Table 4-12. Impacts on Area Roadways during Peak Morning Building Workforce Commute

Intersection	Approach/Movement	Existing (2009) Level of Service	Peak Building Employment (2017) Level of Service	Potential Improvement Alternatives
Northbound I-75 ramps and N. Dixie Hwy.	Northbound ramp	C	F	• Signal timing/phasing modification
Northbound I-75 ramps and Nadeau Rd.	Northbound ramp/left turn	F	F	• Signalization • Lane use modification
Northbound I-75 ramps and Swan Creek Rd.	Northbound ramp/left turn	D	F	• Signalization • Lane use modification
	Northbound ramp/right turn	B	D	
Southbound I-75 ramps and Newport Rd.	Southbound approach	C	F	• Signalization • Lane use modification
N. Dixie Hwy. and Stony Creek Rd.	Stony Creek Rd./eastbound	C	F	• Signalization • Eastbound Stony Creek left/right turn lanes
N. Dixie Hwy. and Pointe Aux Peaux Rd.	N. Dixie Hwy./northeast-bound	B	F	• Signal timing/phasing optimization
N. Dixie Hwy. and Leroux Rd.	Leroux Rd./southwest-bound	B	E	• Left turn restriction
N. Dixie Hwy. and Enrico Fermi Dr.	N. Dixie Hwy./northbound	A	F	• Signal timing/phasing • Northbound/southbound turn lanes on N. Dixie Hwy. • Additional access point • Westbound lane use/storage
	N. Dixie Hwy./southbound	A	F	
	Enrico Fermi Dr./westbound	C	F	
N. Dixie Hwy. and Post Rd.	Post Rd./eastbound	C	F	• Signalization
	Post Rd./westbound	B	F	
Enrico Fermi Dr. and Leroux Rd.	Leroux Rd./northeast-bound	B	F	• Warning signage • Temporary closure

Source: Mannik and Smith Group, Inc. 2009

Table 4-13. Impacts on Area Roadways during Peak Afternoon Building Workforce Commute

Intersection	Approach/Movement	Existing (2009) Level of Service	Peak Building Employment (2017) Level of Service	Potential Improvement Alternatives
Southbound I-75 ramps and N. Dixie Hwy.	Westbound approach/ left turn	A	F	• Signal timing/phasing optimization • Westbound left-turn phase
Northbound I-75 ramps and Nadeau Rd.	Northbound ramp/ left turn	F	F	• Signalization • Lane use modification
Northbound I-75 ramps and Swan Creek Rd.	Northbound ramp/ left turn	E	F	• Signalization • Lane use modification
Southbound I-75 ramps and Newport Rd.	Southbound I-75 ramp/ northbound approach	E	F	• Signalization • Lane use modification
	southbound approach	D	F	
N. Dixie Hwy. and Stony Creek Rd.	Stony Creek Rd./ eastbound	C	F	• Signalization • Eastbound Stony Creek left/right turn lanes
N. Dixie Hwy. and Pointe Aux Peaux Rd.	N. Dixie Hwy./ southwest-bound	C	F	• Signal timing/phasing optimization
N. Dixie Hwy. and Leroux Rd.	Leroux Rd./ southwest-bound	B	F	• Left turn restriction
N. Dixie Hwy. and Enrico Fermi Dr.	Enrico Fermi Dr./ westbound	B	F	• Signal timing/phasing optimization • Northbound/southbound turn lanes on N. Dixie Hwy. • Additional access point • Westbound lane use/storage
N. Dixie Hwy. and Post Rd.	Post Rd./eastbound	C	F	• Signalization
	Post Rd./westbound	B	E	
Enrico Fermi Dr. and Leroux Rd.	Leroux Rd./northeast-bound	B	F	• Warning signage
	Leroux Rd./southwest-bound	B	F	• Temporary closure

Source: Mannik and Smith Group, Inc. 2009

term for the length of the outage (approximately 30 days) and would not represent normal conditions.

From the information provided by Detroit Edison, interviews with local planners and officials, and the review team's independent evaluation, the review team concluded that the offsite impacts of traffic from building of Fermi 3 would be temporary and noticeable but not destabilizing during the peak building employment period. However, Detroit Edison commissioned a traffic study that identified strategies that could mitigate the traffic to a manageable level. Detroit Edison has committed in the ER to working with MDOT and MCRC to determine possible mitigation measures (Detroit Edison 2011a).

4.4.4.2 Recreation

Recreational resources in Monroe, Wayne, and Lucas Counties may be affected by building activities for Fermi 3. Impacts may include (1) increased user demand associated with the projected increase in population as a result of the in-migrating building workers and their families, (2) an impaired recreational experience associated with the views of the building for the 600-ft cooling tower, and (3) access delays associated with increased traffic from the building workers on local roadways. Increased user demand as a result of the in-migrating building workers and their families may include increased competition for recreational vehicle (RV) spaces at campgrounds, which would be used for temporary housing for the workers.

Impacts associated with the increased use of the recreational resources in the vicinity and region would be minimal. The projected increase in population in Monroe, Wayne, and Lucas Counties associated with in-migrating workers and their families is less than 1 percent of the projected 2020 population for any of these counties and would minimally affect the availability and use of recreational resources in the area, especially considering that Wayne and Lucas Counties have experienced and are projected to continue to experience population losses through 2020.

Detroit Edison identified a large number of short-term accommodations within 50 mi of the city of Monroe. These accommodations would be rented by people using recreational areas and by other visitors/tourists to the region, and may also be used by a portion of the in-migrating workforce that does not select a more permanent type of housing. More than 375 establishments, including hotels and motels, bed-and-breakfasts, cabins and cottages, condos, historic inns, and RV parks and campgrounds, are located within 50 mi of the city of Monroe. In addition, the review team expects only a portion of the in-migrating workers would select short-term accommodations. Therefore, the review team expects recreationalists would be minimally affected by the use of short-term accommodations in the region by in-migrating workers.

Users of recreational resources in the immediate vicinity of the Fermi site may have a diminished recreational experience due to the views of building activities, especially tall structures such as the 600-ft cooling tower. Several small beach communities are located along the Lake Erie shoreline within 5 mi of the Fermi site, including Estral Beach, Stony Point, Detroit Beach, and Woodland Beach. Several public and private beaches are located along the Lake Erie shoreline in Monroe and Wayne Counties. Many small marinas and docks also are located along the Lake Erie shoreline within the vicinity of the Fermi site. Building activities associated with the cooling tower may create dust and debris, and night lighting would also be visible from Point Mouillee State Game Area (3.1 mi to the northeast) and Sterling State Park (4.8 mi to the south-southwest). Although the new 600-ft cooling tower will be taller than the existing cooling towers, building activities related to the new cooling tower would be consistent with the existing views of the Fermi site, and the review team determined there would be no discernible adverse impacts on recreational users from the building of the cooling tower for Fermi 3.

