we have established a permanent place to dispose of the spent nuclear fuel produced by the power plants we are currently operating. NO NEW NUCLEAR PLANTS UNTIL THE SPENT FUEL DISPOSAL PROBLEM IS SOLVED. (**0073-1** [Ripple, John])

Comment: The spent fuels from Fermi II reactor are currently being stored on site, as are the radioactive wastes from 104 other currently active reactors. As you are aware, some of these elements in the spent fuels will remain radioactive for millions of years, continuing to impact the health of man and the environment. Until the spent fuels from all nuclear reactor sites have been removed to a safe depository, I ask that no more permits to build be issued. To do so would be irresponsible. Please respond to my concerns. (**0076-1** [Ripple, Florence])

Comment: My concern is how the industry and DOE are dealing with the safe, long-term storage of nuclear wastes, some which have half-lives in the thousands of years and some in millions of years. The efforts at Yucca Mountain, Nevada are failing. As a matter of fact, President Obama has indicated he will withdraw the license application to operate the facility. I understand the concern at Yucca Mountain is the unstable geologic strata.

With the opening of Yucca Mountain in doubt, there is no facility anywhere in the United States to store waste for the long term. Meantime the 104 nuclear power plants in operation today are temporarily storing the waste on site. That is unacceptable. Until there is a reliable, failproof facility to store the thousands of tons of waste already produced, a moratorium on new construction of nuclear power plants should be declared.

Not only is this issue a big concern to me, it is a concern for my children and grandchildren. As the government agency responsible for enforcement of the regulations for nuclear power and the radioactive waste that is generated, I am counting on you to carry out your duty. Please advise me how the NRC is going to deal with the enforcement mandate. (**0077-1** [Feldpausch, Regina A.])

Comment: How and where will the highly radioactive waste be stored? What are the political challenges regarding storing radioactive waste? How will these challenges be addressed? (**0081-3** [Ryan, Janet])

Comment: Nuclear Waste: first and foremost, there is nothing environmentally responsible or sustainable in nuclear waste. High level radioactive waste will be with us for thousands of years. We do not have any depository for the waste even after decades of analysis and debate. Even if the proposed Yucca site were opened today it would be filled by the time the waste of

Fermi 3 and other proposed nuclear plants are operating. Given this reality, there is no foundation for assuming that there will be a political or technological solution to this highly toxic material. Creating more nuclear waste when there is no place to put what we already have is akin to financial institutions creating investment vehicles when they had no understanding of the financial risk or financial assets unpinning the offerings. We are all realizing the folly of that attempt. Simply put, creating more nuclear waste is an additional fouling of our home, our nest, our earth. (**0082-33** [Weber, Margaret])

Comment: The assessment must address the unsolved problem of long-term storage of radioactive waste from operation of the proposed nuclear reactor. These serious environmental and health costs outweigh any potential benefits of building Fermi 3. (**0083-5** [Wolfe, Joan])

Response: *The safety and environmental effects of long-term storage of spent fuel onsite have been evaluated by the NRC and, as set forth in the Waste Confidence Rule at 10 CFR 51.23, the NRC generically determined that if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in any such reactor and generated up to that time. The impact of the uranium fuel cycle, including disposal of low-level radioactive waste and spent fuel, will be considered in Chapter 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S-3, Table of Uranium Fuel Cycle Environmental Data. Per 10 CFR 51.51 and the guidance in Section 5.7 of NUREG-1555, the NRC staff will rely on Table S-3 as a basis for the impact of uranium fuel-cycle impacts. Health impacts associated with reactor operations will be addressed in Chapters 4 and 5 of the EIS.*

Comment: The CO2 that is produced by uranium mining, milling and further processing must be taken into account, as well as the ecological devastation to watersheds and communities where the uranium is mined and processed. (**0051-6** [Cumbow, Kay])

Response: *The impact of the uranium fuel cycle, including carbon emissions, will be considered in Chapter 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S-3, Table of Uranium Fuel Cycle Environmental Data. Per 10 CFR 51.51 and the guidance in Section 5.7 of NUREG-1555, the NRC staff will rely on Table S-3 as a basis for the impact of uranium fuel-cycle impacts.*

Comment: President-Elect Obama has indicated he will withdraw the Department of Energy's license application to the Nuclear Regulatory Commission to operate the Yucca Mountain, Nevada, radioactive storage facility because of its geologic unsuitability.

Last December the Department of Energy reported to Congress and President Bush a second radioactive waste disposal site will be needed if new reactors like Fermi 3 are built. (**0058-91** [Feldpausch, Larry])

Comment: My two questions: Has Michigan been chosen as one of our Great Lakes states as a site for this radioactive disposal? And secondly, where in the State would the disposal site be located, the upper peninsula or the lower peninsula? And why would the decision be made to choose one of our peninsulas? I think it's important, I think it's incumbent upon the NRC to get those two questions answered because I think that they ought to be factored in their decision making. (**0058-92** [Feldpausch, Larry])

Response: *Potential future high-level and low-level radioactive waste disposal facilities are out of the scope of the EIS, which is concerned with the potential environmental effects of construction and operation of the proposed Fermi 3 unit.*

Comment: Spent fuel being considered waste is one of the things that I have been very adamant that we're really misnaming it. It is stuff that we are wasting that shouldn't be. Fuel element that comes out of the reactor when it's being changed, still has heat energy rev of about 12,000 BTU per hour, which can last over 10 years, by using the heat available from those fuel bundles. (**0058-126** [Meyer, Richard])

Response: *This comment expresses concern that current spent fuel management practices do not take advantage of waste heat generated by the spent fuel. The comment provides no new information related to the environmental review and will not be considered further in the EIS.*

Comment: And then look at where our uranium comes from. For the past decade and more, 50 percent of US nuclear fuel, the uranium that goes into it, has come from Russia. Given current headlines about Russian power politics cutting off natural gas supplies to Europe, how smart is that to rely on Russia like that? Other US uranium supplies comes from indigenous peoples lands in places like Canada and Australia, and the Navajo and Pueblo lands of the desert southwest, associated with many environmental justice violations. (**0059-77** [Kamps, Kevin])

Response: *This comment discusses the available uranium-ore supply and associated potential impact on the viability of the nuclear industry and is outside the scope of the environmental review. The comment will not be evaluated in the EIS.*

Comment: (2) When does Fermi 2's current operating license expire?
(3) How much spent fuel is stored at Fermi 2 now and how much will be stored at Fermi 2 by the expiration date of Fermi 2's license.
(4) Where will Fermi 3's spent fuel be stored if the Nevada federal government storage facility is not built in the near future?
(5) What will be the annual rate of accumulation of spent fuel from Fermi 3? (**0083-27** [Kaufman, Hedi])

Response: *The term of Fermi 2's operating license and its relationship to the proposed Fermi 3 unit will be considered in Chapter 7 of the EIS. In addition, the quantity of spent fuel stored at Fermi 2 and its relationship to the proposed Fermi 3 unit will be considered in that chapter. The impact of the uranium fuel cycle, including disposal of low-level radioactive waste and spent fuel, will be considered in Chapter 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S-3, Table of Uranium Fuel Cycle Environmental Data. Per 10 CFR 51.51 and the guidance in Section 5.7 of NUREG-1555, the NRC staff will rely on Table S-3 as a basis for the impact of uranium fuel-cycle impacts.*

D.1.17 Comments Concerning Transportation

Comment: Second, the danger of the transportation of nuclear waste materials to a potential storage site is significant. If they are transported by train, one has only to think of the recent derailment of a train, the devastation of which made the national news. If derailment occurred, the location of the load of waste would endanger people living in the vicinity. (**0023-2** [Mechtenberg, Marilynn])

Response: *The environmental impacts of transportation of radioactive wastes to and from nuclear power facilities will be addressed in Chapter 6 of the EIS.*

D.1.18 Comments Concerning Cumulative Impacts

Comment: How many non-consequentials impacts does it take to become consequential? (**0004-9** [Carey, Corinne])

Comment: Monroe county's three power plants, two coal burning plants, and the nuclear plant Fermi 2, together account for 25% of water withdrawals from the great lakes. Fermi.3 would add to these withdrawals, all from Lake Erie.

It is anticipated that over the next 60 to 70 years global warming will lower the level of Lake Eire from three to six feet. This change must be taken into account, as the period of change overlaps, the working lifetime of the Fermi 3 plant. (**0007-1** [Newman, Kent])

Comment: In addition, thermal pollution from the two coal plants, in Monroe county, Fermi 2 and Fermi 3, added to higher average water temperatures for Western Lake Erie, together, could harm plants, and animals living in the water. (**0007-2** [Newman, Kent])

Comment: I live in a community that has been bombarded by an oil refinery, a salt mine, a city-owned waste treatment facility and a compost facility. No one can tell me that none of these facilities do not do physical, psychological and monetary harm to citizens. Coal is not clean. Nuclear energy/waste is not safe. (**0017-2** [Leonard, Dolores])

Comment: The discharges into Lake Erie and the fallout from the stacks and the accidental discharges are extremely problematic. Many scientists believe that the Great Lakes are at a tipping point. Numerous sources of intensifying stress can overwhelm the natural processes that stabilize and buffer a system from permanent change. Ecosystems can recover from many kinds of disturbances but are not infinitely resilient. (**0019-6** [Schemanksi, Sally])

Comment: As a company who will make a difference, I ask you to face the cumulative, long-term, indirect, long distance and global consequences of a Fermi III and other alternatives. (**0027-1** [Askwith, Annemarie])

Comment: The Environmental Impact Statement (EIS) must address the cumulative impacts of water usage by the proposed plant and existing power plants in Monroe, Toledo, Bay Shore, and Port Clinton. Water intake and usage analyses should include Lucas, Ottawa, and Wayne Counties as well as Monroe County. (**0028-1** [Shiffler, Nancy L.])

Comment: The cumulative impact of another fish kill source should be considered, and the impingement and entrainment data from Fermi 2 needs to be updated. The impact on the Maumee Bay estuary should be included in the analysis. (**0028-3** [Shiffler, Nancy L.])

Comment: The COL discusses its scoring system for projecting impacts on the local and overall ecology of Lake Erie and the project vicinity. The Department believes that the COL should look at both the overall impacts and the cumulative impacts on the local level as well as basin wide. As an example, the COL indicates that the 34,000 gpm of cooling water is a tiny proportion of the whole of Lake Erie, so the impact would be small. It then states that the local potential for withdrawals is not likely to change significantly so the cumulative impacts would be small. The Department maintains that determining the significance or lack thereof, of the local impact of the proposed cooling water use by comparing it to the volume of water in the entirety of Lake Erie is inappropriate. Impacts at the local level are operating at very different scales from those happening lakewide, though certainly both can be impacted by the proposed development and operation of this plant. Furthermore, rationalizing the significance of those impacts, local or cumulative, on the basis that withdrawals are not likely to change does not adequately take into account the impact this development will have either on a local or lakewide (cumulative) scale. Therefore:

Have the waterbody wide effects of preparation of this plant been adequately explored? In conjunction with existing facilities using cooling water from Lake Erie in other states and Canada? (**0029-6** [Freiburger, Chris])

Comment: A new reactor at Fermi would add to the cumulative impact of such routine releases already occurring at operating atomic reactors, namely Fermi 2 and Davis-Besse, on Lake Erie's shallow, fish-rich western basin. (**0050-12** [Kamps, Kevin])

Comment: NRC should address the additional radioactivity exposures caused by discharges from the burning of coal at Monroe County's two fossil fuel plants. Radiation monitoring should be installed at those facilities. The cumulative impacts and incremental changes caused by a new reactor should be evaluated. (**0050-14** [Kamps, Kevin])

Comment: Monroe County already hosts DTE's Monroe (Coal) Power Plant, at 3,000 megawatt-electric, one of the largest in the U.S. It also hosts DTE's Fermi 2 nuclear reactor, as well as Consumers Energy's Whiting Coal Plant. Due to such facilities, many billions of gallons of water are withdrawn from Lake Erie by Monroe County each and every day an incredibly high percentage of water usage in all of Michigan and returned super-heated. Additional nuclear reactors and coal plants in northwest Ohio also contribute heat to Lake Erie's western basin. As already seen throughout the Great Lakes, such overheating could even force the shutdown of thermo-electric power plants on hot summer days, significantly impacting the reliability of the electric grid. (In fact, Fermi 3, at 1,560 megawatts-electric, would introduce significant grid instability if it ever shut down for an extended period for any reason whatsoever, thus increasing potential electricity reliability risks that could well require massive purchases of expensive replacement power.) (**0050-19** [Kamps, Kevin])

Comment: Fermi III will be located near a coal firing plant, which emits sulfur dioxide, nitrous oxide, carbon dioxide and "fine particulate matter," which pose health dangers from lung disease to stroke. Does the radiation emitted from nuclear power plants interact with the emission from coal fired plants operating in close proximity to the nuclear plant? How much more dangerous are the combination of releases than would be if the emissions did not interact? (**0055-3** [Guthrie, Patricia])

Comment: And I wish that the Environmental Impact Statement would include the following considerations, which when I reviewed it [Environmental Report], it did not.

One is the projection of climate change, where they predict that the levels of Lake Erie could drop from 3 to 6 feet. Considering that Maumee Bay, which would be impacted by this plant, whose average was up to 5 feet, western Lake Erie is 24 feet; 3 to 6 feet is very considerable. So please look at climate change as a factor in your consideration for Fermi 3. (**0058-46** [Bihn, Sandy])

Comment: DTE's coal fired power plant, right next door to this, is the fourth largest power plant in North America. If this permit is to be granted, that plant uses 1.9 billion gallons of water a day, it kills millions of fish every day. Hundreds of thousands are impinged, millions are entrained. There should be a cooling tower and there should be mercury reductions at the coal fired power plant as part of the mitigation considerations. (**0058-49** [Bihn, Sandy])

Comment: Also, the environmental impact should consider the impact on sediments and water quality in the basin both from the additional existing plants, and then what would happen with the addition of Fermi 3. (**0058-50** [Bihn, Sandy])

Comment: There is open dumping, over 500,000, up to 800,000 cubic yards a year from the Toledo shipping channel, that go right out in the waters here that you can see here in Western Lake Erie, that would be impacted by the Fermi 3. The turbidity from those waters should be considered as part of the Environmental Impact Statement of the waters they're drawing in. (**0058-51** [Bihn, Sandy])

Comment: Also, the amount of shoreline that doesn't freeze, as someone said, from the Bruce power plant. I can tell you that looking last night -- I was driving home from a meeting -- I can see five power plants today from the shoreline on Bay Shore Road and Oregon, Ohio. You can actually see Bay Shore Power Plant, you can see Consumers Power Plant, you can see DTE, and you can see the smoke from Davis Besse, and you can see Fermi 3. I mean these plants within a mile radius. What is the saturation level of having too many power plants in our area? (**0058-55** [Bihn, Sandy])

Comment: if it is to be built then there ought to be mitigation at the Monroe power plant. (**0058-58** [Bihn, Sandy])

Comment: The plants we have we want to ensure that they comply with the law, and that they operate well. Those plants include Fermi 2, but it also includes the fossil plants, including Monroe's large facility just upriver, or just up the Lake from there. Those plants are currently being refitted. They are being complied with the environmental laws that have been passed, and we are doing everything possible to allow those plants to be operated in a cleaner and less toxic way. Those are environmental activities. There's a lot of money involved with that, of course, and that's a short term issue. (**0059-35** [May, Ron])

Comment: Fermi 3 will be located close to a coal firing plant which emits particulates that are very dangerous to our health. Actually scientists contend that people are exposed to higher radiation doses living near a coal fire plant than living near a nuclear power plant. What studies have been done on the interaction of radiation emitted from nuclear power plants with that produced by coal fired plants? Is it true that radiation bonds with particulates from the coal fired plants which are then ingested by humans and animals causing damage to our health?

Wouldn't this kind of information be pertinent for the environmental analysis for Fermi 3? (**0059-42** [Mumaw, Joan])

Comment: The cumulative impact of fish kills from the five existing power plants and the impacts of adding Fermi 3 should be assessed. There needs to be a determination of the cumulative impacts of the fish kills at the existing five operating power plants in the far Western Basin of Lake Erie and Maumee Bay and then a determination of how many more fish Fermi 3 would kill and what the impacts on the fishery and aquatic life would be.

The Environmental Impact analysis should likewise determine the impact to the ecosystem from heating the billions of gallons at the existing operating five power plants. (**0082-13** [Bihn, Sandy])

Comment: The Environmental Impact should look at mitigation if this permit is to be allowed at the DTE Monroe's Coal Fired Power Plant, the 4th largest power plant in the U.S. Water use, thermal impacts, fish kills and mercury and other emissions to at the nearby Monroe coal fired power plant should be mitigated as part of this permit to reduce the 1.9 billion gallons of day of water used by DTE at this plant. Mitigation should require installing a cooling tower and mercury pollution control equipment at the Monroe plant if Fermi 3 is to get a permit. (**0082-15** [Bihn, Sandy])

Comment: The environmental impact statement should also assess the impact on sediments and water quality by adding a 6th power plant to the existing three coal fired power plants and two nuclear power plants in the Western Basin of Lake Erie. Sediments and water quality in the areas of the existing coal fired power plants and nuclear plants should be assessed for radiation, mercury and other pollutants and then the estimated additional impacts from the proposed Fermi 3 to the sediments and the water should be added. What percentage of water in Maumee Bay is currently used by the existing power plants and how much more would be used by Fermi 3? (Assess the % with the climate change estimated reductions of 3' to 6) (**0082-17** [Bihn, Sandy])

Comment: The impact on keeping the shoreline from freezing and mixing zones caused by thermal impacts should be assessed. Also, the extent and overlapping of the mixing zones at existing power plants from thermal impacts and the proposed Fermi 3 should be mapped and reviewed. This assessment should include the amount of shoreline that is kept from freezing from existing power plants and the additional amount. Mitigation should be required for additional impacts. (**0082-24** [Bihn, Sandy])

Comment: Fermi III will be located close to a coal firing plant which emits particulates that are very dangerous to our health. Actually, scientists contend that people are exposed to higher radiation doses living near a coal-fired plant than living near a nuclear power plant. What studies have been done on the interaction of radiation emitted from nuclear power plants with that produced by coal-fired plants. Is it true that the radiation bonds with particulates from the coal-fired plant which are then ingested by humans and animals causing damage to our health? What research has been done in Monroe County on the possible impact of radioactive releases into the air from Fermi II which is close to a coal firing plant? Wouldn't this information be pertinent for the environmental analysis for Fermi III? (**0083-9** [Mumaw, Joan])

Response: *The cumulative impacts associated with the construction and operation of the proposed Fermi 3 nuclear plant will be evaluated, and the results of this analysis will be presented in Chapter 7 of the EIS.*

D.1.19 Comments Concerning the Need for Power

Comment: From an energy perspective, the proposed new plant would help assure that the energy needs of our region will be met for decades to come - and economic growth clearly cannot be sustained unless an adequate, reasonable energy supply is available. (**0010-3** [Mahoney, Charlie])

Comment: A recent article in the Wall street Journal reported that electricity usage from a number of large utilities across the country has been slowly dropping. Plans made by utilities such as DTE that were based on the assumption of a 1 - 2% annual increase in usage are now out of date. This is especially true in Michigan where population loss, manufacturing cutbacks, and energy efficiency measures have significantly reduced demand. This begs the question - Do We Need a New Nuclear Facility in Michigan?? (**0053-1** [Nordness, Dorothy])

Comment: It is estimated by the year 2030, the average U.S. household will consume about 11 percent more electricity than it does today, due in large measure to the advent of digital technology, according to the Nuclear Energy Institute. (**0058-13** [Mentel, Floreine])

Comment: We appreciate Detroit Edison's taking -- taking a proactive approach of looking at the energy needs of the citizens of our states. From a senior citizen perspective, certainly access to reliable and affordable energy is crucial to their well-being. And while we have a lot of issues and population changes and so forth, one thing that's often overlooked is that the senior population in this State is going to grow tremendously. This year alone, census projects that the growth rate is 118 more seniors per day in the State of Michigan. Again, energy is essential to their well-being.

One of the great success stories in Michigan is their effort to rebalance assistance to those who need long term care, providing people who are formerly warehoused in nursing homes, the ability to live with assistance in community based settings, and we're at the forefront of that.

Electricity and technology is also at the forefront of that. Sixty-four percent of every person that we serve in their home is opposed to the nursing home, depends on technology and electrical devices to provide them monitoring that assures their safety, and the comfort and support of their family members who care for them, much more than anyone else. (**0058-135** [McGuire, Jim])

Comment: And they have a vision of where you need to be in the future, because once our economic problems get by us in this country, there's going to be a great need for power again. And if you don't have it, you're not going to be able to have the success down the road that you did 20, 30 years ago. So if you want to have success in the future, I think these people are a good partner. (**0058-138** [Keith, Fred])

Comment: So I'm wondering why we're heading in that direction when it doesn't seem that we need to, seeing as how, at this point in time, and in the foreseeable future, our energy needs are not rising. If we were to increase to our 10 percent level, that would be an increase in capacity of 1 percent a year, which is above what we are considering what will be necessary by 2015. So I'm just wondering, why is this on the books? (**0058-42** [Simpson, Robert])

Comment: This plant is being viewed for the long haul. This is a plant that will serve this State for 60 to 80 years. It's one that will provide not only long-term good employment, but it will also provide the power that we will need for a very long time. And it's considered baseload plant activity in our company, and therefore we are looking for all of the options, the ones that will fulfill the options associated with a very long term need for our State. (**0058-5** [May, Ron])

Comment: Another component of that energy legislation was in fact a certificate of need process. A review would be conducted by the Michigan Public Service Commission any time a utility would propose to build a baseload power plant. Due to our review, that's been undergoing for several years, including a capacity need for them, study conducted in 2005/2006, and the Michigan 21st Century Energy Plan released in 2007, the State of Michigan recognizes the possible need for new baseload power plants at some point in the foreseeable future. (**0058-65** [White, Greg])

Comment: The need for power from the plant is also far from certain. (**0058-84** [Newnan, Hal])

Comment: there is no convincing evidence that the demand for electricity will grow fast enough in our State to justify the building of this facility. I note that DTE's admission to the NRC on the need for power chapter is largely based on the analysis of the experts at the Michigan Public Service Commission. However, the projections of the Commission were produced over two years ago when the health of the State's economy afforded a far different view of the need for energy than is now the case.

While in mid year 2006, the Public Service Commission estimated that the demand for electricity was only one-and-a-half percent year growth path for several years into the future, that rate has been cut back by several factors -- the loss of population, the mounting unemployment, the shutting of factories, and the foreclosure of thousands of homes that remained unoccupied, among others. Indeed the annual energy outlook of the US Energy Information Agency issued in mid December 2008, just a month ago, for the 2007/2030 period, lowers the national growth rate in electricity used to 1 percent a year. If that's the average for the US, or State's rate is probably close to zero.

Another factor, besides the plummeting economy that should push down the demand for electricity, is the requirement citing by Governor Granholm in mid 2008, which directs the utilities to produce efficiently -- to produce electricity, I'm sorry, from non-sustainable sources. In mid 2008 Governor Granholm signing no bills that require electric utility to establish energy efficiency programs which would obviously cut back on the demand for energy, geared to reducing the consumption of electricity by 1 percent a year.

And on the renewables part, the new law directs the -- mandates the utilities that 10 percent of the electricity produced will come from renewable sources, as I said earlier, and that again will result in lower demand from nuclear and coal sources... we are puzzled by the fact that DTE in recent submissions to the Public Service Commission has downgraded the percent increase, the annual increase in expected demand for electricity. They have done that. However, in their -- as I said earlier, in their need for power chapter they are still relying on a much higher estimate that was put forth, or calculated a couple of years ago. (**0058-90** [Fischer, Lydia])

Comment: While I believe in conservation I also believe in planning ahead. Indeed, wind and water power in the future may be a factor. But realistically we need to plan to develop significant power capabilities to give us a positive economic growth for the future. (**0058-95** [Worrell, Mark])

Comment: there must be some independent evaluation of the economic data that DTE Energy has submitted about the need for future energy in the State of Michigan. During the process when the 21st Century Energy Plan was under development, under the sponsorship of the Michigan Public Service Commission, I acted as a volunteer in the discussions that took place over a period of two years. And one of the factors that we spent a good deal of time on was: what was the basis for the projections that were being made about the future need for electricity in the State of Michigan? And after a great deal of probing and asking for backup data and asking for sources of the information that were being used in that process, we were finally told, well, it all came from the utilities.

Well, we had heard the utilities testify in public hearings earlier that you can't get too much energy, too much electricity, that if you don't need it in Michigan you can always sell it. So I think that an independent evaluation of these projections of DTE Energy of what is needed for the State is a very important part of that scoping process. (**0058-97** [Holden, Anna])

Comment: But the bottom line overall is, we're looking at all choices, and I think we need to. It's a diverse portfolio that we need, and Fermi 3 may just be the opportunity to retire some of those aged fossil plants that we all know are in our system. (**0059-39** [May, Ron])

Comment: Why am I so interested in Fermi? Because it happens to be a subsidiary of DTE Energy, and considering the possible construction of a new nuclear power plant on Fermi 2 site in Newport. Considering a new power plant now, Detroit Edison is acting in the best interest of our customers by making sure it is prepared to meet the State's future energy needs. It is estimated by the year 2030 the average US household will consume about 11 percent more electricity than it does today, due in large measure to the advent of digital technology, according to the Nuclear Energy Institute. (**0059-5** [Mentel, Floreine])

Comment: I had a write-up about the needs assessment that was presented in the report. And I will say that the needs assessment there is based upon business as usual. What it says is that Michigan needs more electricity because the needs are growing at about 1.2 percent annually. The entire basis for that is one report provided to the Governor which had three numbers in it; the growth rate in Southeast Michigan, the rest of the Lower Peninsula, and the UP, all of which were about 1 percent per year. There was no justification, no basis in fact, no evaluation of uncertainty, no sensitivity analysis given for any of those numbers whatsoever.

So far as I can tell the entire basis was one graphic which showed the utilization increasing historically over about a 10 year period, and then that was extrapolated into the future. That historic growth was during a time of population growth in Michigan. Those who know about what's happening to the population in Michigan suspect, with good reason, that that's unlikely to proceed in the future. The entire forecast there about the needs assessment was based upon unsubstantiated numbers from three unnamed utility companies -- I suspect one of them was DTE --and that number was used to extrapolate a straight line growth in utilization into the future. Business as usual is not the answer for Michigan today. (**0059-56** [Wolfe, Robert])

Comment: From an energy perspective, the proposed new plant would help assure that the energy needs of our region will be met for decades to come - and economic growth clearly cannot be sustained unless an adequate, reasonable energy supply is available. (**0083-19** [Pitoniak, Gregory])

Response: *The comment relates to Detroit Edison's statutory obligations to provide energy to citizens in southeast Michigan. It provides no new information, and, therefore, will not be considered further.*

Comment: Detroit Edison specifically has a responsibility to provide power to all of the citizens within Southeast Michigan, and that responsibility comes by way of a franchise governed by a law. So, if you have a responsibility, a company like ours would take that pretty seriously, number one. And number two is, there are penalties by which we would suffer if we didn't provide that energy. (**0059-34** [May, Ron])

Response: *The comment relates to Detroit Edison's statutory obligations to provide energy to citizens in southeast Michigan. It provides no new information, and, therefore, will not be considered further.*

D.1.20 Comments Concerning Alternatives – Energy

Comment: The St. Clair and Detroit rivers currents are strong and could rotate many paddle wheels/generators. How many would be required to generate the same power as Fermi 3? (**0002-2** [Schwartz, R.])

Comment: The output of Fermi.3 has been compared against, all solar power, or all wind power, or all geothermal power. Each of these renewable options, failed to perform as well as Fermi.3. A combination of some solar, some wind, and some geothermal power, should compare better with Fermi.3, than each renewable source alone. Conservation of electricity, was not considered. A significant conservation effort, would make it much more likely, a mixed system of renewable sources, could take the place of Fermi 3, make Fermi 3 unnecessary. (**0007-3** [Newman, Kent])

Comment: Investment: the enormous financial investment in another nuclear power plant is not justified, when the energy needs can be addressed first and foremost by focusing on energy efficiency and conservation. The best bargain for the dollar in energy is conservation and efficiency. Investment in high-cost energy sources such as nuclear power must be the very last resort. Any application for a new nuclear plant must be considered in light of the applicant's investment in the alternatives: beginning with efficiency and conservation and then consideration of the mix of alternative renewable energy options. Investment in multiple sources of renewables, not solely one or the other, is responsible. Diversity of energy sources allows for flexibility. Investment in a nuclear power plant is a poor environmental investment: there are limited financial resources, public or private. What is invested in a nuclear plant cannot be invested in wind, solar, geothermal, efficiency, conservation, etc. The cost of nuclear is akin to putting too many eggs in one basket: it is foolish and too risky for us all, ratepayers and shareholders alike. (**0016-4** [Rivera, Gloria])

Comment: The comparison to renewable sources should be based on a mixture of renewables and conservation rather than comparing nuclear to one alternate source at a time.

There is no need to saddle ratepayers and taxpayers with the cost of this plant when less expensive and more environmentally sensitive alternatives are available. (**0028-4** [Shiffler, Nancy L.])

Comment: We don't need more nuclear power, we need more sensible policies. Wind and solar energies offer clean renewable energy. (**0031-7** [Rysztak, Robert])

Comment: It would be much better to invest in solar and wind energy which in the long run would be cheaper and safer. (**0034-4** [Nett, Ann C.])

Comment: We cannot use nuclear energy as a substitute for coal. We need to turn to more natural methods such as solar, wind and thermal forms of energy. We also need to greatly reduce our energy usage thereby reducing gases that cause global-warming.

We need to revitalize Michigan's economy not with a plan to return to the past but go into the future - we need a green public works project to convert unused and underused factories to produce energy efficient transportation, mass transit vehicles, solar panels, windmills. We need to rebuild health infrastructures for safe drinking water and affordable housing. We need to organize and support local organic farming and a return to local materials for building. A greener life will be a better life for all. (**0035-2** [VItale, Fred])

Comment: The Environmental Report's discussion of alternatives assumes only a direct matchup between renewable energy sources and nuclear; that is, the comparisons in the ER are solely between nuclear and wind, solely between nuclear and solar, and the like, instead of presuming that a mix of solar-passive and solar-photovoltaic, wind, conservation, and other alternatives will be deployed through thousands of market decisions. This to me is a "strawman" argument. In my view, this comparison must be nuclear versus a mix of renewables and conservation, as the state, at least by Governor Granholm's declarations in last week's Michigan State of the State address, is moving quickly towards that actual scenario. Detroit Edison makes no such comparison here. (**0038-1** [D'Amour, James Carl])

Comment: Citizens of the state will benefit greatly from a program of combined reduction of use of energy, and implementation of renewable energy sources, such as wind, solar and use of geothermal energy. Surely DTE can create projects that will contribute to its bottom line that include green energy sources, and so become a producer of energy that will result in a lowered ecological impact overall. (**0039-4** [Mitchell, Rita])

Comment: Please, let's move forward with clean energy that does not deplete our land and water. Let's make Michigan a leader in use of green energy. (**0039-7** [Mitchell, Rita])

Comment: Investing in strong energy efficiency programs and alternative energy is what we need to save the planet, including ourselves. (**0047-7** [Bettega, Gayle])

Comment: The proponent should be required to conduct a detailed analysis of the potential for liberating or producing the same amount of energy benefits as this reactor would produce, through alternative investments in energy efficiency and alternative energy sources, including wind (both onshore and offshore), co-generation, geothermal energy, solar, etc. (**0048-9** [Edwards, Gordon])

Comment: our organizations call upon NRC to undertake a careful review of the energy efficiency and renewable energy potential available in DTE's service area, and to find that they are the preferred alternative to Fermi 3. (**0050-25** [Kamps, Kevin])

Comment: As I listen to the comments of the people who support DTE, especially the Economic Development folks, Chamber of Commerce people, I wonder why they aren't pushing DTE to deploy wind and solar now, creating jobs now, instead of advocating for a long, drawn out process, a long drawn out process of necessity that will take years to result in the construction of a nuclear power plant. A process that will begin in earnest in 2013, have peak jobs at 2015, `16, or `17. If we have any economic catastrophe in this region we need to deal with it sooner rather than later. (**0058-115** [Lodge, Terry])

Comment: I don't think windmills have much of a payroll, so I'm not very fond of those. And they kind of are an eyesore in my sight. Driving across Southern Minnesota they appeared in groups of three or six. I don't know if that's significance, but I think it had to do with some kind of a government program that allowed a certain amount of money. (**0058-128** [Meyer, Richard])

Comment: The only thing I can say about the windmill is it's a great thing, and it's an additive to power with coal and nuclear. But the days that the wind don't blow, they don't work. You still have to put that power out there somehow. And we all kind of take power for granted. You know, we're used to getting up in the morning and turning on a light switch and the light comes on. What do we do some day when we turn that light switch on and the light comes on about half? You know, these are things that we need to think about. (**0058-139** [Keith, Fred])

Comment: Unfortunately, electricity is a commodity that must be used as it is produced for efficiency and economic reasons. Although wind and solar power may be used as supplements, it is necessary that we have a consistent and reliable source of baseload power. The sun doesn't always shine and the wind doesn't always blow. Numerous suppliers have built power plants using natural gas as a fuel source, but now it's been recognized as being too costly to operate these plants due to the fluctuations in the supply and price of natural gas. Using natural gas as fuel source for power has succeeded in driving up the cost of home heating and causing fuel shortages. (**0058-145** [Sweat, Ron])

Comment: The other thing about this is that it takes a long time to get a nuclear power plant up and running. In that time we could be using energy efficiency, we could be using alternative energy, such as wind and solar, and they could be up and running. No terrorist is going to go after a wind turbine. So, there's a lot of reasons.

Energy efficiency alone could save 50 to 75 percent of our electricity bills, and that's according to Amory Lovins, from Rocky Mountain Institute in Colorado. (**0058-25** [Cumbow, Kay])

Comment: And I kindly ask the company to invest this billion into renewable, clean sources of energy like wind, solar, geothermal, waves and tides of our beautiful Great Lakes that are so abundant in waves, tides, wind and solar. (**0058-31** [Pfeiffer, Jelica B.])

Comment: First of all, you can take the coal plants that are just over the horizon here, and see that we're adding onto those plants environmental equipment that we think is not only essential for our environment, but it does a great deal for employment, it does a lot of other important things for our community, but most of all it cleans our air. And those projects, of course, I'm involved with and lead that effort. But that is current and it's going on as we speak.

Just behind that we're building, and will be building, windmills, and other renewable sources. There's legislation that we not only think was wise, but also really endorsed that has provided this State the opportunity to take up to 10 percent of our load and turn it into sustainable energy. And we think that that's really important. And that is in front of this plant. Those issues that come about in terms of our existing plants and those that are associated with renewable energy and efficiency are all in front of this plant. (**0058-4** [May, Ron])

Comment: what I'm here for is to talk about a fight that we've had for the last two-and-a-half years here in Michigan to get some renewable energy on our legal system into law, and we did. It wasn't much of a bill; it was only a 10 percent, which was probably one of the weakest bills of the 25 or `6 states that have gotten mandates on their books. But we finally got something. Now it looks like to me, with all the -- I want to say more energy plans that are coming into sight now, and coal plants, radiation plants, that we're undermining the intent of our whole trust in the State of Michigan, which was to go to cleaner sources of energy. Instead, it seems to me that everyone is backpedaling. We have a lot of different ways to reach that 10 percent, but if we go ahead with other sources of fossil fuel type energy, we undermine the very intent of the law as we have passed it. (**0058-41** [Simpson, Robert])

Comment: The coal plants that we have, they won't last forever. We may not want them to last forever if we're looking at CO2 and other issues. So what are the alternatives? Well, let's build out those windmills, let's build out those efficiencies that we can, and do it in a way that really provides a real advantage to us short term. (**0058-6** [May, Ron])

Comment: My statement today is in fact in support of the continuation of the combined operating license review process that is the subject of this meeting. Within the last few years the State of Michigan has put a great deal of focus on its energy future. And in fact, as referenced by previous speakers, has recently passed comprehensive energy legislation, intended to provide a framework for moving Michigan forward on its energy policy. Now, this framework does in fact include an aggressive energy efficiency program, a renewable portfolio standard, which is a mandate to build out to 10 percent of its energy supply through renewable energy, which perhaps doesn't sound like a lot when compared to maybe 30 percent from the state of Maine. But when you put it into context, a 10 percent build out in Michigan would make Michigan the third largest developer of renewable energy in the country. So you need to put those kinds of numbers into proper context. (**0058-64** [White, Greg])

Comment: Instead of sinking money into the nightmare problems of the nuclear industry, we should be investing in safe, renewable energies that will make our country safe, energy dependable, and strengthen the economy. This point should make sense to anyone. Even to those who may dispute my points on health issues and the essence of the atom, et cetera. (**0059-20** [Barnes, Kathryn])

Comment: Numerous power suppliers have built power plants using natural gas as a fuel source, but now it has become too costly to operate these plants because of the fluctuations in the price and supply of natural gas. Use of natural gas as fuel for producing electricity has driven up the cost of home heating and created shortages in the gas supply. Electricity, unfortunately, is a commodity that must be used as it is produced for efficiency as well as economic reasons. Although wind and solar power may be used as a supplemental source, it is necessary that a consistent and reliable source of power be maintained. The sun isn't always shining here in Michigan, and the wind isn't always blowing. (**0059-31** [Sweat, Ron])

Comment: we were supportive and really provided a lot of energy behind the new legislation that occurred last fall, that obligates this State and our company specifically, to renewable energy. So those of us that are thinking about renewable being a choice against a Fermi plant, that isn't the choice. The choice is, we will do both. Whether we do a Fermi plant long term or not hasn't been decided. But what has been decided is that we will build windmills, we will look at solar, and those issues are being planned, and these are responsibilities I have as well, in the short term, starting this year.

So we're not looking at Fermi as a replacement for renewables. Actually we're going to build out many hundreds of windmills, and the obligation is to find efficiency and windmills is a shorter term, and really an environmentally sound alternative, to the loads and things that we have an obligation to serve for this community.

So that isn't a trade off. That's a given. The trade off then is the longer term power source. As previously stated, there are opportunities over the course of the next several years to see how those renewable sources work. If there are opportunities to build out even more after that we will do that. But the point is, when the wind doesn't blow and the cloud cover is like today, we will need baseload plants.

And so the next question is, will we have a baseload plant that will contribute to additional CO2, or will we have a baseload plant that will contribute to more fossil fuel burning, or will we have a base loaded plant that would be an alternative to that. And so we, I think, are obligated to take a look at nuclear power. And that obligation is around the choice that says, if we can make it effective, both in terms of cost and in terms of safe operation, which we believe we can, that those choices then would be over the longer term. (**0059-36** [May, Ron])

Comment: Real solutions for the climate crisis include safe and clean energy efficiency, and renewable electricity sources, such as wind and solar power. These have been neglected for decades and urgently deserve more support than dirty and dangerous nuclear power.

And in regards to jobs, the Blue/Green alliance, which is an alliance of the Sierra Club and the US Steelworkers Union, estimates that 35 to 65,000 permanent jobs are obtainable in Michigan via wind power, solar, geothermal, biomass, wave, tidal, genuine renewable green collar jobs, this compared to the 400 to 700 jobs that Fermi 3, that were mentioned by previous speakers.

Amory Lovins at the Rocky Mountain Institute has shown that energy efficiency is 7 to times more cost effective than nuclear power at reducing greenhouse gas emissions. Fermi 3 would provide 1,550 megawatts of electricity. If you look at all the nuclear power currently in Michigan, Fermi 2, Palisades, Cook Units 1 and 2, although one of those units at Cook is down for a year or more at this point, due to a turbine accident. If you add up all the nuclear power currently in Michigan, 4,000 megawatts of electricity, compare that to the 16,000 megawatts of potential wind power identified in Michigan on land. Compare that to the 320,000 megawatts of wind power available to Michigan offshore in the Great Lakes, tremendous potential for wind power in this State. (**0059-74** [Kamps, Kevin])

Comment: Why isn't the $7 billion plus, being used for the development of alternative energy sources like wind, solar and geothermal? These alternative sources would supply ongoing jobs of solar-panel installation, retrofitting buildings that are leaking energy, wastewater reclamation, materials reuse and recycling and much more. (**0062-2** [Henige, Margaret Ann])

Comment: What I am asking from your office is to know whether there are any plans to explore other alternative, renewable ways to acquiring energy in the area. With Monroe being located right along the Lake Erie cost line I was wondering if there has been any attempts to start up a wind farm. The maintenance of such a facility as well as retrofitting buildings that are leaking energy offer the opportunity for job growth and ongoing employment. (**0064-2** [Davis, Gary])

Comment: In this time in our history, when we should be looking for positive ways to effect climate change, as well as helping the world economy wouldn't renewable energy sources be the answer? We should be investing in the energy sources that have much lower lead time than nuclear power. The renewable energy sources of wind, solar and gas also provide ongoing jobs for solar-panel installation, retrofitting building that are leaking energy, wastewater reclamation, materials reuse, recycling and technology advances. All of the mentioned are not a part of the nuclear energy solution. (**0066-2** [Tinnirello, Nicole])

Comment: I believe our country needs to be investing in renewable resources. I ask that this commission review alternative energy resources and look forward to your response. (**0066-4** [Tinnirello, Nicole])

Comment: Governor Granholm announced just this week that Wind Turbines were to be built in Monroe. This is a much safer and cleaner way to make electricity. Let's keep Monroe safe and clean. (**0070-4** [Karas, Josephine])

Comment: Unfortunately electricity is a commodity that must be used as it is produced for efficiency and economic reasons. Although wind and solar power may be used as supplements, it is necessary that we have a consistent and reliable source of base load power. The sun doesn't always shine and the wind doesn't always blow.

Numerous suppliers have built power plants using natural gas as a fuel source, but now it has been recognized as being too costly to operate these plants due to fluctuations in the supply and price of natural gas. Using natural gas as fuel source for power has succeeded in driving up the cost of home heating and causing shortages. (**0082-6** [Sweat, Ron])

Comment: Instead of sinking money into the nightmare of problems of the nuclear industry, we should be investing in safe, renewable energies that will make our country safe, energy dependable, and strengthen the economy. This point should make sense to anyone. Even to those who may dispute my points on health issues and the essence of the atom, et cetera. (**0083-34** [Barnes, Kathryn])

Response: *In Chapter 9 of the EIS, the NRC staff will evaluate all reasonable alternatives to nuclear power that could provide over 1500 MW(e) of baseload power to the Detroit Edison service area. The analysis will evaluate all proven renewable energy alternative technologies, both singly and in combination, for their ability and feasibility in meeting the stated purpose and need of the proposed action. The analysis will also extend to an evaluation of actions not involving new power generation facilities such as energy conservation, energy efficiency, and demand-side management programs.*

Comment: As a company of power, I ask you to actively support energy production which prevents pollution of any part of the environment and allow no build-up of radioactive, toxic or other hazardous substances. (**0027-2** [Askwith, Annemarie])

Response: *NRC does not actively support any form of electric power generation. NRC's mission is the safe regulation of nuclear materials to ensure protection of the public and* *environment. NRC will not issue a license to construct and operate the Fermi 3 nuclear plant unless it determines the design and the proposed method of operation are safe.*

Comment: The amount of money spent on new Nuclear Power Plants would be better spent on Renewable energy which would create jobs for our suffering economy and our skilled trades which are at 45% unemployed rate. I am requesting a reply from the NRC to inform me of how these problems will be addressed. (**0030-2** [Conner, Mary V.])

Comment: Fermi 3 is not needed, and rather would displace safer, cheaper, and cleaner energy alternatives such as efficiency and wind power, that better fit Michigan's electricity and job creation needs. Michigan's economic depression requires cost-effective green job creation, affordable electricity rates to spur business development, and 21st century environmental entrepreneurship. Investment in efficiency represents the lowest hanging energy fruit, with tremendous potential for ratepayer cost savings, cost-effective climate mitigation, and widespread job creation. As reported by the National Renewable Energy Lab, Michigan has the potential to develop 16,000 megawatts of land-based wind power. In addition, MSU's Land Use Institute reported in Oct., 2008 that over 320,000 megawatts of wind power is available to the Great Lakes State off-shore; environmentally-sensitive, strategic development of even a very small fraction of that huge potential could supply Michigan's electricity needs for the foreseeable future, at more affordable rates than Fermi 3, while more cost-effectively creating much larger numbers of jobs. (**0050-24** [Kamps, Kevin])

Comment: And a power is needed, it would be more environmentally safe and cost effective for society, that is, to increase available power through energy efficiency measures and renewable energy installations which provide many, many, many, many more jobs, and don't have the health cost implications that a nuclear power plant or a coal power plant have.

Therefore, based on all this, building this plant is a bad idea. We would -- the Sierra Club would believe that energy efficiency is the least expensive way to increase the amount of energy we have available, and that renewable energy efficiency measures and renewable energy measures, which are indeed clean, unlike coal, and safe, unlike nuclear, should be used even before considering nuclear power plants. (**0058-85** [Newnan, Hal])

Comment: In my opinion, investment in the nuclear industry is money that could have gone to producing cheap renewable electricity like wind, solar, and geothermal power, not to mention conservation and efficiency efforts. Besides their lower costs for construction and operation, investments in conservation, efficiency, and renewable energy provide ongoing jobs for solar-panel installation, retrofitting buildings that are leaking energy, wastewater reclamation, materials reuse and recycling and much more.

Please keep the above comments in mind as you consider DTE's application to build a new nuclear power plant in Monroe. (**0075-1** [Campana, Jean Ann])

Response: *NRC does not have authority or responsibility by law or regulation to insist that the proposed plant is the least costly alternative to provide power. The EIS will consider (in Chapter 9) the potential for alternative non-nuclear technologies to provide the electricity that could be generated by the proposed plant and the environmental impacts of those alternatives.*

Comment: Wind and solar power offer a much cleaner path to the future. The worst case scenario for nuclear power is devastating, while wind and solar accidents have no worst case scenario. (**0032-2** [Rysztak, Robert])

Response: *In Chapter 9 of the EIS, the NRC staff will evaluate the feasibility of meeting the stated purpose and need of Fermi 3, provision of over 1500 MW(e) of baseload power to the Detroit Edison service area, with alternative technologies, including renewable energy. In Chapter 5 of the EIS, the NRC staff will evaluate the environmental impacts of design basis accidents and severe accidents.*

Comment: First, I can sympathize with people in Monroe and the Chamber people and business people concerned about jobs and what it does to the economy and so forth. I came to Michigan from a depressed area myself when the coal mines shut down, so I can empathize with that. But let me point out that in Time Magazine they do an issue on energy efficiency, which I think is very good, and points out that there are far more jobs in this field and in alternative energy -- this is E-Magazine with the wind power, than there would be with any construction of coal, fossil fuel or nuclear plants. So that's something to keep in mind. (**0058-103** [McArdle, Ed])

Comment: To help sell the idea of a nuclear plant to the Monroe County public it stands to reason that DTE would draw on any perceived benefits the plant would have for the local area. One of these of course being that the jobs created by the construction and operation of the plant. In the County hard hit by layoffs and plant closings related to the automobile slump, the prospect of new jobs would certainly peak public anticipation for a better economy.

At first glance it would seem that DTE's promise of thousands of temporary jobs and many hundreds of permanent operational jobs should be taken as a great positive. But closer examination reveals a much less attractive picture. Competing for the same public support and financial resources is the renewable energy industry. That's solar and wind, et cetera. In these tough economic times it must be asked, which area of energy generation will benefit us most, which would give us the biggest bang for the buck.

One study cited in Environment America report used the example of the largest currently planned -- this was 2008 -- new nuclear plant. It's the Calvert Cliffs Unit 3 in Maryland. According to one study it is expected to generate 4,000 temporary construction jobs and 360 permanent jobs. Assuming a typical cost for a nuclear plant to be about $7 billion, each of those construction jobs comes at a cost of $1.75 million, with the permanent ones at a whopping $19 million per job.

Another study, also from Environment America states, according to the Nuclear Energy Institute, a 1,000 megawatt nuclear plant creates 400 to 700 permanent jobs. Building a nuclear reactor would result in the creation of 1400 to 1800 jobs during construction. Using the best of these numbers together, this works out to be almost $2.5 million per job.

DTE's own figures is found in the environmental report, indicate an estimated maximum of 2900 construction jobs, and up to 700 permanent jobs during operation for a total of 3,600 jobs. DTE estimates the cost of construction at about $10 billion. This works out to be about $2.8 million per job. Most of which would be temporary, that is, less than the 8 years of construction. And of course who would pay for these very expensive nuclear jobs, the electrical customers of DTE of course through higher utility rates.

By contrast, another study indicates that investing $100 billion in energy efficiency and renewable energy over two years would create 2 million jobs. That works out to be only $50,000 per job. Or, in other words, that's about .05. That's 5/100th of a million dollars. Now, compare that to these previous numbers for nuclear jobs.

Still, another study says, study after study has confirmed that a renewable energy sector produces many more jobs. Wind, like solar, produces five times as much employment as nuclear per amount invested.

And what about those Monroe County automotive job losses? Could those unemployed folks count on stepping into the nuclear construction jobs of building a Fermi 3? Not likely, unless they are experienced carpenters, iron workers, equipment operators, mechanical workers, electrical workers, boilermakers, pipefitters, sheet metal workers, insulators, painters or millwrights. Now, how many of those autoworkers would fit into one of these categories. Now, from what I've studied so far it sure sounds like the construction/operation of Fermi 3 would be a real economic boondoggle. We'd be much better off to invest our resources in energy efficiency and renewable energy resources such as solar and wind. (**0059-24** [Mantai, Frank])

Comment: The United Nations Environment Program, the International Labor Organization, the International Organization of Employers, and the International Trade Union Confederation, published a report this past September on green jobs. The report notes that more than 2.3 million green jobs have been created in recent years in the renewable energy sector. Some 4 million direct green jobs, based on improving energy efficiency, already exist in the United States. Buildings could represent a future source of many more green jobs. There are substantial green employment opportunities in retrofitting diesel busses to reduce air pollutants.

Given the economic crisis in the United States, and particularly difficult conditions in Southeast Michigan, I'm wondering about the potential jobs that would emerge from Fermi 3 in a lineup with the employment potential of Green jobs. How many jobs would be created to design, construct, and operate Fermi 3? What are the salaries and tax revenues associated with those new jobs? How many workers would come from Monroe? How many would be brought in from other areas? What is the hiring timeline? How long would the jobs last? How many jobs would be an equal investment in renewable energy create? Where would these renewable energy workers come from? And how much income would be generated? How do nuclear and renewable technologies compare regarding capital and labor intensity? Let's not leave the answers to these questions up to the company that has invested interest in moving Fermi 3 quickly through the NRC application process. (**0059-40** [Henige, Ann])

Comment: The report also gives some assessment of alternative energy sources and conservation. These are extremely important. These are actually where the jobs are going to be. One thing I would like to ask the people, and this is a rhetorical question because you can't answer it. But people who said, Look what Fermi 2 did for our jobs. It gave me my job. A lot of plumbers got jobs, a lot of people got jobs in construction. But what you never heard from was all of the people who would have gotten jobs if we had had an alternative energy construction source. There would have been many more jobs if we would have been building alternative energy sources. That is well documented by the facts. Studies after study have shown that the same investment made to build the same infrastructure for generating electricity, yields many more local, stable, real important jobs, than does nuclear power if that same money is invested in alternative energy sources. So as you look around and you say, Well, gee, isn't everything okay because look where we got our jobs in the past? You could have had more jobs, you could have had more secure jobs, they would have grown in the future. (**0059-57** [Wolfe, Robert])

Comment: The United Nations Environment Programme, the International Labour Organization, the International Organization of Employers and the International Trade Union Confederation published a report this past September on green jobs.

The report notes that more than 2.3 million green jobs have been created in recent years in the renewable energy sector. Some 4 million direct green jobs based on improving energy efficiency already exist in the United States. Buildings could represent a future source of many more green jobs.

There are substantial green employment opportunities in retrofitting diesel buses to reduce air pollutants. Given the economic crisis in the United States and the particularly difficult conditions in southeast Michigan, I'm wondering about the potential jobs that would emerge from Fermi III in a line-up with employment potential of green jobs.

How many jobs would be created to design, construct and operate Fermi III?

What are the salaries and tax revenues associated with those new jobs?

How many workers would come from Monroe and how many would be brought in from other areas?

What is the hiring timeline?

How long would the jobs last?

How many jobs would an equal investment in renewable energy create?

Where would these renewable energy workers come from and how much income would be generated?

How do nuclear and renewable technologies compare regarding capital and labor intensity?

Let's not leave the answers to these questions up to the company that has a vested interest in moving Fermi III quickly through the NRC application process. (**0083-10** [Henige, Ann])

Response: *In Chapters 4 and 5 of the EIS, the NRC staff will evaluate the socioeconomic impacts of construction and operation, respectively, of the proposed action. Consideration will be given to the availability of various job skills in the region rather than assuming all skills are available in the local workforce. In Chapter 9 of the EIS, the NRC staff will evaluate all reasonable alternatives to nuclear power that could provide over 1500 MW(e) of baseload power to the Detroit Edison service area. The analysis will evaluate all proven renewable energy alternative technologies, both singly and in combination, for their ability and feasibility in meeting the stated purpose and need of the proposed action. The analysis will also extend to an evaluation of actions not involving new power generation facilities, such as energy conservation, energy efficiency, and demand-side management programs.*

Comment: But instead of dwelling on the limitations of nuclear power, let's focus on alternative ways to meet our electricity needs. The Fermi 3 Combined License Application Environmental Report, discusses wind and solar alternatives in chapter 9, and discusses the projected growth of electricity demand in chapter 8. Both chapters are incomplete and inadequate in their present form and reach the wrong conclusion. The report must comprehensively evaluate an electricity future that combines conservation, energy efficiency, wind turbines, solar technology, power storage capacity, and transmission grid infrastructure.

Chapter 9 dismisses wind and solar technologies as unsuitable for baseload generation because they are intermittent. But, do we need to increase the baseload or do we need to increase the peak generation to meet the peak loads that happen with summer air conditioning?

The report fails to consider the natural correspondence between peak solar-electricity generation and peak air conditioning demand. Solar electricity producing in Michigan would be highest exactly when it is needed most during the summer months. The report does not compare the dollar cost of short term storage capacity and transmission grid infrastructure for wind and solar generated electricity, to the costs associated with a Fermi nuclear power plant. Nor does the report compare the environmental and health costs of the proposed Fermi nuclear power plant to those of wind turbines, electricity storage, and transmission grid improvements.

The report claims that many acres would be required for a solar electricity system, acres that would be lost to other uses. The report does not consider the possibility that solar panels could instead be installed on roofs of houses and other buildings, with little loss of land to other uses. Wind and solar technologies could meet the energy needs of Southeast Michigan and would provide a much more cost effective solution than would the untested technology of Fermi 3.

Where will the funds come from for building our new energy infrastructure? These funds will come from future payments by utility customers. The very funds that DTE is proposing to invest in the Fermi 3 nuclear power plant could instead be invested in distributed solar panels connected to the grid, and in wind turbine farms. The report also dismisses solar generation because not much of it has been installed to date in Michigan. That could change quickly if the above funds were used to finance such installations.

What motivated DTE to propose the Fermi nuclear power plant? It may not be as easy for DTE to control and profit from wind and solar electricity generation as from centralized electricity generation. Hence, DTE as a corporation has less incentive to invest in these potentially realistic alternatives. However, DTE customers have a strong incentive to invest in a clean, reliable and safe alternative for Michigan based on solar and wind technologies. (**0059-53** [Wolfe, Joan])

Comment: But instead of dwelling on the limitations of nuclear power, let's focus on alternative ways to meet our electricity needs. The Fermi 3 Combined License Application Environmental Report discusses wind and solar alternatives in Chapter 9 and discusses the projected growth of electricity demand in Chapter 8. Both chapters are incomplete and inadequate in their present form and reach the wrong conclusion. The report must comprehensively evaluate an electricity future that combines conservation, energy efficiency, wind turbines, solar technology, power storage capacity, and transmission grid infrastructure.

Chapter 9 dismisses wind and solar technologies as unsuitable for base load generation because they are intermittent. But do we need to increase the base load, or do we need to increase the peak generation to meet the peak loads that happen with summer air conditioning? The report fails to consider the natural correspondence between peak solar electricity generation and peak air-conditioning demand. Solar electricity production in Michigan would be highest exactly when it is needed most during the summer months.

The report does not compare the dollar cost of short-term storage capacity and transmission grid infrastructure for wind and solar generated electricity to the costs associated with a Fermi 3 nuclear power plant. Nor does the report compare the environmental and health costs of the proposed Fermi 3 nuclear power plant to those of wind turbines, electricity storage, and transmission grid improvements.

The report claims that many acres would be required for a solar electricity system, acres that would be lost to other uses. The report does not consider the possibility that solar panels could instead be installed on roofs of houses and other buildings with little loss of land to other uses. Wind and solar technologies could meet the energy needs of southeast Michigan and would provide a much more cost effective solution than would the untested technology of Fermi 3.

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What motivated DTE to propose the Fermi 3 nuclear power plant? It may not be as easy for DTE to control and profit from wind and solar electricity generation as from centralized electricity generation. Hence DTE as a corporation has less incentive to invest in these potentially realistic alternatives. However, DTE customers have a strong incentive to invest in a clean, reliable, and safe alternative for Michigan based on solar and wind technologies. (**0083-6** [Wolfe, Joan])

Response: *In Chapter 8 of the EIS, NRC will evaluate the need for power, including the need for baseload power. In Chapter 9 of the EIS, the NRC staff will evaluate all reasonable alternatives to nuclear power that can meet the stated purpose and need of providing over 1500 MW(e) of baseload electric power to the Detroit Edison service area. The analysis will extend to all proven renewable energy technologies, both singly and in combination. The evaluation will also extend to an evaluation of actions not involving the introduction of new power production facilities such as energy conservation, energy efficiency, and demand-side management programs.*

Comment: Germany employs 240,000 people in the manufacture of alternative energies. We have two wind farms in the Thumb area with turbines manufactured by General Electric and

John Deere. The only problem is they're manufactured in Germany and Holland. We have an empty auto factory here in Monroe with a Lake shipping port. Hopefully we'll see President-Elect Obama have a major impact on promotion of alternative energy. Hopefully we'll see windmills manufactured at that old empty plant, maybe for export to Europe. (**0059-67** [Farris, Mark])

Response: *The mission of NRC is the regulation of the civilian nuclear industry to ensure public health and safety and protection of the environment. NRC has no role in promoting any form of power generation or manufacturing. This comment provides no additional information relevant to the environmental review and will not be considered further in the EIS.*

Comment: In terms of energy independence and ending our dependence on foreign oil, only 1 to 2 percent of our electricity in the United States comes from burning oil. So this is an apples and oranges comparison. (**0059-76** [Kamps, Kevin])

Response: *The NRC staff must evaluate the Detroit Edison proposal for its ability to satisfy the stated purpose and need. Energy independence and ending our dependence on foreign oil are not within the scope of the staff's environmental review and will not be considered further in the EIS.*

D.1.21 Comments Concerning Alternatives – Sites

Comment: did DTE consider alternative sites in their environmental assessment? (**0058-56** [Bihn, Sandy])

Response: *Alternative sites were considered by Detroit Edison in its ER. The NRC staff will evaluate the impacts of developing a new nuclear plant at alternative sites in Chapter 9 of the EIS.*

Comment: An EIS should include an assessment of alternate sites and a no build. Consumers Power evaluated the site they have here in the Western Lake Erie watershed and instead chose Midland, Michigan. It is hard to imagine that given the shallow fishy waters of Western Lake Erie already burdened by water use from three coal fired power plants and two nuclear plants, that other locations would be a better choice for minimizing water and environmental impacts. Simply put, this is the wrong location for a power plant. These waters are already green again and limits on fish catches are in place because of dwindling quantities. These waters can simply not afford another hit of 498 million gallons a day. (**0082-25** [Bihn, Sandy])

Response: *The NRC staff will evaluate the no-action alternative, as well as impacts of developing a new nuclear plant at alternative sites, in Chapter 9 of the EIS.*

D.1.22 Comments Concerning Benefit-Cost Balance

Comment: Let Fermi 3 be built if there are NO subsidies; that is, if those who control it pay the FULL cost of construction, insurance, decommissioning, and waste disposal. In doing so, the public must be protected by the precautionary principle; that is, it must be assumed that the worst that could happen will happen. Payments - perhaps as bonds - must fully cover that. Residents and taxpayers must not be saddled with any of the financial or other responsibility. (**0006-1** [–, Richa])

Comment: Nuclear power only exists because of constant and consistent financial handouts by the taxpayer. Six of Wall Street's largest investment banks are financially smart enough to know nuclear power is not a good safe investment and too risky. They stated We believe these risks, combined with the higher capital costs and longer construction schedules of nuclear plants as compared to other generation facilities, will make lenders unwilling at present to extend long-term credit. (**0019-10** [Schemanksi, Sally])

Comment: Obviously the cost of a nuclear power plant is exorbitant and difficult to imagine this investment at this time in our history when our country is in such financial straits. (**0034-3** [Nett, Ann C.])

Comment: Fermi 2 has been a dismal failure with cost overruns approaching $6 Billion. This does not make any economic sense at all for the State of Michigan taxpayers to absorb these energy costs, in addition to the new proposed plant. It is much more desirable for the State of Michigan and its SE Region to pursue alternative energy based upon Wind Turbine, Natural gas, or even state of the art scrubber technologies for existing coal fired generator plants. For the price tag of that Fermi 2 Reactor, the State of Michigan could have over 5,000 Wind Turbine generators on line, producing electricity for the power grid with zero thermal and radiation exposure, and no nuclear waste to deal with!!! (**0041-2** [Englund, Lance])

Comment: The proponents should be prevented from availing themselves of pre-emptive bailouts from the federal treasury in the form of loan guarantees. Such loan guarantees are contrary to a free market philosophy and to the level playing field approach which should prevail in any form of responsible and sustainable energy planning. For the federal taxpayers to guarantee all necessary loans without any financial accountability or oversight is to invite abuse and waste of precious capital resources. Too much reckless and irresponsible investment has already taken place in the form of sub-prime mortgages and other schemes which separate the investor from the consequences of bad investment decisions. This should not be allowed to continue. The proponent should be required to justify the investments that will be needed in terms of the willingness of the investor to stand by that investment without requiring federal assistance. (**0048-2** [Edwards, Gordon])

Comment: The proponent should be required to document what efforts have been made by the nuclear industry to persuade insurance companies in North America to remove the nuclear exclusion clause from their insurance policies for property owners. If the nuclear industry believes that these reactors are safe, and not subject to catastrophic accidents, then they should be able to convince the insurers to provide normal coverage to their customers, thereby eliminating the need for the Price Anderson Act (which was originally intended to be only a temporary measure until the industry matured). If, on the other hand, the industry is not mature enough to convince the insurers that offsite damage from reactor accidents can be covered in the normal way, then the NRC would be, in our opinion, irresponsible to allow such reactors to be built within striking distance of large metropolitan areas or beside irreplaceable bodies of water. These considerations are particularly important since the events of 9/11 which have demonstrated the enormous damage that can be done by a small band of dedicated terrorists who have no regard for their own survival. (**0048-7** [Edwards, Gordon])

Comment: Taxpayer and ratepayer subsidies for Fermi 3 represent opportunity costs lost to safer, cheaper, and cleaner alternatives such as efficiency and renewable sources of electricity. The nuclear power industry has enjoyed over half a trillion dollars in public support over the past half century. DTE's Fermi Nuclear Power Plant has already benefitted for decades from federal research and development, as well as liability insurance against major accidents. The federal 2005 Energy Policy Act provided yet another $13 billion in subsidies, tax incentives, and additional support for new reactors. The industry has already successfully lobbied for $18.5 billion for new reactor federal loan guarantees, approved in Dec. 2007, making taxpayers co-signors on financially risky nuclear construction projects. Now DTE as well as Nuclear Energy Institute lobbyists are seeking additional tens of billions of dollars in nuclear loan guarantees as part of the federal economic stimulus bill, even though Fermi 3 cannot even break ground in the next two years. At the state level, DTE has received approval to charge electric ratepayers hundreds of millions of dollars to pay off its construction debt for Fermi 2. It recently applied to the Michigan Public Service Commission for tens of millions of dollars from ratepayers to fund its application to NRC for Fermi 3. Such public funds would be much better invested in energy efficiency, which is seven to ten times more cost effective than a new atomic reactor at reducing greenhouse gas emissions, or in wind power, so plentiful in Michigan and twice as cost effective as nuclear power at carbon reductions. (**0050-23** [Kamps, Kevin])

Comment: as I live within the ten mile radius of the Fermi II plant, I have always tried to keep abreast of the issues surrounding nuclear energy in Monroe, MI where I reside. I am particularly troubled about the proposed Fermi III plant because I do not think it is economically feasible. I think it will cost too much to produce nuclear energy and we will soon learn of better, cleaner less expensive ways to produce the energy we need. (**0052-1** [Fedorowicz, Meg])

Comment: Almost every article I read mentioned the skyrocketing costs of building new nuclear power plants. Quoting from an article in Time Magazine in December or 2008 ". . . rain has fallen on the nuclear parade. It turns out that new plants would be not just extremely expensive but spectacularly expensive". According to the article, the nuclear industry has a history of 250% cost overruns.

A leading expert in power plant costs, Craig A. Severance, who is a practicing CPA has written copiously about the cost of nuclear. Quoting him: "Generation costs per kilowatt hour for new nuclear plants (not including distribution to customers) are likely to be from 25 - 30 cents/kWh."

Such high cost may destroy the very demand the plant was built to serve. High electric rates may seriously impact utility customers and make nuclear utilities' service areas noncompetitive for businesses with other regions of the U.S. which are developing lower-cost electricity. This is a situation Michigan can ill afford. High electric rates will also encourage people to be even more energy-efficient in their homes and businesses, thus reducing demand even further.

Again quoting Mr. Severance - "Given the myriad low-carbon, much-lower-cost alternatives to nuclear power available today -- such as efficiency, wind, solar thermal baseload, solar PV, geothermal, and recycled energy the burden is on the nuclear industry to provide its own detailed, public cost estimates that it is prepared to stand behind in public utility commission hearings." (**0053-5** [Nordness, Dorothy])

Comment: Who will pay, and are they willing to pay?? Pulling again from the Time Magazine article, the answer is Ratepayers would take the main hit, but Taxpayers could be on the hook for billions in loan guarantees, tax breaks, insurance benefits and direct subsidies. This is because banks and bond-rating agencies are skeptical of backing the costs. In 2007 renewables attracted $71 billion globally in private capital during 2007 while nuclear got zip -- zero. The reactors under construction around the world are all government-financed, and ratepayers and taxpayers who will ultimately bear the burden are left out of the decision loop and not given the information they need to make a rational decision. (**0053-6** [Nordness, Dorothy])

Comment: Nuclear power has taken most of federal energy research and development dollars for over 50 years. Yet no private utility would consider investing in a nuclear plant without additional taxpayer backing as in France. Further, the Price/Anderson Act burdens the taxpayers with liability for major nuclear accidents.

A group of concerned Harvard/Boston doctors created the organization Physicians for Social Responsibility (PSR). PSR spread across the country and expanded into the International Physicians for the Prevention of Nuclear War, recipient of the 1985 Nobel Peace Prize. PSR published a definitive work on nuclear power entitled "Dirty, Dangerous, and Expensive: The Truth about Nuclear Power." The full text can be obtained at www.psr.org.

In the January 12, 2009 issue of Time magazine, Michael Grunwald wrote "It turns out that new plants would not just be extremely expensive but spectacularly expensive...sky high costs and uncertain financing could sink nukes again." (**0054-4** [Drake, Gerald A.])

Comment: I am concerned about the larger financial risks associated with the new nuclear power plant in our community.

The distinguished physicist and chief scientist of Rocky Mountain Institute, Amory Lovins, and research analyst, Imran Sheikh, published a report last year entitled, The Nuclear Illusion. The authors price electricity from a new nuclear power plant at cents per kilowatt hour, and then from a wind farm at cents per kilowatt hour. Both include the cost of fuel, capital, operations, maintenance, transmission and distribution. But in addition to its 14 cents per kilowatt hour, nuclear power requires funding for disposing of radioactive waste for ensuring plants against an accident, and for decommissioning plants when they wear out. These added costs are shouldered by taxpayers.

The Price-Anderson Act guarantees utilities protection against 98 percent of nuclear accident liability. All U.S. utilities refuse to generate nuclear power until the government provided this liability limit. Lester Brown, the founder of Earth Policy Institute, and prolific author, calls the economics of nuclear power flawed. He writes: The collective cap on nuclear operator liability is $10.2 billion. This compares with an estimate by SANDIA, a national laboratory, that a worse case accident could cost $700 billion. $10.2 billion, $700 billion. Anything above the $10.2 billion would be covered by taxpayers. If utilities need this kind of protection, shouldn't taxpayers have it as well?

According to Kristin Schrader-Frechette, O'Neill Family Professor in the Department of Biological Sciences and Department of Philosophy at the University of Notre Dame, Standard and Poor's downgrades the rating of any utility that wants a nuclear plant. Forbes Magazine recently called nuclear investment the largest managerial disaster in business history, something pursued only by the blind or the biased.

The Nuclear Energy Institute reported to the U.S. Department of Energy that 100 percent loan coverage by taxpayers is essential. Wall Street refuses to invest in nuclear power because the plants are assumed to have a 50 percent default rate. The only way that Wall Street will put their money behind these plants is if American taxpayers underwrite the risks.

Of 132 nuclear power plants built in the U.S., about one-half of the 253 originally ordered, 21 percent were permanently and prematurely closed due to reliability or cost problems. Another 20 percent have completely failed, for a year or more, at least once.

Michael Toddy writes in the June 30th, 2008 issue of the Wall Street Journal: The entire nuclear power industry is vulnerable to the safety standards of its worst performers because an accident anywhere in the world would stoke another anti-nuclear backlash among the public and investors.

Cost of the Yucca Mountain Nuclear Waste Repository was estimated to be $58 billion in 2001. In 2008, the estimate had soared to $96 billion. Because of escalating costs, the longer the construction lead time the greater the business risk that a proposed facility will exceed its estimated cost. Solar, wind, and gas have much shorter lead times than nuclear.

Investment in misguided attempts to stimulate the nuclear industry is money that could have gone to cheap, renewable electricity, like wind, solar, and geothermal, not to mention conservation and efficiency efforts. Besides their lower cost for construction and operation, investments in conservation efficiency and renewable energy provide ongoing jobs for solar panel installation, retrofitting buildings that are leaking, waste water reclamation, materials reuse, and recycling, and much more. (**0058-18** [Seubert, Nancy])

Comment: They are in a rush for finances. They are in a rush to get federal loan guarantees; they are in a rush to get ratepayers money. They are quite willing to spend ratepayer's money up front, during construction phase, and quite willing to spend federal taxpayer monies. But the utility is not willing to put forward the stockholder monies. So what this amounts to is public risk financially and private profit. Once they turn the key on that thing, you can bet the profit's going to go to Detroit Edison. (**0058-63** [Keegan, Michael])

Comment: the enormous financial investment in another nuclear power plant is not justified when the energy needs can be addressed first and foremost by focusing on efficiency and conservation. This isn't rocket science, it's not a secret. We all know that the best bargain for the buck in energy is conservation and efficiency.

Investment in high cost energy sources, such as nuclear power, must be the very last resort. Any application for a new nuclear plant must be considered in light of the applicant's investment in alternatives, beginning with efficiency and conservation, and then consideration of the mix of alternative energy option. Investment in multiple sources, not solely one or mega project is responsible. What is invested in nuclear power cannot be invested in wind, solar, geothermal, efficiency and conservation. The cost of nuclear energy is akin to putting too many eggs in one basket. It is foolish and too risky for us all; ratepayers, investors, and citizen taxpayers. (**0058-69** [Weber, Margaret])

Comment: There is also financial angle to this story, and again, I am reiterating some of what previous speakers talked about. New technologies that are being proposed are not tested, and maybe no more than theories put forth by nuclear proponents who want to profit from uninformed taxpayers by convincing them to pay the bills for the new facilities.

Let me explain. Given that the risk of default on loan repayments by most new reactor projects was assessed as very high. Wall Street and investment firms have stayed away from financing the new projects. The industry then turned to Congress, which pressured by the industry, agreed to authorize federal loan guarantees in 2005. So, if new reactors default, taxpayers will be held liable to repay the loans to the tune of many billions for each defaulted reactor.

However, this won't work for the financing of the ESBWR reactor, which is, as I understand, will not receive any of the 18.5 billion already approved by Congress in nuclear loan guarantees. DTE has yet to explain how it will finance Fermi 3 without those loan guarantees. But in the meantime the utility has applied to the Michigan Public Service Commission, to allow tens of millions of dollars to be charged on ratepayer electricity bills to cover its expenses in fighting paperwork with the NRC for the Fermi reactor proposal. (**0058-89** [Fischer, Lydia])

Comment: My understanding of the NEPA process, which was described earlier, is that there is a burden on the part of a proposal for a permit for anything affecting the environment, any possible impact on the environmental parts of air, water, people, flora, fauna, et cetera, is to look at alternative sources and make a solid case that there's no better alternative to supply whatever product it is that is being permitted.

Now, in this case I say that we should have a very rigorous examination of what are the benefits of alternative energy produced as opposed to the Fermi 3 plant. Because I think we will find out - we've certainly seen a lot of evidence to that already -- that if you compare the risk of Fermi 3 to the risk of alternative sources, which would be wind power, solar power, geothermal, and energy efficiency, conservation, that if you look very rigorously at the impact on people and their health, on public health, on the ecology, on the amount of economic opportunities that are available to people, job creation, that you will find that you cannot get the same benefits from the expanded tour that's being proposed from the taxpayer and from the ratepayers, for the Fermi 3 plant as opposed to what would be a comparable investment and alternative renewable sources.

And I agree with one of the previous speakers, that there is a great risk of undermining the development of renewable energy by going ahead with plans for a major power plant of the scope of Fermi 3. (**0058-98** [Holden, Anna])

Comment: What type of electricity generating equipment should we, the utility customers of DTE, invest in? We must consider both the costs and the benefits of the proposal before us, and alternatives to it.

Let's start with the costs. In the case of the proposed Fermi 3 nuclear power plant, the true costs include not only the very large financial costs of constructing, operating, decommissioning, and storing the radioactive waste from the plant, but also very significant safety, environmental, and health consequences. These costs should be compared to the costs of solar and wind alternatives.

What about the benefits? The benefits include not only the electricity produced, but also jobs and profits associated with the project. Nuclear power may be better for profits, but solar and wind will provide more jobs in Michigan. (**0059-47** [Wolfe, Joan])

Comment: Should we, the customers of DTE, assume the responsibility of paying for the costs of construction, operation, decommissioning, and long term storage of nuclear waste associated with the proposed Fermi 3 nuclear power plant? Can the residents and neighbors of Southeast Michigan afford to reap the environmental and health consequences of nuclear power in their backyards? We need to assess how the same funds could be instead used to develop and build a distributed wind and solar electricity generation, storage, and grid distribution system. That could meet our electricity use needs with far less damaging environmental and health costs. We need to ask whether there are less costly ways than the proposed Fermi 3 nuclear power plant to meet the electricity needs of the people of Southeast Michigan. And we must assess who will bear the costs and who will reap the benefits. (**0059-54** [Wolfe, Joan])

Comment: There are new solutions which will work better than the failed solutions of the past. The up to date knowledge and scientific materials presented by other speakers today here about alternative energy sources, demonstrates that the best option for meeting Michigan's energy needs, will be found not with expensive, untested, job stealing environmental unsafe nuclear power. That sounds contradictory to some things that other people said. But remember, I'm the statistician who says, Compared to what, job stealing? I thought it gave us jobs. It did, but fewer jobs than we would have gotten by the alternative of alternative energy sources.

Instead Michigan's energy needs can be met with safe, proven, cost effective alternative energy technology that is available today, built by Michigan workers and maintained by Michigan workers throughout the State. Development of alternative energy sources would provide many more jobs for Michigan and provide a larger tax base and would be much less environmentally risky than would the taxpayer subsidies needed to build an untested nuclear reactor design.

Nuclear power generation required massive tax subsidies from plants that were to last built 90 years ago. Today the economic advantages of alternative energy sources makes nuclear power even less economically feasible than it was even decades ago when it failed. (**0059-59** [Wolfe, Robert])

Comment: The proponents of Fermi 3 keep talking about the future, but I don't think they can see any farther than the dollar signs in their eyes. What they think would be good for Monroe would definitely be bad for Michigan, the Country, and the world. If you look at the entire nuclear cycle, Fermi 3 will be the most expensive electricity produced which will destroy the potential for long term jobs in the State. (**0059-66** [Farris, Mark])

Comment: Decommissioning of all the nukes is nearing the end of their operational lives. There will be a financial burden on the national economy in our lifetimes. DTE doesn't really have a solution for Fermi 1 and Fermi 2 decommissioning, and that cost will be dumped on citizens. About 20 years ago the shipping port reactor was decommissioned at a cost of over $100 million. Fermi 2 is about 20 times the size of Fermi 1, and Fermi 3 is projected to be about 25 times larger than Fermi 1. It will cost billions to decommission those three nukes. We'll pay coming and going for expensive electricity. (**0059-69** [Farris, Mark])

Comment: So, regarding taxpayer loan guarantees that's been mentioned today. The only way that DTE can finance the construction of its proposed Fermi reactor is for US taxpayers to bear all the financial risks. In 2003 the Congressional Budget Office warned that over half of all new reactor projects would likely default on their loan repayments.

Wall Street and investment firms are not interested in shouldering such risks. Thus, the nuclear power industry pressured the US Congress in 2005 to authorize federal loan guarantees. Now if new reactors default, taxpayers will be held liable to repay the loans, to the tune of many billions of dollars for each defaulted reactor. However, the US Department of Energy recently decided that the General Electric Hitachi's so-called Economic Simplified Boiling Water Reactor Design proposed at Fermi 3, will not receive any of the $18.5 billion already approved by Congress in nuclear loan guarantees a year ago.

Because of this the biggest nuclear utility in the United States, Exelon of Chicago, announced last November that it would not pursue ESBWRs at its new twin reactor project in Victoria County Station, Texas. Upon announcing its rejection of the ESBWR design, Exxon told NRC that another reactor design would enhance Exxon's ability to obtain federal loan guarantees, which are essential for financing a new nuclear development project. DTE has yet to explain how it will finance Fermi 3 absent taxpayer loan guarantees. The nuclear power industry has already enjoyed over $500 billion in public subsidies over the past 50 years. The giveaways have included $145 billion in federal research and development, tens of billions of dollars from ratepayers poured into the nuclear waste fund for irradiated nuclear fuel disposal. Hundreds of millions to billions of dollars per year in the form of insurance premiums that the nuclear power industry does not have to pay, because the federal Price-Anderson Act puts liability risks from major accidents onto the backs of US taxpayers. $125 billion in household and business payments on electricity bills to pay off nuclear utilities construction debts on the last generation of reactors. The list goes on and on.

DTE has even applied to the Michigan Public Service Commission to allow additional tens of millions of dollars to be charged on ratepayer electricity bills to cover its expenses, in filing paperwork with the US NRC for the Fermi 3 reactor proposal. After 50 years of receiving the lion's share of public support in the electricity sector, while only providing 20 percent or less of our electricity, none of our transport and none of our heating, the nuclear power industry should be required to stand on its own two feet in the marketplace. (**0059-73** [Kamps, Kevin])

Comment: My concern is the enormous cost for the Fermi 3 facility. In addition to the 14 cents per kilowatt hour price of electricity from a new nuclear power plant, the tax-payer must shoulder the cost for disposing of radioactive waste, for insuring plants against an accident, and for the decommissioning of plants. The over-all cost of Fermi III would be $7 billion, plus over-run costs. (**0062-1** [Henige, Margaret Ann])

Comment: As a concerned citizen I am worried about the building of Fermi 3 nuclear power plant and would like to address some of my concerns to your office. I am troubled by the high costs of building and operating such a plant and am wondering if other alternative means to acquire energy have been explored.

According to Amory Loving and Imran Shaikh of the Rocky Mountain Institute the cost to produce the same amount of energy produced by a wind farm, at 7 cents per kilowatt hour, is half of that to produce the same amount of energy that a nuclear power plant would, at 14 cents per kilowatt hour (The Nuclear Illusion).

The cost of building these plants is also of some concern to me. With $18.5 billion dollars in loans approved by the federal government, I was troubled to learn that out of roughly half of the 253 plants originally ordered, about 132 plants, 21 percent were permanently closed due to cost problems and another 27 percent have completely failed for a year or more at least once. These numbers are very alarming. (**0064-1** [Davis, Gary])

Comment: Much debate has been given to whether or not nuclear energy is a clean energy source. However, not much is ever discussed about the monetary value attached to the nuclear industry. In The Nuclear Illusion, Amory Lovins and Imran Sheikh priced nuclear electricity at 14 cents per kilowatt hour compared to wind power at 7 cents per hour. In addition to the 14 cents per kilowatt hour, there is the added expense of disposing of radioactive waste, for insuring plants against an accident and decommissioning plants when they wear out. (**0066-1** [Tinnirello, Nicole])

Comment: The expense of building at this time is prohibitive in this time of recession (**0070-2** [Karas, Josephine])

Comment: Investment: the enormous financial investment in another nuclear power plant is not justified, when the energy needs can be addressed first and foremost by focusing on energy efficiency and conservation. This is not a secret or rocket science: the best bargain for the dollar in energy is conservation and efficiency. Investment in high-cost energy sources such as nuclear power must be the very last resort. Any application for a new nuclear plant must be considered in light of the applicant's investment in the alternatives: beginning with efficiency and conservation and then consideration of the mix of alternative renewable energy options. Investment in multiple sources of renewables, not solely one or the other, is responsible. Diversity of energy sources allows for flexibility. Investment in a nuclear power plant is a poor environmental investment: there are limited financial resources, public or private. What is invested in a nuclear plant cannot be invested in wind, solar, geo-thermal, efficiency, conservation, etc. The cost of nuclear is akin to putting too many eggs in one basket: it is foolish and too risky for us all, ratepayers, taxpayers, and shareholders alike. (**0082-35** [Weber, Margaret])

Comment: Background: Public Act 286 (Oct. 6, 2008) passed after heavy lobbying by DTE Energy. The bill severely limits choice (to 10%) and allows Energy Providers (i.e., DTE & CMS) to bill--via rate hikes--based on anticipated future expenses, rather than traditional rate-setting tied to current costs. Ron A. May just spoke on plan to get tax credit. He and other Execs are paid for this ("incentivized type of strategy").