People using recreational facilities near the site may experience traffic congestion on the roads during the morning and afternoon commutes of the building workforce. Sterling State Park, in particular, is near the I-75 interchange with North Dixie Highway, which also provides access to the local road network for the Fermi site. From the information provided by Detroit Edison, interviews with local planners and officials, and the review team's independent evaluation, the review team concluded that the recreational impacts from building Fermi 3 could be temporary and noticeable but not destabilizing during the peak building employment period. However, measures to mitigate traffic delays at selected intersections and I-75 interchanges have been recommended for the building period; they would alleviate impacts on users of recreational facilities as well as members of the general public using local roadways. Therefore, the review team expects the recreational impacts from building Fermi 3 would be minimal after mitigation.

4.4.4.3 Housing

As discussed in Section 2.5, the review team expects that approximately 85 percent of the building workforce would be local workers who currently reside within a commute of approximately 50 mi from the Fermi site. The majority of these workers would commute from their homes to the project site and not be expected to affect the housing market. The review team expects the remaining 15 percent of the building workforce, or approximately 435 workers during peak employment, to relocate into the region. The review team expects these in-migrating workers will have characteristics similar to the current workforce with respect to choices and preferences (e.g., commute distance, available amenities). Therefore, the residential distribution of the in-migrating workforce is based on the residential distribution of the current Fermi 2 workforce, with most (about 85 percent) residing in Monroe and Wayne Counties in Michigan and Lucas County in Ohio during the building period. Table 4-14 compares the available housing with the number of in-migrating building workers.

Table 4-14. Impact on Housing Availability within Monroe, Wayne, and Lucas Counties

Parameter	Monroe	Wayne	Lucas
Workforce relocating from outside the region	250	83	47
Vacant housing units	4632	135,385	23,659
Estimated demand for housing as percent of housing availability	5.4	<0.01	0.2

Given the relatively large size of the regional housing market, the increased demand for housing for the relocating workers and their families would have no noticeable impact on the availability or price of housing. As presented in Section 2.5, the U.S. Census Bureau determined that more than 1 million housing units were located in Monroe, Wayne, and Lucas Counties in 2010, of which more than 300,000 were rental units. The vacancy rate within the three counties ranged between 2.4 and 4.4 percent for owner-occupied housing and 9.1 and 11.3 percent for rental units; approximately 146,000 housing units were vacant. The Southeast Michigan Council of Governments (SEMCOG 2008) reported 68 mobile home parks and 15,835 mobile home sites in Wayne County and 29 mobile home parks and 7452 mobile home sites, of which 17.2 percent surveyed in Monroe County were vacant, in 2006.

Substandard housing units are being demolished by Wayne and Monroe County, which has resulted in a net loss of housing units in Wayne County. However, the review team has also considered that a large number of housing units are in foreclosure, population in the local area is declining, and additional housing units are being approved for construction in Monroe County, which has resulted in a net gain in housing units. Despite the changes that are expected to occur in the housing market, the review team expects that the overall number of housing units will be more than sufficient to accommodate workers relocating from outside the local area.

In addition, more than 375 establishments are located within 50 mi of the city of Monroe and would be available as short-term accommodations for those relocating from outside the area or those choosing to minimize their commute for all or a portion of the work effort.

Given the large supply of housing and the size of the Detroit and Toledo metropolitan areas relative to the 435 in-migrating families during the peak building employment period, and the availability of short-term accommodations, the review team expects sufficient housing to be available for workers relocating to the area and that there would be minimal impacts on the housing supply or prices in the local area. In addition, given the large supply of housing as well as short-term accommodations, and the declining population in the area, the review team does not expect that the in-migration of 435 families would stimulate new housing construction.

Building Fermi 3 could affect housing values in the vicinity of the Fermi site. In a review of previous studies on the effect of seven nuclear power facilities, including four nuclear power plants, on property values in surrounding communities, Bezdek and Wendling (2006) concluded that assessed valuations and median housing prices have tended to increase at rates above

national and State averages. Clark et al. (1997) similarly found that housing prices in the immediate vicinity of two nuclear power plants in California were not affected by any negative views of the facilities. These findings differ from studies that looked at undesirable facilities, largely related to hazardous waste sites and landfills, but also including several studies on power facilities (Farber 1998) in which property values were negatively affected in the short-term, but these effects were moderated over time. Bezdek and Wendling (2006) attributed the increase in housing prices to benefits provided to the community in terms of employment and tax revenues, with surplus tax revenues encouraging other private development in the area. Given the findings from the studies discussed above, the review team determines that the impact on housing value from building Fermi 3 would be minor.

4.4.4.4 Public Services

This section discusses the impacts on existing water supply and wastewater treatment and police, fire, and healthcare services in Monroe, Wayne, and Lucas Counties.

Water Supply and Wastewater Treatment Services

Approximately 85 percent of the project workforce would be local workers who currently reside within a 50-mi radius of the Fermi site. The majority of these workers would commute from their homes to the project site and would not relocate. Therefore, the majority of workers are currently served by water supply and wastewater treatment services within the communities in which they reside.

At peak employment, the review team expects about 435 workers to relocate with their families into the region, primarily to Monroe, Wayne, and Lucas Counties. These relocating workers would increase the demand on the water supply and on wastewater treatment services within the communities in which they choose to reside.

The review team expects that these workers would obtain housing within the existing housing market rather than stimulate new housing construction, and would not expand existing water supply or wastewater treatment services to new areas. Potable water is available to the existing housing market through wells or municipal water supplies, and residents either have access to municipal wastewater collection and treatment systems or individually own onsite wastewater disposal systems.

The estimated demand for water supply and wastewater treatment services in Monroe, Wayne, and Lucas Counties is shown in Table 4-15.