Questions:

1. May Det. Edison (or DTE) begin increasing rates for these anticipated capital expenditures?

2. MPSC's investigation into Detroit Edison's A&G expenditures (Admin & General Expenses) identified extraordinary costs passed onto consumers at Nov. 2004 (see Case No. U-14666 and U-13808). Why would we expect responsible "anticipation of costs"? Det. Edison employees told me the Corp. Execs....

Note: Among DTE/MCN entities per SEC filings show Caymen Island entities (which may heed "avoid" taxes). (**0082-40** [B., M. J.])

Comment: What type of electricity generating equipment should we the utility customers of DTE invest in? We must consider both the costs and the benefits of the proposal before us and alternatives to it. Let's start with the costs. In the case of the proposed Fermi 3 nuclear power plant, the true costs include not only the very large financial costs of constructing , operating, decommissioning, and storing the radioactive waste from the plant, but also significant safety, environmental, and health consequences. These costs should be compared to the costs of solar and wind alternatives.

What about the benefits? The benefits include not only the electricity produced, but also the jobs and the profits associated with this project. Nuclear power may be better for profits, but solar and wind will provide more jobs in Michigan. (**0083-1** [Wolfe, Joan])

Comment: The USA is in deep recession. Many have lost their homes and jobs. Who will pay for Fermi? Will Detroit Edison pay for it all? I doubt it. Every nuclear facility that exists has been subsidized by taxpayers. The reactor of Fermi 3 is planned on being built in France. i.e. more job outsourcing. (**0083-33** [Barnes, Kathryn])

Comment: I am concerned about the larger financial risks associated with a new nuclear power plant in our community. The distinguished physicist and chief scientist of Rocky Mountain Institute, Amory Lovins, and research analyst Imran Sheikh published a report last year entitled The Nuclear Illusion. The authors price electricity from a new nuclear power plant at 14 cents per kilowatt hour and that from a wind farm at 7 cents per kilowatt hour. Both include the costs of fuel, capital, operations, maintenance, transmission and distribution. But in addition to its 14 cents per kilowatt hour, nuclear power requires funding for disposing of radioactive waste, for insuring plants against an accident, and for decommissioning plants when they wear out. These added costs are shouldered by taxpayers.

The Price-Anderson Act guarantees utilities protection against 98 percent of nuclear-accident liability. All U.S. utilities refused to generate nuclear power until the government provided this liability limit.

Lester Brown, the founder of Earth Policy Institute and prolific author, calls the economics of nuclear power flawed. The collective cap on nuclear operator liability is $10.2 billion, he writes. This compares with an estimate by Sandia National Laboratory that a worst-case accident could cost $700 billion. Anything above $10.2 billion would be covered by taxpayers. If utilities need this kind of protection, shouldn't taxpayers have it as well?

According to Kristin Shrader-Frechette, O'Neill Family Professor in the Department of Biological Sciences and Department of Philosophy at the University of Notre Dame, Standard and Poor's downgrades the rating of any utility that wants a nuclear plant. Forbes magazine recently called nuclear investment 'the largest managerial disaster in business history,' something pursued only by the 'blind' or the 'biased'.

The Nuclear Energy Institute reported to the US Department of Energy that 100 percent loan coverage by taxpayers is essential. Wall Street refuses to invest in nuclear power because the plants are assumed to have a 50 percent default rate. The only way that Wall Street will put their money behind these plants is if American taxpayers underwrite the risks. (**0083-35** [Seubert, Nancy])

Comment: Should we the customers of DTE assume the responsibility of paying for the costs of construction, operation, decommissioning, and long term storage of nuclear waste associated with the proposed Fermi 3 nuclear power plant? Can the residents and neighbors of southeast Michigan afford to reap the environmental and health consequences of nuclear power in their back yards?

We need to assess how the same funds could instead be used to develop and build a distributed wind and solar electricity generation, storage, and grid distribution system that could meet our electricity use needs with far less damaging environmental and health costs.

We need to ask whether there are less costly ways than the proposed Fermi 3 nuclear power plant to meet the electricity needs of the people of southeast Michigan, and we must assess who will bear the costs and who will reap the benefits. (**0083-7** [Wolfe, Joan])

Response: *The costs and benefits of construction and operation of the proposed Fermi 3 nuclear plant will be addressed in Chapter 10 of the EIS. NRC does not have authority or responsibility by law or regulation to ensure that the proposed plant is the least costly alternative to provide energy services under any particular set of assumptions concerning future circumstances. The EIS will consider (in Chapter 9) the potential for alternative non-nuclear technologies to provide the electricity that could be generated by the proposed plant and the environmental impacts of those alternatives. NRC is not involved in establishing energy policy. Rather, it regulates the nuclear industry to protect the public health and safety and the environment within existing policy. Therefore, issues such as the potential effect of a particular nuclear power investment on the future development and implementation of alternative technologies, subsidies for nuclear power, and characterization of financial risks associated with such projects are not within the scope of the NRC environmental review and will not be considered further in the EIS. The sufficiency of decommissioning funding is also outside the scope of environmental review; however, 10 CFR 50.75 requires licensees to provide reasonable assurance that funds will be available for the decommissioning process.*

Comment: Up until a few years ago, there had been no new nuclear power reactors ordered in North America since 1978. Reactor orders on this continent dried up for many reasons.

Reactors proved to be far more expensive than previously thought, and the costs proved notoriously difficult to control.

Construction times were so long that the building of each nuclear reactor simply added to the energy demand for a decade or more before useful energy could be produced, often too late to respond to the demand that had been perceived 10 or 15 years earlier.

The problem of safely guarding high-level radioactive wastes in perpetuity had not been properly appreciated or satisfactorily addressed.

The accumulation of over 200 million tons of radioactive tailings from uranium mining operations in the USA posed what the Wall Street Journal once described as an economic and environmental time-bomb.

The catastrophic potential of reactor accidents had not yet received the public attention that ensued from the Three Mile Island and Chernobyl reactor accidents.

The perilous link between Atoms for Peace and Atoms for War had not yet been demonstrated with the Indian atomic bomb explosion in 1974 (brought about using peaceful nuclear technology provided by Canada and the USA).

The enormous potential for meeting our energy needs through efficiency measures and through renewable sources of energy was not as evident as it is today.

We at CCNR believe that the Environmental Impact Statement prepared for a new reactor today should be required to address all these issues quite thoroughly and explicitly. (**0048-1** [Edwards, Gordon])

Response: *The impacts of construction and operation of the proposed Fermi 3 nuclear plant will be presented in Chapters 4 and 5 of the EIS. The impacts of accidents will be discussed in Chapter 5 of the EIS. The impacts of the uranium fuel cycle will be discussed in Chapter 6 of the EIS. Alternatives to the proposed action, including renewable energy sources and demand-side management, will be evaluated in Chapter 9 of the EIS. Benefit-cost balance will be discussed in Chapter 10 of the EIS.*

Comment: Where do you recognize that THERE IS NO NET GAIN OF ENERGY IN NUCLEAR POWER? (**0004-8** [Carey, Corinne])

Comment: As the NRC proceeds with the environmental impact analysis for this proposed plant, I implore you to include a comprehensive analysis of the potential economic benefits it will generate for MI and our region. This is clearly an essential component to assure balance in your final conclusions on the costs and benefits of the proposed plant. (**0010-5** [Mahoney, Charlie])

Comment: Fourth point: And the reason for moratorium is very high construction expenses. I heard that it would be costing DTE $1 billion to construct this Fermi 3 nuclear reactor. (**0058-30** [Pfeiffer, Jelica B.])

Comment: I'm here to address costs, both long term and short term. With the various subsidies, it's costing about to 30 cents per kilowatt hour out the gate. This is wholesale, not retail. (**0058-32** [Yascolt, Stas])

Comment: These serious environmental and health costs outweigh any potential benefits of building Fermi 3. (**0059-52** [Wolfe, Joan])

Comment: As the NRC proceeds with the environmental impact analysis for this proposed plant, I implore you to include a comprehensive analysis of the potential economic benefits it will generate for MI and our region. This is clearly an essential component to assure balance in your final conclusions on the costs and benefits of the proposed plant. (**0083-21** [Pitoniak, Gregory])

Comment: To help sell the idea of a new nuclear plant to the Monroe County public it stands to reason that DTE would draw on any perceived benefits the plant would have for the local area - one of these being that of the jobs created by the construction and operation of the plant. In this county, hard hit by layoffs and plant closings related to the automobile slump, the prospect of lots of new jobs would certainly peek public anticipation of a better economy. At first glance it would seem that DTE's promise of thousands of temporary construction jobs and many hundreds of permanent operational jobs should be taken as a great positive. But closer examination reveals a much less attractive picture. Competing for the same public support and financial resources is the renewable energy industry (solar, wind, etc.). In these tough economic times it must be asked, Which area of energy generation will benefit us most? Which will give the most bang for the buck?

One study (see www.environmentamerica.org/reports/election-2008-reports2/election-20008reports/john-mccain-nuclear-plans) used the example of the largest currently planned (2008) new nuclear plant, the Calvert Cliffs Unit 3 in Maryland. It is expected to generate 4000 temporary construction jobs and 360 permanent jobs. Assuming a typical cost for a nuclear plant to -be $7 billion, each of those construction jobs comes at a cost of $1.75 million, with the permanent ones at a whopping $19 million per job!

Another study (see reference in previous paragraph) states: According to the Nuclear Energy Institute, a 1000 MW nuclear plant creates 400-700 permanent jobs. Building a nuclear reactor would result in the creation of 1,400 -1,800 jobs during construction. Using the best of these numbers together, this works out to be almost $2.5 million per job.

DTEs own figures (as found in Ch. 4 of the NRC environmental report), indicate an estimated maximum of 2900 construction jobs and up to 700 permanent jobs during operation, for a total of 3,600 jobs. DTE estimates the cost of construction at $10 billion. This works out to be about $2.8 million per job, most of which would be temporary (less than 8 yrs). And who would pay for these very expensive nuclear jobs? DTE electrical customers through higher utility rates, of course.

By contrast, another study (see reference in paragraph two above) indicates that investing $100 billion in energy efficiency and renewable energy over two years would create 2 million jobs -that works out to be only $50,000 per job (or only $0.05 million per job). Still another study (see www.tarsandswatch.org, and find their Jan16, 2008 report) says: ...study after study has confirmed that a renewable energy sector produces many more jobs. Wind like solar, produces five times as much employment as nuclear per amount invested.

And what about those Monroe County automotive job losses-could those unemployed folks count on stepping into the nuclear construction jobs building a Fermi III? Not likely, unless they are experienced carpenters, iron workers, equipment operators, mechanical workers, electrical workers, boiler makers, pipe fitters, sheet metal workers, insulators, painters, or millwrights. How many would fit into one of these categories??

From what I've studied so far, it sure sounds like the construction and operation of Fermi III would be a real economic boondoggle! We'd be much better off to invest our resources in energy efficiency and renewable energy sources such as solar and wind. (**0083-36** [Mantai, Frank])

Response: *Costs and benefits of construction and operation of the proposed Fermi 3 nuclear plant will be presented in Chapter 10 of the EIS. Consideration will be given to the availability of various job skills in the region rather than assuming all skills are available in the local workforce.*

Comment: We also -- affordability remains an essential issue as well, and we understand as we transfer some of the responsibility for payments, more from corporations and financiers to citizens, the necessity to protect our most vulnerable citizens from some of the economic impact of these cost shifts. We understand that there are some programs that help the low income population to assure that they can -- affordability. And we serve as an advocate for a little bit of expansion of those, breaking the ties of assistance in the definition of the indigent who need help in purchasing needed energy, from the poverty level to a higher level of standard. That represents about 300 percent of the SSI level, which is the test that we're using more and more to really, truly, define those who have the greatest needs for the life sustaining supports and the technology needed to help people maintain their independence in this State. (**0058-136** [McGuire, Jim])

Response: *NRC's responsibility is to regulate the nuclear industry to protect the public health and safety and the environment. NRC is not involved in establishing and administering energy policy. This comment is outside the scope of the staff's environmental review and will not be considered further in the EIS.*

Comment: As a company who can lead the charge in even better energy production, I ask that you internalize the full environmental and social cost in the selling price so that consumers can identify choices that meet the highest social and environmental standards. (**0027-3** [Askwith, Annemarie])

Response: *The comment requests Detroit Edison to internalize environmental and social costs in the selling price of energy. As this is not within NRC's authority, the comment is outside the scope of the environmental review and will not be considered further. Costs and benefits of construction and operation of the proposed Fermi 3 nuclear plant will be presented in Chapter 10 of the EIS.*

Comment: One horsepower is 746 watts. When you consider how valuable electricity is. When I was young there was farm areas where my folks came from that were just getting the benefits of the rural electrification, and what a wonderment that is. And we have people who complain about the price of electricity. When you consider a horsepower hour is costing you about 9 cents, I don't think it's too much to complain about. (**0058-130** [Meyer, Richard])

Response: *This comment provides general support for the cost of nuclear power. The comment provides no new or significant information relevant to the staff's environmental review and will not be considered further in the EIS.*

Comment: I'd just like to say in conclusion, that I am greatly opposed as a taxpayer and as a ratepayer with the proposal that the burden of paying for this Fermi 3 plant should be on our shoulders as opposed to being funded by the stockholders. It's a very profitable company, and those who have stock, I would think, probably want profits. But I think we should put these other factors above profit, and that we should not have this come out the ratepayers. (**0058-102** [Holden, Anna])

Comment: USA is in deep recession. Many have lost their homes and jobs. Who will pay for Fermi? Will Detroit Edison pay for it all? I doubt it. Every nuclear facility that exists has been subsidized by taxpayers. The reactor of Fermi 3 is planned on being built in France. That is more job outsourcing. (**0059-19** [Barnes, Kathryn])

Response: *The comments relate to the costs of power generation that are passed on to customers. NRC's responsibility is to regulate the nuclear industry to protect the public health and safety within existing policy. NRC is not involved in establishing the rates paid by customers.*

Comment: I would like to ask you to let me and the citizens of Monroe, MI know how we are going to pay for the building of another plant, how we are going to pay the high costs of producing this form of energy (**0052-3** [Fedorowicz, Meg] [Fedorowicz, Meg])

Response: *The purpose of the EIS is to disclose potential environmental impacts of building and operating the proposed nuclear power plant. Neither the determination of the impact of building and operating a nuclear power plant on retail power rates, nor the impacts such potential rate changes may cause are under NRC's regulatory purview; therefore, these comments will not be considered further.*

Appendix E

Draft Environmental Impact Statement Comments and Responses

Appendix E

Draft Environmental Impact Statement Comments and Responses

This appendix is intentionally left blank. The final environmental impact statement (EIS) will contain the comments on and responses to the draft EIS in this appendix.

Appendix F

Key Consultation Correspondence

Appendix F

Key Consultation Correspondence

Table F-1 identifies the consultation correspondence sent and received during the environmental review of the Enrico Fermi Unit 3 (Fermi 3) combined license application.

Table F-1. List of Consultation Correspondence

Source	Recipient	Date Accession No.
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	U.S. Fish and Wildlife Service (Craig Czarnecki)	December 23, 2008 ML083151398
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	National Marine Fisheries Service (Mary Colligan)	December 24, 2008 ML083151403
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Ohio Department of Natural Resources (Patricia Jones)	December 24, 2008 ML083151404
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Great Lakes Fisheries Commission (Kelley Smith)	December 24, 2008 ML083151400
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Advisory Council on Historic Preservation (Don Klima)	December 24, 2008 ML083151399
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Keweenaw Bay Indian Community (Warren C. Swartz)	December 24, 2008 ML083190398
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Bay Mills Indian Community (Jeffery D. Parker)	December 24, 2008 ML083190083
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Grand Traverse Band of Ottawa and Chippewa Indians (Robert Kewaygoshkum)	December 24, 2008 ML083190375
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Lac Vieux Desert Band of Lake Superior Chippewa Indians (James Williams, Jr.)	December 24, 2008 ML083190406
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Little Traverse Bay Bands of Odawa Indians (Frank Ettawageshik)	December 24, 2008 ML083190425

Table F-1. (contd)

Source	Recipient	Date Accession No.
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Pokagon Band of Potawatomi Indians (John A. Miller)	December 24, 2008 ML083190442
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Sault Ste. Marie Tribe of Chippewa Indians of Michigan (Aaron Payment)	December 24, 2008 ML083190489
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Hannahville Indian Community (Kenneth Meshigaud)	December 24, 2008 ML083190379
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Huron Potawatomi, Inc. (Laura Spurr)	December 24, 2008 ML083190382
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Saginaw Chippewa Indian Tribe of Michigan (Fred Cantu, Jr.)	December 24, 2008 ML083190448
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Match-e-be-nash-she-wish Band of Pottawatomi Indians of Michigan (David K. Sprague)	December 24, 2008 ML083190436
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Little River Band of Ottawa Indians (Larry Romanelli)	December 24, 2008 ML083190415
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	International Joint Commission (James G. Chandler)	December 24, 2008 ML083151401
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Michigan State Historic Preservation Officer (Brian D. Conway)	December 24, 2008 ML083151405
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Michigan Natural Features Inventory (Leni Wilsmann)	December 24, 2008 ML083151402
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Forest County Potawatomi (Harold G. Frank)	December 31, 2008 ML083520641
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	U.S. Environmental Protection Agency, Region 5 (Anna Miller)	December 31, 2008 ML083590143
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Michigan Department of Environmental Quality (Steven Chester)	December 31, 2008 ML083590138
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Shawnee Tribe (Ron Sparkman)	December 31, 2008 ML083530066

Table F-1. (contd)

Source	Recipient	Date Accession No.
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Delaware Nation (Edgar L. French)	December 31, 2008 ML083530050
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Wyandotte Nation (Leaford Bearskin)	December 31, 2008 ML083530077
U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	Ottawa Tribe of Oklahoma (Charles Todd)	December 31, 2008 ML083530043
National Marine Fisheries Service (Mary A. Colligan)	U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	January 21, 2009 ML090711069
U.S. Fish and Wildlife Service (Craig Czarnecki)	U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	January 28, 2009 ML090750973
Michigan Department of Environmental Quality (Elizabeth M. Browne)	U.S. Nuclear Regulatory Commission	February 3, 2009 ML0906504561
Michigan Department of Natural Resources (Lori Sargent)	U.S. Nuclear Regulatory Commission (Gregory P. Hatchett)	February 9, 2009 ML090401015
U.S. Environmental Protection Agency (Kenneth Westlake)	U.S. Nuclear Regulatory Commission (Michael Lesar)	February 9, 2009 ML090650467
U.S. Army Corps of Engineers (John Konik)	U.S. Nuclear Regulatory Commission (Scott Flanders)	March 3, 2009 ML090850037
U.S. Nuclear Regulatory Commission (Bruce A. Watson)	Michigan State Historic Preservation Officer (Brian D. Conway)	December 2, 2010 ML101790096
U.S. Nuclear Regulatory Commission (Ryan Whited)	Michigan State Historic Preservation Officer (Brian D. Conway)	December 16, 2010 ML101820302
U.S. Nuclear Regulatory Commission (John Fringer)	Michigan State Historic Preservation Officer (Martha M. Faes)	August 22, 2011 ML112070027
U.S. Nuclear Regulatory Commission (John Fringer)	Michigan State Historic Preservation Officer (Martha M. Faes)	August 24, 2011 ML112070043
U.S. Army Corps of Engineers (John Konik)	U.S. Nuclear Regulatory Commission (Bruce Olson)	September 16, 2011 ML112660005

Appendix G

Supporting Documentation on the Radiological Dose Assessment for Fermi 3

Appendix G

Supporting Documentation on the Radiological Dose Assessment for Fermi 3

The U.S. Nuclear Regulatory Commission (NRC) staff performed an independent dose assessment of the radiological impacts resulting from normal operation of the new nuclear unit at the Detroit Edison Enrico Fermi Atomic Power Plant (Fermi) site. The results of this assessment are presented in this appendix and are compared to the results from the Detroit Edison Company (Detroit Edison) found in this environmental impact statement (EIS) in Section 5.9, Radiological Impacts of Normal Operations. This appendix is divided into four sections: (1) dose estimates to the public from liquid effluents, (2) dose estimates to the public from gaseous effluents, (3) cumulative dose estimates, and (4) dose estimates to biota from liquid and gaseous effluents.

G.1 Dose Estimates to the Public from Liquid Effluents

The NRC staff used the dose assessment approach specified in Regulatory Guide 1.109 (NRC 1977) and the LADTAP II computer code (Strenge et al. 1986) to estimate doses to the maximally exposed individual (MEI) and population from the liquid effluent pathway of the proposed Enrico Fermi Unit 3 (Fermi 3).

G.1.1 Scope

Doses from the proposed Fermi 3 to the MEI were calculated and compared to regulatory criteria for the following:

- *Total Body*. Dose was the total for all pathways (i.e., drinking water, fish and shellfish consumption, shoreline usage, swimming exposure, boating) with the highest value for the adult, teen, child, or infant compared to the 3 mrem/yr per reactor dose design objective in Title 10 of the Code of Federal Regulations (CFR), Part 50, Appendix I.
- *Organ*. Dose was the total for each organ for all pathways (i.e., drinking water, fish and shellfish consumption, shoreline usage, swimming exposure, boating) with the highest value for the adult, teen, child, or infant compared to the 10 mrem/yr per reactor dose design objective specified in 10 CFR Part 50, Appendix I.

The NRC staff reviewed the assumed exposure pathways and the input parameters and values used by Detroit Edison (2011a) for appropriateness, including references made to the General

Electric-Hitachi Nuclear Energy Americas, LLC (GEH) Economic Simplified Boiling Water Reactor (ESBWR) Design Control Document (GEH 2010). Default values from Regulatory Guide 1.109 (NRC 1977) were used when site-specific input parameters were not available from Detroit Edison. The staff concluded that the assumed exposure pathways were reasonable and that the input parameters and values used by Detroit Edison were appropriate.

G.1.2 Resources Used

To calculate doses to the public from liquid effluents, the NRC staff used a personal computer (PC) version of the LADTAP II code entitled NRCDOSE, Version 2.3.10 (Chesapeake Nuclear Services, Inc. 2008) obtained through the Oak Ridge Radiation Safety Information Computational Center (RSICC).

G.1.3 Input Parameters

Table G-1 provides a listing of the major parameters used in calculating dose to the public from liquid effluent releases during normal operation.

G.1.4 Comparison of Results

The NRC staff compared the results documented in the Environmental Report (ER) (i.e., Detroit Edison 2011a) with the results calculated by the NRC. Doses calculated for the MEI and population by the NRC staff confirmed the doses calculated by Detroit Edison.

For calculating the population dose from liquid effluents, the population distribution used by Detroit Edison was for year 2060, 10 years beyond the anticipated operating license. However, Environmental Standard Review Plan (ESRP) Section 5.4.1 (NRC 2000) instructs the NRC staff to use the "projected population for 5 years from the time of the licensing action under consideration." Assuming the combined license (COL) licensing action occurred in year 2010 and adding 5 years yields year 2015. Using the population projections from ER Tables 2.5-10 and 2.5-12 (Detroit Edison 2011a) (summarized in Table G-2) yields a population estimate for the year 2015 of 5,971,392. This population estimate is significantly smaller than the 2060 projected population (7,713,709), so the doses calculated by Detroit Edison are conservatively high. For comparability, NRC staff also used the 2060 population estimate. Doses for the year 2015 would be lower by a factor of 1.29 than those reported below.

G.2 Dose Estimates to the Public from Gaseous Effluents

The NRC staff used the dose assessment approach specified in Regulatory Guide 1.109 (NRC 1977) and the XOQDOQ and GASPAR II computer codes (Sagendorf et al. 1982;

Table G-1. Parameters Used in Calculating Dose to the Public from Liquid Effluent Releases

Parameter	Staff Value		Comments
New unit liquid effluent source term (curie [Ci]/yr)[(a)(b)]	H-3	1.40×10^{1}	Values from GEH ESBWR Design Control Document (DCD) Table 12.2-19b for a single unit (GEH 2010).
	Na-24	4.19×10^{-3}	
	P-32	3.51×10^{-4}	
	Cr-51	1.10×10^{-2}	
	Mn-54	1.30×10^{-4}	
	Mn-56	1.00×10^{-3}	
	Fe-55	1.90×10^{-3}	
	Fe-59	6.00×10^{-5}	
	Co-58	3.70×10^{-4}	
	Co-60	7.51×10^{-4}	
	Cu-64	1.00×10^{-2}	
	Zn-65	3.70×10^{-4}	
	Zn-69m	7.51×10^{-4}	
	Br-83	1.00×10^{-4}	
	Sr-89	1.90×10^{-4}	
	Sr-90	1.00×10^{-5}	
	Sr-91	9.51×10^{-4}	
	Y-91	1.20×10^{-4}	
	Sr-92	2.30×10^{-4}	
	Y-92	8.70×10^{-4}	
	Y-93	1.00×10^{-3}	
	Zr-95	1.00×10^{-5}	
	Nb-95	1.00×10^{-5}	
	Mo-99	2.50×10^{-3}	
	Tc-99m	4.60×10^{-3}	
	Ru-103	4.00×10^{-5}	
	Ru-105	1.30×10^{-4}	
	Te-129m	7.00×10^{-5}	
	Te-131m	8.00×10^{-5}	
	Te-132	1.00×10^{-5}	
	I-131	6.19×10^{-3}	
	I-132	9.30×10^{-4}	
	I-133	3.00×10^{-2}	
	I-134	4.00×10^{-5}	
	I-135	7.11×10^{-3}	
	Cs-134	5.70×10^{-4}	
	Cs-136	3.51×10^{-4}	
	Cs-137	1.50×10^{-3}	
	Ba-139	3.00×10^{-5}	

Table G-1. (contd)

Parameter	Staff Value	Comments
	Ba-140 6.89×10^{-4} Ce-141 6.00×10^{-5} La-142 2.00×10^{-5} Ce-143 3.00×10^{-5} Pr-143 7.00×10^{-5} W-187 2.00×10^{-4} Np-239 9.30×10^{-3}	
Discharge flow rate (cubic feet [ft]^3/second [sec])	0.234	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Source term multiplier	1	Single-unit source term.
Site type	Fresh water	Discharge is to the freshwater Lake Erie.
Reconcentration model	No impoundment	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Impoundment total volume (ft^3)	0	Set to zero for “no impoundment” model (Strenge et al. 1986).
Shore width factor	0.3	Suggested value for lake (NRC 1977; Strenge et al. 1986).
Dilution factor at discharge location	115	Blowdown flow rate divided by discharge flow rate from Table 5.4-1 of the ER (Detroit Edison 2011a).
Dilution factors after discharge Aquatic food and boating Shoreline and swimming Drinking water	 100 45 67 (MEI), 100 (population)	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Transit time (hour [hr]) Drinking water Boating and swimming Fish and invertebrate	 22.6 (MEI), 24 (population) 10.6 24	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Consumption and usage factors for adults, teens, children, and infants	Shoreline recreational usage (hr/yr) 12 (adult) 67 (teen) 14 (child) 0 (infant)	Site-specific values from Table 5.4-2 of the ER (Detroit Edison 2011a) and LADTAP II code default values (NRC 1977; Strenge et al. 1986).

Table G-1. (contd)

Parameter	Staff Value	Comments
	Drinking water usage (liters [L]/yr) 730 (adult) 510 (teen) 510 (child) 330 (infant) Fish consumption (kilograms [kg]/yr) 21 (adult) 16 (teen) 6.9 (child) 0 (infant)	
Total 50-mile (mi) population	7,713,709	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Total 50-mi sport fishing harvest (kg/yr)	11,450,000	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Total 50-mi commercial fishing harvest (kg/yr)	2,070,000	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Total 50-mi commercial invertebrate harvest (kg/yr)	33,000,000	Site-specific value from Table 5.4-1 of the ER (Detroit Edison 2011a).
Total 50-mi shoreline usage (person-hr/yr)	5,747,850	Calculated using site-specific individual value from Table 5.4-1 and usage factors for average individual from Table 5.4-2 of the ER (Detroit Edison 2011a), as well as age distribution from LADTAP II code defaults (NRC 1977; Strenge et al. 1986).
Total 50-mi swimming usage (person-hr/yr)	5,747,850	Calculated using site-specific individual value from Table 5.4-1 and usage factors for average individual from Table 5.4-2 of the ER (Detroit Edison 2011a), as well as age distribution from LADTAP II code defaults (NRC 1977; Strenge et al. 1986).
Total 50-mi boating usage (person-hr/yr)	5,747,850	Calculated using site-specific individual value from Table 5.4-1 and usage factors for average individual from Table 5.4-2 of the ER (Detroit Edison 2011a), as well as age distribution from LADTAP II code defaults (NRC 1977; Strenge et al. 1986).

(a) To convert Ci/yr to becquerel (Bq)/yr, multiply the value by 3.7×10^{10}.
(b) Only radionuclides included in Regulatory Guide 1.109 are considered (NRC 1977).

Table G-2. Population Projections from 2000 to 2060 within 50 mi of the Fermi Site

	Population Projections[a] within Radii/Distances (mi)							Annual Average Percent Change for the 10-Year Period
Year	0 to 1 mi[a]	1 to 10 mi	10 to 20 mi	20 to 30 mi	30 to 40 mi	40 to 50 mi	0 to 50 mi[d]	
2000[b]	570	106,166	347,077	1,769,937	2,010,398	1,344,775	5,578,923	Not applicable
2008[c]	1163	112,665	348,369	1,791,988	2,081,615	1,449,117	5,784,917	Not applicable
2020[c]	1153	123,378	351,302	1,831,686	2,198,894	1,624,796	6,131,209	Not applicable
2030[c]	1144	133,239	354,711	1,871,367	2,307,607	1,791,234	6,459,302	0.52
2040[c]	1133	144,031	359,060	1,917,634	2,427,914	1,978,702	6,828,474	0.55
2050[c]	1122	155,853	364,415	1,971,113	2,561,627	2,190,275	7,244,405	0.59
2060[c, d]	1109	168,799	370,858	2,032,503	2,710,898	2,429,542	7,713,709	0.63

Source: Detroit Edison 2011a

(a) Population estimates and projections include transient and residential population in the 0- to 10-mi range.

(b) Residential population in 2000, U.S. Census Bureau, decennial census.

(c) The populations for years 2008 through 2060 have been projected by calculating a growth rate using State population projections (by county) as the base.

(d) Population used in GASPAR II population runs (Detroit Edison 2011a).

Strenge et al. 1987) to estimate doses to the MEI and to the population within a 50-mi radius of the proposed Fermi 3 site from the gaseous effluent pathway for the proposed unit.

G.2.1 Scope

The NRC staff performed multiple calculations to confirm that Detroit Edison properly accounted for dispersion and deposition from three stack releases to identify the most limiting MEI. The maximum gamma air dose, beta air dose, total body dose, and skin dose from noble gases was calculated at the exclusion area boundary location 0.48 mi north-northwest (NNW) of the proposed Fermi 3 site. The maximum dose from ground exposure was calculated at the exclusion area boundary location 0.48 mi west-northwest (WNW) of the proposed Fermi 3 site. The maximum dose to residents and the MEI from consumption of vegetables was calculated at 0.59 mi NW of the site. The maximum dose from the milk ingestion pathway was calculated at 2.1 mi WNW of the site. The maximum dose from the meat ingestion pathway was calculated at 3.0 mi NNW of the site. The dose to the MEI is estimated as the sum of the maximum doses from each of the following exposure pathways: plume immersion, direct shine from deposited radionuclides, inhalation, ingestion of local farm or garden vegetables, ingestion of locally produced beef, and ingestion of locally produced milk (Detroit Edison 2011a).

The NRC staff reviewed the input parameters and values used by Detroit Edison (2011a) for appropriateness, including references made to the GEH ESBWR design control document (GEH 2010). Default values from Regulatory Guide 1.109 (NRC 1977) were used when site-specific input parameters were not available. The NRC staff concluded that the assumed exposure pathways and input parameters and values used by Detroit Edison were appropriate. These pathways and parameters were used by the NRC staff in its independent calculations using GASPAR II.

Joint frequency distribution data of wind speed and wind direction by atmospheric stability class for the proposed Fermi 3 site (Detroit Edison 2011a) were used as input to the XOQDOQ code (Sagendorf et al. 1982) to calculate long-term average atmospheric dispersion χ/Q and deposition factor D/Q values for routine releases. The NRC staff’s independent calculations of χ/Q and D/Q values confirmed the values reported by Detroit Edison in ER Tables 2.7-87 through 2.7-152 (Detroit Edison 2011a).

Population doses were calculated for all types of releases (i.e., noble gases, iodines and particulates, and H-3 and C-14) using the GASPAR II code for the following exposure pathways: plume immersion, direct shine from deposited radionuclides, ingestion of vegetables, and ingestion of milk and meat.

G.2.2 Resources Used

To calculate doses to the public from gaseous effluents, the NRC staff used a PC version of the XOQDOQ and GASPAR II codes entitled NRCDOSE Version 2.3.10 (Chesapeake Nuclear Services, Inc. 2008) obtained through the Oak Ridge RSICC.

G.2.3 Input Parameters

Table G-3 provides a listing of the major parameters used in calculating dose to the public from gaseous effluent releases during normal operation. For dose estimation, the gaseous effluent source terms from reactor building, turbine building, and radwaste building were evaluated separately.

G.2.4 Comparison of Doses to the Public from Gaseous Effluent Releases

The NRC staff compared the results documented in the ER (Detroit Edison 2011a) for doses from noble gases at the exclusion area boundary with the results calculated by the NRC staff. The doses calculated by the NRC staff confirmed the doses calculated by Detroit Edison.

The NRC staff also compared its estimates of the doses to the MEI to the doses calculated by Detroit Edison. Doses to the MEI were calculated at the nearest residence, nearest garden, nearest milk cow, and nearest beef cattle. The term “nearest” means the location where the individual would receive the highest calculated dose for the specific pathway. The doses calculated by the NRC staff confirmed the doses calculated by Detroit Edison.

G.2.5 Comparison of Results – Population Doses

The NRC staff compared its calculations with the Detroit Edison population dose estimates documented in the ER (Detroit Edison 2011a, Table 5.4-7). The NRC staff’s calculations for population dose confirmed the Detroit Edison estimates (Detroit Edison 2011a, Table 5.4-7) for the new Fermi 3. Both Detroit Edison and NRC staff used population estimates for the year 2060, which is a factor of 1.29 times higher than the population estimated for the year 2015 (and 5 years past the expected licensing action).

G.3 Cumulative Dose Estimates

The NRC staff compared the results documented in the ER (Detroit Edison 2011a) for cumulative dose estimates to the MEI with those calculated by the NRC staff. Cumulative dose estimates include doses from all pathways (i.e., direct exposure, liquid effluents, and gaseous effluents) for both the proposed Fermi 3 and the existing Fermi 2 at the Fermi site. These cumulative dose estimates were calculated for comparison to the dose standards of

Table G-3. Parameters Used in Calculating Dose to the Public from Gaseous Effluent Releases

Parameter	NRC Staff Value		Comments
New unit gaseous effluent source term – reactor building (Ci/yr)[(a)]	Kr-83m	2.30×10^{-3}	Values from GEH ESBWR DCD Table 12.2-16 for a single unit (GEH 2010) and Final Safety Analysis Report (FSAR) Table 12.2-206 (Detroit Edison 2011b).
	Kr-85m	2.44×10^{0}	
	Kr-85	2.03×10^{-3}	
	Kr-87	1.22×10^{0}	
	Kr-88	2.45×10^{0}	
	Kr-89	1.22×10^{0}	
	Xe-131m	1.11×10^{-3}	
	Xe-133m	5.14×10^{-3}	
	Xe-133	6.79×10^{1}	
	Xe-135m	3.78×10^{1}	
	Xe-135	7.84×10^{1}	
	Xe-137	1.11×10^{2}	
	Xe-138	4.87×10^{0}	
	I-131	3.46×10^{-2}	
	I-132	2.31×10^{-1}	
	I-133	1.76×10^{-1}	
	I-134	4.06×10^{-1}	
	I-135	2.36×10^{-1}	
	H-3	3.95×10^{1}	
	Na-24	1.59×10^{-4}	
	P-32	4.05×10^{-5}	
	Cr-51	5.00×10^{-3}	
	Mn-54	1.94×10^{-3}	
	Fe-55	1.38×10^{-3}	
	Mn-56	3.24×10^{-4}	
	Co-58	5.35×10^{-4}	
	Co-60	7.03×10^{-3}	
	Fe-59	5.78×10^{-4}	
	Ni-63	1.41×10^{-6}	
	Cu-64	2.03×10^{-4}	
	Zn-65	8.14×10^{-3}	
	Rb-89	5.41×10^{-6}	
	Sr-89	1.95×10^{-4}	
	Sr-90	2.32×10^{-5}	
	Sr-91	2.03×10^{-4}	
	Sr-92	1.32×10^{-4}	
	Y-90	2.41×10^{-6}	
	Y-91	5.14×10^{-5}	
	Y-92	1.03×10^{-4}	

Table G-3. (contd)

Parameter	NRC Staff Value		Comments
	Y-93	2.19×10^{-4}	
	Zr-95	1.36×10^{-3}	
	Nb-95	1.35×10^{-2}	
	Mo-99	8.99×10^{-2}	
	Tc-99m	6.49×10^{-5}	
	Ru-103	5.70×10^{-3}	
	Ru-106	4.32×10^{-6}	
	Rh-103m	1.03×10^{-7}	
	Rh-106	1.41×10^{-10}	
	Ag-110m	4.62×10^{-6}	
	Sb-124	6.76×10^{-5}	
	Te-129m	4.86×10^{-5}	
	Te-131m	1.62×10^{-5}	
	Te-132	4.05×10^{-6}	
	Cs-134	6.52×10^{-3}	
	Cs-136	6.93×10^{-4}	
	Cs-137	8.21×10^{-3}	
	Cs-138	2.30×10^{-5}	
	Ba-140	3.01×10^{-2}	
	La-140	3.78×10^{-4}	
	Ce-141	1.25×10^{-3}	
	Ce-144	4.32×10^{-6}	
	Pr-144	4.86×10^{-9}	
	W-187	3.78×10^{-5}	
	Np-239	2.43×10^{-3}	
New unit gaseous effluent source term – turbine building (Ci/yr)[(a)]	Kr-83m	3.78×10^{-9}	
	Kr-85m	1.53×10^{1}	
	Kr-85	1.41×10^{2}	
	Kr-87	3.78×10^{1}	
	Kr-88	5.41×10^{1}	
	Kr-89	3.51×10^{2}	
	Xe-131m	4.05×10^{0}	
	Xe-133m	2.19×10^{-5}	
	Xe-133	8.99×10^{2}	
	Xe-135m	2.43×10^{2}	
	Xe-135	4.97×10^{2}	
	Xe-137	6.22×10^{2}	
	Xe-138	6.22×10^{2}	
	I-131	1.90×10^{-1}	

Table G-3. (contd)

Parameter	NRC Staff Value		Comments
	I-132	1.24×10^{0}	
	I-133	9.21×10^{-1}	
	I-134	2.27×10^{0}	
	I-135	1.27×10^{0}	
	H-3	3.24×10^{1}	
	C-14	1.43×10^{1}	
	Ar-41	3.78×10^{-2}	
	Cr-51	1.22×10^{-3}	
	Mn-54	8.11×10^{-4}	
	Co-58	1.35×10^{-3}	
	Co-60	1.35×10^{-3}	
	Fe-59	1.35×10^{-4}	
	Zn-65	8.11×10^{-3}	
	Sr-89	8.11×10^{-3}	
	Sr-90	2.70×10^{-5}	
	Zr-95	5.41×10^{-5}	
	Nb-95	8.11×10^{-6}	
	Mo-99	2.70×10^{-3}	
	Ru-103	6.76×10^{-5}	
	Sb-124	1.35×10^{-4}	
	Cs-134	2.70×10^{-4}	
	Cs-136	1.35×10^{-4}	
	Cs-137	1.35×10^{-3}	
	Ba-140	1.35×10^{-2}	
	Ce-141	1.35×10^{-2}	
New unit gaseous effluent source term – radwaste building (Ci/yr)[(a)]	Kr-89	1.76×10^{1}	Values from GEH ESBWR DCD Table 12.2-16 for a single unit (GEH 2010) and FSAR Table 12.2-206 (Detroit Edison 2011b).
	Xe-133	1.35×10^{2}	
	Xe-135m	3.24×10^{2}	
	Xe-135	1.70×10^{2}	
	Xe-137	5.14×10^{1}	
	Xe-138	1.22×10^{0}	
	I-131	9.19×10^{-3}	
	I-132	8.11×10^{2}	
	I-133	5.95×10^{-2}	
	I-134	1.49×10^{-1}	
	I-135	8.38×10^{-2}	
	Cr-51	9.46×10^{-4}	
	Mn-54	5.41×10^{-3}	
	Co-58	2.70×10^{-4}	

Table G-3. (contd)

Parameter	NRC Staff Value	Comments
	Co-60 9.46×10^{-3} Fe-59 4.05×10^{-4} Zn-65 4.05×10^{-4} Zr-95 1.08×10^{-3} Nb-95 5.41×10^{-6} Mo-99 4.05×10^{-6} Ru-103 1.35×10^{-6} Sb-124 9.46×10^{-5} Cs-134 3.24×10^{-3} Cs-137 5.41×10^{-3} Ba-140 5.41×10^{-6} Ce-141 9.46×10^{-6}	
Population distribution	Tables 2.5-10 and 2.5-12 of the ER (Detroit Edison 2011a)	Population distribution used by Detroit Edison and the NRC staff was for year 2060. Note that ESRP Section 5.4.1 requires use of "projected population for 5 years from the time of the licensing action under consideration." Assuming the ESRP licensing action occurred in year 2010, adding 5 year yields year 2015. See discussion of population dose in Section G.2.5.
Wind speed and direction distribution	Table 2.7-63 of the ER (Detroit Edison 2011a)	Site-specific data provided by Detroit Edison for time periods from 2003 to 2007.
Atmospheric dispersion factors (sec/cubic meter [m^3])	Tables 2.7-87 through 2.7-95 and Tables 2.7-108 through 2.7-140 of the ER (Detroit Edison 2011a)	Site-specific data provided by Detroit Edison for time periods from both 1985 to 1989 and 2003 to 2007.
Ground deposition factors (m^{-2})	Tables 2.7-87 through 2.7-95 and Tables 2.7-108 through 2.7-140 of the ER (Detroit Edison 2011a)	Site-specific data provided by Detroit Edison for time periods from both 1985 to 1989 and 2003 to 2007.
Milk production rate within a 50-mi radius of the Fermi site (kg/yr)	6.043×10^{8}	Site-specific data from Table 5.4-3 provided by Detroit Edison (2011a).
Vegetable/fruit production rate within a 50-mi radius of the Fermi site (kg/yr)	9.689×10^{9}	Site-specific data from Table 5.4-3 provided by Detroit Edison (2011a).

Table G-3. (contd)

Parameter	NRC Staff Value	Comments
Meat production rate within a 50-mi radius of the Fermi site (kg/yr)	1.919×10^7	Site-specific data from Table 5.4-3 provided by Detroit Edison (2011a).
Pathway receptor locations (direction and distance) – nearest site boundary, vegetable garden, residence, meat animal, milk animal	Tables 2.7-80 through 2.7-86 of the ER (Detroit Edison 2011a)	Site-specific data provided by Detroit Edison (2011a).
Consumption factors for milk, meat, leafy vegetables, and vegetables	Milk (L/yr) 310 (adult) 400 (teen) 330 (child) 330 (infant) Meat (kg/yr) 110 (adult) 65 (teen) 41 (child) 0 (infant) Leafy vegetables (kg/yr) 64 (adult) 42 (teen) 26 (child) 0 (infant) Vegetables (kg/yr) 520 (adult) 630 (teen) 520 (child) 0 (infant)	Table 5.4-2 of the ER (Detroit Edison 2011a) and Regulatory Guide 1.109 (NRC 1977).
Fraction of year that leafy vegetables are grown	0.33	Site-specific value from Table 5.4-3 of the ER (Detroit Edison 2011a).
Fraction of year that milk cows are on pasture	0.58	Site-specific value from Table 5.4-3 of the ER (Detroit Edison 2011a).
Fraction of year that goats are on pasture	0.67	Site-specific value from Table 5.4-3 of the ER (Detroit Edison 2011a)
Fraction of MEI vegetable intake from own garden	0.76	Default value of GASPAR II code (Strenge et al. 1987).
Fraction of milk-cow intake that is from pasture while on pasture	1	Default value of GASPAR II code (Strenge et al. 1987).
Fraction of goat intake that is from pasture while on pasture	1	Default value of GASPAR II code (Strenge et al. 1987).

Table G-3. (contd)

Parameter	NRC Staff Value	Comments
Average absolute humidity over the growing season (g/m^3)	11	Site-specific value from the Detroit Edison (2011a), Table 5.4-3.
Average temperature over the growing season (°F)	None	Default value of GASPAR II code (Strenge et al. 1987).
Fraction of year that beef cattle are on pasture	0.58	Site-specific value from Table 5.4-3 of the ER (Detroit Edison 2011a).
Fraction of year of beef cattle intake that is from pasture while on pasture	1	Default value of GASPAR II code (Strenge et al. 1987).

(a) To convert Ci/yr to Bq/yr, multiply the value by 3.7×10^{10}.

40 CFR Part 190. The NRC staff's calculations for cumulative dose confirmed the Detroit Edison estimates (Detroit Edison 2011a, Table 5.4-8).

G.4 Dose Estimates to the Biota from Liquid and Gaseous Effluents

To estimate doses to the biota from the liquid and gaseous effluent pathways, the NRC staff used the LADTAP II code (Strenge et al. 1986), the GASPAR II code (Strenge et al. 1987), and input parameters supplied by Detroit Edison in its ER (Detroit Edison 2011a).

G.4.1 Scope

The NRC staff estimated the doses to biota other than human beings using surrogate species; using the characteristics of surrogate species to represent a range of species is an accepted methodology. Fish, algae, and invertebrate species are used as surrogate aquatic biota species. Muskrats, raccoons, herons, and ducks are used as surrogate terrestrial biota species. The staff recognizes the LADTAP II computer program as an appropriate method for calculating doses to the aquatic biota and for calculating the liquid-pathway contribution to terrestrial biota. The LADTAP II code calculates an internal dose component and an external dose component and sums them for a total body dose. The NRC staff reviewed the input parameters used by Detroit Edison for appropriateness. Default values from Regulatory Guide 1.109 (NRC 1977) were used when site-specific input parameters were not available. The NRC staff concluded that all of the LADTAP II input parameters used by Detroit Edison were appropriate. These parameters were used by the NRC staff in its independent calculations using LADTAP II.

The LADTAP II code calculates only biota doses from the liquid effluent pathway. Terrestrial biota could also be exposed via the gaseous effluent pathway. The gaseous pathway doses would be the same as doses for the MEI calculated using the GASPAR II code. Detroit Edison

(2011a) used the MEI doses at 0.25 mi from the release point to estimate onsite biota exposures. To account for the greater proximity of the main body mass of animals to the ground as compared to that of humans, the biota calculation assumed a ground deposition factor twice that used in the human MEI calculation. The gaseous pathway doses are summed and combined with the liquid pathway doses for the representative biota species. The NRC staff used the same approach in its calculations with one exception. The NRC staff included doses from ingestion of vegetation in the gaseous pathway estimates.

G.4.2 Resources Used

To calculate doses to the biota, the NRC staff used a PC version of the LADTAP II and GASPAR II computer codes entitled NRCDOSE Version 2.3.10 (Chesapeake Nuclear Services, Inc. 2008). NRCDOSE was obtained through the Oak Ridge RSICC.

G.4.3 Input Parameters

The NRC staff used the input parameters for LADTAP II and GASPAR II specified in Sections G.2.3 and G.2.4 to calculate biota doses.

G.4.4 Comparison of Results

Table G-4 compares Detroit Edison's biota dose estimates from liquid and gaseous effluents presented in the ER (Detroit Edison 2011a, Table 5.4-9) with the NRC staff's estimates. The NRC staff's dose estimates were slightly higher than Detroit Edison's estimates for gaseous pathways because of the addition of the vegetation ingestion pathway.

Table G-4. Comparison of Dose Estimates to Biota from Liquid and Gaseous Effluents for Fermi 3

Biota	Pathway	Detroit Edison (2011a, Table 5.4-9) (milliradian [mrad]/yr)	NRC Staff Calculation (mrad/yr)	Percent Difference
Fish	Liquid	2.31	2.31	0
	Gaseous[a]	NA	NA	–
Muskrat	Liquid	14.8	14.8	0
	Gaseous	11.15	12.7	12
Raccoon	Liquid	0.43	0.43	0
	Gaseous	11.15	12.7	12
Heron	Liquid	6.87	6.87	0
	Gaseous	11.15	12.7	12
Duck	Liquid	14.8	14.8	0
	Gaseous	11.15	12.7	12
Algae	Liquid	11.9	11.9	0
	Gaseous[a]	NA	NA	–
Invertebrate	Liquid	7.65	7.65	0
	Gaseous[a]	NA	NA	–

(a) Fish, invertebrate species, and algae would not be exposed to gaseous effluents.

G.5 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

40 CFR Part 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190 "Environmental Radiation Protection Standards for Nuclear Power Operations."

Chesapeake Nuclear Services, Inc. 2008. *NRCDOSE for Windows*. Radiation Safety Information Computational Center, Oak Ridge, Tennessee.

Detroit Edison Company (Detroit Edison). 2011a. *Fermi 3 Combined License Application, Part 3: Environmental Report*. Revision 2, Detroit, Michigan. February. Accession No. ML110600498.

Detroit Edison Company (Detroit Edison). 2011b. *Fermi 3 Combined License Application, Part 2: Final Safety Analysis Report*. Revision 3, Detroit, Michigan. February. Accession No. ML110600475.

General Electric-Hitachi Nuclear Energy Americas, LLC (GEH). 2010. *ESBWR Design Control Document – Tier 2, Chapter 12 Radiation Protection.* Revision 9. December. Accession No. ML103440247.

Sagendorf, J.F., J.T. Goll, and W.F. Sandusky. 1982. *XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations*. NUREG/CR-2919, Pacific Northwest National Laboratory, Richland, Washington.

Strenge, D.L., R.A. Peloquin, and G. Whelan. 1986. *LADTAP II – Technical Reference and User Guide*. NUREG/CR-4013, Pacific Northwest Laboratory, Richland, Washington.

Strenge, D.L., T.J. Bander, and J.K. Soldat. 1987. *GASPAR II – Technical Reference and User Guide*. NUREG/CR-4653, Pacific Northwest Laboratory, Richland, Washington.

U.S. Nuclear Regulatory Commission (NRC). 1977. *Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I*. Regulatory Guide 1.109, Office of Nuclear Reactor Regulation, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan*. NUREG-1555, Office of Nuclear Reactor Regulation, Washington, D.C. Available at http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1555/. Accessed July 13, 2008.

Appendix H

Authorizations, Permits, and Certifications

Appendix H

Authorizations, Permits, and Certifications

This appendix contains a list (Table H-1) of the environment-related authorizations, permits, and certifications potentially required by Federal, State, regional, local, and affected Native American Tribal agencies related to the combined license for the proposed Enrico Fermi Unit 3 (Fermi 3). The table is adapted from Table 1.2-1 of the Environmental Report (ER) submitted to the U.S. Nuclear Regulatory Commission (NRC) by the applicant, Detroit Edison Company (Detroit Edison).

Table H-1. Authorizations/Permits Required for Combined License

Agency[a]	Authority	Requirement	Activity Covered	Status[b]
Federal Authorizations				
NRC	10 Code of Federal Regulations (CFR) Part 52, Subpart C	Combined License	Construction activities associated with a nuclear power facility.	Submitted September 18, 2008
NRC	10 CFR Part 40	Source Material License	Approval to possess source material.	To be issued as part of COL
NRC	10 CFR Part 70	Special Nuclear Materials License	Approval to possess special nuclear material.	To be issued as part of COL
NRC	10 CFR Part 30	Byproduct License	Approval to possess fuel and source material.	To be issued as part of COL
NRC/U.S. Environmental Protection Agency	Resource Conservation and Recovery Act (RCRA), Atomic Energy Act, 40 CFR Part 266	Low-Level Mixed Waste Conditional Exemption	Allows the storage and treatment of low-level mixed waste.	Not yet submitted
Department of Energy (DOE)	Nuclear Waste Policy Act (42 USC 10101 *et seq.*) and 10 CFR Part 961	Spent Fuel Contract	The DOE Standard Contract for disposal of spent nuclear fuel contained in 10 CFR Part 961.	DE-CR01-11GC1126
Federal Aviation Administration (FAA)	14 CFR 77.13, Federal Aviation Act	Notice of Proposed Construction or Alteration	Construction of structures (>200 ft) affecting air navigation.	Not yet submitted
Department of Transportation (DOT)	49 CFR Part 107, Subpart G	Hazardous Materials Certificate of Registration	Shipment of radioactive and hazardous materials.	Reg. No. 061009 551 033RT[c]
U.S. Coast Guard	14 USC 81, 83, 85, 633 33 CFR Part 66	Authorization to Impact Navigation/Private Aids to Navigation	The interference of existing navigation aids or the placement and use of private aids to navigation in navigable waters of the United States.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[b]
U.S. Army Corps of Engineers (USACE)	Section 10 of the Rivers and Harbors Appropriation Act of 1899, 33 USC 403 *et seq.*	Section 10 Permit	Structures and/or work that may affect navigability of any navigable waters of the United States. Structural alterations may include barge slip construction and the installation of or modification to existing intake and outfall structures.	Included in Joint Permit Application submitted to USACE on September 9, 2011
USACE	Clear Water Act (CWA), Section 404, 33 USC 1344	Section 404 Permit	Discharge of dredge or fill material within waters of the United States, including wetlands.	Included in Joint Permit Application submitted to USACE on September 9, 2011
U.S. Fish and Wildlife Service (FWS)	Endangered Species Act (ESA) Section 7, 16 USC 1539	ESA Section 7 Consultation	Consultation regarding the potential impacts on Federally threatened and endangered species.	Ongoing
FWS	Bald and Golden Eagle Protection Act (BGEPA), 16 USC 668	BGEPA Consultation	Consultation regarding the potential impacts on bald and golden eagles.	Ongoing
FWS	Migratory Bird Treaty Act (MBTA), 16 USC 703	MBTA Consultation	Consultation regarding the potential impacts on protected migratory birds.	Ongoing
State Authorizations				
Michigan Department of Environmental Quality (MDEQ) Office of Great Lakes	CZMA, 16 USC 1451 *et seq.*	Preliminary Coastal Zone Management Act Concurrence Consultation	Obtaining a Federal license or permit.	Included in Joint Permit Application submitted to MDEQ June 17, 2011

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[(b)]
MDEQ Water Resources Division	MCL 324.30306 *et seq*.; CWA, Section 404, 33 USC 1344	Wetland Protection Permit	Any projects on or in wetlands regulated by the State of Michigan.	Included in Joint Permit Application submitted to MDEQ June 17, 2011
MDEQ Water Resources Division	MCL 324.32501 *et seq*.	Great Lakes Bottomlands Permit	Dredging, filling, modifying, constructing, enlarging, or extending of structures in Great Lakes waters or below the ordinary high water mark of the Great Lakes; or connecting any natural or artificial waterway, canal, or ditch with any Great Lake including Lake St. Clair.	Included in Joint Permit Application submitted to MDEQ June 17, 2011
MDEQ Water Resources Division	MCL 324.32723	Water Withdrawal Permit	Withdrawals from the Great Lakes and connecting waterways of over 5 MGD.	Not yet submitted
MDEQ Water Resources Division	MCL 324.32705	Water Withdrawal Registration	Development of the withdrawal capacity on the property of an additional 100,000 gal of water per day from the waters of the State.	Not yet submitted
MDEQ Water Resources Division	MCL 324.4101 *et seq*.	Wastewater Facilities Construction Permit/Part 41 Construction Permit	Construction or modification of sewers, pumping stations, force mains, and treatment plants.	Not yet submitted
MDEQ Water Resources Division	33 USC 1251 *et seq*. MCL 324.3101 *et seq*. MCL 324.3301 *et seq*.	National Pollution Discharge Elimination System (NPDES) Permit	Discharge of waste, waste effluent, and certain categories of stormwater runoff into the surface waters of Michigan during operation of the facility.	Submitted May 18, 2011
MDEQ Water Resources Division	MCL R323.2190	NPDES Permits, Stormwater Construction Permit	A Permit by Rule may be obtained to authorize stormwater discharges from a construction site greater than or equal to 5 ac.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[b]
MDEQ Water Resources Division	33 USC 1251 *et seq.* MCL 324.3101 *et seq.*	NPDES General Dredging Dewatering Water Permit	Discharges of dredging dewatering water resulting from the removal of uncontaminated sediment from a waterway.	General Permit Number MIG690000[c]
MDEQ Water Resources Division	33 USC 1251 *et seq.* MCL 324.3101 *et seq.*	NPDES General Hydrostatic Pressure Test Water	Discharges from the hydrostatic pressure testing of new and existing piping, tanks, vessels, and other associated equipment that have been physically cleaned and/or provided with effluent treatment.	Permit Number MIG6790000[c]
MDEQ Water Resources Division	CWA Section 401, 33 USC 1341	Section 401 Water Quality Certification	The construction or operation of a facility that may result in any discharge into the navigable waters that will require a Federal license or permit.	Included in Joint Permit Application and NPDES application submitted to MDEQ on June 17, 2011 and March 18, 2011, respectively
MDEQ Resource Management Division	MCL R299.9303 *et seq.*	Hazardous Waste Management, Site Identification Number	A generator shall not treat, store, dispose of, or transport or offer for transport hazardous waste without having received a site identification number from the regional administrator.	Permit Number MID 087 056 685[c]
MDEQ Resource Management Division	MCL 29.5c	Review, Approval, and Certification of Aboveground Storage Tank (AST) Systems	Regulation of installation of new AST systems with individual tanks having a storage capacity of more than 1100 gal of flammable liquid or combustible liquid.	Not yet submitted
MDEQ Resource Management Division	MCL R299.9822	Low-Level Mixed Waste Conditional Exemption	Low-level mixed waste storage and treatment conditional exemption eligibility and standards.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[(b)]
MDEQ Resource Management Division	MCL 333.13505	Radioactive Material Registration	Possession of radioactive materials.	Not yet submitted
MDEQ Air Quality Division	The Natural Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended, Part 55 (Air Pollution Control) MCL R336.1201	Permit to Install	Construction of any air emission source.	Not yet submitted
MDEQ Air Quality Division	NREPA Part 55 (Air Pollution Control) MCL R336.1210-R336.1218 40 CFR Part 70	Air Permit	Operation of a source of air pollutants.	Not yet submitted
Michigan State Historic Preservation Office (SHPO)	National Historic Preservation Act (NHPA), Section 106, 36 CFR Part 800	Consultation	Consultation concerning the potential impacts on cultural resources.	Section 106 review form submitted December 16, 2010
Michigan Department of Natural Resources (MDNR)	MCL 324.36501 *et seq*.	Endangered Species Permit	Taking or harming of State-listed endangered species.	Not yet submitted
MDNR	MCL 324.36501 *et seq*.	Consultation	Consultation regarding the potential impacts on threatened and endangered species.	Ongoing
Michigan Department of Transportation (MDOT)	MCL 259.481 *et seq*.	Tall Structures Act Permit	Construction of an object that has the potential to affect navigable airspace (height in excess of 200 ft or within 20,000 ft of an airport).	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[b]
MDOT	MCL 247.171 *et seq.*	Construction Permits (Right–of-Way [ROW] Permit)	Activities by businesses or private parties and utility companies wishing to use the highway ROW for operations other than normal vehicular or pedestrian travel are required to obtain a permit from MDOT.	Not yet submitted
MDOT	MCL 257.716 *et seq.*	Transport permit	Movement over state highways of vehicles or loads that exceed the size or weight limitations specified by law.	Not yet submitted
Michigan Department of Community Health	MCL 333.13522	X-Ray Equipment Registration	Possession of a radiation machine.	Not yet submitted
Local Authorizations				
City of Monroe, Michigan	33 USC 1251 *et seq.* Michigan Water Resource Act Codified Ordinances of Monroe, Michigan, Streets, Utilities and Public Services Code, Chapter 1042, Division 2 Section 1042.15	Monroe Metropolitan Water Pollution Control Facility Industrial Pretreatment Permit	Treatment of wastewater to comply with categorical pretreatment standards and local limits.	Permit No. 1020[c]
City of Monroe, Michigan/ Frenchtown Township	Codified Ordinances of Monroe, Michigan, Streets, Utilities and Public Services Code, Chapter 1042, Division 15 Section 1042.71	Sanitary Sewer Service Connection Permit	Required before a person uncovers, makes any connection with or opening into, uses, alters, or disturbs any public sewer or appurtenance to.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[b]
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 6, Section 6.04 and Article 27.00, Section 27.06	Site Plan and Development Approval	Review of planned construction activities. Requires submittal of application for Site Plan Approval, which requires review of items such as engineering. The approval process may also result in the issuance of permits such as a grading permit issued under the authority of the Building Official.	Not yet submitted
Frenchtown Township		Engineering Review	Review of detailed engineering construction plans addressing water, sanitary, stormwater drainage, grading, and paving for the site.	Not yet submitted
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200	Occupancy Permit	Occupancy of the building.	Not yet submitted
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 4, Section 4.40 and Article 24, Section 24.05	Building Permit	Permit authorizing the construction, removal, moving, alteration, or use of a building or construction of any driveway or parking lot constructed of hard surface materials.	Not yet submitted
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 20	Special Approval of Activities within either the Floodway or Floodway Fringe	Approval of activities within the floodway area of floodway, fringe area of the floodway, or floodplain district.	Not yet submitted
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 4, Section 4.10	Temporary Building Used During Construction	Use of a portable structure as a temporary building during construction.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[(b)]
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 26, Section 26.04	Landscape Development Plan	Submittal of a landscape development plan that illustrates areas of existing trees or wood lots that will be removed and those that will be retained.	Not yet submitted
Frenchtown Township	Frenchtown Charter Township Zoning Ordinance No. 200 Article 4, Section 4.21.2	Excavation Permit	Activities that propose to fill an area of 20,000 ft^2 or greater or any excavation and removal regardless of area involved except for mineral mining operations, farm ponds, and landscape ponds.	Not yet submitted
Monroe County, Michigan, Office of On-site Water Supply/Frenchtown Township	Codified Ordinances of Monroe, Michigan, Monroe County Environmental Health/Sanitary Code, Chapter III – Water Supplies	Well Permit	Construction of water supply wells, irrigation wells, heat exchange wells, industrial wells for water supply, test wells to obtain information regarding groundwater quantity or quality, recharge well, dewatering well, fresh water well at oil or gas well-drilling site.	Not yet submitted
Monroe County, Michigan, Drain Commissioner	Local Ordinance	Engineering Review	Review of surface water flow during operation.	Not yet submitted
Monroe County, Michigan, Drain Commissioner	NREPA Part 91, of Act 451 of the Michigan Public Acts of 1994 MCL 324.9101 *et seq.*	Soil Erosion and Sedimentation Control (SESC) Permit	Any earth change that disturbs 1 or more acres or is within 500 ft of a lake or stream.	Not yet submitted
Monroe County, Michigan, Drain Commissioner	Act No. 40 of 1956	Drain Culvert Permit	Permit to construct in a drain.	Not yet submitted

Table H-1. (contd)

Agency	Authority	Requirement	Activity Covered	Status[b]
Monroe County, Michigan, Health Department/ Frenchtown Township	Monroe County Environmental Health/ Sanitary Code, Chapter III, Section 302 Part 127 of Michigan Public Health Code, 1978 PA 368, as amended	Water Supply Permit	Any new construction or extensive change affecting the basic unit or the suction line on any water supply system within Monroe County, Michigan.	Not yet submitted

(a) Federal, State, and local authorizations that are required for building or operational activities are included. There are no Native American tribes with jurisdictional authority over activities at the Fermi site.

(b) Detroit Edison states in the ER that all necessary permits will be applied for in a timely manner. New permits may not be obtained in certain instances due to potential authorization of construction and operational activities through the modification of existing permits possessed by the Fermi Station.

(c) Permit authorizing current activities associated with operations on the Fermi site. When practical, existing permits will be modified to authorize activities associated with the construction or operation of a new nuclear facility on site.

Appendix I

Severe Accident Mitigation Alternatives

Appendix I

Severe Accident Mitigation Alternatives

I.1 Introduction

The Detroit Edison Company (Detroit Edison) has submitted an application to construct a General Electric-Hitachi Nuclear Energy, LLC- (GEH-) designed Economic Simplified Boiling Water Reactor (ESBWR) at the Enrico Fermi Atomic Power Plant (Fermi) site. Current policy developed after the Limerick decision (Limerick 1989) requires that the U.S. Nuclear Regulatory Commission (NRC) staff consider alternatives to mitigate the consequences of severe accidents in a site-specific environmental impact statement (EIS). The severe accident mitigation alternative (SAMA) review presented here considers both severe accident mitigation design alternatives (SAMDAs) and procedural alternatives.

In Title 10 of the Code of Federal Regulations (CFR), specifically 10 CFR 52.79(a)(38), the NRC requires that applicants for combined licenses (COLs) include “a description and analysis of design features for the prevention and mitigation of severe accidents” in the Final Safety Analysis Report (FSAR). Detroit Edison provides this information in Part 2 of the COL application. The Environmental Report (ER) (Part 3 of the COL application) also includes information regarding the SAMA analysis (Detroit Edison 2011).

In 10 CFR 52.47(a)(23), the NRC requires that applications for a reactor design certification include “a description and analysis of design features for the prevention and mitigation of severe accidents….” In addition, 10 CFR 52.47(a)(27) requires a description of a “plant-specific probabilistic risk assessment (PRA) and its results,” and in 10 CFR 52.47(b)(2) the NRC requires an Environmental Report (ER) that contains the information required by 10 CFR 51.55. GEH has submitted all this information in documents that are part of the application for certification of the ESBWR design. Specifically, GEH has provided technical documents covering Revision 6 of the ESBWR PRA (GEH 2010a) and Revision 4 of the ESBWR SAMDA (GEH 2010b).

The NRC staff conducted a review of the Detroit Edison SAMDA analysis specific to operation of an ESBWR at the Fermi site. The staff reviewed the input parameters and values used by Detroit Edison (Detroit Edison 2011) for appropriateness, including references made to the ESBWR design certification document (GEH 2007 and 2009). The analysis is based on (1) the Revision 4 PRA (GEH 2009) and SAMDA analysis (GEH 2007) for the ESBWR design certification, and (2) results of the analysis of probability-weighted risks of the ESBWR design at the Fermi site described in Section 5.11.2 of this EIS.

An analysis for an ESBWR at a generic site is presented first, and then the analysis is extended to include consideration of Fermi site-specific information. These analyses have been updated by the NRC staff based on ESBWR PRA Revision 6 (GEH 2010a). The SAMDA analysis for the proposed ESBWR design certification will be finally resolved through the design certification rulemaking process.

I.2 ESBWR SAMDA Review – Generic Site

This section addresses the generic analysis of SAMDAs conducted by GEH, the applicant for certification of the ESBWR design. The SAMA review in Section I.3 extends the generic SAMDA analysis to include Fermi site-specific factors including meteorology, population, and land use. Section I.3 also addresses SAMAs that were not included in the generic analysis because they do not involve reactor system design.

I.2.1 ESBWR PRA and Consequence Results

GEH, the applicant for certification of the ESBWR design, conducted Level 1, Level 2, and Level 3 PRAs to estimate the core damage frequencies (CDFs) and offsite risk consequences that might result from a large number of initiating events and accident sequences. Table I-1 lists these CDF estimates and estimates of the large release frequencies (LRFs). Releases other than technical specification limits, when the containment is intact, are considered to be large. Table I-1 also lists NRC staff goals related to CDFs and LRFs.

Although this table does not provide quantitative estimates of CDFs and LRFs for fire, flood, and high-wind events during shutdown, they are discussed in ESBWR PRA Chapter 17 (GEH 2010a). Chapter 15 of the ESBWR PRA presents the results of a seismic margins analysis in which PRA methods are used to identify potential vulnerabilities in the design and so corrective measures can be taken to reduce risk. Based on the design considerations, risks associated with the seismic events are considered to be insignificant by GEH.

Chapter 10 of the ESBWR PRA Revision 6 (GEH 2010a) of the design certification application for the ESBWR design provides the results of Level 3 PRA in terms of an estimate of the offsite risk to the population within a 10-mi radius of a generic ESBWR location with conservative siting characteristics. The baseline results of the PRA for internal events during full-power operation are presented and compared to the Commission’s individual and societal safety goals in Table I-2.

Table I-1. Comparison of ESBWR PRA Results with the Design Goals

Event Type	NRC Design Goal(a) Core Damage Frequency (per Ryr)	NRC Design Goal(a) Large Release Frequency (per Ryr)	ESBWR PRA Results(b) Core Damage Frequency (per Ryr)	ESBWR PRA Results(b) Large Release Frequency (per Ryr)
Internal at-power events	1.0×10^{-4}	1.0×10^{-6}	1.7×10^{-8}	1.4×10^{-9}
At-power flooding events	1.0×10^{-4}	1.0×10^{-6}	7.0×10^{-9}	4.1×10^{-9}
At-power fire events	1.0×10^{-4}	1.0×10^{-6}	1.3×10^{-8}	1.6×10^{-9}
At-power high-wind events	1.0×10^{-4}	1.0×10^{-6}	8.5×10^{-8}	1.2×10^{-9}
Internal shutdown events	1.0×10^{-4}	1.0×10^{-6}	1.7×10^{-8}	1.7×10^{-8}

(a) SECY-90-016 (NRC 1990).
(b) From Chapter 17 of the ESBWR PRA Revision 6 (GEH 2010a).

These results indicate that the risk from severe accidents would be at least four orders of magnitude lower than the Commission's safety goals (51 FR 30028).

The ESBWR PRA Revision 6 includes values for all external events and shutdown modes except for seismic events. Table 10.4.2 of the ESBWR PRA provides results similar to those presented in Table I-2 for the external event and shutdown modes. The values listed in this table are of the same magnitude as those for the at-power internal events case. Because the individual CDF values are developed with differing levels of conservatism, it is not meaningful to add the CDF values to create total values. Nevertheless, it is apparent that for the two safety goal measures, the total risk from all accidents (internal and external events) would not increase by more than two orders of magnitude. Overall, the individual risk and societal risk goals are below the safety goals with a sufficient margin of safety.

I.2.2 Potential Design Improvements

In the ER submitted as part of the design certification application (GEH 2010b), GEH identified 177 candidate alternatives based on a review of alternatives for other plant designs, including those considered in license renewal environmental reports and in the General Electric Advanced Boiling-Water Reactor (ABWR) SAMDA study (GE 1994), and on consideration of plant-specific enhancements. The candidate alternatives were then screened to identify candidates for detailed evaluation. The categories used in screening were as follows:

- not applicable
- already incorporated into the ESBWR design
- not a design alternative (not required for design certification)

Table I-2. Comparison of ESBWR PRA Results for a Generic Site with the Commission's Safety Goals

Goal	Risk Goal	ESBWR 24 hours after Onset of Core Damage (ground release)	ESBWR 72 hours after Onset of Core Damage (elevated release)	Safety Goal Achieved 72 hours after the Onset of Core Damage
Individual risk (0–1 mi)	$<3.9 \times 10^{-7}$ (0.1%)	1.6×10^{-10}	1.6×10^{-10}	Yes
Societal risk (0–10 mi)	$<1.7 \times 10^{-6}$ (0.1%)	2.0×10^{-11}	2.6×10^{-11}	Yes
Radiation dose[(a)] probability at 0.25 Sv (0–0.5 mi)	$<10^{-6}$	2×10^{-9}	2×10^{-9}	Yes

Source: Table 10.4-2 of GEH 2010b.

(a) The values listed are radiation dose probability at 0.20 Sv, which is more bounding.

- alternative prevention or mitigation functions extant
- very low benefit
- excessive implementation cost
- consideration for further evaluation.

The development of the ESBWR design has benefitted from insights gained in numerous PRAs. The low CDFs and LRFs in Table I-1 are attributable to the implementation of improvements already incorporated into the design. The following are examples of enhancement features currently included in the ESBWR design:

- improved isolation condenser system design
- depressurization valves
- alternating current (AC) independent fire water pumps for makeup and injection
- passive containment cooling system
- basemat internal melt arrest and coolability device and gravity-driven cooling system deluge function
- direct current (DC) power reliability
- actuation logic reliability
- motor-driven, feed-water pumps

- water pool elevation above drywell head elevation
- containment ultimate strength and maximum design pressure
- incorporation of flood mitigation into design
- reactor water cleanup system heat exchanger sized for decay heat removal
- 72-hr coping period for station blackout
- upgraded low-pressure piping for the reactor coolant pressure boundary
- digital instrumentation and control systems.

The screening process eliminated 40 candidate alternatives as being not applicable to the ESBWR design; 71 candidate alternatives were considered to be similar to those already included in the ESBWR design, and 27 candidate alternatives were identified as procedural or administrative rather than design alternatives (whose benefits were considered to be unlikely to exceed those alternatives evaluated relative to their potentially high costs). Of the remaining 39 candidate alternatives, 37 were ruled out for cases in which other design features already perform the proposed function or obviate its need, and 2 were considered to have very low benefit because their insignificant contribution to reducing risk did not outweigh their excessive implementation costs. No candidate alternatives were identified for further evaluation.

I.2.3 Cost-Benefit Comparison

GEH used the cost-benefit methodology guidance in NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997), to calculate the maximum attainable benefit associated with completely eliminating all risk for the ESBWR.

This methodology involves determining the net value for a SAMDA according to the following formula:

$$\text{Net Value} = (\text{APE} + \text{AOC} + \text{AOE} + \text{AOSC}) - \text{COE}$$

where:

APE	=	present value of averted public exposure ($)
AOC	=	present value of averted offsite property damage costs ($)
AOE	=	present value of averted occupational exposure costs ($)
AOSC	=	present value of averted onsite costs ($); this includes cleanup, decontamination, and long-term replacement power costs
COE	=	cost of enhancement ($).

If the net value of a SAMDA is negative, the cost of implementing the SAMDA is larger than the benefit associated with the SAMDA, and it is not considered to be cost-beneficial.

To assess the risk reduction potential for SAMDAs, GEH assumed that each design alternative would work perfectly to completely eliminate all severe accident risk from the events that were evaluated. This assumption is conservative because it maximizes the benefit of each design alternative. GEH estimated the public exposure benefits for the design alternative on the basis of the reduction of risk expressed in terms of whole body person-rem per year received by the total population within a 50-mi radius of the generic ESBWR site.

Table I-3 summarizes the GEH's and NRC staff's estimates of each of the associated cost elements. The results are based on the approach, parameters, and data listed in NUREG/BR-0184. GEH's estimates in Table I-3 are based on the PRA Revision 5 CDF of 1.12×10^{-7} per reactor-year (Ryr) (GEH 2010c), which are similar to those in PRA Revision 6 (GEH 2010a). (The total CDF in the Revision 4 PRA is 1.2×10^{-7} per Ryr [GEH 2009].) The CDF is driven by high core damage frequencies from internal and high-wind events during shutdown. GEH used the results from the ESBWR Level 3 PRA, namely, an offsite population dose risk of 0.035 Sv/Ryr and an offsite cost risk of $1931/Ryr based on input from the Electric Power Research Institute Advanced Light Water Reactor Utility Requirement Document (GEH 2010c).

GEH provided the present value estimates for the various attributes using a 3 percent discount rate and the maximum parameter values provided in NUREG/BR-0184. The NRC recently issued Revision 4 of NUREG/BR-0058, *Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission* (NRC 2004), which reflects the agency's policy on discount rates. NUREG/BR-0058 Revision 4 states that two sets of estimates should be developed: one at 7 percent and one at 3 percent for sensitivity analysis.

The monetary present value estimate for each risk attribute does not represent the expected reduction in risk resulting from a single accident; rather, it is the present value of a stream of potential losses extending over the projected lifetime of the facility (in this case, projected to be 60 years). Therefore, the estimate reflects the expected annual loss resulting from a single accident, the possibility that such an accident could occur at any time over the licensed life, and the effect of discounting these potential future losses to present value.

As indicated above, GEH estimated the total present dollar value equivalent associated with complete elimination of severe accidents at a single ESBWR unit site to be $397,863. Therefore, for any SAMDA to be cost-beneficial, the enhancement cost must be less than $397,863. GEH assessed the capital cost associated with two design alternatives evaluated for the ESBWR. For both design alternatives, GEH stated that the implementation cost would be more than $1 million (GEH 2010b). Based on the averted cost estimate of $397,863, GEH concluded that none of the SAMDA candidates are cost-beneficial, because any design change costs would far exceed this value.

Table I-3. Summary of Estimated Averted Costs for a Generic Site

Quantitative Attributes		Present Value Estimate ($)		
		NRC Staff Best Estimate[(a)]	**GEH Maximum[(b)]**	**NRC Staff Maximum[(c)]**
Health	Public	100,000[(d)]	194,740	197,720[(d)]
	Occupational	56	249	250
Property	Offsite	27,200[(d)]	53,720	53,770[(d)]
	Onsite	NA[(e)]	NA	NA
Cleanup and decontamination	Onsite	1710	4674	4060
Replacement power		4520	144,480	148,020
Total		**133,486**	**397,863**	**403,820**

Source: GEH 2010b.

(a) “Best estimate” is based on mean release frequency (from Revision 5 of the PRA), “best estimate” parameter values in NUREG/BR-0184, and 7 percent discount rate.

(b) Maximum estimate is based on mean release frequency (from Revision 5 of the PRA), high or upper estimate parameter values in NUREG/BR-0184, and 3 percent discount rate.

(c) NRC staff maximum is based on parameter values used in (b), and release frequency from Revision 5 of the PRA.

(d) Estimated using the applicant-provided Electric Power Research Institute Advanced Light Water Reactor Utility Requirement Document, property damage, and the new release category frequencies (GEH 2010a).

(e) NA = Not analyzed.

Note: PRA Revision 5 release frequencies are the same as those in PRA Revision 6.

I.2.4 Staff Evaluation

In 10 CFR 52.47(a)(27), the NRC requires that an applicant for design certification perform either a plant-specific or site-specific PRA. The aim of this PRA is to seek improvements in the reliability of core and containment heat removal systems that are significant and practical. The set of potential design improvements considered for the ESBWR includes those from generic boiling water reactor SAMA reports and from the ABWR design. The ESBWR design already incorporates many design enhancements related to severe accident mitigation. Such design improvements have resulted in a CDF that is about an order of magnitude less than that of the ABWR design. For example, the ESBWR design can cope with a station blackout (SBO) for 72 hr (i.e., no reliance on AC power for the first 72 hr), thus eliminating CDF sequences that contributed more than 40 percent of CDF in the ABWR design.

GEH's risk reduction estimates are based on mean values of release frequencies and maximum-estimate parameter values from NUREG/BR–0184, without consideration of uncertainties in CDF or offsite consequences. Even though this approach is consistent with that used in previous design alternative evaluations, further consideration of these factors could lead to significantly higher risk reduction values, given the extremely small CDF and risk estimates in the baseline PRA. The uncertainties in CDF or in offsite radiation exposures are fairly large because key safety features of the ESBWR design are unique, and their reliability has been evaluated through analysis and testing programs rather than through operating experience.

The NRC staff's analyses of the total present value using the mean CDF and release frequencies from Revision 6 of the PRA and a 3 percent discount rate indicate a maximum value of about $403,820. NRC staff notes that the estimated averted public exposure is a major contributor. This arises from high release frequencies for internal and high-wind events during shutdown. For events during shutdown, the analysis conservatively assumes that core damage scenarios will lead to large releases. This is because, the containment is open during most of the shutdown period.

The second major contributor to the present value estimate is replacement power costs. The replacement power cost parameters recommended in NUREG/BR–0184 are based on a generic reactor operating at an average capacity factor of about 65 percent and on replacement energy costs in 1993 dollars, The total present dollar value would be even higher if the annual replacement power cost was adjusted for a future energy cost increase and the capacity factor was increased to 90 percent, which is the design operating assumption for the ESBWR. However, GEH used a very conservative approach in estimating the replacement power cost. GEH selected the parameter that corresponds to the 3 percent discount rate for the net present value of replacement power for a single event recommended in NUREG/BR-0184. Then GEH used this parameter as an input and estimated a new, more conservative net present value of the replacement power for a single event. This approach resulted in a net present value of replacement power that is about a factor of ten higher than the value estimated in NUREG/BR-0184. Even with this increase, which is more than what it would be if adjustments for the future energy cost increase and capacity factor were to be made, the present value estimate is still lower than the GEH's $1 million minimum cost estimate for a SAMDA. Also, the ESBWR CDF is very low on an absolute scale as compared to those of currently operating plants. Moreover, in view of the features already incorporated in the ESBWR design and the margin between the cost of SAMDAs evaluated and their potential benefits, any increase in benefits due to increased replacement power costs would not be significant enough to cause any SAMDAs to become cost-beneficial. Therefore, the NRC staff concludes that further evaluation of future energy cost and capacity factor increases is not warranted.

GEH indicated that any of the potential design modifications considered would cost a minimum of $1 million to implement, as indicated above. NRC staff considers the assertion of potential costs for the ESBWR acceptable, because it is reasonable to conclude that the cost of implementing (design, procurement, installation, testing, etc.) the design alternatives that were considered, such as constructing a building connected to the containment building or installing limit switches on all containment isolation valves, would far exceed GEH's $1 million minimum cost estimate. Therefore, a minimum cost of $1 million is approximately 2.5 times the maximum benefit of $403,820. The NRC staff concludes that no single modification would eliminate the total CDF and that none of the potential design modifications could be justified on the basis of cost-benefit considerations.

I.3 Fermi Site-Specific SAMDA Review

The discussion above evaluates SAMDAs for the ESBWR at a generic site. The following discussion updates that evaluation to include consideration of Fermi site-specific factors, including meteorological conditions, population distribution, and land use. It also updates the evaluation to include the results and the approach in PRA Revision 4 for the generic design. The last part of this discussion deals with SAMAs for procedures and training.

I.3.1 Risk Estimates

NRC staff evaluated the potential risks associated with severe accidents for an ESBWR by using Fermi site-specific data. Detroit Edison provided a site-specific consequence analysis using the Revision 4 PRA CDF (Detroit Edison 2011). Table 5.11-3 of this EIS, gives a population dose and a cost risk of 0.032 person-rem/Ryr and $110/Ryr, respectively, for the at-power internal events with a CDF of 1.7×10^{-8} per Ryr. CDF estimates in PRA Revision 4 (GEH 2009) indicate that the total CDF for all events including externally initiated events and events while the reactor is shut down is about a factor of 7.1 higher than that of the at-power internal events alone. Chapter 10 of PRA Revision 4 assigns the various external events and shutdown accidents to those of the at-power internal event release categories. This method provides a comprehensive approach in estimating the potential consequences from all accident conditions using those calculated for the at-power internal events. The NRC staff's estimates of population dose and cost risks for the total CDF (1.2×10^{-7} per Ryr in PRA Revision 4) using Detroit Edison's values for the at-power internal events are: 2.28 person-rem/Ryr and $4900/Ryr, respectively.