The review team expects the increase in demand for water supply by the in-migrating workers and their families will have a minor impact on municipal water suppliers in the local area because (1) the increase in population is projected to be small, (2) the in-migrating population

Table 4-15. Estimated Increase in Demand for Water Supply and Wastewater Treatment Services in Monroe, Wayne, and Lucas Counties from In-migrating Building Workforce

Increases	Monroe	Wayne	Lucas
Estimated increase in population	650	216	122
Estimated increase in residential daily water demand[(a)]	0.09 MGD	0.03 MGD	0.02 MGD
Estimated increase in residential daily wastewater flow[(b)]	0.05 MGD	0.02 MGD	0.01 MGD

(a) Average daily water use per person is estimated to be 135 gpd on the basis of the planning criteria used in DWSD (2004).
(b) Average daily wastewater flow per person is estimated to be 77 gpd on the basis of the planning criteria used in DWSD (2003).

would be served by a number of municipalities and jurisdictions, and (3) moving into existing homes implies that the residences would already be a part of the existing infrastructure.

In Monroe County, the largest municipal water supplier is the City of Monroe. The City of Monroe treatment plant is designed to treat 18 MGD, and its average daily water demand is 7.8 MGD (Monroe County Planning Department and Commission 2010). Other municipal water suppliers in Monroe County may also provide a water supply to the in-migrating population, including Frenchtown Charter Township; the City of Milan, Michigan; the City of Toledo, Ohio; and the Detroit Water and Sewerage Department (DWSD), which also serves portions of Monroe County. Therefore, the estimated water demand of 0.09 MGD for the additional people choosing to reside in Monroe County would have a minor impact on water suppliers.

Wayne County is serviced by the DWSD, which has a treatment capacity of 1720 MGD. The average daily water demand for the DWSD is 622 MGD (Ellenwood 2010). Therefore, the estimated water demand of 0.03 MGD for the additional people choosing to reside in Wayne County would have a minor impact on the DWSD.

The largest municipal water supplier in Lucas County is the City of Toledo, which also services the northeastern portion of the county, where workers are more likely to settle. Its plant has a treatment capacity of 120 MGD, with an average daily demand of 73 MGD (Leffler 2010). Therefore, the estimated water demand of 0.02 MGD for the additional people choosing to reside in Lucas County is expected to have a minor impact on the municipal water suppliers in Lucas County.

The increase in demand for wastewater treatment is expected to have a minor impact on wastewater treatment plants in the local area because of the number of jurisdictions that provide wastewater collection and treatment services in the local area compared with the size of the population increase associated with Fermi 3.

In Monroe County, the largest wastewater treatment plant is operated by the City of Monroe. It is designed to treat 24 MGD wastewater flows, and its average daily wastewater flow is 15.9 MGD (MDEQ 2011b). In addition, wastewater treatment services are provided by a number of municipalities in Monroe County, including the townships of Bedford, Berlin, Ida, and Raisinville; cities of Milan, Petersburg, and Luna Pier; and villages of Dundee, Carleton, and Maybee. Therefore, the estimated wastewater treatment flow of 0.05 MGD for the additional people choosing to reside in Monroe County would have a minor impact on wastewater treatment capability.

Wayne County is served by two large wastewater treatment facilities: the DWSD, which has a treatment capacity of 930 MGD and treats an average wastewater flow of 727 MGD (Ellenwood 2010), and the Downriver Treatment Plant, which has a treatment capacity of 125 MGD and treats an average wastewater flow of 52 MGD. In addition, Gross Ile Township, City of Rockwood, and City of Trenton maintain wastewater treatment facilities. Therefore, the estimated wastewater treatment flow of 0.02 MGD for the population choosing to reside in Wayne County would have a minor impact on wastewater treatment capability in Wayne County.

The City of Toledo's wastewater treatment plant is the largest in Lucas County. The plant has a treatment capacity of 195 MGD, with an average daily demand of 71 MGD (McGibbeny 2010). Therefore, the estimated wastewater treatment flow of 0.01 MGD for the population choosing to reside in Lucas County is expected to have a minor impact on wastewater treatment capability in Lucas County.

During the building of Fermi 3, the onsite workforce would place additional demands on the potable water supply to the Fermi site and on wastewater treatment services at the site. Potable water is currently provided to the plant site by Frenchtown Charter Township, and wastewater is treated through the Monroe Metropolitan Wastewater Treatment Facility. Detroit Edison estimates that approximately 8700 gpd of potable water would be required during the peak building employment period (Detroit Edison 2011a). The Frenchtown Charter Township water treatment plant and Monroe Metropolitan Wastewater Treatment Facility both have the capacity to accommodate the increased demand for these public services.

Surface water withdrawn directly from Lake Erie would provide the water supply for other building activities, including concrete batching, dust suppression, and fire protection. Therefore, municipal water supply services would not be affected by building activities. Impacts associated with surface-water withdrawal are discussed in Section 4.2.

The review team has concluded from the information provided by Detroit Edison, interviews with local planners and officials, and its own independent evaluation that the building of Fermi 3 would have minimal impacts on the local water supply and on wastewater treatment facilities.

Police, Fire Response, and Health Care Services

The building workforce for Fermi 3 would increase the demand for police, fire response, and health care services within the communities where the workers reside and at the Fermi site.

The review team expects the majority of the locally available workers would commute from their homes to the project site and would be served by the police, fire response, and health care services within the communities in which they reside. Although these workers' commute from their residences to their place of work would change, the demand for police, fire response, or health care services would not be appreciably different from that of the baseline population served by any one jurisdiction.

The review team expects that the remaining 435 workers during peak building employment would relocate into the region, primarily to Monroe, Wayne, and Lucas Counties. These relocating workers would increase the demand on police, fire response, and health care services within the communities in which they chose to reside.

As discussed in Section 4.4.2, the projected population increase associated with the in-migrating workers, based on an average household size of 2.6 persons, is 1131 persons. On the basis of the existing distribution pattern of the Fermi 2 operational workforce, it is estimated that 650 persons would relocate to Monroe County, 216 persons would relocate to Wayne County, and 122 persons would relocate to Lucas County (see Table 4-6). Approximately 143 persons would relocate elsewhere in the region. As shown in Table 4-16, the projected increase in population would have no measurable effect on the ratio of police officers, firefighters, or health care workers per 1000 residents who serve the population in Monroe, Wayne, or Lucas Counties, based on the 2010 population as presented in Section 2.5.