I.3.2 Cost-Benefit Comparison

In Section 7.3.2 of the ER (Detroit Edison 2011), Detroit Edison estimates the averted costs associated with eliminating all severe accident risks for an ESBWR at the Fermi site. The analysis is an update of the GEH SAMDA analysis (GEH 2007) to include site-specific information. Detroit Edison substituted population dose and offsite cost risks based on 2060 population projections for the Fermi site for the population dose and offsite property costs in the GEH analysis.

Detroit Edison provided a site-specific cost-benefit analysis using the Revision 4 PRA CDF (Detroit Edison 2011). Detroit Edison provided an estimated total present dollar value equivalent associated with complete elimination of severe accidents at a single ESBWR unit site to range between \$139,446 and \$280,189 and concluded that no design changes would be cost-effective to implement (Detroit Edison 2011).

NRC staff evaluated the risk reduction potential of design improvements for the ESBWR at the Fermi site based on the Detroit Edison's risk reduction estimates for the various design alternatives, in conjunction with an assessment of the potential impact of uncertainties on the results. The staff performed the averted cost estimates with the parameters used by Detroit Edison and the upper bound values used in ESBWR SAMDA Revision 4 (GEH 2010b). The results of both the Detroit Edison and the NRC estimates of averted costs are presented in Table I-4. The NUREG/BR–0184 handbook provides two sets of parameters (best estimate and high estimate) for the parameters used in the calculations of the occupational dose after accident and during decontamination and cleanup, and for the replacement power costs. The NRC staff's maximum estimate is based on the use of "high or upper bound" estimated parameters in NUREG/BR-0184 and the ESBWR power rating of 1585 MW(e) that were used in ESBWR SAMDA Revision 4 (GEH 2010b). The major contributor to this estimate is the use of the GEH's high value for the long-term replacement power costs parameter for a 910-MWe "generic" reactor in NUREG/BR–0184. The use of the GEH's high value increases the replacement power costs by about a factor of 10 over the best estimate (see Table I-4, Columns 6 and 7). As stated in Section I.2.4, this increase replacement power cost is well above any potential change for adjustments in the future energy cost increase and capacity factor.

The NRC staff's analyses of the total present value using the mean CDF and release frequencies from Revision 4 of the PRA and a 3 percent discount rate indicate a maximum value of about \$422,000. The NRC staff noted that any design modifications would be costly, and a single modification would not eliminate the total CDF. On the basis of results presented in Table I-4, the NRC staff agreed with Detroit Edison's conclusion that no design change would be cost-beneficial.

1.3.3 Procedural and Training SAMAs

The original list of 177 ESBWR SAMDAs included 27 candidate alternatives that were procedural or administrative in nature. These items were eliminated from consideration

Table I-4. Summary of Estimated Averted Costs for the Fermi Site

Quantitative Attributes		Present Value Estimate ($)				
		Detroit Edison[(a)]		NRC Estimates[(b)]		
		7% Discount	3% Discount	7% Discount	3% Discount	Maximum[(c)] Estimate
Health	Public	64,166	126,875	65,855	130,213	130,213
	Occupational	58	133	58	133	258[(c)]
Property	Offsite	68,950	136,335	68,247	134,943	134,943
	Onsite	NA[(d)]	NA	NA	NA	NA
Cleanup and decontamination	Onsite	1761	4184	1761	4183	4183
Replacement power		4512	12,668	4658	13,077	152,565[(c)]
Total		139,446	280,189	140,579	282,549	422,162

(a) From Fermi 3 Environmental Report support documentation, based on PRA Revision 4 CDF estimates.

(b) NRC staff estimates are based on PRA Revision 4 CDF estimates and Chapter 10, Table 10.3-3C, release category assignments (GEH 2009), and the EBWR power rating of 1585 MW(e) used in ESBWR SAMDA Revision 4 (GEH 2010b). The ESBWR power rating in the Detroit Edison's analysis is 1535 MW(e). This change will affect only the replacement power cost.

(c) The maximum estimate is based on "high or upper bound" estimated parameters in NUREG/BR-0184 and the ESBWR power rating of 1585 MW(e) and on replacement power parameters in ESBWR SAMDA Revision 4 (GEH 2010b).

(d) NA = Not analyzed.

because they did not involve design changes. Examples of items removed from consideration for this reason are as follows:

- Enhance procedural guidance for use of cross-tied component cooling or service water pumps.
- Implement procedures for alignment of a spare diesel to shut down board after loss of offsite power and failure of diesel normally supplying it.
- Emphasize steps in recovery of offsite power after an SBO.
- Develop a severe weather conditions procedure.
- Develop procedures for replenishing diesel fuel.
- Increase frequency for valve leak testing. Improve inspection of rubber expansion joints on the main condenser.

These candidate alternatives fall within the scope of the SAMA review that the NRC conducts as part of the environmental review of applications. However, such SAMAs generally involve operational and training procedures that have not been developed for a reactor and are typically not developed until construction has been completed and the plant is approaching operation.

The staff reviewed the candidate alternatives that were previously screened out because they did not involve design changes. Because the maximum attainable benefit is so low, a SAMA based on procedures or training for an ESBWR at the Fermi site would have to reduce the CDF or risk to near zero to become cost-beneficial. Based on its evaluation, the staff concludes that it is unlikely that any of the SAMAs based on procedures or training would reduce the CDF or risk that much. Therefore, the staff further concludes it is unlikely that these SAMAs would be cost-effective.

Detroit Edison states that it will consider the procedural and administrative SAMAs when it is developing its procedures, as long as they do not exceed the maximum averted cost. Detroit Edison makes this statement through a commitment (COM ER 7.3-002) which states (Detroit Edison 2011):

> SAMA analysis to comply with 40 CFR 1502.16(h) shall be conducted of the administrative and procedural measures applicable to Fermi 3 and considered for implementation prior to fuel load if the associated cost does not exceed the maximum value associated with averting all risk of severe accidents.

Based on this statement, the staff expects that Detroit Edison will consider risk insights and mitigation measures in the development of procedures and training; however, this expectation is not crucial to the staff's conclusions because the staff already concluded procedural and training SAMAs would be unlikely to be cost-effective.

I.4 Conclusions

Based on the evaluation of the ESBWR PRA (GEH 2010a) and SAMDA analysis (GEH 2010b), the Fermi site-specific severe accident and SAMDA analysis (Detroit Edison 2011), and its own independent review, the staff concludes that there are no ESBWR SAMDAs that would be cost beneficial at the Fermi site. The staff expects that Detroit Edison will use risk insights and mitigation measures in the development of procedures and training; however, this expectation is not crucial to the staff's conclusions because the staff already concludes procedural and training SAMAs would be unlikely to be cost-effective.

I.5 References

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

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Appendix J

U.S. Army Corps of Engineers Public Interest Review Factors and Onsite Alternatives Analysis

Appendix J

U.S. Army Corps of Engineers Public Interest Review Factors and Onsite Alternatives Analysis

This appendix presents (1) a summary of the factors that are considered by the U.S. Army Corps of Engineers (USACE) in its public interest review of applications for a permit to perform regulated activities that would affect waters of the United States and (2) an onsite alternatives analysis prepared by Detroit Edison Company (Detroit Edison) to demonstrate that its proposed site layout chosen for the proposed new Enrico Fermi Unit 3 (Fermi 3) at the Enrico Fermi Atomic Power Plant (Fermi) site would minimize impacts to jurisdictional wetlands and waters of the United States. These topics are addressed in Sections J.1 and J.2 of this appendix, respectively.

J.1 Public Interest Review Factors

As set forth in Title 33 of the Code of Federal Regulations (CFR) Part 320, a public interest review must be completed prior to any Department of the Army (DA) permit decision by the USACE. The USACE decision on whether to grant or deny a permit is based, in part, on an evaluation of the probable impact of the proposed activity and its intended use on the public interest. This evaluation is referred to as the "public interest review." The public interest review requires a careful weighing of all relevant factors in a particular case. The specific weight of each factor is determined by its importance and relevance to the proposed project. Some public interest review factors may be given greater weight, while others may not be relevant or as important based on project characteristics. The USACE public notice will be the primary method for soliciting public comment on the project's effect on public interest factors. Full consideration and appropriate weight will be given to all comments, including those of Federal, State, and local agencies, and other experts on matters within their expertise. The benefits and detriments of a project are balanced by considering effects on such public interest factors as conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shore erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people. The conditions, including compensatory mitigation, under which a proposal would be allowed to go forward, would be developed and incorporated within the public interest review process to the extent that such conditions are found by the USACE to be appropriate and practicable. However, only the measures required to confirm that the project is not contrary to the public interest may be required in this specific context. This required public interest review ensures that a USACE permit decision reflects the National concern for both protection and utilization of important resources. The public interest review described above can be found in 33 CFR 320.4 and will be completed by the USACE as part of its evaluation of the Fermi 3 proposal for a DA permit.

J.2 Onsite Alternatives Analysis and Least Environmentally Damaging Practicable Alternative (LEDPA)

Activities involving the discharge of dredged or fill material into waters of the United States, including wetlands, typically require authorization from the USACE under Section 404 of the CWA. The CWA Section 404(b)(1) Guidelines (40 CFR Part 230) (Guidelines) are the substantive criteria the USACE uses to determine a project activity's environmental impact on aquatic resources from discharges of dredged or fill material. Among other things, an applicant for a 404 permit must demonstrate to the USACE that proposed project-related dredged or fill activities satisfy the Guidelines and constitute the least environmentally damaging practicable alternative (LEDPA). An applicant would typically conduct an analysis of the impacts of its proposed actions involving dredged or fill discharges into waters of the United States and of alternatives to avoid and minimize impacts in order to identify the LEDPA that still allows accomplishment of the overall project purpose, and to demonstrate compliance with the Guidelines, and may even submit a conceptual plan to address mitigation of any unavoidable losses that would occur despite the proposed avoidance and minimization measures.

Based on guidance provided by the USACE regarding Guidelines compliance during pre-application coordination, Detroit Edison conducted an onsite alternatives analysis to identify a practicable alternative that would avoid and minimize impacts to waters of the United States. While the USACE has preliminarily reviewed Detroit Edison’s analysis from a pre-application viewpoint, the adequacy of Detroit Edison’s proposed LEDPA has not been verified by the USACE. The final evaluation of onsite avoidance and minimization of waters of the United States, leading to the USACE identification of the LEDPA, would be conducted by the USACE through its permit evaluation process after receipt of a complete permit application from Detroit Edison. There is the potential that the USACE could identify further practicable avoidance and/or minimization measures during its analysis resulting in the USACE-identified LEDPA having fewer impacts to waters of the United States than Detroit Edison’s proposed LEDPA as presented in its analysis.

Detroit Edison has also proposed a conceptual aquatic resources compensatory mitigation strategy to address the unavoidable loss of wetlands and other aquatic resources associated with its proposed LEDPA. The conceptual strategy is presented in Appendix K of this EIS. The evaluation of alternative energy sources (e.g., power purchases, demand-side management, fossil-fuel alternatives, and renewable energy alternatives), alternative sites (Fermi, Belle River-St. Clair, Greenwood, Petersburg, and South Britton), and system design alternatives (including heat dissipation and cooling system alternatives) are discussed in Chapter 9 of this EIS.

Section 4 of Detroit Edison's Joint Permit Application (Detroit Edison 2011), which presents their onsite alternatives analysis and proposed LEDPA determination, is provided in the remainder of this section.

SECTION 4: PROPOSED PROJECT PURPOSE, INTENDED USE, AND ALTERNATIVES CONSIDERED

1) Purpose/Intended Use:

Detroit Edison proposes to construct and operate a new nuclear power plant at the Fermi site. The proposed unit is to be designated as Fermi 3. The purpose of the Fermi 3 project is fourfold:

1. Generate a net electrical output of approximately 1,535±50 megawatts (MWe) for sale that will reliably aid in satisfying the forecasted energy and capacity needs of Detroit Edison customers located in the Detroit Edison Service Area;
2. Provide new baseload electric generation capacity as early as 2021 to compensate for the expected retirement of existing, aging baseload generating units and diminishing availability of the midwest independent service operator region's baseload generation capacity;
3. Provide price stability by minimizing reliance on imported power into the Detroit Edison service territory; and
4. Utilize an electric generation technology that is less subject to price fluctuations resulting from either fuel or regulatory drivers, provides fuel diversity, and reduces reliance on fossil fuel and their attendant environmental impacts.

The above purpose is in-line with Detroit Edison's mission to provide reliable and affordable electrical power.

Construction of a new nuclear electric generating facility is needed to provide reliable, affordable power to address Michigan's expected future peak electric demand. Detroit Edison has evaluated the need for power and the related benefits to be generated by the proposed facility. The need for power was assessed by balancing the current and forecasted demand against the current and forecasted supply, while demonstrating that an adequate reserve margin is maintained. Detroit Edison's assessment considered information regarding factors such as marketing, location, and history that influence or constrain the nature, size, price, and class of the project.

The need for power assessment is derived from the "Michigan 21st Century Electric Energy Plan" (Plan).[1] The Plan was prepared and issued by the Michigan Public Service Commission pursuant to Executive Directive No. 2006-02. The Plan reached several significant conclusions, including the following:

- Michigan's peak electric demand is forecasted to grow at approximately 1.2 percent per year for the next 20 years;
- There is a need for additional electric generating resources in order to preserve electric reliability and provide affordable energy over the next 20 years. This modeling outcome is confirmed even in the presence of increased use of energy efficiency and renewable resources;
- The projected electric demand will not be satisfied through the expansion of transmission nor access to external markets; and
- There is need for regulated baseload capacity to prevent natural gas prices from driving up wholesale costs and market prices for an increasing number of hours each year.

The above conclusions were based upon key factors such as the current age of baseload units and newer electric generating units' reliance on natural gas. As indicated above, the Plan concluded that the state of Michigan has a current need for new baseload capacity and the need is projected to increase. Michigan's current baseload generating units are an average of more than 48 years old.

[1] See http://www.dleg.state.mi.us/mpsc/electric/capacity/energyplan/index.htm.

The average age of Detroit Edison's coal-fired generation units is 44 years old. The last new baseload plant in the state of Michigan began commercial operation more than 18 years ago. The assessment assumes that older, less efficient units, totaling 3,755 MW of capacity, will be retired by 2025.

Further, new baseload electric production is needed due to the fact that recently constructed electric generation units in Michigan have been limited to natural gas-fired facilities. Natural gas-fired units currently represent approximately 29 percent of Michigan's generating capacity. Dependence upon natural gas-fired units has exposed Michigan to volatile electricity prices driven by fluctuating fuel market prices.

Detroit Edison evaluated alternative means of meeting the baseload generation need. That analysis concluded that coal-fired or natural-gas fired generation provide reasonable alternatives to Fermi 3 for meeting the identified need for new baseload generation. However, after considering the potential environmental impacts associated with these alternative energy sources, Detroit Edison determined they would not be environmentally preferable to the proposed Fermi 3 nuclear power plant.

2) Alternatives Considered:

Detroit Edison sought to avoid and minimize impacts to waters of the United States, including wetlands, associated with the proposed Fermi 3 project by evaluating practicable alternatives that would fulfill the project's purpose and need. Detroit Edison's alternatives analysis included consideration of alternative locations for new nuclear electric production consistent with the purpose and need described above. After determining that the Fermi site was the practicable alternative project location that would result in the least potential impacts to aquatic resources, Detroit Edison considered site layout alternatives to minimize potential wetland impacts in terms of both quantity and quality. Both components of the alternatives analysis are summarized below. Detroit Edison's alternatives evaluation illustrates that the proposed use of the Fermi site is the least environmentally damaging practicable alternative (LEDPA) that fulfills the project's purpose and need. Detroit Edison has also proposed mitigation for the unavoidable impacts to waters of the United States.

a) Alternative Sites

Detroit Edison reviewed the eight candidate sites identified through the site selection process described in Section 9.3 of the Fermi 3 Combined License Application Environmental Report within the context of the CWA Section 404(b)(1) guidelines to identify a LEDPA site. The candidate sites were evaluated for practicability to construct and operate a nuclear generating facility. The sites that were found to be practicable were then evaluated for potential impacts on waters of the United States and adjacent wetlands to identify an environmentally preferable location.

The candidate sites included five greenfield sites, two existing fossil-fired sites, and one existing commercial nuclear site. The practicability assessment considered various technical, economic, safety, and environmental criteria that reflect the overall purpose of the project. The results of that evaluation are summarized in **Table 4-1**. Six sites (five greenfield sites and one existing fossil-fired site) that exhibited undesirable characteristics were judged to be impracticable as sites for locating a new nuclear plant and were excluded from further review. The two remaining candidate sites, the Greenwood Energy Center site and the Fermi site, were then evaluated for impacts on waters of the U.S. and adjacent wetlands.

Detroit Edison evaluated the potential wetland and stream impacts associated with construction of the nuclear generating facility and any required infrastructure such as transmission corridors and make-up water supply or blowdown discharge pipelines to support the closed-cycle cooling

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system. The potential impacts associated with nuclear development at the Fermi and Greenwood sites are summarized in the **Table 4-2**. Based on the overall potential impacts to waters of the U.S., the Fermi site would be the LEDPA.

b) Site Layout Alternatives

Detroit Edison proposes to construct and operate a new nuclear power plant at the Fermi site. The proposed unit is to be designated as Fermi 3. The Fermi site (the area within the Fermi property boundary) consists of approximately 1260 acres in eastern Monroe County, Michigan. The existing Fermi 2 unit is in the northeast part of the site. Fermi 3 and associated facilities will be located in an area south of the existing Fermi 2 protected area. Most of the land that will be occupied by Fermi 3 and associated facilities was disturbed during construction of Fermi 1 and Fermi 2; however, some construction will occur in areas that have been undisturbed for longer periods of time. This section discusses the onsite layout alternatives considered and the relevant impacts to aquatic resources associated with those alternatives for the Fermi 3 project.

The Fermi 3 site layout includes the power block, cooling tower, switchyard, parking, construction laydown areas, transmission lines, access road, cooling water intake structure, discharge pipe, and barge docking facility. Detroit Edison applied as much repositioning of project components as possible within project practicability limits to avoid and minimize impacts to wetlands and other natural resources at the Fermi site. Four project layout alternative scenarios were evaluated. These alternative layouts are identified as Revision 0, Revision 1, Revision 2, and the Preferred Alternative.

The site layout was evaluated for potential environmental impacts to the Fermi site. This analysis focused on environmental categories that are protected under special-purpose environmental laws and that contain specific provisions for the avoidance and minimization of impacts. These categories include wetlands, archaeological resources, and protected species. Complete avoidance of some impacts to environmental categories, such as wetlands, associated with Fermi 3 may not be feasible due to the large area of land disturbance required. Efforts were made to avoid impacts to wetlands through consideration of several different project alternatives.

A process to avoid, minimize, or compensate impacts to waters of the United States, including wetlands, was completed for the Fermi 3 project. This process included the consideration of alternative onsite locations for major structures and changes in site configuration to minimize damages to waters of the United States.

<u>Key Constraints</u>

Several key constraints guided the process of determining locations for Fermi 3 Nuclear Power Plant and construction-related activities relative to the available property on the Fermi site and the location and operational needs of the Fermi 2 Nuclear Power Plant. As this discussion will illustrate, unavoidable impacts to wetlands resulted when the key constraints could not be satisfied without incurring those temporary or permanent impacts.

The key constraints are as follows:

1) The site layout must minimize impacts to the environment and to the Detroit River International Wildlife Refuge.
2) Fermi 3 construction cannot interfere with the operations of the existing Fermi 2 Nuclear Power Plant.
3) Fermi 3 construction cannot interfere with Fermi 2 security requirements or programs.
4) Fermi 2 operations must not interfere with Fermi 3 construction.
5) Fermi 2 operations must not interfere with federally mandated Fermi 3 security requirements, which are distinct from operating plant security requirements.

6) The location of the Fermi 3 power block must allow for both Fermi 2 and Fermi 3 plants to be combined into a single protected area security boundary after construction is completed that meets federally mandated security requirements. This will facilitate operational synergies such as sharing of personnel and common support facilities, the Primary Access Portal (PAP) to the protected area, warehouses, and maintenance shops.
7) The construction site must provide for a contiguous, unimpeded flow of personnel, equipment and materials.
8) The Fermi 3 construction site must have adequate, onsite space for the following: laydown and staging of materials; fabrication and assembly of modular components, and; construction support facilities. Nuclear power plant construction management consultants have advised Detroit Edison that a minimum of 100 acres of land should be available onsite, contiguous to or near the construction area, for these activities.
9) Placement of structures must satisfy nuclear safety requirements.

Constraint 1 has been a primary consideration throughout the site layout development process, however, as the project has moved forward, additional environmental studies and information have been developed which have been the principal driver for revisions to the proposed site layout to further minimize environmental impacts.

While the constraints have remained the same throughout the development of the site layout, as Detroit Edison's knowledge of site environmental conditions evolved, revised versions of the site layout were created in keeping with Constraint 1. Each of the four versions of the site layout satisfied the key constraints based upon the state of knowledge at the time the site revision was developed.

The method chosen to address Constraints 2 through 5 was to separate Fermi 2 operational activities from the Fermi 3 construction site the maximum extent. This separation resulted in Constraints 10 and 11, as follows:

10) All Fermi 2 operational activities will be on the north side of the Fermi site and all Fermi 3 construction activities will be on the south side of the site. The boundary separating Fermi 2 operations from Fermi 3 construction activities is roughly an east-west line extending across the site from the southern boundary of the Fermi 2 protected area. This constraint significantly reduces the amount of land available for building and construction because land north of the line will not be available for Fermi 3 construction.
11) Fermi 2 operations and the Fermi 3 construction site must have completely separate access roads, entrances and exits. Fermi 2 and Fermi 3 roads and activities must not cross each other. This is to avoid traffic impacting either site. This also relates to Constraint 7.

Constraints 2, 3, 4, 5, and 6 allow very little flexibility on where power block structures such as the reactor building can be located. The only location suitable is south of the existing Fermi 2 protected area on the opposite side of the imaginary east-west dividing line.

Constraints 7 and 8 require arranging the Fermi 3 site to ensure that there will be adequate space near the primary construction area to allow a free flow of personnel, materials and equipment. Fermi 3 requires a large construction workforce with up to 2900 construction workers at peak and 900 onsite workers when operational. Adequate staging and laydown area (temporary storage of construction materials) is needed to support the modular construction of nuclear power plants. Reactors such as the ESBWR proposed for Fermi 3, use standardized modules and certified designs to expedite the construction schedule. Nuclear power plant construction management consultants have advised Detroit Edison that a minimum of 100 acres of land should be available near the construction site for staging, laydown, and assembly of equipment and pre-assembled modules. A comparison of the amount of proposed land available for other United States nuclear

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license applicants indicates that the Fermi 3 site, in the preferred site layout, is among the smallest sites in terms of acres used.

Constraint 9 requires a final review and approval of any proposed site layout arrangement by security subject matter experts with appropriate clearances to ensure that the layout is in compliance with all security plan requirements.

Efforts to minimize impacts in the alternatives development process included:

- Avoiding and minimizing impacts to all wetlands with priority given to avoiding impacts to the most valuable/functional wetlands;
- Where wetland impacts were unavoidable, the preference was for temporary wetland impacts over permanent wetland impacts, with the understanding that wetland mitigation implemented prior to, or concurrent with, the impact will still be required. A temporary impact means that the wetland will be restored to existing or better condition once the temporary land use for construction activities is completed, and;
- Placing the Fermi 3 power block in the largest contiguous upland area.

Efforts were made to avoid, to the extent practicable, adverse impacts associated with filling or modification of wetlands and new construction in wetlands wherever there is a practicable alternative. Impacts were only considered when there was no practicable alternative, and the proposed configuration for Fermi 3 includes all practicable measures to reduce impacts to wetlands and jurisdictional waters. Detroit Edison evaluated each of the onsite alternative layouts based on the approximate acreage, type, and value of wetlands that would be impacted. Alternatives that would minimize impacts to wetlands were preferred over alternatives that would result in greater impacts.

Wetland impacts of the Revision 0, Revision 1, and Revision 2 site layouts presented in the Fermi 3 Environmental Report, were evaluated using the updated Fermi site wetland delineation provided in this application (see Figure 2-2). Impacts to the open water areas H and U are treated as emergent wetland impacts. Therefore, the acres of impact presented here differ slightly from those presented in the Environmental Report.

<u>Revision 0 Site Layout</u>

Revision 0 is the site layout presented in the original Fermi 3 combined license application (COLA) submittal in September 2008. The Revision 0 layout was finalized in February 2008 using preliminary site wetlands information and was laid out along traditional concepts for large, long-term, construction sites.

Unchanged Site Layout Elements

The location of the Fermi 3 power block, which includes the reactor building, turbine building, control building, fuel building, radwaste building, diesel generators and other plant support systems, is fixed according to the requirements set out in Constraints 6 and 10. This location did not change in subsequent site-layout revisions.

Lake Erie will be used as the source for makeup water to the plant. The Fermi 3 makeup water intake will be adjacent to the intake for Fermi 2, i.e., located between the two existing groins that protrude into Lake Erie in the location of existing Fermi 1 structures. A barge slip for delivery of prefabricated modules, large components and building materials will be located between the two groins and adjacent to the south groin. These structures will be located in areas that have already been disturbed, in conformance with Constraint 1 and 10. The location of these structures did not change in subsequent revisions.

The Fermi 3 blowdown water outfall to Lake Erie will be offshore via an underwater discharge line in conformance to Constraints 1, 2 and 10. The configuration and discharge location of this line did not change in subsequent revisions. Four discharge locations were considered including two shoreline discharges (concrete, partially submerged, discharge structure along the shoreline) and

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an inland location. The inland location into the south lagoon was eliminated due to environmental considerations according to Constraint 1. The warm blowdown water could potentially disturb the local aquatic ecosystem and wetlands in the south lagoon. The two shoreline discharge locations considered on the south side of the site, per Constraint 2, were also eliminated due to environmental considerations per Constraint 1 and potential Fermi 2 operational impacts per Constraint 2. One consideration with both shoreline locations was the possibility of variable, near-shore currents sending the warm blowdown water back into the Fermi 2 and Fermi 3 makeup water intakes, which could impact plant heat loads and water chemistry. The other consideration with both shoreline locations was that warm blowdown water discharged during a seiche event, with winds from the east, could flow back into the south lagoon, potentially disturbing the local aquatic ecosystem and wetlands. Shoreline discharge locations would pose greater impacts than the proposed offshore discharge, which is considered environmentally preferable.

Site Layout Elements that Changed in Subsequent Site Layout Revisions

The normal power heat sink for Fermi 3 is a single concrete natural draft cooling tower. The cooling tower location changed from Revision 0 to Revision 1. Several criteria were utilized in identifying the initial cooling tower location, as follows:

- The cooling tower must be at least 800 feet away from safety-related structures in conformance with Constraint 9 (the cooling tower must be located, at minimum, a distance equal to its height from any safety-related structures such as the reactor building. This is to eliminate the potential for damage to these structures, if the tower collapsed), and;
- The cooling tower must be at least 1000 feet away from the switchyard to minimize icing and salt drift impacts also in conformance with Constraint 9.

Other considerations included the following: minimizing the length of the circulating water piping; minimizing the distance to Lake Erie, minimizing wetland impacts according to Constraint 1; minimizing Fermi 2 system impacts, and; minimizing temporary impacts to Fermi 2 and Fermi 3 site access during construction according to Constraints 2, 10 and 11. Four locations were considered. The location chosen was south of Fermi 3 in an area that was considered to be forested upland. The location selected conformed with the above-mentioned constraints and had the smallest impact to wetlands, the shortest circulating water pipe length, and had the smallest Fermi 2 system impacts.

In conformance with Constraints 10 and 11, several Fermi 2 operational facilities (warehouses, administration and engineering offices, maintenance shops) were relocated from the Fermi 3 construction site to the Fermi 2 side of the site. These facilities were to be relocated in an area that was considered to be forested upland. The location of these facilities changed from Revision 0 to Revision 1 to minimize wetland impacts, in conformance with Constraint 1, based on additional wetlands delineation information.

In conformance with Constraint 11, the Fermi 2 site to the north, and the Fermi 3 construction site to the south, must have completely separate access roads, entrances and exits. This is to prevent traffic from either site affecting the operation of Fermi 2 or Fermi 3. The Fermi 2 access road followed the west property line along Toll Road, then turned west through an area that was considered to be forested upland. The access road was altered from Revision 0 to Revision 1 to minimize wetland impacts, in conformance with Constraint 1, based on additional wetlands delineation information. The Fermi 2 access road was slightly altered in Revision 2 to further reduce wetland impacts.

The Fermi 3 temporary construction parking lot was proposed to be located on the north side of Fermi Drive, beneath the existing transmission corridors in accordance with the Fermi 2 and Fermi 3 separation requirements per Constraint 10. A large area is needed for construction parking to accommodate 2900 workers at the peak of construction. This area is also directly connected to the construction site and meets the requirements of Constraint 7. The utility of this area for other construction activities was limited due to the existing high-voltage overhead lines. The location of construction parking and the utilization of this field changed from Revision 1 to Revision 2.

Revision 1 Site Layout

Based on completion of the Ducks Unlimited wetland study in July 2008, Detroit Edison recognized that the cooling tower location and the location of the Fermi 2 facilities moved from the Fermi 3 construction site, had greater wetland impacts than originally assessed and that these placements would have to be modified. Therefore, at the U.S. Nuclear Regulatory Commission (NRC) environmental audit in February 2009, Detroit Edison informed the NRC, Michigan Department of Environmental Quality (MDEQ), and the U.S. Army Corps of Engineers (USACE), that the Revision 0 site layout would be revised to further minimize wetland impacts.

Through planning and consultation with natural resource professionals, stakeholders and subject matter experts (nuclear security, materials management, construction planning, operations, maintenance, environmental and licensing), Detroit Edison developed a Revision 1 site layout that reduced wetland impacts to only those areas where a practicable alternative could not be identified that would still fulfill the overall project purpose. All available land onsite with no wetland impacts and low wetland impacts, that also conformed to the key constraints, was identified on a figure, for use in reconfiguring the Fermi 3 site layout. The stakeholder team then worked to eliminate or minimize wetland impacts by redesigning the site layout utilizing those identified low-impact and no-impact areas, with a focus on relocating Fermi 3 structures and activities with the greatest wetland impacts (e.g., cooling tower location, Fermi 2/Fermi 3 PAP, parking, office buildings, warehousing, and shops). The Revision 1 site layout was submitted to the NRC in December of 2009.

One of the key changes made to the Revision 1 site layout was moving the cooling tower from the forested wetland, south of Fermi Drive, to land just west of the Fermi 3 power block. This location has several advantages such as shorter circulating water lines, no temporary disturbance to construction site roadways, and no wetland impacts (per the 2008 wetlands delineation). One consideration of this location was that it was close to safety-related structures such as the reactor building. According to Constraint 9, the cooling tower was positioned a distance greater than its height from safety-related structures to prevent damage to these structures, if the tower were to collapse. The South Canal is impacted by the new cooling tower location and by the need to maintain a free flow of personnel, equipment and materials to the construction site, according to Constraint 7. The intersection of Fermi Drive, Quarry Lake Road and Doxy Road is considered a pinch point to the free flow of personnel, equipment and materials. Bridging of the South Canal allows for an unconstrained connection between the field to the west and the construction site. Due to the considerations explained above regarding Constraints 7 and 9, the impact to the South Canal is unavoidable.

A disadvantage to locating the cooling tower adjacent to the Fermi 3 power block is the loss of a large expanse of land adjacent to the primary construction site needed for laydown, staging, fabrication and assembly of modular components, according to Constraint 8. This loss can be partially, but not completely, compensated by managing the construction sequence. To address this constraint, the area known as the “pork chop” located south of Fermi Drive and west of Quarry Lakes Road, was utilized in the Revision 1 site layout, in conformance with Constraints 7, 8, and 10. The “pork chop” provides approximately 30 acres of prime construction land that includes 11.80 acres of forested wetland near the construction site. Natural resource inventories suggested the forested wetland in this area was of lower value ecologically than the other large forested systems onsite. The wetland is connected hydrologically with culverts but fragmented from other wetland areas and Lake Erie due to multiple roadways completely surrounding the site. It also had a larger component of dead/dying ash trees and invasive species and was subject to ongoing disturbance.

The “pork chop” is an important feature of the Revision 1 site layout due to its proximity to the construction site; location adjacent to Fermi Drive and rail access; and, the absence of overhead

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transmission lines that can present a safety hazard and barrier to movement and assembly of equipment, materials and modules. Construction warehouses, staging, assembly areas, and maintenance shops were planned for this location. Utilization of this area greatly facilitates the free flow of personnel, equipment and materials, further relieving the pinch-point concern at the Fermi Drive and Quarry Lakes Road intersection. Traffic through this area includes workers and materials coming from Dixie Highway, laydown and staging areas, the rail spur, and the barge slip.

The other key change to the Revision 1 site layout was removing the Fermi 2 operational structures (permanent parking lot, warehouses, an administration building and maintenance shops) from the forested wetland west of the Fermi 2 protected area. These structures were relocated in the Revision 1 site layout as follows:

- An administrative support campus outside the owner controlled area, associated with the Nuclear Operations Center/Nuclear Training Center (NTC), was created to move the Fermi 2/Fermi 3 Administration Building and the Fermi 3 Training Simulator out of forested Wetland I, in conformance with Constraint 1. Conformance to Constraints 4, 10 and 11 was evaluated for this location due to Fermi 2 operational support facilities being moved to the southern, Fermi 3 side of the site. Several considerations mitigate these constraint conformance issues, as follows: a bridge or tunnel will be utilized to cross Fermi Drive without affecting the construction site; personnel utilizing the training facility and administrative offices are generally at that location the entire day and would not need to cross to the Fermi 2 side of the site; and; increased use of technology such as video conferencing will minimize cross over. In addition, this arrangement reduces the need for additional operational parking at the PAP due to reduced personnel inside the protected area, which reduces the parking-structure foot print, thus minimizing environmental impacts in this area in conformance with Constraint 1.
- The flat operational parking was moved out of forested Wetland I and replaced by two multiple-level parking structures to minimize land use and wetland impacts, and to improve the overall site parking situation in conformance with Constraint 1. One parking structure is proposed near the NTC for permanent training and administration parking to support the new administrative campus. The other structure is located near the new PAP on the west side of the protected area boundary for protected area parking. A small wetland impact associated with a portion of this parking structure remains. This impact could not be avoided due to the proximity of existing and proposed structures in this area, along with nuclear security distance requirements in conformance to Constraint 9. The two parking garages will be sized to accommodate Fermi 2 and Fermi 3 operational parking.
- The combined Fermi 2/Fermi 3 warehouse was moved out of forested Wetland I in conformance with Constraint 1 and moved east to straddle the protected area boundary near the vehicle inspection building (VIB) and PAP. This location minimizes impacts, however some wetland impacts were unavoidable due to necessary sizing of the Fermi 2/Fermi 3 warehouse and the need for an access road along the west side of the structure. This arrangement will improve operational efficiency of the Fermi 2 and Fermi 3 sites. Other areas north and west of the protected area were considered, however, key stakeholder feedback, primarily from materials management and nuclear security, insisted on this location for secure protected area operations in conformance with Constraints 2, 3, 6 and 9. Two other smaller warehouses (32 and 34) were also moved out of forested Wetland I, to a location along the access road with no associated wetland impact.
- The Fermi 2 operational access road was moved to minimize environmental impacts in conformance with Constraint 1. The access road no longer cuts through forested Wetland I. The access road now follows the existing Toll Road, then transitions to existing site roads, which route around Wetland I to access the site. Wetland impacts were minimized, however some impacts were unavoidable, in conformance with Constraints 6, 10 and 11. The unavoidable impacts were associated with a new Fermi 2 operational security gate,

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necessary road improvements and rerouting of the existing road along the west side of the new Fermi 2/Fermi 3 warehouse.

Other modifications reflected in the Revision 1 site layout include the following:

- The Fermi 2/Fermi 3 meteorological tower was relocated because the new Fermi 3 cooling tower location will interfere with the current meteorological tower location. The new meteorological tower is relocated in an area near the southeast corner of the site. This location was selected because there were no known wetland impacts in conformance with Constraint 1 and because it met NRC regulatory guidance for meteorological tower placement.
- Construction staging and laydown was added on the south site border in a low-wetland impact area, on the east side of Quarry Lakes Road and around Fox Road, in conformance with Constraints 8 and 10. Unavoidable, temporary impacts are incurred to several small, fragmented, low-value emergent and scrub shrub wetlands (Wetlands AA, JJ, II). Nuclear construction subject matter experts engaged by Detroit Edison indicated that more land was needed for construction activities (staging, laydown, temporary spoils storage, and component assembly) than was originally allocated in the Revision 0 site layout.
- The Fermi 3 switchyard was moved to the agricultural field at the far west side of the property, adjacent to the south side of Fermi Drive. In Revision 0, the Fermi 3 switchyard was adjacent to the Fermi 2 switchyard in the protected area. Further analysis of the Fermi 3 interconnection determined the available space adjacent to the Fermi 2 switchyard was not sufficient for the new Fermi 3 switchyard. In addition, in accordance with Constraint 2, the original location was an impediment to movement and a potential impact to Fermi 2 operations. The new location also places the switchyard outside the owner-controlled area to facilitate access by ITC*Transmission* (owner and operator of the switchyard).

<u>Revision 2 Site Layout</u>

After the Revision 1 site layout was finalized, terrestrial and aquatic studies continued on the site. The results indicated a greater diversity in the vegetative communities within the "pork chop," than was originally understood. Subsequently, in a meeting to discuss Fermi 3 wetland permitting in July 2010, the MDEQ and USACE indicated that the wetland impacts associated with the "pork chop," contained in the Revision 1 site layout, were problematic. In response to this feedback and in conformance with Constraint 1, Revision 2 of the site layout was developed to address the wetland impact to the "pork chop" area.

Construction activities were moved out of the "pork chop" (Wetlands BB, EE, and FF) and the contiguous forested upland associated with that parcel, in accordance with Constraint 1. Site elements were rearranged to eliminate the "pork chop" impact, in conformance with Constraints 1, 7, 8 and 10. Most of the construction activities planned for the "pork chop," were moved to the north side of Fermi Drive. Some of the construction activities were also moved into areas designated for construction laydown located around the Quarry Lakes. Construction parking originally planned for the field north of Fermi Drive, was moved into the farmer's field located along the western property line. The use of the field on the north side of Fermi drive was limited in the previous site layout because of existing overhead transmission lines, so in Revision 2, the 345 kV lines are rerouted.

The resulting changes are summarized as follows:

- The 345 kV transmission lines that serve Fermi 2 and the proposed Fermi 3 were rerouted to open up the field on the north side of Fermi Drive for all necessary construction activities to satisfy Constraints 7, 8 and 10. The transmission is rerouted due west through emergent Wetland C, then south along Toll Road, to the Fermi 3 switchyard, which was moved into the field at the corner of Toll Road and Fermi Drive. This change eliminates impacts to a large parcel of rare and imperiled wetland (the "pork chop") and incurs unavoidable impacts to approximately 2 acres of forested wetland (the impacts will change the edge of Wetland F

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below the transmission lines from a forested wetland to a emergent wetland) and small, unavoidable, permanent and temporary impacts to an emergent Wetland C.

- Land surrounding the Quarry Lakes, designated as laydown, was added for various construction activities in conformance with Constraints 7, 8 and 10, to replace loss of laydown and staging areas from the "pork chop" area and from moving construction parking into the farmer's field. Some temporary, unavoidable impacts are incurred to small, fragmented, low-value forested and emergent wetlands in these areas (Wetlands W and Y).
- The Fermi 3 switchyard was moved from the south side to the north side of Fermi Drive to facilitate the transmission corridor rerouting in conformance with Constraints 1, 7 and 8. Construction parking, previously located in the field north of Fermi Drive, is moved into the farmer's field.
- The Fermi 2 access road was realigned to further minimize impacts to forested Wetland I in conformance with Constraint 1. The new alignment will follow Toll Road further north, just past Langton Road, prior to transferring onto the Fermi site access road.
- The meteorological tower was moved southeast of the Revision 1 location to eliminate any potential wetland impacts. When the Revision 1 location was identified, the understanding was that cutting trees in a wetland did not require a wetland permit. At the July 2010 meeting with the MDEQ and USACE, the staff clarified that cutting trees from forested wetland areas in association with the meteorological tower would require a permit for the conversion of wetland type. In conformance with Constraint 1, the Revision 2 site layout identified a location that was consistent with the recommendations of the meteorological tower siting study and did not require tree cutting in wetland areas.
- In Revision 2, construction boundaries were refined to eliminate unintended impacts in the Revision 1 site layout associated with construction along Quarry Lake Road and the Dredged Spoils Disposal Basin.
- Operations and maintenance dredging authorized under existing Fermi 2 permits was eliminated as an impact attributed to Fermi 3 construction (reduction of 7.32 acres of open water impacts). The incremental change in the extent of dredging within Lake Erie required to support Fermi 3 construction was included.