Building Fermi 3 may result in an increased demand for onsite police, fire response, or health care services, especially in the event of construction workplace injuries or accidents. Police, fire response, and other emergency response personnel may encounter traffic congestion on local roadways when responding to calls when the building workforce is commuting to the site, especially during peak building employment periods. However, the area around the Fermi site is sparsely populated, so there would not be a high demand for police, fire response, or other emergency response personnel. In addition, measures to mitigate traffic delays at selected intersections and I-75 interchanges have been recommended for the construction period; these could reduce the impacts on emergency responders as well as on members of the general public using local roadways. During the site plan review and approval process, Frenchtown Charter Township will require that the project, as necessary, be reviewed by the MCRC and MDOT. The MCRC may require that a traffic impact study be conducted in accordance with Traffic and Safety Note 607C, "Traffic Impact Studies" (MDOT 2009), and improvements to local roadways be considered by Detroit Edison at that time.

Table 4-16. Changes in Population Served by Law Enforcement Personnel, Firefighters, and Health Care Workers in Monroe, Wayne, and Lucas Counties

Type of Public Service Workers	Number of Officers/Firefighters/ Health Care Workers	Existing Conditions		Conditions with In-migrating Workers and Families Associated with Building Fermi 3	
		Population Served	Officers/Firefighters/ Health Care Workers per 1000 Residents	Population Served[a]	Officers/Firefighters/ Health Care Workers per 1000 Residents
County Sheriff and Municipal Law Enforcement Personnel					
Monroe	277	152,021	1.8	152,671	1.8
Wayne	6957	1,820,584	3.8	1,820,800	3.8
Lucas	973	441,815	2.2	441,937	2.2
Firefighters					
Monroe	606	152,021	4.0	152,671	4.0
Wayne	3407	1,820,584	1.9	1,820,800	1.9
Lucas	1195	441,815	2.7	441,937	2.7
Health Care Workers[b]					
Monroe, MI, MSA	2770	152,021	18.2	152,527	18.2
Detroit-Livonia-Dearborn Metro Division	69,030	4,296,250	16.1	4,296,533	16.1
Toledo, OH, MSA	34,600	651,429	53.1	651,551	53.1

Sources: FBI 2009; FEMA 2010; USBLS 2008a

(a) Population served includes the 2010 population data plus the projected population increase associated with relocating workers and their families. Normal population increases or decreases and any associated changes in the public services provided are not considered here.

(b) Occupational employment and corresponding population served are provided for the metropolitan area in which the county is located.

Detroit Edison will prepare and implement a construction safety plan that conforms to industry requirements and OSHA regulations to minimize the number of safety incidents that could occur onsite. The workers would be required to take training and become familiar with the plan and adhere to safety standards applicable to the construction industry (Detroit Edison 2011a). Fire suppression equipment and a first aid station are available onsite, and Detroit Edison has existing agreements with local emergency response organizations (Detroit Edison 2011a). Because of these offsite and onsite safety strategies, the review team expects that the impact of building activities on the demand for local emergency room service personnel would be minimal.

4.4.4.5 Education

The building workforce for Fermi 3 could increase the demand for educational services.

The review team expects that the locally available project workforce would commute from their homes to the project site and would not make any additional demands on educational services in Monroe, Wayne, and Lucas Counties.

As described in Section 4.4.2, the review team expects that the in-migrating workforce of 435 would relocate into the region, in the same distribution pattern as the current Fermi 2 workforce, primarily to Monroe, Wayne, and Lucas Counties. If the in-migrating workers were to bring their families, school enrollments would increase by an estimated 133 school-aged children in Monroe County, 44 school-aged children in Wayne County, and 25 school-aged children in Lucas County (Table 4-17).

During the 2008–2009 school year, enrollment in the nine public school districts in Monroe County was 23,283, and in Wayne County, enrollment in 35 public school districts was 276,862 (Table 4-18). During the same year, enrollment in eight school districts in Lucas County was 57,263. The review team determined that the impact of the projected increase in population associated with the building workforce for Fermi 3 on local schools would be negligible because

Table 4-17. Estimated Number of School-Aged Children Associated with In-migrating Workforce Associated with Building Fermi 3

Workers and Their Children	Monroe	Wayne	Lucas
Estimated number of building workers in-migrating to county	250	83	47
Estimated increase in population[(a)]	650	216	122
Estimated increase in number of school-aged children[(b)]	133	44	25

(a) Based on 2.6 persons per household (USCB 2010a).
(b) Based on the 2010 census data for the country, which shows that 20.4 percent of the population is between 5 and 19 years old (USCB 2010a).

Table 4-18. Building-Related Changes in Student/Teacher Ratio for School Districts in Monroe, Wayne, and Lucas Counties

	Existing Conditions			Conditions with In-migrating Workers and Families	
County	Total Countywide Number of Teachers	Total Countywide Student Enrollment	Student/ Teacher Ratio throughout County	Total Countywide Student Enrollment[(a)]	Student/ Teacher Ratio throughout County
Monroe	1254	23,283	18.6	23,554	18.8
Wayne	15,853	276,862	17.5	276,908	17.5
Lucas	3716	57,263	15.4	57,289	15.4

Source: U.S. Department of Education 2010

(a) Population served includes the 2008–2009 countywide school enrollment plus the projected number of school-aged children associated with in-migrating workers.

the children of the households associated with the relocated workers would be dispersed throughout numerous public schools in these school districts as well as in numerous private, parochial, charter, and alternative schools.

4.4.4.6 Summary of Infrastructure and Community Services Impacts

The review team has concluded from the information provided by Detroit Edison, interviews with staff from county departments, and its own independent evaluations that the impact of building activities on regional infrastructure and community services – including recreation, housing, water and wastewater facilities, police, fire, and medical facilities, and education – would be SMALL. The estimated peak workforce of 2900 would have a MODERATE, temporary adverse impact on traffic on local roadways near the Fermi site. These traffic-related impacts could be reduced but not eliminated with proper planning and mitigation measures similar to those discussed in the traffic study conducted for Detroit Edison by Mannik and Smith Group, Inc. (Mannik and Smith Group, Inc. 2009). These conclusions are predicated on the specific assumptions about the size, composition, and behavior of the project workforce discussed in detail in Section 4.4.2 of this EIS. Therefore, the projected increase in population associated with workers relocating to build Fermi 3 would mitigate the economic consequences of current population losses and have a beneficial impact on the two counties.

4.4.5 Summary of Socioeconomic Impacts

The review team has assessed the proposed building activities related to Fermi 3 and the potential socioeconomic impacts in the region and local area. Areas of physical impact on workers and the general public include noise levels, air quality, existing buildings, roads, and aesthetics. The review team has concluded that all physical impacts in the region and in the local area from building activities at Fermi 3 would be SMALL.

On the basis of information supplied by Detroit Edison and interviews conducted with public officials in Monroe, Wayne, and Lucas Counties, the review team concluded that impacts from building activities on the demographics of the entire 50-mi region would be beneficial and SMALL. Economic impacts would be beneficial and SMALL for all areas in the 50-mi region. Tax impacts would be SMALL and beneficial throughout the 50-mi region, except in Monroe County, where the review team determined there would be LARGE beneficial impacts on property taxes.

Infrastructure and community services impacts span issues associated with traffic, recreation, housing, public services, and education. Impacts from building activities on infrastructure and community services would be SMALL in all these areas except for traffic impacts during the peak employment period. Traffic-related impacts on local roadways near the Fermi site would be short-term, MODERATE, and adverse during the peak employment period, but manageable with the implementation of mitigation strategies similar to those discussed by Detroit Edison.

On the basis of the above analysis, and because NRC-authorized construction activities represent only a portion of the analyzed activities, the NRC staff concluded that the socioeconomic impacts of NRC-authorized construction activities would be SMALL, with two exceptions, which are outlined below. The NRC staff also concluded that no further mitigation measures beyond the actions outlined by the applicant in its ER would be warranted.

To determine the portion of the short-term MODERATE adverse traffic impact attributable to NRC-authorized construction activities, the NRC staff assumes, on the basis of Detroit Edison's ER, that 70 percent of traffic-related impacts over the life of the project would be associated with NRC-authorized construction activities. The NRC staff concluded that the applicant's percentage allocation of 70–30 based on expected labor hours was a reasonable estimate of the actual allocation. Using this allocation, the NRC staff concluded that the impact on traffic from Fermi 3 NRC-authorized construction activities would be short-term, MODERATE, and adverse and would largely occur during the peak building employment period. Detroit Edison may choose to implement the traffic-mitigation activities noted in Section 4.4.4.1, and it will implement the roadway improvements that are determined by MDOT and MCRC as a condition of Frenchtown Charter Township's site plan approval, which would reduce the traffic impacts to SMALL levels. The NRC staff concluded that the tax impact on Monroe County from NRC-authorized construction activities would be LARGE and beneficial.

4.5 Environmental Justice Impacts

In the context of the questions outlined in Section 2.6.1, the review team evaluated whether minority or low-income populations would experience disproportionately high and adverse human health or environmental effects from the building of Fermi 3. To perform this assessment, the review team (1) identified (through U.S. Census Bureau demographic data and

on-the-ground assessments) minority and low-income populations of interest, (2) identified all potentially significant pathways for human health, environmental, physical, and socioeconomic effects on those identified populations of interest; (3) determined the impact of each pathway for individuals who are within minority or low-income populations; and (4) determined whether or not the characteristics of the pathway or special circumstances of the minority or low-income populations would result in a disproportionately high and adverse impact.

4.5.1 Health Impacts

Section 4.9 of this EIS assesses the radiological doses to construction workers and concludes that the doses would be within NRC and EPA dose standards. Section 4.9 further concludes that radiological health impacts on the construction workers for proposed Fermi 3 would be SMALL. In addition, there would be no radioactive material on the construction site except for very small sources such as those commonly used by radiographers; therefore, there would be no radiation exposure to members of the public living near the construction site. Based on this information, the review team concludes there would be no disproportionately high and adverse impact on low-income or minority members of the construction workforce or the local population.

Section 4.8 of this EIS assesses the nonradiological health effects for construction workers and the local population from fugitive dust, noise, occupational injuries, and transport of materials and personnel. In Section 4.8, the review team concludes that nonradiological health impacts on construction workers and the local population would be SMALL. The review team's investigation and outreach did not identify any unique characteristics or practices among minority or low-income populations that might result in disproportionately high and adverse nonradiological health effects.

4.5.2 Physical and Environmental Impacts

For the physical and environment-related considerations described in Section 2.6.1, the review team determined through literature searches and consultations that (1) the impacts on the natural or physical environment would not significantly or adversely affect a particular group; (2) no minority or low-income population would experience an adverse impact that would appreciably exceed or be likely to appreciably exceed those on the general population; and (3) the environmental effects would not occur in groups affected by cumulative or multiple adverse exposure from environmental hazards. Sections 4.5.2.1 through 4.5.2.4 summarize the physical and environmental effects on the general population, and Section 4.5.2.5 assesses the potential for disproportionately high and adverse physical and environmental impacts on minority or low-income populations.

The review team determined that the physical and environmental impacts from onsite building activities at the Fermi 3 site would attenuate rapidly with distance, intervening foliage, and

terrain. There are four primary exposure media in the environment: soil, water, air, and noise. The following four subsections discuss each of these pathways in greater detail.

4.5.2.1 Soil

Building activities on the Fermi site represent the largest source of soil-related environmental impacts. The site is well-defined, and access is restricted. Soil-disturbing activities are localized on the site, sufficiently distant from surrounding populations, and have little ability to migrate, resulting in no noticeable offsite impacts. Soil migration will be minimized by adherence to regulations and permits and the use of BMPs.

4.5.2.2 Water

Water-related environmental impacts from erosion-related degradation of surface water and the introduction of anthropogenic substances into surface and groundwater would occur, but the impacts would be mitigated through adherence to permit requirements and BMPs. Increased water turbidity during dredging activities could affect near-shore water quality, but the effect would be minimized through adherence to permit requirements and BMPs. Consumptive use of surface water for building activities would also occur but would have only a minimal effect because the water supply is from Lake Erie. The water-related impacts of building activities associated with the proposed action would be of limited magnitude, localized, and temporary.

4.5.2.3 Air

Air emissions are expected from increased vehicle traffic, construction equipment, and fugitive dust from building activities. Emissions from vehicles and construction equipment would be unavoidable but would be temporary and minor in nature, and subject to management under State and Federal air regulations and permits. Furthermore, because of the distance between building activities and the closest minority or low-income population of interest, the review team did not identify any disproportionately high and adverse impacts from air-related pathways.

4.5.2.4 Noise

Noise would result from clearing; moving earth; preparing foundations; pile-driving; concrete mixing and pouring; erecting steel structures; and various stages of facility equipment fabrication, assembly, and installation. Detroit Edison, however, would employ standard noise control measures for construction equipment, limit the types of building activities during nighttime and weekend hours, notify all potentially affected neighbors of planned activities, and establish a construction-noise monitoring program. The review team determined that noise impacts on the public would be temporary and would not be significant; therefore the review team determined there would be no disproportionately high and adverse impact on any minority or low-income population from noise.