<u>Preferred Site Layout</u>

Refinements to the Revision 2 site layout were made during the development of the joint permit application. Detroit Edison modified the alignment of the new operations access road to avoid potential wetland impacts in the area west of the existing Toll Road. This change resulted in a small increase in the forested and emergent wetland impacts on the Fermi property side of the access road. The shift in the access road alignment altered the path of the onsite transmission, resulting in an increase of 1 acre (from 1.53 acres to 2.53 acres) in the forested wetland that would be cleared within the transmission corridor. The proposed roadway, security gate, and box culvert design were modified to minimize the encroachment into the wetland areas as much as practicable. Overall the wetland impacts associated with the road increased by 0.53 acre. The wetlands west of the existing Toll Road have not been formally delineated. Based on federal wetland mapping and field observations, Detroit Edison believes equal or greater wetland impacts would have resulted from the previous access road alignment.

<u>Summary of Project Alternatives and LEDPA Analysis</u>

Table 4-3 compares potential impacts to wetlands on the Fermi site of the four alternative site layouts discussed above. Wetland impacts were further characterized by Michigan Natural Communities to illustrate impacts to higher valued wetlands.

Detroit Edison minimized potential project impacts to waters of the United States, including wetlands. The site layout for the Fermi 3 project was based on an iterative approach to determine a layout that would most practicably avoid and minimize impacts to USACE jurisdictional waters and wetlands. Areas of the Fermi site that represented no, or minimal, impacts to wetland functions and values were identified. Stakeholders were engaged to identify constraints on the site layout, including integration of Fermi 3 with the ongoing operations of Fermi 2. Those constraints were used to identify locations for the proposed Fermi 3 and associated construction. Efforts were made to avoid, to the extent possible, impacts associated with the destruction or modification of wetlands and streams and new construction in wetlands and streams wherever there was a practicable alternative.

The Fermi 3 power block was located in the largest contiguous upland area consistent with Constraints 1, 2, 3, 4, 5, 6, 7, 9 and 10. The cooling tower was also located in this upland area at a distance from the power block that satisfies nuclear safety considerations, per Constraint 9. The minimum separation distance precludes siting the cooling tower entirely within the available upland adjacent to the Fermi 3 power block area.

A combined Fermi 2/Fermi 3 warehouse, parking, VIB, and PAP located on the west side of the protected area boundary, offers significant efficiency advantages over the operational life of the plants. A multi-level parking structure connected to the PAP addresses the need for parking for an additional 900 staff when Fermi 3 is operational while minimizing impact to the adjacent wetlands. The location of these facilities supports the integration of the Fermi 2 and Fermi 3 protected areas when construction is completed and satisfies other nuclear security considerations per Constraints 2, 3, 6, 9 and 10.

Construction of the Fermi 3 intake structure, discharge pipe, and barge slip within the existing Fermi 2 intake embayment reduces the cumulative area of lake bottom that will be disturbed per Constraint 1. The discharge pipe and fish return pipe are the only Fermi 3 components that will require dredging beyond the operations and maintenance dredging currently authorized for Fermi 2 under MDEQ and USACE permits.

Adequate laydown area is needed to support the modular construction that is a key component of modern nuclear power plants, as described in Constraint 8. Reactors such as the ESBWR proposed for Fermi 3 use standardized modules to expedite the construction schedule. With the relocation of the 345kV transmission, the field to the west, and immediately adjacent to the power block, along the north side of Fermi Drive, possesses the attributes necessary for key construction activities consistent with Constraints 7 and 8. Use of this area includes some unavoidable impacts to wetland areas that will be restored following completion of construction of Fermi 3.

The design iterations reduced the potential wetland impacts from over 150 acres to approximately 40 acres. Overall impacts to wetlands were reduced in the Preferred Alternative. Open water impacts were also reduced in the Preferred Alternative. The Preferred Alternative also reduces the total impact to those Michigan Natural Communities that are considered rare and imperiled. These include Great Lakes marsh and southern swamp (southern hardwood swamp). All the permanent and temporary wetland impacts in the preferred site layout were unavoidable given the ten constraints previously outlined. The preferred alternative presents significantly less impact to the high functioning, high value wetland communities at the Fermi site. Based on the results of the alternative site layout analysis, the Preferred Alternative was selected as the proposed site layout that best addresses avoidance and minimization of wetland impacts.

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Table 4-1. Candidate Site Practicability Review (Sheet 1 of 2)

	Site A – Petersburg	Site C – South Britton	Site F – Greenwood	Site M – Fermi	Site N – Belle River	Site W1 – Port Austin	Site W2 – Caseville	Site W3 – Bay Port
Land Acquisition	**Impracticable** 32 private owners, few houses.	**Acceptable** 14 private owners, 15-25 houses/ facilities. May need to acquire additional land for EAB	**Acceptable** Detroit Edison. Would need to acquire additional land for EAB	**Acceptable** Detroit Edison. Fermi 3 EAB entirely within existing Fermi property and security zone	**Acceptable** 81% Detroit Edison / 19 % Michigan Public Power Authority	**Impracticable** 85 private owners. Many houses/ facilities	**Impracticable** 90 private owners. Many houses/ facilities	**Impracticable** 120 private owners. Many houses/ facilities. May need to acquire additional land for EAB
Transmission Lines	**Acceptable** 345-kV lines with available capacity 1.2 miles north of site	**Acceptable** 345-kV line with available capacity 1 mile north of site	**Marginal** 345-kV line onsite but congested	**Acceptable** 345-kV line with available capacity onsite	**Marginal** 345-kV line onsite but congested	**Impracticable** Nearest 345-kV line is approximately 48 miles from the site	**Impracticable** Nearest 345-kV line is approximately 41 miles from the site	**Impracticable** Nearest 345-kV line is approximately 35 miles from the site
Water Supply	**Impracticable** 15.4 miles inland from Lake Erie	**Impracticable** 24.4 miles inland from Lake Erie	**Acceptable** 11 miles inland from Lake Huron	**Acceptable** On the shore of Lake Erie	**Acceptable** 2 miles west of St. Clair River	**Acceptable** 1.4 miles inland from Lake Huron	**Acceptable** 2.8 miles inland from Lake Huron	**Acceptable** 1.4 mile inland from Saginaw Bay

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Table 4-1. Candidate Site Practicability Review (Sheet 2 of 2)

	Site A – Petersburg	Site C – South Britton	Site F – Greenwood	Site M – Fermi	Site N – Belle River	Site W1 – Port Austin	Site W2 – Caseville	Site W3 – Bay Port
Hazardous Land Uses	**Impracticable** Petroleum product pipeline 2 miles south. Two natural gas pipelines traversing the site from southwest to northeast within ½ mile of plant	**Impracticable** Two natural gas pipelines traversing the site from southwest to northeast. Would require relocation of a 30-inch line to avoid conflicts with the plant	**Marginal** Oil-fired peaking unit and three gas turbines onsite	**Acceptable** Two limestone quarries 3 miles northeast.	**Impracticable** Multiple large natural gas transmission lines, gas storage field and compressor station within 2 miles. Bulk petroleum facility 3 miles north of the site	**Acceptable** No hazardous land use sites within 5 miles.	**Acceptable** No hazardous land use sites within 5 miles.	**Acceptable** Limestone quarry and anhydrous ammonia facility within 3 miles of the site.
Railroad Access	**Acceptable** Indiana & Ohio Railroad 1.5 miles west of the site.	**Acceptable** Norfolk Southern Railway 1.9 miles east of the site.	**Acceptable** PVTX Railway spur on site.	**Acceptable** Canada National Railway spur on site.	**Acceptable** CSX Transportation spur on site.	**Acceptable** Huron & Eastern Railway 1.4 miles southeast of the site.	**Marginal** Huron & Eastern Railway 6.7 miles south of the site.	**Acceptable** Huron & Eastern Railway 5.4 miles south of the site.
Overall Conclusion	**Impracticable**	**Impracticable**	**Acceptable**	**Acceptable**	**Impracticable**	**Impracticable**	**Impracticable**	**Impracticable**

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Table 4-2. Comparison of Wetland/Water Impacts from Alternative Sites

Onsite Wetlands/Waters	**Proposed Site Fermi**		**Alternative Site Greenwood**	
Delineated Property Acreage	1106		1729	
Wetlands Acreage	513		386	
Open Water Acreage	40		NA	
Streams Linear Feet (LF)	0		30,303	
Wetlands Affected Acreage	40		39	
Streams Affected LF	0		401	
Open Water (Lake Erie) Affected Acreage	0.08		NA	
Open Water (inland) Affected Acreage	NA		NA	
Offsite Wetlands/Waters	**Wetlands (acreage)**	**Streams (LF)**	**Wetlands (acreage)**	**Streams (LF)**
Makeup Water Intake (acreage)[a]	-	-	NA	NA
Water Pipeline ROW	-	-	3.1	4378
Transmission Line ROW	121	7304	257	29,648
Blowdown Pipeline ROW	-	-	0	273
Total Wetlands/Waters Affected				
Wetlands Affected Acreage	161		300	
Streams Affected LF	7304		34,701	
Open Water (Lake Erie) Affected Acreage	0.08		NA	
Open Water (inland) Affected Acreage	NA		NA	

[a] Impacts within Lake Huron for the construction of an intake structure for the Greenwood site alternative were not evaluated.

Table 4-3. Comparison of Impacts for Alternative Site Layouts

Type	Revision 0	Revision 1	Revision 2	Preferred Alternative
Wetland Impacts (acres) by Type				
PEM wetland[a]	54.84	18.79	26.08	26.40
PFO wetland	96.66	18.97	6.84	8.03
PSS wetland	7.00	4.10	5.28	5.28
Total wetlands	158.49	41.86	38.19	39.71
Open water	8.87	7.40	0.08	0.08
Wetland Impacts (acres) by Michigan Natural Community[b]				
Rare and imperiled: Great Lakes marsh	47.53	10.38	12.86	13.19
Rare and imperiled: southern hardwood swamp	92.19	14.08	1.95	3.15
Southern shrub carr	7.00	3.92	3.91	3.91
PEM wetland – coastal	0	0.80	0.80	0.80
PEM wetland[a]	7.31	7.61	12.42	12.42
PFO wetland	4.47	4.89	4.89	4.89
PSS wetland	0	0.18	1.37	1.37
Open water	8.87	7.40	0.08	0.08

[a] Includes 1.88 acres of nonjurisdictional PEM wetland impacts.

[b] Chapter 324, Section 303.01(t) of the Michigan Natural Resources and Environmental Protection Act lists Michigan Natural Communities that are considered rare and imperiled. These include Great Lakes marsh and southern swamp (southern hardwood swamp). Any wetland considered "other" that is connected hydrologically to Lake Erie or is within 1000 feet of the ordinary high water mark (elevation 571.6 feet IGLD 1955) is considered coastal.

J.3 References

33 CFR Part 209. Code of Federal Regulations, Title 33, *Navigation and Navigable Waters,* Part 209, "Administrative Procedure."

33 CFR Part 320. Code of Federal Regulations. Title 33, *Navigation and Navigable Waters,* Part 320, "General Regulatory Policies."

Detroit Edison Company (Detroit Edison). 2011. *Detroit Edison Fermi 3 Project, U.S. Army Corps of Engineers and Michigan Department of Environmental Quality, Joint Permit Application.* Revision 1, Detroit Michigan. August. Accession No. ML112700388.

Executive Order 11988. 1977. "Floodplain Management." *Federal Register Vol.* 42, p. 26951. May 24, 1977.

Fish and Wildlife Coordination Act of 1934. 16 USC 661–667e, *et seq*.

Michigan Natural Resources and Environmental Protection Act of 1994. PA 451.

Rivers and Harbors Appropriation Act of 1899. 33 USC 403, as amended (also referred to as the Rivers and Harbors Act of 1899).

Appendix K

Detroit Edison's Proposed Fermi 3 Conceptual Aquatic Resource Mitigation Strategy

Appendix K

Detroit Edison's Proposed Fermi 3 Conceptual Aquatic Resource Mitigation Strategy

This appendix presents a conceptual aquatic resource mitigation strategy prepared by Detroit Edison Company (Detroit Edison) to compensate for the Detroit Edison-identified unavoidable impacts to aquatic resources associated with the building of Enrico Fermi Unit 3 (Fermi 3), as presented in its onsite alternatives analysis (see Appendix J of this EIS).

Based on guidance provided by the U.S. Army Corps of Engineers (USACE) during pre-application coordination regarding Clean Water Act Section 404(b)(1) Guidelines compliance, Detroit Edison conducted an onsite alternatives analysis and identified its preferred alternative that would avoid and minimize impacts to waters of the United States. Since the preferred alternative resulted in unavoidable aquatic resource losses, Detroit Edison subsequently developed a conceptual level mitigation strategy to compensate for those unavoidable losses.

As discussed in Appendix J, USACE has preliminarily reviewed but not verified the adequacy of Detroit Edison's preferred alternative (referred to as the Least Environmentally Damaging Practicable Alternative [LEDPA] in the analysis in Appendix J). USACE also has preliminarily reviewed Detroit Edison's conceptual mitigation plan (as presented in this appendix) to compensate for the unavoidable aquatic resource losses related to the preferred plan, but has not verified the adequacy of the proposed mitigation. The USACE review of Detroit Edison's conceptual mitigation plan would occur after receipt of a complete application and USACE determination of the LEDPA and compliance with other restrictions of the Guidelines and public interest review. After adequately addressing any USACE comments on the conceptual mitigation plan, Detroit Edison would be required to submit a final mitigation plan that must be approved by the District Engineer prior to USACE issuance of a permit for the proposed work related to the Fermi 3 project. The USACE permit would include conditions under which Detroit Edison must confirm that the proposed mitigation would meet the Federal wetland criteria as discussed in Section 1.1.3 of this EIS.

Fermi 3 Conceptual Aquatic Resource Mitigation Strategy

MDEQ/USACE Joint Permit Application

PREPARED BY:

CONSERVATION CONNECTS

TETRA TECH

2011

Aquatic Resource Conceptual Mitigation Strategy

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1.0 INTRODUCTION

Detroit Edison has developed the following conceptual mitigation strategy to compensate for proposed impacts to aquatic resources associated with construction of Fermi 3 (Proposed Development) at the Enrico Fermi Atomic Power Plant (Fermi site). The Proposed Development site is located on the western shore of Lake Erie at Newport, Monroe County, Michigan on a 1,260-acre parcel owned and managed by Detroit Edison (Figure 1).

A full description of the Proposed Development is presented in the associated Joint Permit Application. Proposed impacts include 30.37 acres of mixed wetland types within the coastal zone of Western Lake Erie and the northern portion of the Ottawa-Stony Watershed, USGS Cataloging Unit and Hydrologic Unit Code (HUC): 04100001. Wetland types are classified broadly according to the U.S. Fish and Wildlife Service Cowardin classification and more specifically according to the Michigan Natural Community classification. Potential impacts include approximately 10.90 acres of palustrine emergent marsh (PEM; Great Lakes marsh), 3.15 acres of palustrine forested wetland (PFO; southern hardwood swamp), 3.91 acres of palustrine scrub shrub (PSS; southern shrub carr), 0.80 acres of PEM (coastal emergent wetland), 5.36 acres of PEM (other emergent wetland), 4.89 acres of PFO (other forested wetland) and 1.37 acres of PSS (other scrub shrub wetland).

To compensate for wetland impacts, Detroit Edison proposes to:

- Restore approximately 82 acres of wetland and enhance existing wetlands offsite in the coastal zone of Western Lake Erie. Restoration will include approximately 52 acres of PEM (Great Lakes marsh), 21 acres of PFO (southern hardwood swamp), and 9 acres of PSS wetland.
- Restore approximately 21 acres of impacted wetlands onsite post-construction.

This conceptual mitigation strategy is based on existing, available data, the attributes of potentially impacted wetlands, watershed priorities, feedback from natural resource professionals and ongoing communication with the regulatory and conservation community. The following narrative provides an overview of the conceptual mitigation strategy and its development.

2.0 MITIGATION GOALS AND OBJECTIVES

The principal goal of this mitigation strategy is to restore, enhance and protect wetland functions and values of equal or greater value than those impacted by construction of the Proposed Development (Figure 2). This goal will be achieved through wetland mitigation activities offsite within the coastal zone and restoration of impact areas onsite post-construction. The specific objectives listed below were developed based on an in-depth evaluation of the natural resources at the impact site and the condition and conservation needs of the surrounding watershed (see Section 3.1). A watershed analysis allowed for integration of watershed attributes including history, current condition, land use trends, stressors, conservation priorities and other conservation efforts in the Ottawa-Stony watershed and the coastal zone of Western Lake Erie in Monroe County, Michigan (Section 3.1.2). Site level and landscape level perspectives were combined with feedback from regulatory and conservation agency staff to develop an integrated compensation strategy, consistent with guidance from U.S. Army Corps of Engineers (USACE) contained in 33 CFR Part 332 – Compensatory Mitigation for Losses of Aquatic Resources, the Environmental Protection Agency guidance contained in 40 CFR Part 230 – Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, and the Michigan Department of Environmental Quality (MDEQ) Technical Guidance for Wetland Mitigation (Reference 1).

2.1 Mitigation Overview

Over 500 acres of wetlands are present at the Fermi site. Wetlands potentially impacted by the Proposed Development have been avoided and minimized to the maximum extent practicable. Aquatic resources on the Fermi Site were identified, evaluated and considered throughout the design process. The first consideration was to determine if wetland impacts could be avoided entirely. The second consideration was to minimize potential impacts in terms of both quantity and quality to the maximum extent possible. The third consideration was to develop a mitigation strategy that would compensate for all unavoidable impacts. Design iterations reduced potential wetland impacts from over 150 acres to approximately 30.37 acres of regulated wetlands requiring mitigation (21 acres of which will be restored post-construction). In addition to reducing total acreage of impacts, wetland location and quality were taken into consideration as discussed below and in Section 3.1.

To compensate for the loss of wetlands at the Proposed Development site, Detroit Edison will restore and enhance wetlands of similar ecological type within the same coastal zone. For the purposes of this document, restoration implies returning an area to wetland that once was wetland but currently is not because of past and ongoing modifications. Enhancement implies improving wetland functions in an existing wetland. To achieve the mitigation goal stated above, this conceptual mitigation strategy proposes to implement the following mitigation actions:

- Restore approximately 82 acres of wetland and enhance existing wetlands offsite in the coastal zone of Western Lake Erie. Restoration will include approximately 52 acres of PEM (Great Lakes marsh), 21 acres of PFO (southern hardwood swamp), and 9 acres of PSS wetland.
- Restore approximately 21 acres of impacted wetlands onsite post-construction.

Restoration and enhancement activities proposed for the on- and offsite wetland mitigation projects emphasize heterogeneity in microtopography, vegetation and hydrology to maximize diversity and ecological resilience of wetland habitat. Projects were designed to restore and enhance wetland functions and values including:

- Flood flow attenuation and storage
- Sediment retention

- Food chain support
- Breeding and migration habitat for migratory birds
- Breeding and over-wintering habitat for amphibians
- Increased nutrient cycling
- Increased connectivity of habitat types, and
- Water quality improvements for surface outflow to Lake Erie.

Wetland mitigation has also been designed to specifically replace the functions and values provided by wetlands with proposed impacts at the Fermi site. These functions and values include varying degrees of flood flow attenuation and storage, sediment, nutrient and toxicant retention, and fish and wildlife habitat. Section 3.1.8 details the wetland conditions, functions and values of impacted wetlands. This comprehensive mitigation strategy proposes mitigation that will ultimately restore and enhance significant coastal wetland resources along Lake Erie. Detroit Edison proposes to implement these conservation measures to satisfy the site specific compensation requirements for impacts to wetlands and address critical watershed needs and priorities as described below in Section 3.1.9. Mitigation activities will commence with, or prior to, wetland impacts.

2.2 Mitigation Ratios

Ratio of wetland replacement is based on the community type and other attributes of a particular wetland and on guidance from regulatory agencies (see Attachment 12-14 of the associated Joint Permit Application). These guidance ratios are presented in Table 1. A summary of wetland impacts and attributes is provided in Table 2. A more detailed description of the impacted wetlands is provided in Section 12 of the associated Joint Permit Application.

Wetland mitigation objectives proposed here will replace wetland functions and values impacted in the expansion area by restoring 82 acres of wetlands of similar type offsite in the same watershed (coastal zone) at an average replacement ratio of approximately 2.7:1. In addition, several existing wetlands at the offsite mitigation area will be enhanced, and 21 of the 30.37 acres of impacted wetlands onsite will be restored to wetland habitat once construction is complete. Table 1 provides the types and acreages of wetlands impacted, the required ratios and mitigation, and the proposed acreage of mitigation. As per regulatory guidance, the onsite restoration of 21 acres of the impacted wetlands post-construction and the enhancement of existing wetlands at the offsite mitigation area will provide added ecological value and benefits above the required compensatory mitigation. These actions may be proposed to decrease the acreage of mitigation required by 20 percent. This 20 percent decrease is reflected in the total acreage of wetland mitigation proposed in the offsite mitigation plan (Table 1).

In summary, Detroit Edison recognizes the value of coastal wetland habitat along Lake Erie. Avoidance and minimization strategies were employed to minimize impacts to wetlands of high ecological value. Unavoidable impacts were restricted to low quality wetlands and wetland areas to the greatest extent possible. As described above, each acre of wetland impacted will be compensated for by the restoration of 2.7 acres of high quality, intact wetland, enhancement of existing wetland habitat, and by post-construction restoration of more than 70% of the impacted wetlands onsite. This mitigation strategy proposes compensation at the appropriate level to achieve replacement of lost functions and values, satisfy regulatory mitigation requirements and will also support Detroit Edison's corporate environmental stewardship initiatives through continued collaboration and partnership with U.S. Fish and Wildlife Service and other conservation entities.

3.0 BASELINE INFORMATION

3.1 Impact Area

3.1.1 Location and Ownership

The Proposed Development site is at the Enrico Fermi Atomic Power Plant (Fermi site), Latitude: 41.961 and Longitude: -83.261 on the western shore of Lake Erie at Newport, Monroe County, Michigan on a 1,260-acre parcel owned and managed by Detroit Edison (Figure 1). The impact site is within the coastal zone of Western Lake Erie and the northern portion of the Ottawa-Stony Watershed.

3.1.2 Land Use

Land use on the Fermi site is split mainly into developed areas and swamp or wetland areas. Most of the forested areas on the site are subject to flooding, and, therefore, are considered woody wetlands. The majority of the Fermi site that is not developed is included as part of the Detroit River International Wildlife Refuge (DRIWR), known as the Lagoona Beach Unit. The DRIWR encompasses a 656-acre portion of the Fermi site.

The 1260 acre Fermi site is composed of approximately 16.8% developed areas and 5.1% cropland. Terrestrial habitats account for 61% of the property. The remaining 17% are water bodies, e.g., Quarry Lakes and the main body of Lake Erie that lies east and north of the site. Figure 3 illustrates the extent and location of the habitats identified and the developed areas on the Fermi site. A summary of the acres of each habitat type on the site is provided below (Reference 2).

Habitat	Acres	Percent of Site
Coastal Emergent Wetland Open Water	35	2.8
Coastal Emergent Wetland Vegetated	238	18.9
Grassland: Right-of-Way	29	2.3
Grassland: Idle/Old Field/Planted	75	6.0
Grassland: Row Crop	64	5.1
Shrubland	113	9.0

Thicket	23	1.8
Forest: Coastal Shoreline	47	3.7
Forest: Lowland Hardwood	92	7.3
Forest: Woodlot	117	9.3
Developed Areas	212	16.8
Lakes, Ponds, Rivers	44	3.5
Lake Erie (main body)	171	13.6
Totals	1,260	100

3.1.3 Topography

Topography in the vicinity is fairly flat, with some lower elevation wetland areas along the Lake Erie shoreline, including the Fermi site (Figure 4). To prevent flooding of the developed areas, these areas were elevated during the construction of Fermi 2 using crushed limestone taken from the southwest portion of the Fermi site (Quarry Lakes). Site elevations range from the level of Lake Erie to approximately 25 feet above lake level on the western edge of the site (Reference 3). Topography on the Fermi site is relatively level in the undeveloped areas, with an elevation range of approximately 10 feet over the site according to U.S. Geological Service (USGS) topographic maps.

3.1.4 Soils

The overburden soils at the site consist of lacustrine deposits, glacial till, and rock fill. The rock fill is present only in the immediate area of the reactor; therefore, in the wetland areas, the overburden soils consist of lacustrine deposits and glacial till. The overburden is underlain by the Bass Islands Group dolomite bedrock. Groundwater is present in the overburden and the bedrock. The groundwater in the overburden is unconfined, while the Bass Islands Group aquifer is confined. The glacial till acts as an aquitard between the unconfined groundwater in the overburden and the confined groundwater in the Bass Islands Group aquifer.

The Monroe County Soil Survey (Reference 4) lists soil series Lenawee silty clay loam, ponded (Map Symbol 10) and Lenawee silty clay loam (21) as the primary mapped soil types on the Fermi site. Other soils found on the Fermi property include: urban land (63) on the eastern portion of the site where the existing Fermi 1 and Fermi 2 buildings and infrastructure are located; urban land-Lenawee complex (57) on the southern edge of the Fermi site; Aquents complex (31) and Blount loam (13A) on the northwestern side of the site; Pits-Aquents complex (33) in the southeast portion of the site; water (W) primarily in the southeast and northeast portions of the site; and beaches (27) along the eastern edge of the Fermi property adjacent to Lake Erie. Figure 5 depicts the soil series identified.

3.1.5 Vegetative Communities

Vegetative communities and wetland habitats were evaluated during detailed terrestrial surveys conducted from 2008 through 2010. In 2008 and 2009, spring, summer and fall pedestrian surveys of flora and fauna were conducted in all habitat types including wetlands on the Fermi site (Reference 5). In 2010 individual wetlands were revisited to determine Michigan Natural Community classification and wetland condition and quality. Several upland and wetland vegetative communities have been distinguished at the Fermi site as listed above in Section 3.1.2 - Land Use. An in-depth discussion of vegetative communities for wetland covertypes is provided below in Section 3.1.8 - Wetlands.

Requests for data concerning known or potential occurrences of endangered, threatened, candidate, or special concern plant species on the Fermi site were submitted to the United States Fish and Wildlife Service (USFWS) and the Michigan Natural Features Inventory. In addition, a list of threatened, endangered, or candidate species for Monroe County, Michigan was obtained online from the Michigan Natural Features Inventory. The American lotus (*Nelumbo lutea*) is a state threatened plant species. However, large local populations of American lotus are scattered in areas of southern Michigan, reaching an apparent peak in Monroe County (Reference 6). In the south lagoon, and to a lesser extent in the north lagoon, are large stands of American lotus. American lotus is also abundant in the South Canal (Figure 6).

3.1.6 Wildlife

As discussed in Section 3.1.5 above and Section 3.1.8 below, the Fermi site includes several ecological communities, some of which are considered rare and imperiled. The Fermi site was extensively surveyed for wildlife in 1973 and 1974 (Reference 7) with updates to species occurrences in 2000 and 2002 as part of a wildlife habitat planning effort. The most recent terrestrial and aquatic wildlife surveys were conducted during 2008 and 2009 (References 8 and 12) to confirm data from earlier surveys and to further characterize the wildlife species using the Fermi property. Secondarily, the surveys aided in determining if important species use the site and to guide decisions concerning avoiding, minimizing or compensating for impacts to these species from the proposed expansion. As such, wildlife surveys focused on portions of the Fermi site where construction and operation of Fermi 3 could potentially impact wildlife, whether from habitat destruction, conversion to other habitat types or through general habitat degradation.

The USFWS was consulted concerning the occurrence or potential occurrence of species on or in the vicinity of the Fermi property that are protected under the Endangered Species Act. The USFWS stated that the project occurs within the potential range of some federally listed species, but that the USFWS had no records of occurrence on the Fermi site or in the vicinity, nor was there any designated critical habitat in the area. The USFWS further stated that because of the types of habitat present at Fermi, no further action is required under Endangered Species Act. The USFWS did state that if more than 6 months pass before the project is initiated, then the USFWS should again be contacted to ensure there have been no regulatory changes. Detroit Edison will continue consultations with the USFWS per their recommendations.

The MDNR and the Michigan Natural Features Inventory (Reference 10) was consulted regarding the presence of known or potential occurrences of state-listed threatened or endangered species on the Fermi site. The only species in the USACE/MDEQ-regulated project areas is the Eastern fox snake (*Pantherophis gloydi*).

Based upon the review of the data collected in the terrestrial and aquatic surveys there were no occurrences of federally and/or state listed threatened or endangered species. Based on avian surveys conducted during 2006-2008, the bald eagle (*Haliaeetus leucocephalus*) is the only migratory species of note that has been observed on the Fermi site. None of the previously observed bald eagle nests were observed on the Fermi site as of January 2011. During 2008, while wetland surveys were being conducted, two fox snakes were observed on two separate occasions. In addition, fifteen separate sightings were made by Detroit Edison employees between 1990 and 2007 with 1-6 snakes identified on each occasion. In addition to minimizing wetland impacts, the fox snake's primary habitat, Detroit Edison has developed a draft mitigation plan which will be implemented to minimize the project's impact to the species.

3.1.7 Site Hydrology

Currently the hydrology of the area is influenced by the physical processes of Lake Erie. Lake Erie has a perfect seiche fetch. With a predominant southwest wind, specific locations on Lake Erie are susceptible to great fluctuations in water levels due to sustained winds pushing the lake water to the east, and then, as the winds subside, the water levelizes across the lake. This creates large waterless expanses followed quickly by water inundating creek and river mouths, resulting in a bathtub like "sloshing" effect. This creates unique opportunities for both plants and wildlife. Other local hydrological conditions are dictated by the Swan Creek.

Water is seasonally to permanently present throughout the majority of the Fermi site. Average annual precipitation is 31.5 inches and generally well distributed throughout the year. The site receives direct, surface runoff from a 2,440 acre drainage basin with cropland, wetland and forest as the primary cover types. Surface water is received from Lake Erie during periods of high water and storm events.

The hydrology of the Fermi palustrine emergent (PEM) wetland areas is controlled almost entirely by the elevation of surface water in Swan Creek and Lake Erie. The surface water in Swan Creek and Lake Erie is directly connected to the PEM areas on the Fermi site. Five sets of large-diameter culverts connect the majority of the inland PEM areas west of Doxy Road with the PEM areas that are directly connected with Swan Creek and Lake Erie. These culverts allow free flow of surface water throughout the interconnected PEM areas. Therefore, the surface water level in the majority of the PEM areas is directly controlled by the surface water elevation of Lake Erie and Swan Creek, rather than groundwater levels. Figure 7 shows the culvert locations and movement of surface water on the Fermi site.

Palustrine forested (PFO) and palustrine scrub-shrub (PSS) areas on the Fermi site are, for the most part, contiguous with the PEM areas. Therefore, these areas are hydraulically connected with the PEM wetlands, so the groundwater level in these areas is influenced by the surface water levels in Swan Creek and Lake Erie. With the exception of a few wetlands separated by berms or roads, the majority of wetland communities on the Fermi property are hydrologically connected and thus considered one wetland system.

3.1.8 Wetlands

Detroit Edison conducted assessments of wetland resources on 1,106 acres of undeveloped lands at the Proposed Development site between 2008 (Reference 13) and 2011. The purpose of these assessments is to identify and integrate natural resource considerations throughout the design and implementation phases of the Proposed Development and to guide mitigation measures including avoidance, minimization and the development of a high quality mitigation strategy to compensate for unavoidable impacts. The assessments are based on existing data and onsite data collection. Existing data include topographic maps, federal and state wetland maps, soil maps, aerial photos, land use data, and ecological survey data from previous studies. Onsite assessment data were collected in each year to delineate wetland boundaries, evaluate wetland functions and services, determine natural community types and assess wetland condition and quality. A jurisdictional determination was completed and minor edits to wetland boundaries were made in 2011 (Figure 8). Watershed assessments of the northern section of the Ottawa-Stony Creek watershed and the coastal zone of Western Lake Erie in Monroe County were completed to further inform development strategies and conservation priorities at the Proposed Development site. This section provides an overview of wetlands with potential impacts associated with the Proposed Development. Section 3.1.2 provides a summary of the watershed assessments.

A functional assessment based on the USACE New England Highway Method (Reference 14) was originally conducted during the 2008 field delineation (Reference 13). In 2010, field observations of wetlands with proposed impacts included a refined assessment of vegetation communities and other wetland characteristics to further describe the condition, functions and services of impact areas. Data collection and analysis methods were based on the Michigan Rapid Assessment Method for Wetlands (MiRAM, Reference 15) and the Delaware Rapid Assessment Procedure (Reference 16) and included metrics such as wetland size and connectivity, adjacent area use, hydrologic alterations and soil disturbance, habitat structure, and presence of invasive species. The results of the 2008/2009 terrestrial surveys, 2010 field visits described above, and feedback from regulatory staff were used to further evaluate individual wetlands potentially impacted by the Proposed Development and to define appropriate compensation ratios as presented in Table 1.

Over 500 acres of wetland were delineated at the Proposed Development site. The majority of wetlands at the Fermi site were ranked low to medium quality based on factors including hydrological disturbance, presence of invasive species, adjacent land use, fragmentation, human activity, deforestation, etc. There were several wetlands ranked high quality based on connectivity, presence of native, diverse vegetation communities, and wildlife habitat potential. Several other wetlands were given high ecological value based solely on their rare and imperiled status in Michigan even though condition ratings were low (MiRAM guidance, see below). Depending on condition, the principal functions and services provided by wetlands on the Fermi site include flood flow alteration, sediment/toxicant retention, nutrient removal, and fish and wildlife habitat.

Chapter 324, Section 303.01(t) of the Michigan Natural Resources and Environmental Protection Act identifies Michigan Natural Communities that are considered rare and imperiled. These include Great Lakes marsh and southern swamp (southern hardwood swamp). At the Fermi site, these communities are found relatively intact in Wetlands C, M and the South Canal (Great Lakes marsh) and I, F, BB/EE/FF and L (southern swamp, Figure 8). Impacts to these wetlands will require a 5:1 replacement ratio. Wetland E is a combination of emergent marsh/wet meadow and southern shrub carr with direct surface water connection to Lake Erie requiring a 2:1 replacement ratio (coastal wetland ratio). The other wetlands potentially impacted by Fermi 3 activities do not readily fall into a natural community category due to variables such as fragmentation and disturbance. Any wetland considered "other" that is connected hydrologically to Lake Erie or is within 1000 feet of the ordinary high water mark (elevation 571.6 ft IGLD 1955) is considered coastal and a 2:1 mitigation ratio applies. This excludes Wetland A and possibly Open Water H and Wetlands II and JJ. If any of the open water areas were officially developed as stormwater areas exemptions may apply. The depth of open water areas H and U may mean they are not protected as wetlands. Anything up to 2 meters in depth is considered wetland. MDEQ staff indicated that condition and quality are relevant factors in any mitigation proposed for areas that are fragmented with a high level of disturbance (not just invasive species), limited functions and that do not match a natural community description. It would not be expected that these areas, which include B, D, R, T, Y, AA, II, JJ, and KK would require a 5:1 mitigation ratio. These "other" wetlands would require a 2:1 ratio if they are considered coastal and a 1.5:1 ratio if they are not.

Wetlands with proposed impacts and their associated covertypes are presented in Table 2. Mitigation is proposed for approximately 30.37 acres of potential impacts to regulated wetlands due to the Proposed Development. These potential impacts include approximately 10.90 acres of Great Lakes marsh, 3.15 acres of southern hardwood swamp, 3.91 acres of southern shrub carr, 0.80 acres of coastal emergent wetland, 5.36 acres of other emergent wetland, 4.89 acres of other forested wetland and 1.37 acres of other scrub shrub wetland.

3.1.9 Watershed Analysis

As part of the natural resource assessment effort, Detroit Edison conducted a watershed analysis to provide a broader geographic context to guide land use decisions at the Fermi site. The purpose of the watershed assessment is to provide an analysis of land use features of the inland and coastal watersheds that encompass the Fermi site and evaluate the connection between natural resources on the Fermi site and site-specific and watershed conservation priorities. The watershed assessment also provides a landscape level perspective useful in consideration of any land use changes, proposed impacts and proposed compensation strategies.

The Fermi site is located in the northern portion of the Ottawa-Stony watershed (OSW), USGS Cataloging Unit and Hydrologic Unit Code (HUC): 04100001 and the coastal zone of Western Lake Erie in Monroe County (CZM, Figure 9 and 10). The OSW drains areas to the north and west of Lake Erie and flows directly into the lake (Figure 9). The northern portion of the OSW has a drainage basin of approximately 182,733 acres and is dominated by agriculture (55%). Approximately 25% of the OSW land area is in natural cover and approximately 20% is developed (Figure 8). The CZM encompasses approximately 18,697 acres with an almost even interspersion of natural lands (38%), developed lands (38%) and agriculture (24%, Figure 10). Protected lands for conservation and recreation make up approximately 4% of the OSW and 36% of the CZM.

Wetlands comprise approximately 6% of the OSW and 43% of the CZM. The OSW is dominated by vegetated wetlands. Forested wetlands comprise the majority of vegetated wetlands (60%) with the remainder being emergent (24%) and shrub/scrub (15%). The CZM has equal proportions of vegetated and non-vegetated (open water) wetlands. Emergent wetlands are the dominant type comprising 71% of the vegetated wetlands with the remaining wetlands being forested (17%) and scrub shrub (11%).

An approximation of historic wetlands for the OSW and the CZM was developed based on soils classified as >80% hydric (soils >80% of a soil map unit classified as hydric by the Natural Resources Conservation Service) and current mapped wetlands. Former wetlands were defined as areas that are mapped hydric soils (>80% of map unit) but not mapped as wetlands based on the latest wetland maps. The topography and landscape position of the OSW and CZM are ideal for the development of wetlands because the land is very flat and in close proximity to the coast of Lake Erie. Prior to European colonization, approximately 45% of the land area of the OSW was wetland (Figure 11). Based on the most recent wetland maps 6% of the OSW area is currently wetland which constitutes an 86% loss in the OSW. Historically, 77% of the land area of the CZM was wetland (Figure 12). Based on the most recent wetland maps, 43% of the CZM is wetland which constitutes a 44% loss in the CZM.

Watershed Conservation Priorities

Based on natural resource assessments conducted at the Fermi site and within the OSW and CZM, the following wetland-based conservation priorities were identified for this project:

1. Protect and enhance existing high quality wetlands especially those that are directly connected to Lake Erie in the CZM and/or part of a larger wetland complex.
2. Improve a network of natural land use in the CZM and OSW by increasing the amount of large blocks (>50 acres) of natural lands and buffered streams to support ecosystem functions and services and establish corridors to connect large blocks.
3. Restore and enhance wetlands in the CZM to provide wildlife habitat and protect water quality in Lake Erie.
4. Restore wetlands and stream buffers in the OSW to re-establish large wetland complexes and riparian connections.

Because of the Fermi site's location in the lowest reaches of the OSW (in the CZM), any activity onsite will have the greatest local effects (either positive or negative) on coastal resources and Lake Erie itself. Based on the results of the watershed assessment, planned activities at Fermi have strategically avoided and minimized impacts to natural resources of high ecological value to the greatest extent possible. For unavoidable impacts, this mitigation strategy has been designed to address any loss of coastal habitat and the watershed conservation priorities listed above. Specifically, the proposed mitigation will restore 75 acres of coastal wetland including Great Lakes marsh and southern hardwood swamp and reconnect this large block of natural land directly to Lake Erie via a restored and buffered stream channel. In addition, existing wetlands will be enhanced and protected at the offsite mitigation area to decrease invasive species, increase vegetation diversity and provide enhanced habitat for wildlife. Approximately 21 acres of impacted wetlands will be restored post-construction. On- and offsite mitigation actions are in close proximity to existing conservation efforts to help establish connectivity and habitat corridors.

3.2 Onsite Restoration Area Overview

The 21 acres of impacted wetlands that will be restored post-construction include approximately 13 acres of PEM, 3 acres of PFO, and 5 acres of PSS wetland. These areas are described in detail in Section 12 of the associated Joint Permit Application.

3.3 Offsite Mitigation Area Overview

The proposed offsite mitigation area, referred to as the Monroe Site, is approximately 7.25 miles from the Fermi site on Detroit Edison's Monroe Plant, east of Interstate 75, north of La Plaisance Creek and immediately adjacent to Lake Erie (La Plaisance Bay), Town of Monroe, Monroe County, Michigan, in the Ottawa-Stony Watershed (HUC: 04100001, Figures 13 and 14). The Monroe Site is owned and managed by Detroit Edison as part of the Monroe Power Plant, a coal-fired power plant constructed in the early 1970s. The Monroe Site and adjacent areas include active agriculture, early successional old field and shrub habitat, agricultural ditches, small forest patches, existing and restored wetland and grassland habitat, industrial, residential and other developed areas, access roads, highways and Lake Erie.

The proposed mitigation targets a 210-acre agricultural field. Figures 13-17 show location, aerial photo, topography, soils, hydrology, land use, and mapped federal wetlands. The restoration site is primarily active agriculture with small remnants of PEM and PSS wetlands separated from Lake Erie by perimeter dikes. Excess water is pumped from the fields to accommodate farming. The soil observed within the wetland mitigation area is predominately Lenawee silty clay loam, a hydric soil suitable for wetland restoration/creation. The area was dry at the time of a site visit on August 20, 2010 with the exception of existing swales. The pumps were not running. There is a Michigan Department of Transportation (DOT) ditch that currently drains water from Interstate 75 through a ditch adjacent to the southwest corner of this site.