4.5.2.5 Summary of Physical and Environmental Impacts on Minority or Low-Income Populations

The review team's investigation and outreach did not identify any unique characteristics or practices among minority or low-income populations that might result in physical or environmental impacts on them that were different from those on the general population.

As discussed in Section 2.6, most of the census block groups classified as minority or low-income lie in urban centers to the north and south of the Fermi site, within and near Detroit (at the edge of the 50-mi region) and Toledo (about 25 mi from the Fermi site). The closest population of interest is a single census block group within Monroe County that qualifies as both a minority and a low-income population of interest. It is located approximately 5 mi from the Fermi site. This census block group would not be affected by any physical or environmental impact because the census block group is distant from the site. The review team did not identify any pathways by which any physical impacts would affect migrant farm workers if they were employed in transient farming activity near the Fermi site, and no subsistence activities are known to occur near the Fermi site.

On the basis of information provided by Detroit Edison and the review team's independent review, the review team found no pathways from soil, water, air, and noise that would lead to disproportionately high and adverse impacts on minority or low-income populations.

4.5.3 Socioeconomic Impacts

Socioeconomic impacts (discussed in Section 4.4) were reviewed to evaluate whether there would be any building activities that could have a disproportionately high and adverse effect on minority or low-income populations. Except for effects on traffic, any adverse socioeconomic impacts associated with the building of Fermi 3 are expected to be SMALL. While there likely would be adverse MODERATE impacts on traffic, these impacts are not expected to disproportionately affect low-income and minority populations.

4.5.4 Subsistence and Special Conditions

NRC's environmental justice methodology includes an assessment of minority or low-income populations of interest with unique circumstances, such as minority communities exceptionally dependent on subsistence resources or identifiable in compact locations, such as Native American settlements.

As discussed in Section 2.6.3, access to the Fermi site is restricted; such restricted access reduces any impact on plant-gathering, hunting, and fishing activities at the site. Detroit Edison and the review team interviewed community leaders in Monroe County with regard to subsistence practices, and no such practices were identified in the vicinity of the Fermi site.

There is no documented subsistence fishing in Lake Erie, Swan Creek, or Stony Creek, and no documented subsistence plant-gathering or hunting in the vicinity of the Fermi site. From the information provided by Detroit Edison, interviews with local planners and officials, and the review team's independent evaluation, the review team concluded that there would be no building-related disproportionately high and adverse impacts on subsistence activities by minority or low-income populations.

4.5.5 Summary of Environmental Justice Impacts

The review team evaluated the proposed activities related to building Fermi 3 and potential environmental justice impacts in the vicinity and region. The review team did not identify any potential environmental pathways by which the identified minority or low-income populations in the 50-mi region would be likely to experience disproportionately high and adverse human health, environmental, physical, or socioeconomic effects as a result of building activities; therefore, environmental justice impacts would be SMALL. On the basis of the above analysis, and because NRC-authorized construction activities represent only a portion of the analyzed activities, the NRC staff concludes that there are no environmental pathways by which the identified minority or low-income populations in the 50-mi region would be likely to experience disproportionately high or adverse environmental or health impacts as a result of the NRC-authorized construction activities. Environmental justice impacts would therefore be SMALL.

4.6 Historic and Cultural Resources

The NEPA requires Federal agencies to take into account the potential effects of their undertakings on the cultural environment, which includes archaeological sites, historic buildings, and traditional places important to local populations. The NHPA also requires Federal agencies to consider impacts on those resources if they are eligible for listing on the *National Register of Historic Places* (NRHP) (such resources are referred to as "Historic Properties" in the NHPA). As outlined in 36 CFR 800.8, "Coordination with the National Environmental Policy Act of 1969," the NRC coordinated compliance with Section 106 of the NHPA in meeting the requirements of the NEPA.

Building new nuclear units can affect either known or undiscovered cultural resources. Therefore, in accordance with the provisions of the NHPA and NEPA, the review team must make a reasonable and good faith effort to identify historic properties in the area of potential effects (APE) and, if any such properties are present, determine whether any significant impacts are likely to occur. Identification is to occur in consultation with the SHPO, American Indian Tribes, interested parties, and the public. If significant impacts are possible, efforts should be made to mitigate them. As part of the NEPA/NHPA integration, even if no historic properties (i.e., places eligible for listing on the NRHP) are present or affected, the NRC must notify the SHPO before proceeding with their respective authorized activities. If it is determined that

historic properties are present, the NRC and the USACE are required to assess and resolve adverse effects of their respective regulated activities for the undertaking.

4.6.1 Onsite Historic and Cultural Resources Impacts

Historic and cultural resources on the Fermi site are described in Section 2.7. As explained in Section 2.7, previous cultural resource identification efforts indicated the presence of eight archaeological site locations on the Fermi site (within the direct APE), none of which are recommended eligible for listing in the NRHP (Demeter et al. 2008; Taylor 2009). One architectural resource located on the Fermi site (within the direct APE), Fermi 1, has been recommended as eligible for listing in the NRHP under Criteria A and C as part of a separate undertaking (Kuranda et al. 2009). In its letter dated May 9, 2011 (which was received on May 10, 2011), the Michigan SHPO stated that Fermi 1 appears to meet the criteria for listing in the NRHP (Conway 2011).

The review team analyzed the construction and preconstruction activities related to building Fermi 3 and the potential cultural and historic resources impacts. Detroit Edison has not determined whether to remove the Fermi 1 external structure after the site is decommissioned and its NRC license is terminated. If the external structure is present when Fermi 3 building activities begin, then the NRC review team has determined that such activities would adversely affect Fermi 1. Thus, for the purposes of NHPA Section 106 consultation, based on (1) the measures that Detroit Edison would take to avoid or limit adverse impacts to significant cultural resources, (2) the review team's cultural resource analysis and consultation, and (3) Detroit Edison's commitment to follow its procedures should ground-disturbing activities discover cultural and historic resources, the NRC review team concludes with a finding of historic properties adversely affected (36 CFR Section 800.5(d)(2)) onsite and within the APE, based on the demolition of Fermi 1. The NRC review team consulted with the Michigan SHPO, Detroit Edison, and Monroe County Community College to develop an MOA (see Appendix F) to resolve the adverse effects on Fermi 1 pursuant to 36 CFR 800.6(c). Measures to mitigate adverse effects on Fermi 1 consist of preparation of recordation documentation for the Fermi 1 structure consistent with the Michigan SHPO's Documentation Guidelines and development of a public exhibit on the history of Fermi 1. These mitigation measures are described in greater detail in Section 2.7.4.

The review team also reviewed Detroit Edison's plan to develop procedures or guidance necessary to address the steps that Detroit Edison and its contractors will follow upon the unanticipated discovery of archaeological resources or human remains during construction and preconstruction activities. These procedures or guidelines will be in place prior to beginning ground-disturbing activities (e.g., preliminary site work, excavation, grading) for Fermi 3. The protective measures that will be reflected in these procedures and guidelines will consist of temporarily suspending activities in the area that may damage or alter any unanticipated cultural resources or human remains; securing the area to prevent additional disturbance of the

unanticipated discovery; and notification of Detroit Edison's Engineering, Procurement, and Construction (EPC) Executive or his/her representative so that the Michigan SHPO and the Office of the State Archaeologist can be notified and determine the significance of the unanticipated discovery and what, if any, special disposition of the finds should be made (Detroit Edison 2009c, 2010b).

For the purposes of the review team's NEPA analysis, based on information provided by Detroit Edison, the review team's independent evaluation, and the review team's consideration of the intrinsic attributes of Fermi 1 that contributed to its cultural significance, the review team concludes that the impacts from building Fermi 3 on onsite historic properties would be MODERATE if the Fermi 1 structure is present when Fermi 3 construction activities begin. The attributes that make Fermi 1 eligible for listing in the NRHP are National Register Criterion A, for Fermi 1's role in the development of the nuclear power industry, and Criterion C, for the engineering design of the reactor and its associated components. Because access to the Fermi 1 site is restricted, the public will have an increased opportunity to learn about and understand Fermi 1's attributes once mitigation measures, which will consist of recordation documents and a public exhibit, are implemented. Thus, impacts on Fermi 1 are considered MODERATE because of these mitigation measures, even though its non-accessible external structure will be removed.

The review team concludes that the potential MODERATE impacts on cultural resources (i.e., Fermi 1) would be the result of NRC-authorized construction activities. The cumulative impacts on historic and cultural resources are analyzed and discussed in Chapter 7 of this EIS.

4.6.2 Offsite Historic and Cultural Resources Impacts

Offsite historic and cultural resources information is provided in Section 2.7. As explained in Section 2.7, previous cultural resource identification efforts indicated the presence of two archaeological resources and 83 architectural resources offsite, but within the indirect APE for Fermi 3. Neither of the two archaeological resources has been evaluated for NRHP eligibility (Demeter et al. 2008). Of the architectural resources, 21 were determined or recommended eligible for the NRHP listing under Criteria A, B, and/or C, and the remaining 62 have been recommended not NRHP-eligible (Demeter et al. 2008). The Michigan SHPO has indicated concurrence with the identification of historic properties for the Fermi 3 project in its letter dated May 9, 2011 (Conway 2011).

The process of building Fermi 3 would result in new facilities that would visually affect historic and cultural resources that are offsite, but within the indirect APE for the Fermi 3 project, and would have the potential to result in alterations to the visual landscape within the indirect APE for the Fermi 3 project. These alterations would consist of the introduction of new power plant facilities, including buildings and structures, into the existing viewsheds and settings of the 21 determined or recommended NRHP-eligible architectural resources and the settings of the

two previously archaeological sites that have not been evaluated for NRHP eligibility. However, the existing viewsheds and settings of these 21 architectural resources and two archaeological sites include three existing power plant facilities along the shoreline of Lake Erie: the onsite decommissioned Fermi 1 facilities, the onsite operating Fermi 2 facilities, and the offsite operating Detroit Edison Monroe Power Plant to the south near the City of Monroe. As such, the indirect visual impacts that may result from building Fermi 3 would be consistent with existing landscape features in the viewsheds and settings of these 21 offsite architectural resources, such that there would be no new significant visual impacts that would affect the NRHP-eligibility determination or recommendations for the 21 offsite architectural resources that are within the indirect APE for the Fermi 3 project (Demeter et al. 2008). Similarly, there would be no new significant visual impacts on the two offsite archaeological resources that would affect NRHP-eligibility determinations or recommendations.

For the purposes of NHPA Section 106 consultation pursuant to 36 CFR 800.8, the NRC concludes with a finding of no adverse effect on offsite historic properties within the indirect APE, because, based on the characteristics of the existing offsite setting within the indirect APE, indirect visual impacts resulting from building Fermi 3 would be consistent with, and would not result in significant changes to, offsite historic properties within the indirect APE.

For the purposes of the review team's NEPA analysis, based on information provided by Detroit Edison, and the review team's independent evaluation, the review team concludes that the impacts from Fermi 3 construction and preconstruction activities on offsite cultural resources and/or historic properties within the indirect APE for the Fermi 3 project would be minor, because new facilities would be consistent with the landscape features within the existing setting of these offsite historic properties.

The portions of the proposed offsite transmission line route that are within the indirect APE for the Fermi 3 project will utilize an existing transmission line route, and will not result in new impacts on offsite historic or cultural resources within the Fermi 3 APE. The portion of the proposed offsite transmission line route that is located outside the Fermi 3 APE and extends north and west from the Fermi 3 project area to the Sumpter-Post Road junction in Wayne County will also utilize an existing transmission line route and will also result in no new impacts on offsite historic or cultural resources. The approximately 11-mi portion of the proposed offsite transmission line route from the Sumpter-Post Road junction in Wayne County to the Milan Substation in Washtenaw County will require a new transmission line route and may result in impacts on historic and/or cultural resources. The process of building new transmission lines may result in direct impacts on previously and as-yet-unidentified archaeological or architectural resources crossed by the proposed transmission lines or indirect visual impacts on as-yet-unidentified architectural resources in the vicinity of the new transmission lines. Cultural resource impacts would be evaluated during the siting process of transmission lines whose exact location is undetermined. Thus, the potential for direct and indirect or visual impacts

exists, and in the absence of more detailed information, these impacts cannot be evaluated with certainty.

Detroit Edison has indicated that construction and operation of the transmission lines will be the responsibility of ITC*Transmission*, an intrastate transmission company. As such, any further investigations to identify the presence of cultural and historic resources and to evaluate the NRHP-eligibility of such resources would be the responsibility of ITC*Transmission*, who would conduct such investigations in accordance with applicable regulatory and industry standards to assess impacts (Detroit Edison 2011a).