4.0 MITIGATION SITE SELECTION FACTORS

An extensive exploration of potential mitigation projects spanning several years both on- and offsite within the Ottawa Creek and coastal zone of Western Lake Erie has been conducted. The on- and offsite mitigation projects proposed here were determined to be the best based on site selection factors including:

- location, size and attributes of existing habitat;
- quality of mitigation options and likelihood of success based on both ecological and economic factors;
- land ownership and availability;
- adjacent land use;
- value and proximity to existing conservation plans, projects and watershed priorities;
- connectivity of habitat types;
- possible benefits to threatened and endangered species; and
- stewardship capabilities.

5.0 MITIGATION WORK PLAN

A conceptual discussion of on- and offsite work plans including construction techniques and sequence, planting, and conceptual design drawings illustrating the location, type and extent of mitigation actions are discussed here and illustrated in Figures 18 and 19. The conceptual design and work plan are based on existing, available data. Final site plans are contingent upon verification of existing data, collection of additional topography, soil, hydrology and vegetation information, and input and approval by the governing regulatory agencies. Final mitigation plan sets will contain detailed grading, planting and soil erosion and sediment control plans suitable for the mitigation site construction. Wetland mitigation activities including both restoration and enhancement actions will commence with or prior to impacts and once all necessary permits are in place.

Mitigation design emphasizes heterogeneity in vegetation and hydrology to maximize ecological diversity and functional resilience of the wetland. Wetland restoration and enhancement activities are designed to emphasize techniques that restore functions such as flood flow attenuation and storage, sediment/toxicant retention, nutrient removal, food chain support, breeding and migration habitat for migratory birds, breeding and over-wintering habitat for amphibians, increased nutrient cycling, increased connectivity of coastal habitat types, and water quality improvements for surface outflow. A natural buffer will be established or existing buffers maintained to protect mitigation wetlands. The final mitigation wetland design and management plan will be developed in cooperation with the existing conservation focus areas (e.g., Detroit River International Wildlife Refuge), watershed plans and priorities supported by local, state and federal conservation agencies and organizations.

5.1 Onsite Work Plan

Approximately 21 of the 30.37 acres of proposed wetland impact will be restored to wetland habitat following construction at the Fermi site (Figure 18). Best management practices will be applied to these areas before, during and after construction to the greatest extent possible to facilitate the return of these areas to functional wetland systems. It is anticipated that restoration measures will result in higher quality wetland systems than currently exist in those locations.

5.2 Offsite Work Plan

Offsite wetland restoration and enhancement efforts will replace and repair habitat modified by agricultural practices and hydrological disturbance within sensitive coastal areas (Figure 19). Mitigation actions will increase the abundance, integrity and quality of aquatic habitat types that are currently listed as rare and imperiled in the state of Michigan. The mitigation actions described below will restore a total of 82 acres of wetlands in the 210-acre agricultural area as illustrated in Figure 19. The 82 acres will include approximately 21 acres of forested, 9 acres of scrub shrub, and 52 acres of emergent wetland with direct hydrological connection to Lake Erie. A wetland delineation will be conducted in the 210-acre agricultural field prior to final design. Any existing wetlands that are improved by the mitigation action proposed here will then be counted as enhancement in addition to the restoration acreages proposed above.

A specific objective of the offsite restoration area is to reestablish a direct connection between the current agricultural area and Lake Erie and to redirect runoff from Interstate 75 into the restored wetland. These actions will reconnect a relatively large coastal floodplain area and will allow water to be filtered before it reaches Lake Erie.

5.2.1 Construction and Planned Hydrology

Construction activities in the agricultural area will include clearing, excavating and grading the proposed mitigation area to elevations conducive for development of coastal PEM, PSS and PFO wetlands. The entire restoration area will be restored to two separate but hydrologically connected wetland units. The eastern unit will be directly connected to Lake Erie and water levels in this unit will fluctuate with Lake

Erie water levels. The western unit will be partially connected to Lake Erie and with a wetter hydroperiod than the eastern unit.

Existing fill and an existing berm along the east side and adjacent to Lake Erie will be partially removed to allow water from Lake Erie to enter the proposed wetland area (Figure 19). A meandering waterway excavated to the west of the lake connection will allow for a permanent open water marsh zone in the emergent marsh area, providing habitat for aquatic species. Grading of soils adjacent to this waterway will provide for a variety of water levels and habitat types within the eastern unit.

A low berm will be constructed between the eastern and western restoration units. This berm will be constructed to an elevation that will help to ensure successful restoration of proposed habitat types and acreages in the western unit. A spillway will be constructed in the berm to allow excess water to spill over and enter the eastern unit waterway and eventually flow into Lake Erie. Depending on topography and final design, this spillway will also be constructed at an elevation that will allow high lake levels (e.g., seiche events) to enter the western unit. Additional hydrology will be introduced into the western unit by plugging a drainage ditch that currently flows along the north perimeter of the entire area. This ditch will be plugged to the west of the proposed berm to redirect its water into the western unit. Additionally, a Michigan DOT drainage ditch that currently transfers water from Interstate 75 to La Plaisance Creek and into Lake Erie will be redirected into the western unit. This step will increase water flow into the wetland and also slow floodwater and reduce sediment loading and filter toxicants from runoff water before it reaches Lake Erie. There may be an additional grading and planting plan designed specifically to accommodate requirements of a right-of-way associated with existing electric power lines located along the northern edge of the western unit.

Graded wetland basins will be left rough to establish microtopography essential for creating niches for a variety of wetland plants. The edges of the excavated wetlands will be irregular in shape with variable, shallow slopes. Soil disturbance and compaction will be minimized as much as possible. Earthmoving equipment will be cleaned before deployment to prevent possible contamination by invasive species.

5.2.2 Planned Vegetation and Habitat Features

Existing wetlands at the offsite enhancement area will be treated with herbicide to kill invasive plant species including common reed, cattail and reed canary grass. A treatment plan will be implemented with herbicide applied in years 1-3, year 5, year 7 and year 10, or adjusted as needed. Response from native vegetation will be facilitated by removing dead, chemically treated vegetation through mechanical removal after each treatment. MDEQ, MDNR, Ducks Unlimited and other participating land managers are currently experimenting with various techniques for controlling common reed in coastal wetlands along Saginaw Bay. The techniques being tested include glyphosate, imazapyr, and a glyphosate/imazapyr mixture along with mechanical management actions. The USFWS Detroit River International Wildlife Refuge is also evaluating Phragmites control techniques in coastal wetlands immediately north of the

Fermi site. The treatment plan for the mitigation enhancement project proposed here will be based on the MDEQ Guide to the Control and Management of Invasive Phragmites (Reference 17), the most current results of the Saginaw Bay study, and on consultation with regulatory and conservation agency staff who have extensive knowledge of chemical control of invasive species in the coastal zone of Western Lake Erie.

The offsite restoration area and buffer will be planted and seeded to establish a native plant community, prevent soil erosion, increase the likelihood of mitigation success, and minimize the opportunity for invasive species to become established. Forested, shrub and emergent wetlands will be planted and seeded to closely resemble vegetation communities typical of southern hardwood swamps, southern shrub carr and Great Lakes marsh prior to invasion of common reed and other invasive and exotic species. These vegetation communities are described in Natural Communities of Michigan: Classification and Description (Reference 18). Seed will be adapted to northern United States ecotypes and will be applied in a manner and at a rate that will allow effective establishment of the wetland pool area and wetland margins. Planting and seeding of these species will stabilize soil structure, provide biological diversity, restore ecosystem functionality, and protect against invasion by exotic and invasive herbaceous species. Construction areas will be seeded with a mix to prevent erosion, stabilize excavated areas and establish an herbaceous community typical of the region. Re-vegetation of wetland areas will be accomplished by using a combination of potted trees and shrubs, plugs, rootstock cuttings, and seed. Plant species will be chosen for their proven hardiness in the area, their ability to out-compete invasive plant species, wildlife value and their overall suitability to develop native communities. The species all will occur naturally within the region and no exotic or potentially nuisance species will be utilized. Wild-type nursery stock of an age and condition suitable for transplantation will be used. The precise list of species to be planted will be dependent on availability of nursery stock. Final design will include species lists, quantities and locations for container, plug and seed stock.

Habitat structures will be placed on the site following construction and prior to seeding and planting at a minimum of six per acre as required by MDEQ mitigation guidance (Reference 1). Habitat structures include whole trees, logs, snags, tree stumps and sand mounds. Some habitat structures, namely tree stumps, whole trees, and logs, may be taken from the impacted areas at the Proposed Development site.

6.0 PROTECTION

Ownership of on- and offsite mitigation areas will remain with Detroit Edison. The restored and enhanced mitigation wetlands will be permanently protected as directed by regulatory requirements to preserve the wetland functions restored.

7.0 PERFORMANCE STANDARDS

Performance standards for on- and offsite mitigation areas will be based on the goals and objectives of the mitigation projects as well as the character of existing wetlands surrounding the mitigation site. The general standards listed below were developed using the MDEQ Technical Guidance for Wetland Mitigation (Reference 1). These standards will be refined with final design and will be used to evaluate development and overall success of the mitigation project:

1. Construction has been completed in accordance with approved plans and specifications in the permit.
2. The wetland has soil saturation and/or evidence of inundation via water potential or water height measurements during the growing season during the required monitoring period.
3. A 6-inch layer of high-quality soil, from the A horizon of an organic or loamy surface texture soil, is present over the entire mitigation area.
4. The mitigation wetland is free of oil, grease, debris, and all other contaminants.
5. A minimum of six habitat structures, consisting of at least three types, have been placed per acre of mitigation wetland with at least 50% of each structure extending above the normal water level.
6. Mean percent cover of native wetland species (those with a regional indicator status of FAC, FAC+, FACW +/-, or OBL in the U.S. Fish and Wildlife Service report entitled National List of Plant Species that Occur in Wetlands, North Central Region 3, Reference 19), in the herbaceous layer at the end of the monitoring period is not less than 60% for a PEM wetland and 80% for PFO and PEM (wet meadow) wetlands.
7. Open water with no emergent or floating vegetation will not exceed 20% of the mitigation wetland area.
8. Extensive areas of bare soil shall not exceed 5% of the mitigation wetland area, with the exception of heavily shaded portions of the PFO portion of the mitigation site.
9. The minimum number of native wetland species per wetland type shall not be less than 15 species for PSS, PFO and PEM wetlands and not less than 20 species for PEM – wet meadow.
10. At the end of the monitoring period, the mitigation wetland will support a minimum of:
    a. 300 individual surviving, established, and free-to-grow trees per acre in the PFO wetlands that are classified as native wetland species and consisting of at least three different plant species.
    b. Eight native wetland species of grasses, sedges, or rushes in PEM - wet meadow wetlands.
11. At the end of the fifth monitoring year, no more than 10 percent of the vegetation will consist of the following invasive species: purple loosestrife, common reed and reed canary grass.

The success of this wetland mitigation project will be determined based on the performance standards outlined above along with any additional conditional standards identified and agreed on by the USACE and upon final design or during the permitting process.

8.0 MONITORING

Monitoring activities completed at the mitigation site will be conducted as described by MDEQ Technical Guidance for Wetland Mitigation represented below (Reference 1). This monitoring plan also satisfies USACE guidance contained in 33 CFR Part 332 – Compensatory Mitigation for Losses of Aquatic Resources. A monitoring plan is necessary to evaluate the mitigation wetland in regards to meeting the performance standards of the project. Monitoring visits will be performed annually beginning with the first growing season after construction is completed. Emergent wetlands will be monitored for a minimum of 5 years and shrub and forested wetlands will be monitored for a minimum of 10 years or until performance standards are met following the year that construction is completed, as follows:

1. During construction provide one-time photographic documentation of high quality soil placement across the site.
2. Measure inundation and saturation at all staff gauges, monitoring wells, and other stationary points shown in the mitigation plan monthly during the growing season. Hydrology data shall be measured and provided at sufficient sample points to accurately depict the water regime of each wetland type.
3. Sample vegetation in plots located along transects shown in the mitigation plan once between July 15 and August 31. The number of sample plots necessary within each wetland type shall be determined by use of a species-area curve or another approach approved by the MDEQ and USACE. The minimum number of sample plots for each wetland type shall be no fewer than five (5). Sample plots shall be located on the sample transect at evenly spaced intervals or by another approach acceptable to the MDEQ and USACE. If additional or alternative sample transects are needed to sufficiently evaluate each wetland type, they must be approved in advance in writing by the MDEQ and USACE. The herbaceous layer (all non-woody plants and woody plants less than 3.2 feet in height) shall be sampled using a 3.28 foot by 3.28 foot (1 square meter) sample plot. The shrub and tree layer shall be sampled using a 30-foot radius sample plot. The data recorded for each herbaceous layer sample plot shall include a list of all living plant species, and an estimate of percent cover in 5 percent intervals for each species recorded, bare soil areas and open water relative to the total area of the plot. The number and species of surviving, established and free-to-grow trees and surviving, established, and free-to-grow shrubs shall be recorded for each 30-foot radius plot. Provide plot data and a list of all the plant species identified in the plots and otherwise observed during monitoring. Data for each plant species will include common name in English, scientific name, wetland indicator category

from the U.S. Fish and Wildlife Service's National List of Plant Species That Occur in Wetlands for Region 3 (Reference 19), and whether the species is considered native according to the Michigan Floristic Quality Assessment (Reference 20). Nomenclature shall follow Reference 21 through Reference 23. The location of sample transects and plots will be identified in the monitoring report on a plan view showing the location of wetland types. Sample transects shall be permanently staked at a frequency sufficient to relocate the transect in the field.

4. Delineate any extensive (greater than 0.01 acre in size) open water areas, bare soil areas, areas dominated by invasive species, and areas without a predominance of wetland vegetation, and provide their location on a plan view.

5. Document any sightings or evidence of wading birds, songbirds, waterfowl, amphibians, reptiles, and other animal use (lodges, nests, tracks, scat, etc.) noted within the wetland during monitoring. Note the number, type, date, and hour of the sightings and evidence.

6. Inspect the site during all monitoring visits and inspections for oil, grease, man-made debris, and all other contaminants and report findings. Rate (e.g., poor, fair, good, excellent) and describe the water clarity in the mitigation wetland and determine source(s) of turbidity.

7. Provide annual photographic documentation of mitigation wetland development during vegetation sampling from permanent photo stations located within the mitigation site. At a minimum, photo stations shall be located at both ends of each transect. Photos will be labeled with the location, date, and direction.

8. Provide the number, type and location of habitat structures placed and representative photographs of each structure type.

9. Conduct a wetland delineation to determine the area meeting all three wetland criteria (dominance by hydrophytic vegetation, wetland hydrology and hydric soils) at the completion of the monitoring period. Include the wetland delineation in the final monitoring report as a supplement and include the estimated wetland acreage in the report.

10. Provide a written summary of data from previous monitoring periods and a discussion of changes or trends based on all monitoring results.

11. Provide a written summary of all the problem areas that have been identified and potential corrective measures to address them.

Monitoring reports shall cover the period of January 1 through December 31 of each year following planting. Reports will be submitted to Detroit Edison before January 31 of the following year. Detroit Edison will forward the annual reports to the appropriate regulatory agencies. Additional monitoring beyond the 5 or 10-year standard monitoring period may be required if all performance standards are not met to the satisfaction of MDEQ and USACE.

9.0 MAINTENANCE, LONG-TERM AND ADAPTIVE MANAGEMENT

When monitoring indicates that a performance standard is not being met or will not be met, that standard will be evaluated to determine if more time is needed for site development and maturation or if a remedial action may be required. This will be accomplished by consulting wetland experts and permitting agencies to determine an appropriate course of action. Remedial measures may include seeding or planting, additional non-native plant control and/or erosion control measures. In rare circumstances, contingencies may require re-grading the wetland basin, removal or addition of water control structures and access control. An implementation timetable will be constructed to correct deficiencies noted in the annual monitoring report. It is the responsibility of Detroit Edison to address adaptive management issues. Once the monitoring period is over, the completed wetland will be protected and managed as needed and specified in the site management plan.

10.0 FINANCIAL ASSURANCES

Financial assurances at the appropriate level and type will be provided by Detroit Edison for completion of the mitigation strategy described above. Cost estimates for implementation of the mitigation strategy will be provided with final design to determine the financial assurance amount.

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TABLES AND FIGURES

Table 1. Wetland Impacts, Proposed Mitigation and Ratios

Wetland Type - Emergent Marsh	**Fermi 3 Impacted Areas (Acres)**	**Mitigation Ratio for Wetland Type**	**Required Mitigation (Acres)**	**20% Decrease for Enhancement**	**Mitigation Plan Compensation (Acres)**
Great Lakes marsh (rare/imperiled)	10.90	5:1	54.50	43.60	52
Great Lakes marsh (rare/imperiled) *	2.29	0:0	0.0	0.00	0
Palustrine emergent (coastal)	0.80	2:1	1.60	1.28	0
Palustrine emergent (other)	5.36	1.5:1	8.04	6.43	0
Emergent Marsh Totals	**19.35**		**64.14**	**51.31**	**52**
Wetland Type - Forested Wetland	**Fermi 3 Impacted Areas (Acres)**	**Mitigation Ratio for Wetland Type**	**Required Mitigation (Acres)**	**20% Decrease for Enhancement**	**Mitigation Plan Compensation (Acres)**
Southern hardwood swamp (rare/imperiled)	3.15	5:1	15.75	12.60	21
Palustrine forested (coastal and other)	4.89	2:1	9.78	7.82	0
Forested Wetland Totals	**8.04**		**25.53**	**20.42**	**21**
Wetland Type - Scrub Shrub Wetland	**Fermi 3 Impacted Areas (Acres)**	**Mitigation Ratio for Wetland Type**	**Required Mitigation (Acres)**	**20% Decrease for Enhancement**	**Mitigation Plan Compensation (Acres)**
Southern shrub carr (coastal)	3.91	2:1	7.82	6.26	9
Palustrine scrub shrub (other)	1.37	2:1	2.74	2.19	0
Shrub/Scrub Wetland Totals	**5.28**		**10.56**	**8.45**	**9**
Total Wetlands	**Fermi 3 Impacted Areas Requiring Mitigation (Acres)****	**Combined Mitigation Ratio for All Wetland Types**	**Required Mitigation (Acres)**	**20% Decrease for Enhancement**	**Mitigation Plan Compensation (Acres)**
Wetland Totals	**30.37**	**3.2:1**	**100.23**	**80.18**	**82**

*Approximately 2.29 acres of temporary impact associated with construction of transmission lines. As per communication with regulatory staff this impact requires a permit and restoration after impact but no additional mitigation.

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**Total impacts minus 2.29 acres of temporary impacts described in note above.

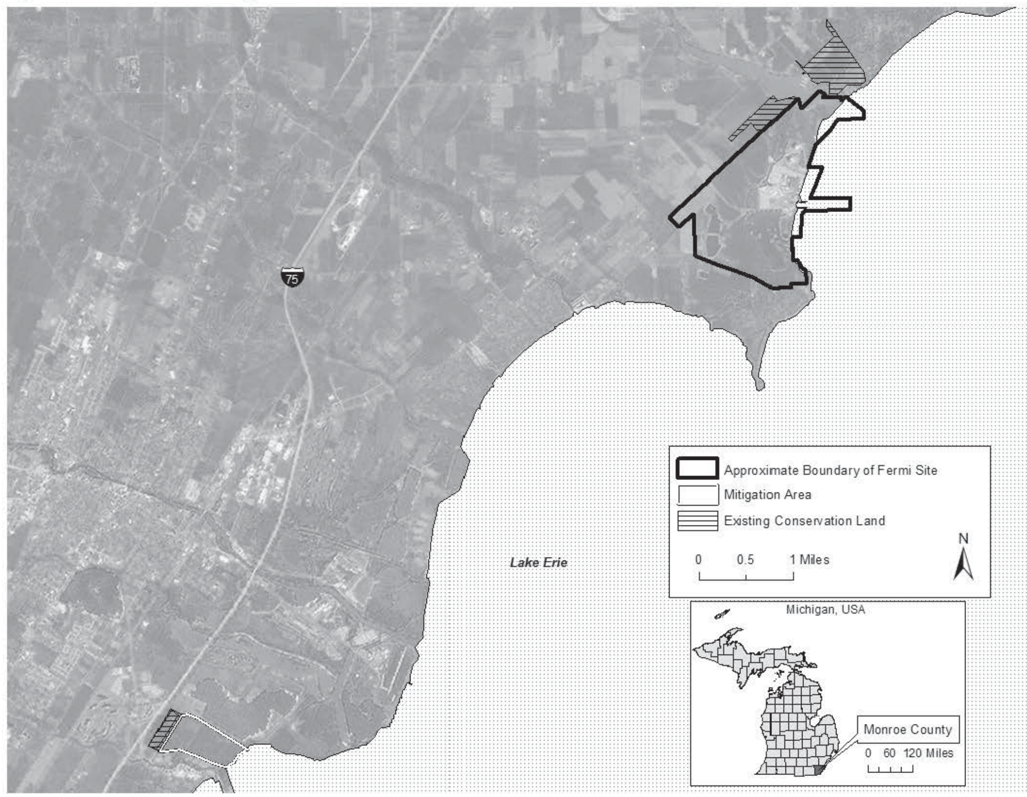
Table 2. Wetland Impacts and Attributes Summary Table (Sheet 1 of 2)

ID	Type/General Description	Total Size (acres)	Impact (acres)	Jurisdiction	Condition/ Primary Function	Guidance Mitigation Ratio
B	Linear PFO	0.76	0.76	MDEQ/USACE	Low/ Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat	2:1
C	Great Lakes marsh, fragmented from Lake Erie by access roads, but connected hydrologically through culverts	48.18	9.73	MDEQ/USACE	Medium (high ecological value)/ Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat	5:1
D	Palustrine forested wetland with partially open canopy	1.37	1.37	MDEQ/USACE	Medium/ Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat	2:1
E-North	North: Palustrine mix of scrub-shrub, emergent marsh/wet meadow, in two sections split by Wetland D,	2.67	1.87	MDEQ/USACE	Medium/Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat for both portions of E	2:1
E-South	South: Southern shrub carr or other coastal wetland type	2.04	2.04			
F	PFO southern hardwood swamp, relatively intact,	31.07	2.71	MDEQ/USACE	Medium (high ecological value)/Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat	5:1
H	PEM edge around a created open water pit	0.10	0.10	MDEQ	Low/Minimal floodflow alteration, sediment/toxicant retention and nutrient removal	1.5:1
I	PFO southern hardwood swamp, relatively intact, indirectly connected to Lake Erie, provides a buffer for the interior and less disturbed wetland	39.74	0.10	MDEQ/USACE	Medium (high ecological value)/Floodflow alteration, sediment, toxicant retention, nutrient removal and wildlife habitat	5:1
U	PEM edge around a created open water canal	0.15	0.15	MDEQ/USACE	Low/Minimal floodflow alteration, sediment/toxicant retention and nutrient removal.	1.5:1
W	PEM wet meadow wetland	4.59	4.59	MDEQ	Low/ Floodflow alteration, sediment, toxicant retention, nutrient removal and marginal wildlife habitat	1.5:1

Table 2. Wetland Impacts and Attributes Summary Table (Sheet 2 of 2)

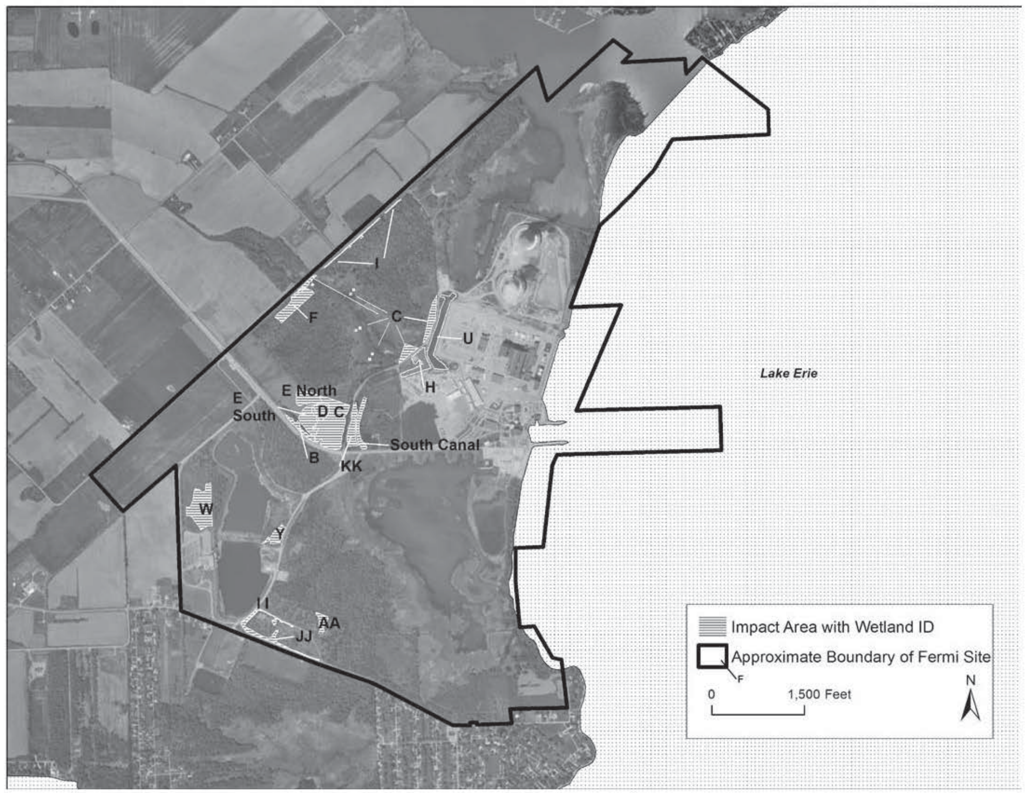
ID	Type/General Description	Total Size (acres)	Impact (acres)	Jurisdiction	Condition/ Primary Function	Guidance Mitigation Ratio
Y	PFO fragmented early successional with mixed vegetation and a partially open canopy	1.14	1.14	MDEQ	Low/Marginal wildlife habitat for edge species and limited water storage.	2:1
AA	PEM established spoil area	0.80	0.80	MDEQ/USACE	Low/Minimal floodflow alteration, sediment/toxicant retention and nutrient removal	2:1
II	PEM ditch, contains vegetation communities with high structural diversity and low species diversity with well-established invasive species populations	0.52	0.52	MDEQ	Low/ minimal floodflow alteration, sediment/toxicant retention and nutrient removal	1.5:1
JJ	PSS established spoil area	1.37	1.37	MDEQ	Low/ minimal floodflow alteration, sediment/toxicant retention and nutrient removal	1.5:1
KK	PFO linear wetland, connected to the South Canal	1.62	1.62	MDEQ/USACE	Low/ floodflow alteration, sediment/toxicant retention, nutrient removal, marginal wildlife habitat for edge species	2:1
South Canal	PEM Great Lakes marsh hydrologically connected to Lake Erie	1.97	1.17	MDEQ/USACE	Medium/ fish and wildlife habitat, floodflow alteration, sediment, toxicant retention and nutrient removal	5:1

Figure 1: Site Location Map



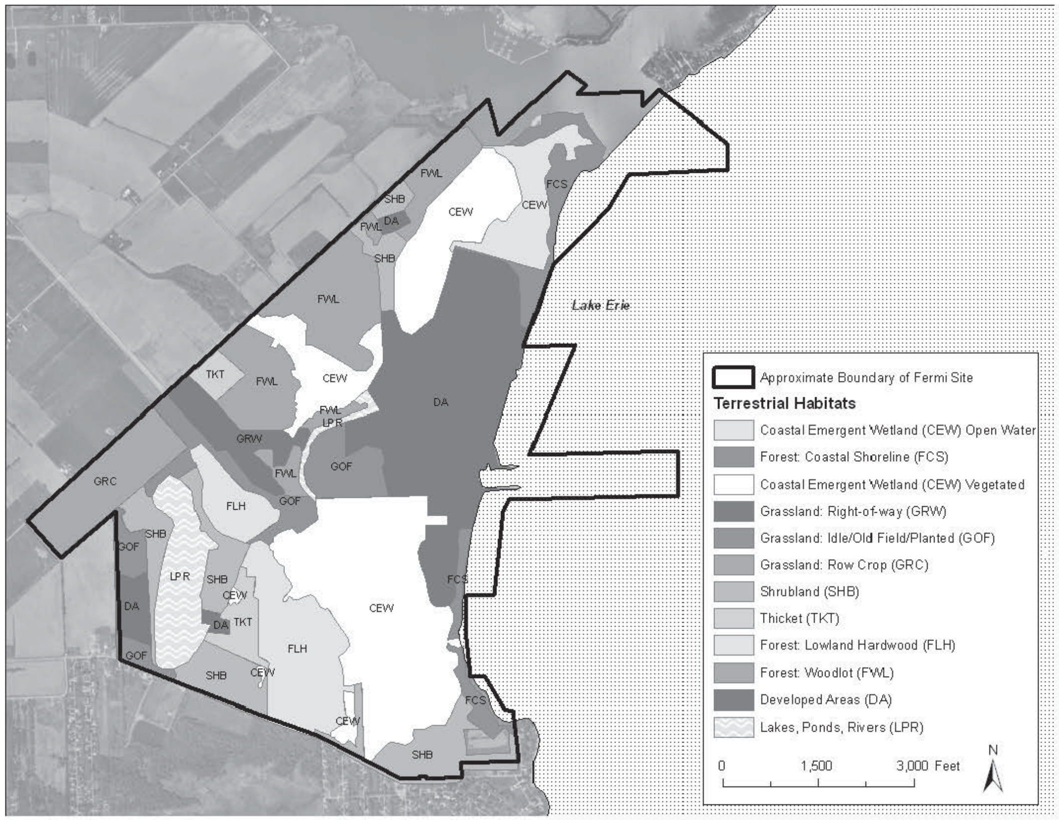
Source: Reference 24

Figure 2: Wetland Impact Area Map



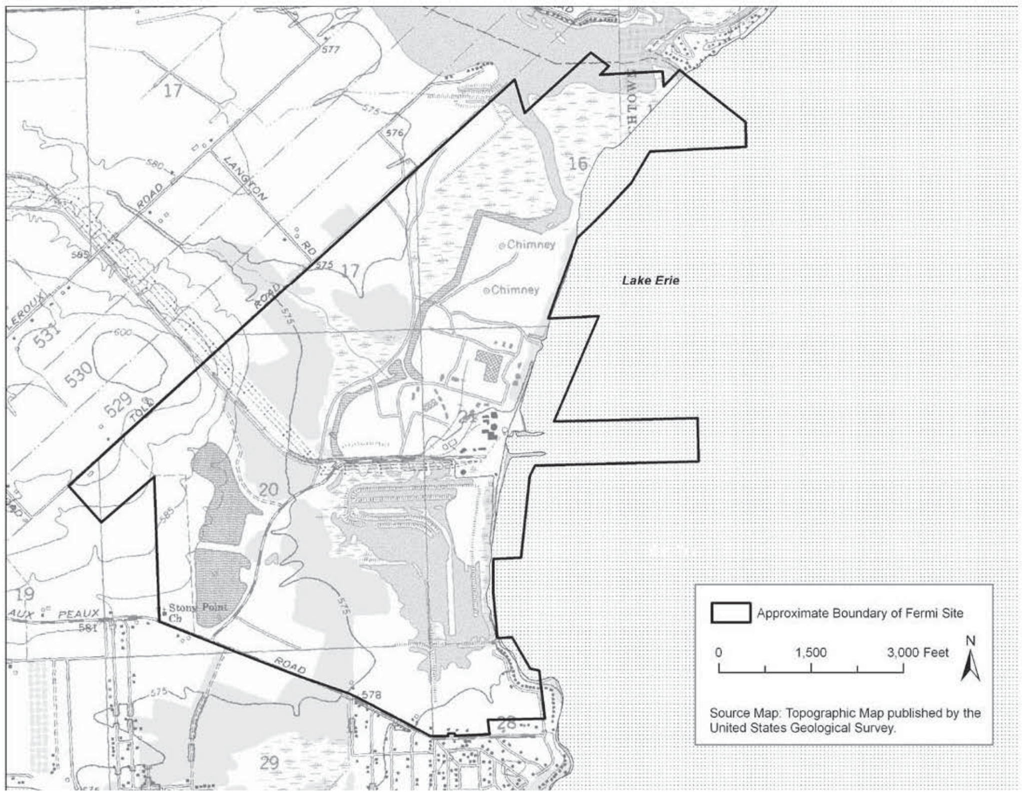
Source: Reference 24

Figure 3: Land Uses on the Fermi Site



Source: Reference 2

Figure 4: Topography of the Fermi Site



Source: Reference 31

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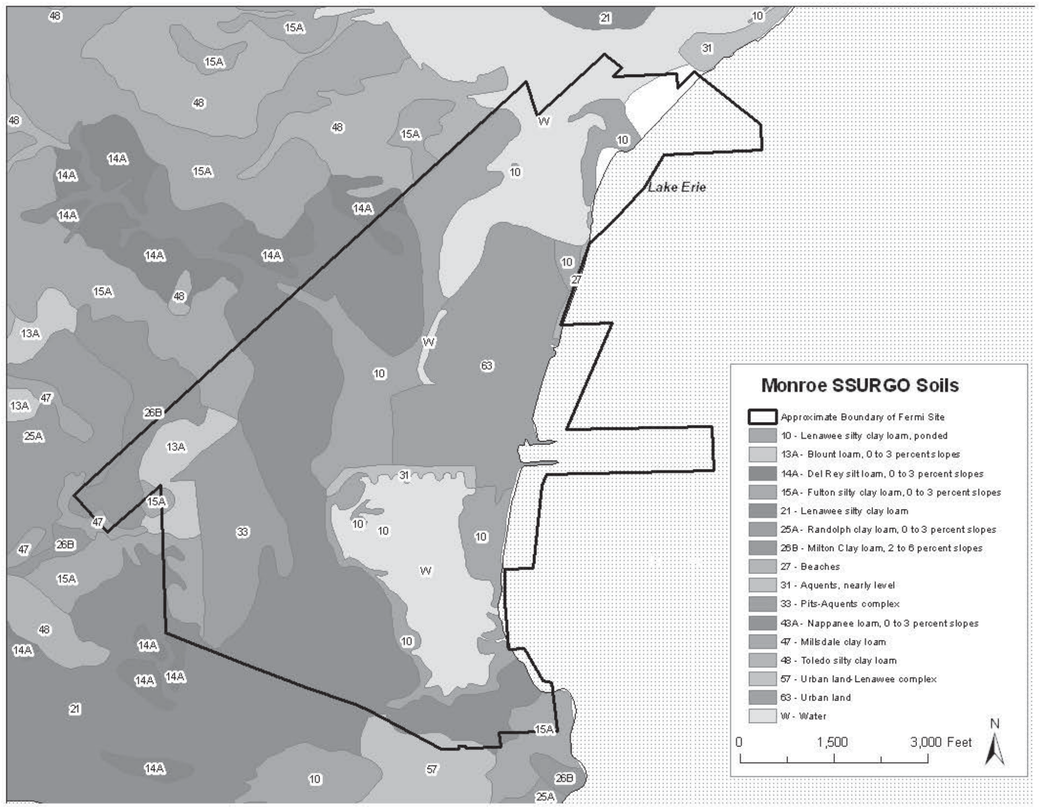
Figure 5: Soil Types on the Fermi Site



Source: Reference 32

Figure 6: Observed Locations of American Lotus on the Fermi Site

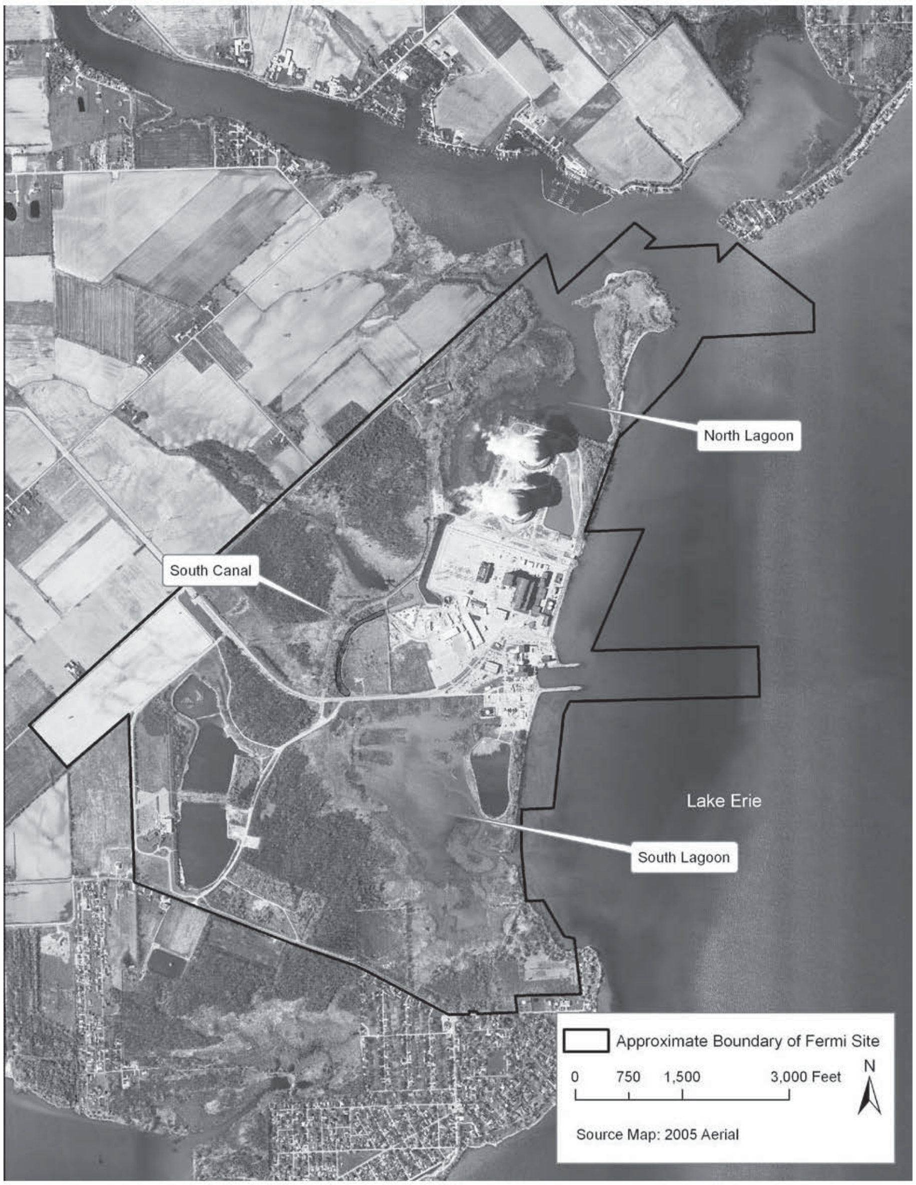


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Figure 7: Culvert Locations on the Fermi Site

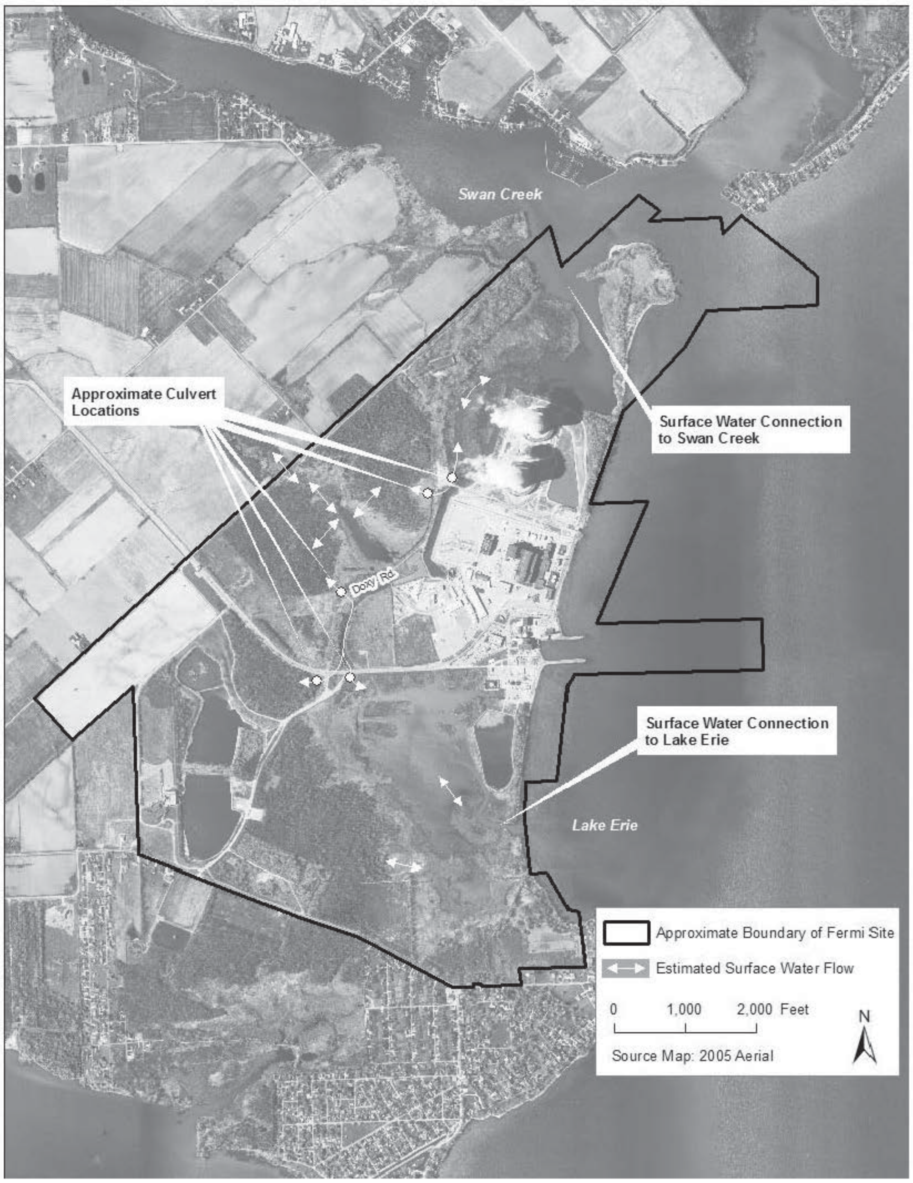

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Figure 8: Wetlands Delineated on the Fermi Site

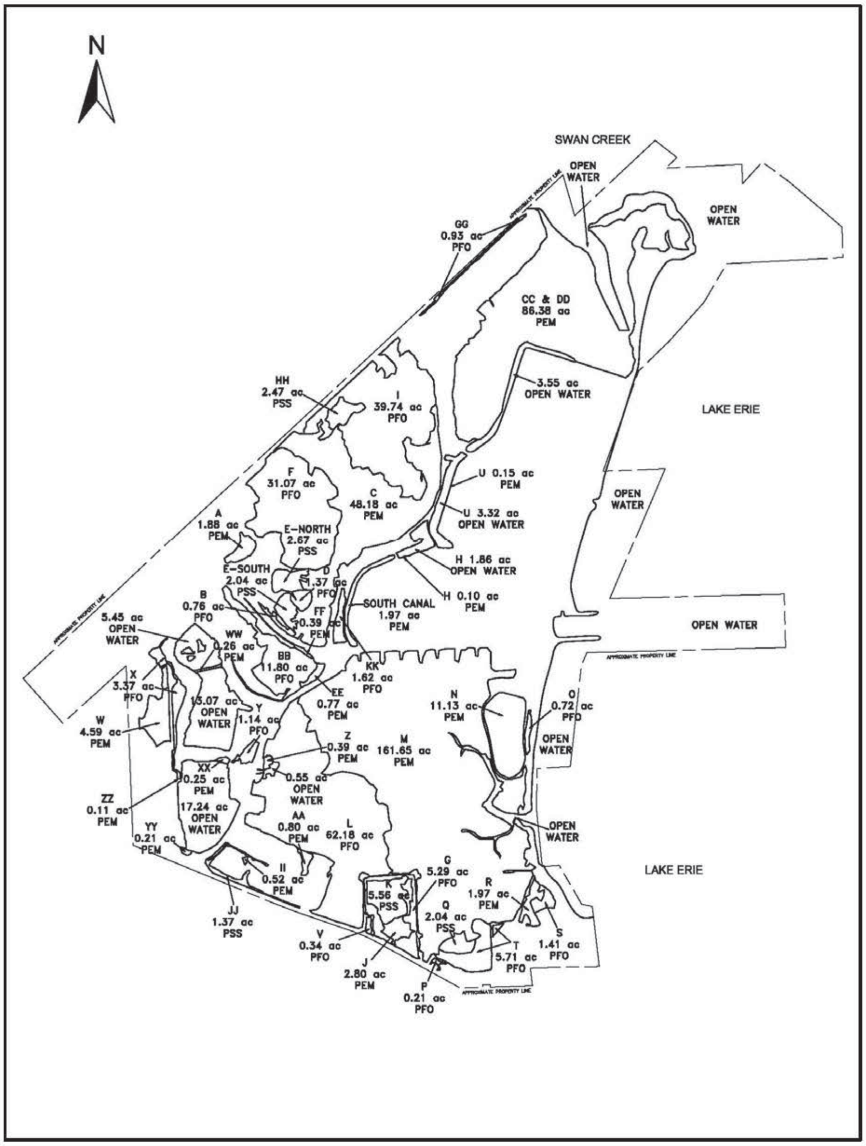

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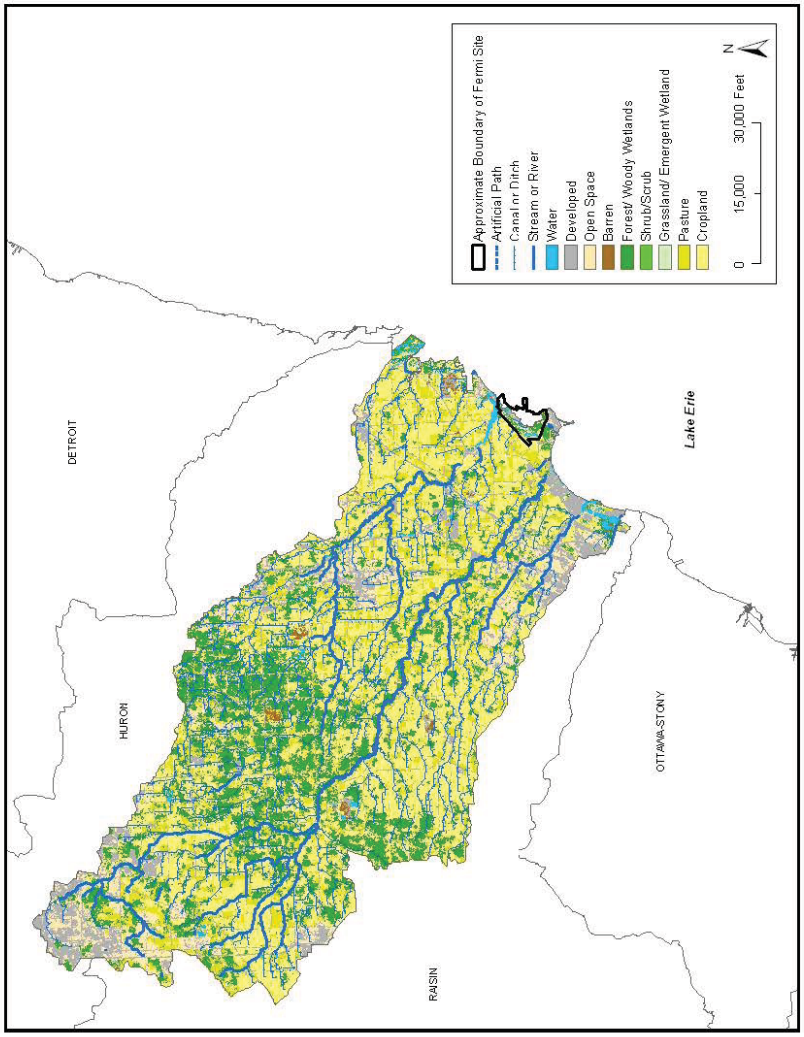
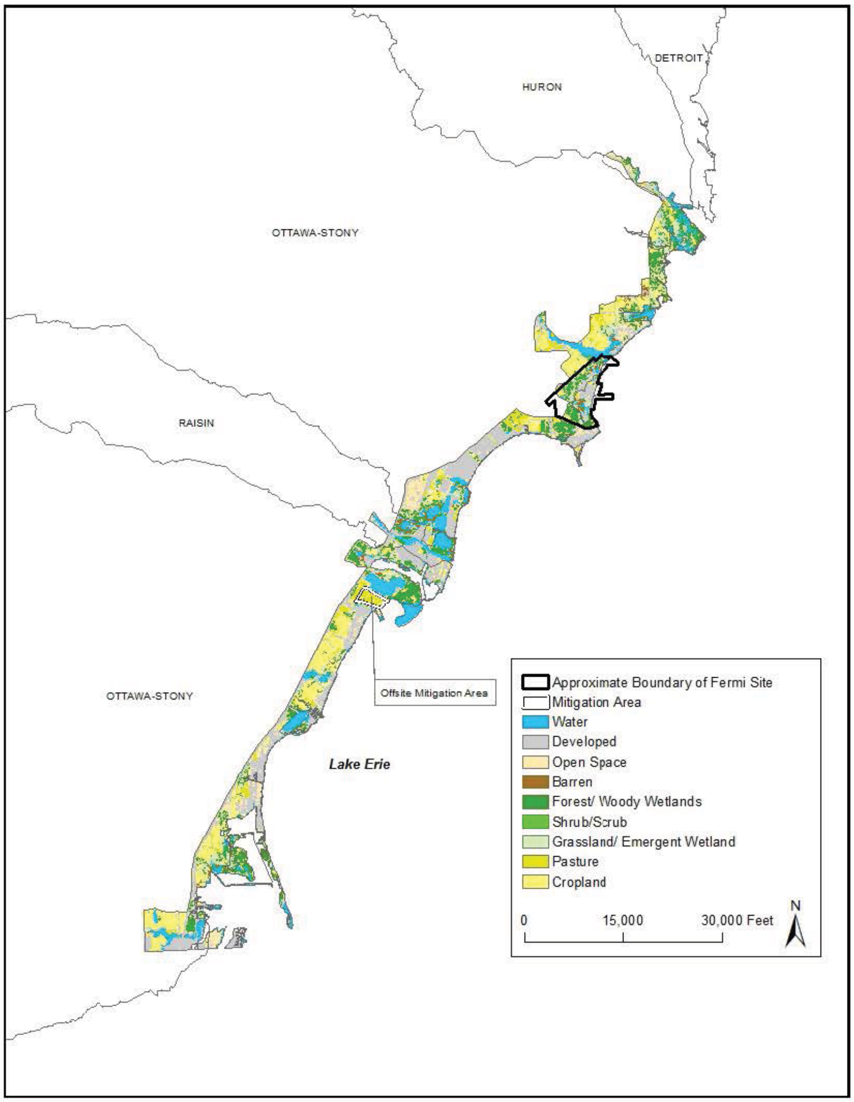
Figure 9: Land Use Land Cover (2001) in the Ottawa-Stony Watershed



Source: Reference 25 and Reference 26

35

Figure 10: Land Use Land Cover (2001) in the Coastal Zone of Lake Erie



Source: Reference 26 and Reference 27

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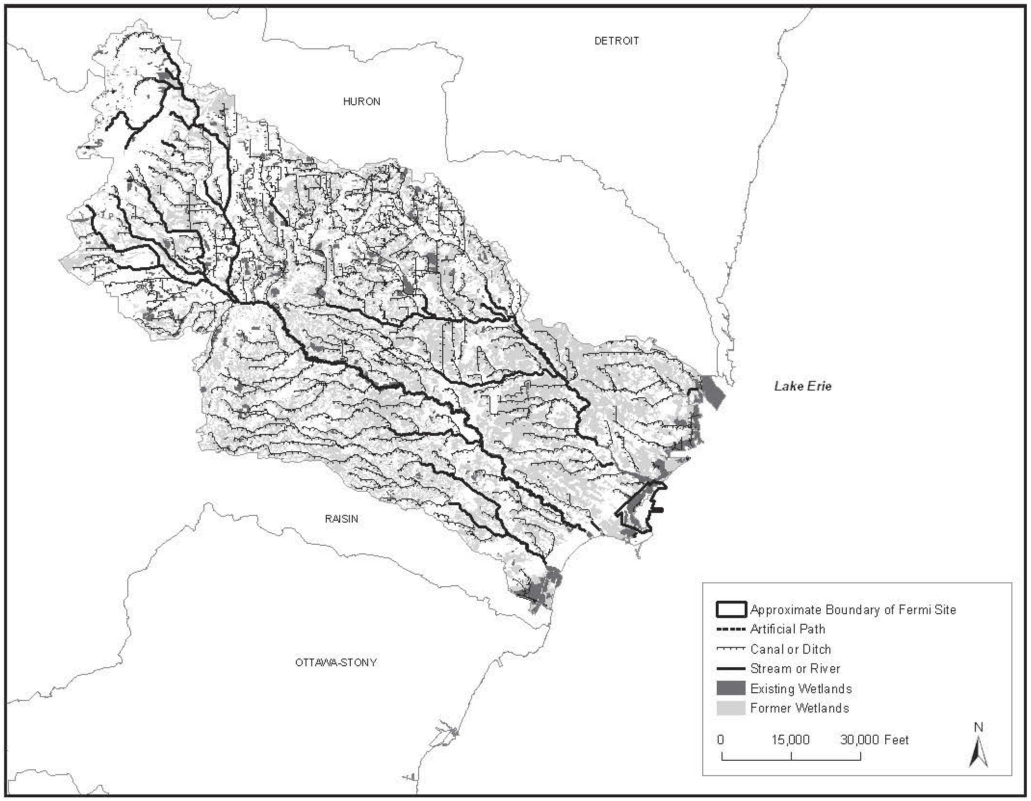
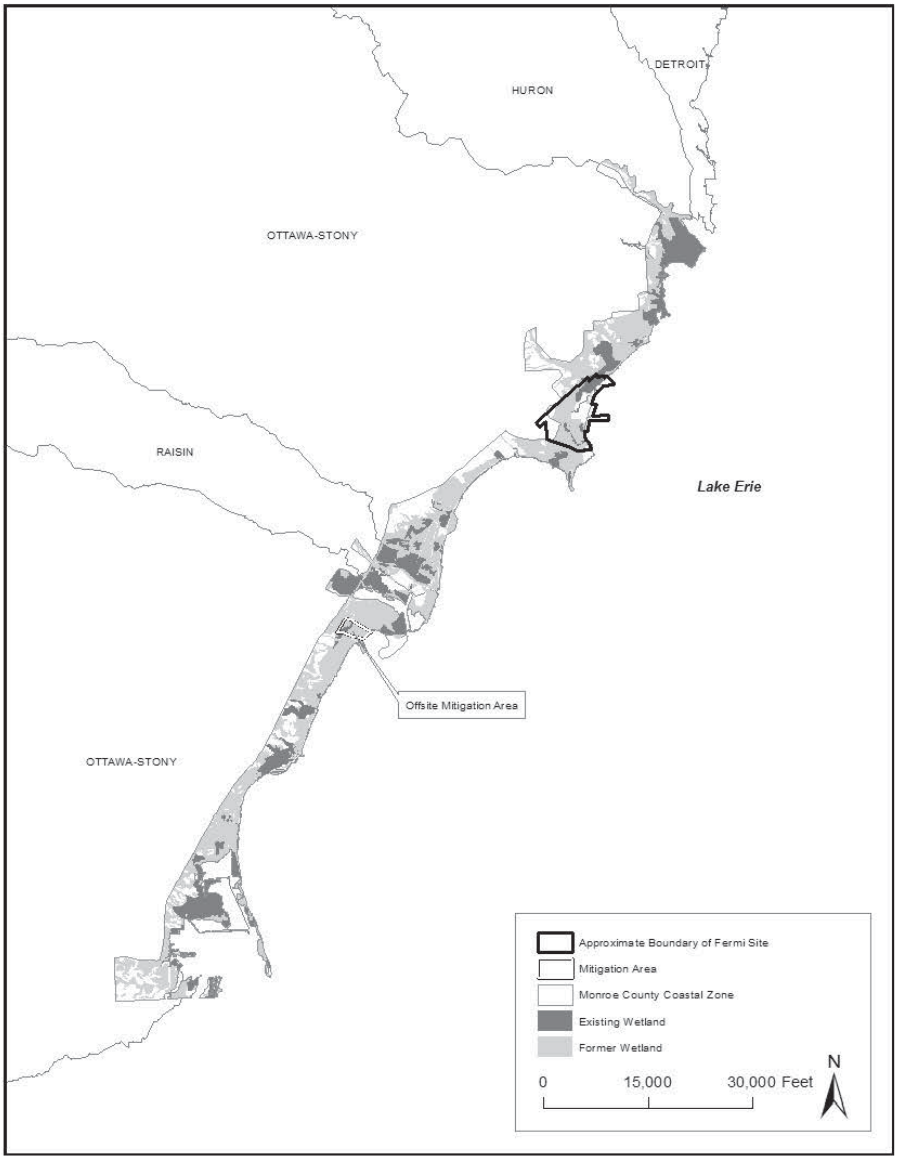
Figure 11: Existing and Former Wetlands in the Ottawa-Stony Watershed



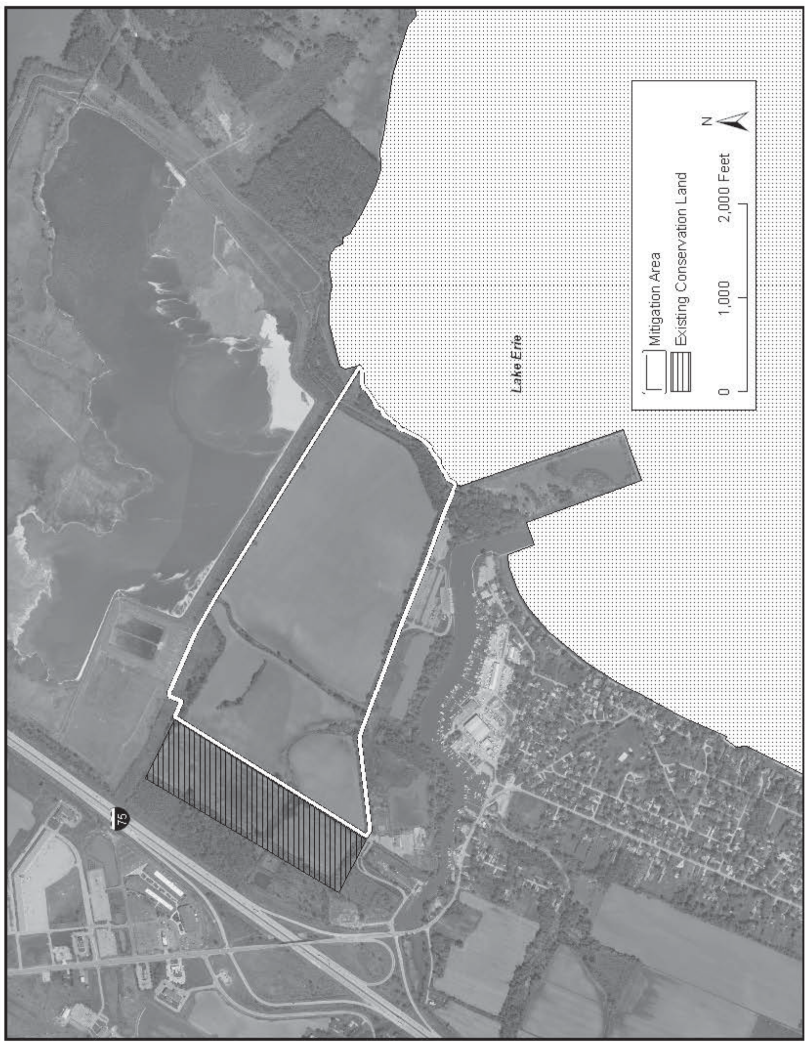
Source: Reference 25 and Reference 28 through Reference 30

Figure 12: Existing and Former Wetlands in the Coastal Zone of Lake Erie



Source: Reference 27 and Reference 30

Figure 13: Offsite Mitigation Project Area Aerial Photo



Source: Reference 24

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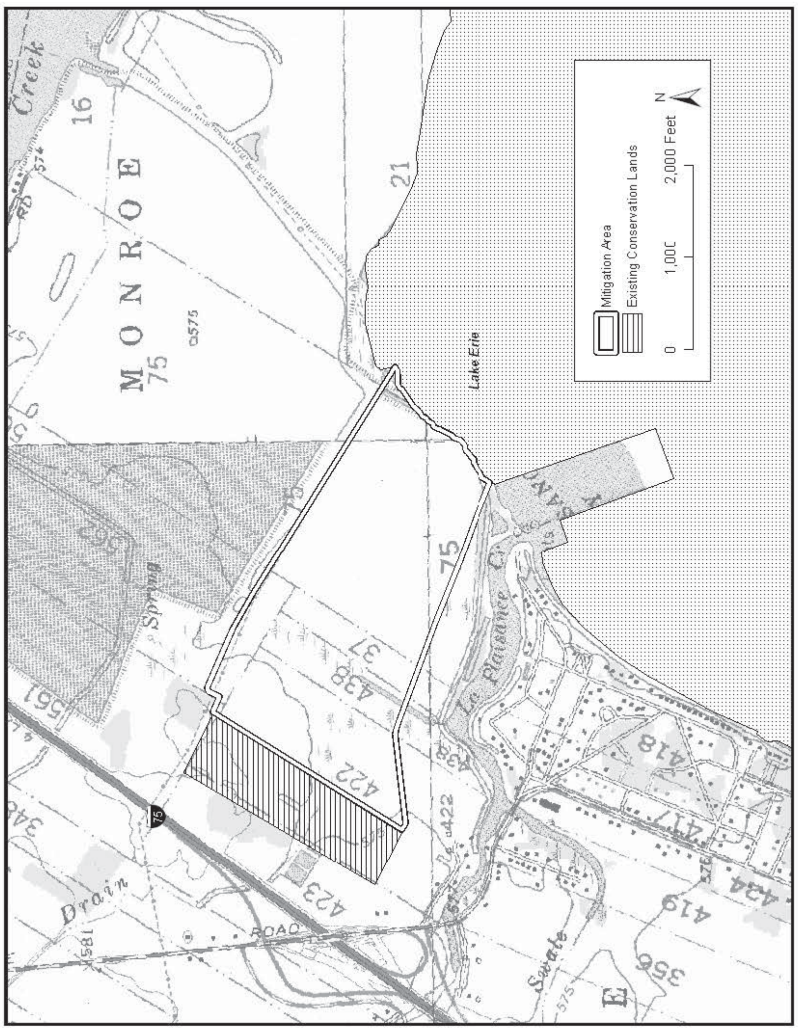
Figure 14: Offsite Mitigation Area Topographic Map



Source: Reference 31

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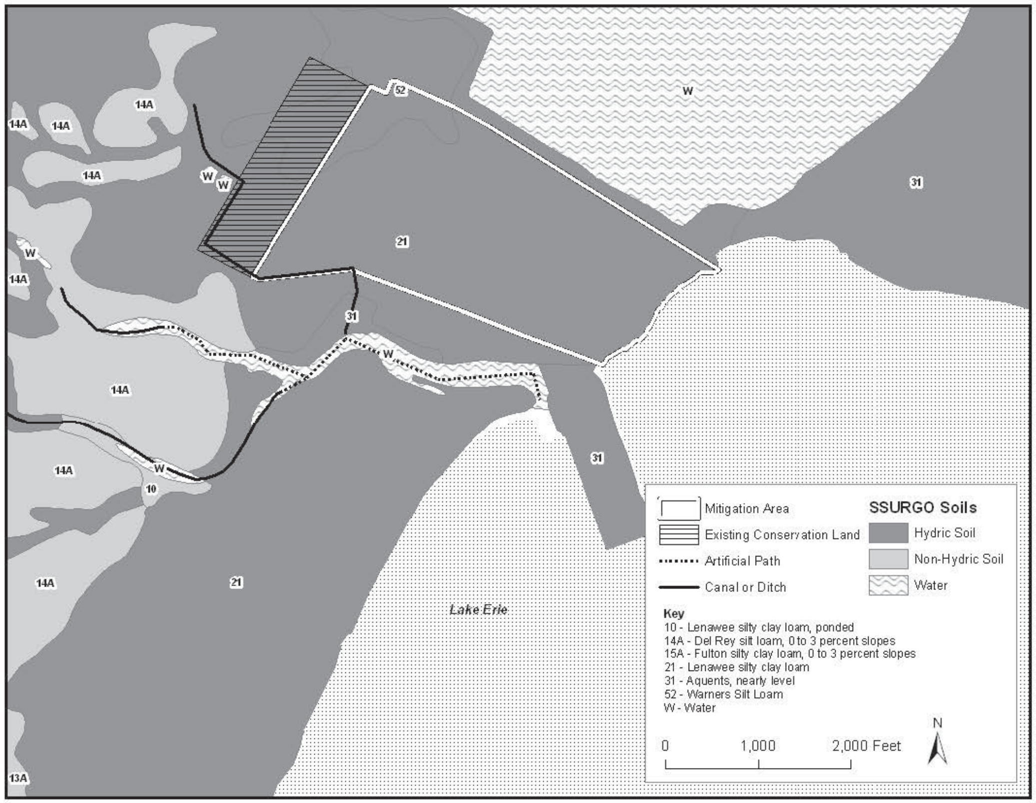
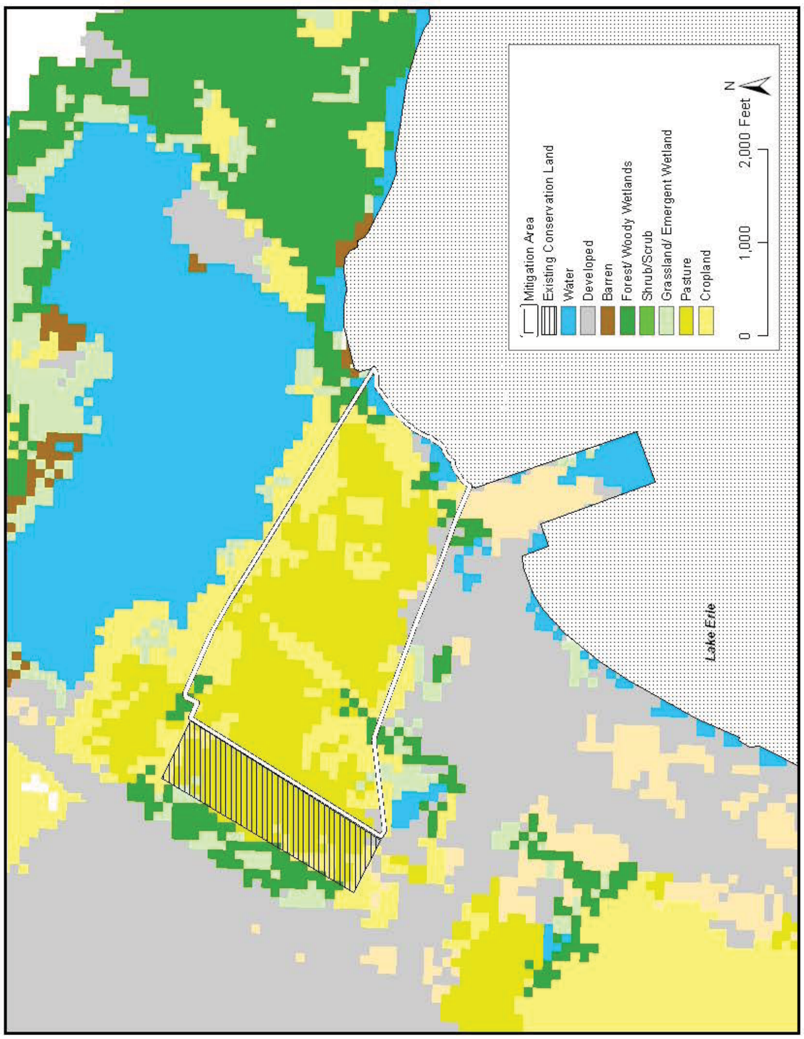
Figure 15: Offsite Mitigation Area Soils and Hydrology Map



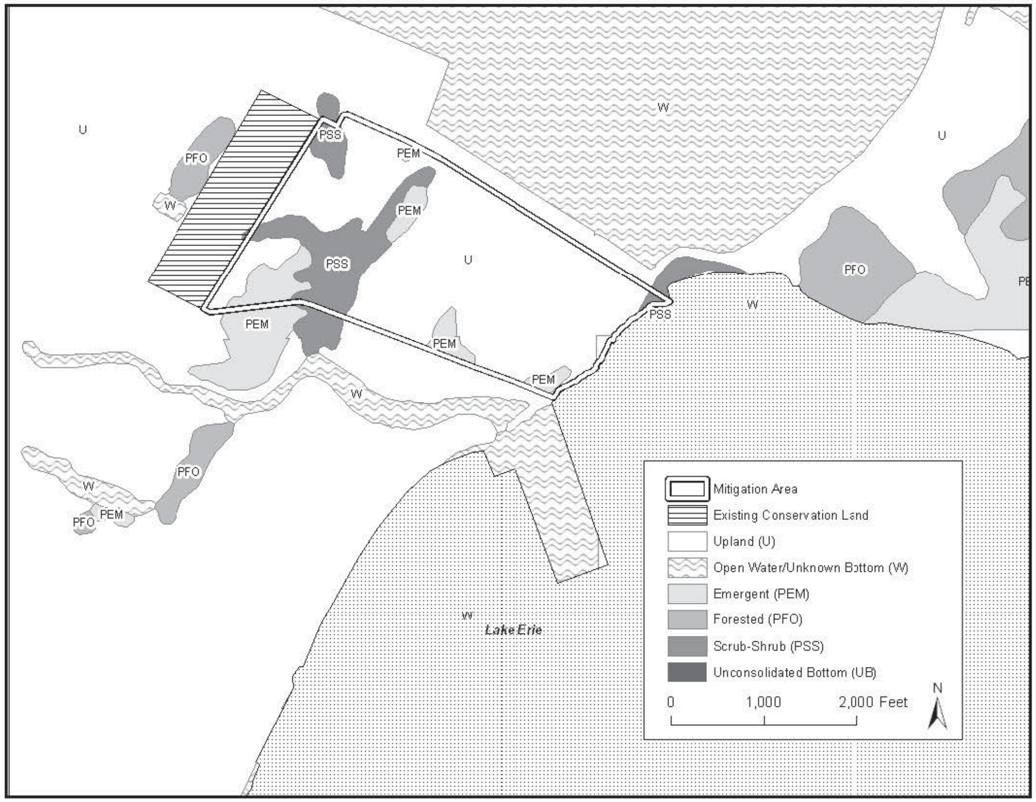
Source: Reference 25 and Reference 32

Figure 16: Offsite Mitigation Area Covertype Map



Source: Reference 26

Figure 17: Offsite Mitigation Area Federal Mapped Wetlands



Source: Reference 30

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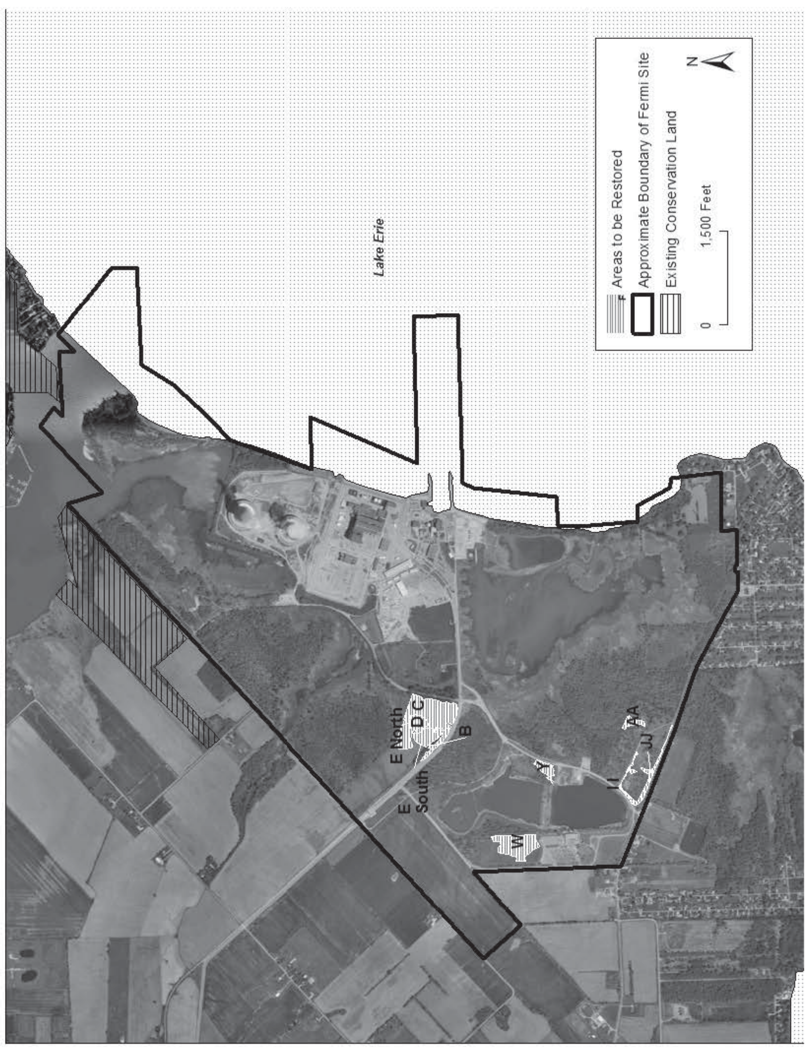
Figure 18: Onsite Mitigation Conceptual Plan



Source: Reference 24

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Figure 19: Offsite Mitigation Conceptual Plan

Source: Reference 24

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Appendix L

Carbon Dioxide Footprint Estimates for a 1000-MW(e) Light Water Reactor (LWR)

Appendix L

Carbon Dioxide Footprint Estimates for a 1000-MW(e) Light Water Reactor (LWR)

The U.S. Nuclear Regulatory Commission (NRC) review team has estimated the carbon dioxide (CO_2) footprint of various activities associated with nuclear power plants, including building, operating, and decommissioning. The estimates include direct emissions from the nuclear facility and indirect emissions from workforce transportation and the uranium fuel cycle.

Construction equipment estimates listed in Table L-1 are based on hours of equipment use estimated for a single nuclear power plant at a site requiring a moderate amount of terrain modification. A reasonable set of emissions factors used to convert the hours of equipment use to CO_2 emissions is based on carbon monoxide (CO) emissions (UniStar 2007) scaled to CO_2 using a scaling factor of 165 tons of CO_2 per ton of CO. This scaling factor is based on emissions factors in Table 3.3-1 of AP-42 (EPA 1995). Equipment emissions estimated for decommissioning are one-half of those for construction.

Table L-1. Construction Equipment CO_2 Emissions (metric tons equivalent)

Equipment	Construction Total[(a)]	Decommissioning Total[(b)]
Earthwork and dewatering	1.1×10^4	5.4×10^3
Batch plant operations	3.3×10^3	1.6×10^3
Concrete	4.0×10^3	2.0×10^3
Lifting and rigging	5.4×10^3	2.7×10^3
Shop fabrication	9.2×10^2	4.6×10^2
Warehouse operations	1.4×10^3	6.8×10^2
Equipment maintenance	9.6×10^3	4.8×10^3
Total[(c)]	$\mathbf{3.5 \times 10^4}$	$\mathbf{1.8 \times 10^4}$

(a) Based on hours of equipment usage over 7-year period.
(b) Based on equipment usage over 10-year period.
(c) Total not equal to the sum due to rounding.

Workforce estimates are typical workforce numbers for new plant construction and operation based on estimates in various combined operating license applications; decommissioning workforce emissions estimates are based on decommissioning workforce estimates in NUREG-0586 S1, *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors* (NRC 2002). A typical construction workforce averages about 2500 for a 7-year period with a peak workforce of about 4000. A typical operations workforce for the 40-year life of the plant is assumed to be about 400, and the decommissioning workforce during a 10-year decontamination and dismantling period is assumed to be 200 to 400. In all cases, the daily commute is assumed to involve a 100-mi roundtrip with 2 individuals per vehicle. Considering shifts, holidays, and vacations, 1250 roundtrips per day are assumed each day of the year during construction; 200 roundtrips per day are assumed each day during operations; and 150 roundtrips per day are assumed 250 days per year for the decontamination and dismantling portion of decommissioning. If the SAFSTOR decommissioning option is included in decommissioning, 20 roundtrips each day of the year are assumed for the caretaker workforce.

Table L-2 lists the review team's estimates of the CO_2-equivalent emissions associated with workforce transport. The table lists the assumptions used to estimate total miles traveled by each workforce and the factors used to convert total miles to metric tons CO_2-equivalent. The CO_2-equivalent accounts for other greenhouse gases (GHGs), such as methane and nitrous oxide, which are emitted by internal combustion engines. The workers are assumed to travel in gasoline-powered passenger vehicles (cars, trucks, vans, and sport utility vehicles) that get an average of 19.7 mi per gallon of gas (FHWA 2006). Conversion from gallons of gasoline burned to CO_2-equivalent is based on U.S. Environmental Protection Agency (EPA) emissions factors (EPA 2007a, b).

Table L-2. Workforce CO_2 Footprint Estimates

	Construction Workforce	**Operational Workforce**	**Decommissioning Workforce**	**SAFSTOR Workforce**
Roundtrips per day	1250	200	150	20
Miles per roundtrip	100	100	100	100
Days per year	365	365	250	365
Years	7	40	10	40
Miles traveled	3.2×10^8	2.9×10^8	3.8×10^7	2.92×10^7
Miles per gallon[(a)]	19.7	19.7	19.7	19.7
Gallons fuel burned	1.6×10^7	1.5×10^7	1.9×10^6	1.58×10^6
Metric tons CO_2 per gallon[(b)]	8.81×10^{-3}	8.81×10^{-3}	8.81×10^{-3}	8.81×10^{-3}
Metric tons CO_2	1.4×10^5	1.3×10^5	1.7×10^4	1.3×10^4
CO_2-equivalent factor[(c)]	0.971	0.971	0.971	0.971
Metric tons CO_2-equivalent	1.5×10^5	1.3×10^5	1.7×10^4	1.3×10^4

(a) FHWA (2006).
(b) EPA (2007b).
(c) EPA (2007a).

Published estimates of uranium fuel cycle CO_2 emissions required to support a nuclear power plant range from about 1 percent to about 5 percent of the CO_2 emissions from a comparably sized coal-fired plant (Sovacool 2008). A coal-fired power plant emits about 1 metric ton (MT) of CO_2 for each megawatt hour generated (Miller and Van Atten 2004). Therefore, for consistency with Table S-3 of Title 10 of the Code of Federal Regulations (10 CFR 51.51), the NRC staff estimated the uranium fuel cycle CO_2 emissions as 0.05 MT of CO_2 per MWh generated. Finally, the review team estimated the CO_2 emissions directly related to plant operations from the typical usage of various diesel generators onsite using EPA emissions factors (EPA 1995). The review team assumed an average of 600 hr of emergency diesel generator operation per year (total for four generators) and 200 hr of station blackout diesel generator operation per year (total for two generators).

Given the various sources of CO_2 emissions discussed above, the review team estimates the total life CO_2 footprint for a reference 1000-MW(e) nuclear power plant with an 80 percent capacity factor to be about 18 million MT. The components of the footprint are summarized in Table L-3. The uranium fuel cycle component of the footprint dominates all other components. It is directly related to power generated. As a result, it is reasonable to use reactor power to scale the footprint to larger reactors.

Table L-3. 1000-MW(e) LWR Lifetime Carbon Dioxide Footprint

Source	Activity Duration (years)	Total Emissions (metric tons)
Construction equipment	7	3.5×10^4
Construction workforce	7	1.5×10^5
Plant operations	40	1.9×10^5
Operations workforce	40	1.3×10^5
Uranium fuel cycle	40	1.7×10^7
Decommissioning equipment	10	1.8×10^4
Decommissioning workforce	10	1.7×10^4
SAFSTOR workforce	40	1.3×10^4
Total		$\mathbf{1.8 \times 10^7}$

The review team considers the footprint estimated in Table L-3 to be appropriately conservative. The CO_2 emissions estimates for the dominant component (uranium fuel cycle) are based on 30-year-old enrichment technology, assuming that the energy required for enrichment is provided by coal-fired generation. Different assumptions related to the source of energy used for enrichment or the enrichment technology that would be just as reasonable could lead to a significantly reduced footprint.

Emissions estimates presented in the body of this environmental impact statement (EIS) have been scaled to values that are appropriate for the proposed project. The uranium fuel cycle emissions have been scaled by reactor power using the scaling factor determined in Chapter 6. Plant operations emissions have been adjusted to represent the number of large CO_2 emissions sources (diesel generators, boilers, etc.) associated with the project. The workforce emissions estimates have been scaled to account for differences in workforce numbers and commuting distances. Finally, equipment emissions estimates have been scaled by estimated equipment usage. As can be seen in Table L-3, only the scaling of the uranium fuel cycle emissions estimates makes a significant difference in the total carbon footprint of the project.

Sovacool (2008) also calculated GHG emission factors during the life cycle of nuclear power plants based on the statistical analysis from 19 qualified studies examined. Estimated GHG emission factors ranged from 1.4 g CO_2-equivalent per kWh to 288 g CO_2-equivalent per kWh, with a mean value of 66 g CO_2-equivalent per kWh (equivalent to 0.066 MT of CO_2-equivalent per kWh). The emission factor of 0.05 MT of CO_2 per MWh used in this analysis is about three-fourths the mean emission factor of 0.066 MT of CO_2-equivalent per MWh but is considered comparable, considering the wide range of emission factors (0.0014 to 0.288) estimated in that study.

L.1 References

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10. SUPPLEMENTARY NOTES

Docket No. 52-033

11. ABSTRACT *(200 words or less)*

This environmental impact statement (EIS) has been prepared in response to an application submitted by Detroit Edison Company to the U.S. Nuclear Regulatory Commission (NRC) for a combined licenses (COL) for Unit 3 at the Enrico Fermi AtomicPower Plant (Fermi) site in Monroe County, Michigan. This EIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action and mitigation measures for reducing and avoiding adverse impacts.

The NRC staff's preliminary recommendation to the Commission, considering the environmental aspects of the proposed action, is that the COL be issued. This recommendation is based on (1) the COL application, including the Environmental Report submitted by Detroit Edison Company; (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the consideration of public scoping comments; and (5) the assessments summarized in this EIS, including the potential mitgation measures identified in the ER and this EIS.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

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