Based on the review team's NEPA analysis of cultural resources, building the offsite transmission lines has the potential to impact cultural resources. Impacts could be minor if there are no significant alterations to the cultural environment. If these activities result in significant alterations to the cultural environment, the impact could be greater.

According to 10 CFR 50.10(a)(2)(vii), transmission lines are not included in the definition of construction and are not an NRC-authorized activity. Therefore, the NRC considers the offsite proposed transmission lines to be outside the NRC's APE and therefore not part of the NRC's consultation.

Section 2.7.3 contains a description of known cultural resources in the transmission line corridors. Cultural resources impacts related to construction of the proposed transmission lines are also discussed in Sections 10.2.1 and 10.4.1.5. Operational impacts of the proposed transmission lines on cultural resources are discussed in Section 5.6 and 10.2.2, and cumulative transmission line cultural resource impacts are discussed in Section 7.5.

4.7 Meteorological and Air Quality Impacts

Section 2.9 describes the meteorological characteristics and air quality of the Fermi site. The primary impacts that building Fermi 3 would have on local air quality would result from fugitive dust produced by soil disturbance, engine exhaust emissions from heavy construction equipment and machinery, concrete batch plant operations, and emissions from vehicles used to transport workers and materials to and from the site. Open burning of wastes is prohibited by the MDEQ (Detroit Edison 2011a).

4.7.1 Preconstruction and Construction Activities

Building the proposed Fermi 3 would result in temporary impacts on local air quality as a result of emissions associated with construction and preconstruction activities. Equipment and vehicle emissions from these activities would contain carbon monoxide, oxides of nitrogen, and volatile organic compounds (VOCs). As with any large-scale construction project, dust particle emissions would also be generated during land-clearing, grading, and excavation activities.

Fugitive dust particles would be generated by recently disturbed or cleared areas during windy periods and by the movement of machinery and materials over these areas. In general, emissions from these activities would vary based on the level and duration of each specific activity and site-specific factors such as local meteorology and soil conditions. The overall impact from fugitive dust is expected to be temporary and limited in magnitude, because the site is relatively flat and limited amounts of earthmoving will be required.

In the ER, Detroit Edison (Detroit Edison 2011a) concluded that, in view of the relatively isolated nature of the Fermi 3 construction area, the net impact of construction and preconstruction on air quality would be small and no mitigation measures beyond those required for dust under the Permit to Install would be warranted. Detroit Edison has not yet applied to the MDEQ for a Permit to Install, which will be needed prior to beginning preconstruction and construction activities at the proposed Fermi 3 site. The detailed data needed to support such a permit application remains to be developed, and modeling and emissions estimates were not presented in the ER.

Monroe County is in an area that has been designated a nonattainment area for $PM_{2.5}$ NAAQS and a maintenance area for 8-hr ozone (EPA 2010a). 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 2011a). In July 2012, the EPA issued a proposed rule designating southeastern Michigan as having attained both the 1997 annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS, based on 2009–2011 ambient air monitoring data (77 FR 39659, dated July 5, 2012), but the final determination has yet to be made. If this proposal is eventually approved, Monroe County would then become a maintenance area for $PM_{2.5}$. In either case, the direct and indirect emissions of air pollutants associated with NRC's proposed Federal action to issue a COL for construction and operation of a new nuclear power plant at the Fermi 3 site, and the USACE-proposed Federal action to issue a permit to perform certain regulated activities at the Fermi 3 site would be subject to conformity evaluations. These conformity evaluations must show that the Federal actions would not affect the ability of southeast Michigan to meet and maintain $PM_{2.5}$ and ozone NAAQS.

Detroit Edison (2012b) provided emission estimates related to building Fermi 3 to assist the NRC in developing its conformity applicability analysis regarding whether a general conformity determination would be required under 40 CFR Part 93, Subpart B. This regulation requires a conformity determination for Federal actions in nonattainment and maintenance areas if the action results in emissions exceeding specified *de minimis* levels. Detroit Edison provided estimates for direct and precursor emissions of $PM_{2.5}$ and ozone ($PM_{2.5}$, nitrogen oxides [NO_x], VOCs, and sulfur dioxide [SO_2]). Particulate matter emissions with an aerodynamic diameter of 10 microns or less (PM_{10}) were not estimated.

As part of its emission estimates related to building Fermi 3, Detroit Edison included a list of building activities, the preliminary building schedule, and an estimate of equipment use

by year (Detroit Edison 2012b).[(a)] It was assumed that building activities would begin in April 2011 and last for 62 months (18 months of site preparation activities followed by 44 months of site erection activities) up to May 2016. From this list, Detroit Edison estimated building-related emissions from 2011 to 2016. The review team examined the building activity and equipment usage estimates and performed an independent assessment of the building-related emissions using current EPA emissions factors and models. The first year of building-related activities (2011) is expected to result in the highest emissions of NO_x and VOCs, while the third year of building-related activities (2013) is expected to result in the highest emissions of $PM_{2.5}$ and SO_2.

Table 4-19 presents the highest annual emissions estimates for combined preconstruction and construction (NRC-authorized) activities during the 62-month building schedule. Peak emissions from the activities associated with building Fermi 3 would be up to about 1.1 percent (for $PM_{2.5}$) of total emissions in Monroe County and up to 0.2 percent (for $PM_{2.5}$) of total emissions in all neighboring counties that are currently designated as $PM_{2.5}$ nonattainment or ozone maintenance areas (EPA 2010b). Given these relatively small and temporary emissions, impacts are expected to be minor. Notwithstanding these small emissions, the NRC and the USACE will each perform a Clean Air Act Section 176 air conformity applicability analysis pursuant to 40 CFR Part 93, Subpart B, to determine whether additional mitigation may be warranted.

Specific mitigation measures to control fugitive dust would be identified in a dust-control plan or a similar document prepared prior to starting the project in accordance with all applicable State and Federal permits and regulations. As stipulated in MDEQ Rule 336.1372, Detroit Edison states the mitigation measures for transporting of bulk materials, roads and lots, and general construction activities (Detroit Edison 2011a). Some of these mitigation measures would include the following:

- Using practices for dust control that are consistent with State requirements;
- Spraying all work areas with water or other dust suppressants approved by the MDEQ;
- Reseeding laydown and other areas as they are no longer needed; and
- Installing a dust-control system on the concrete batch plant that will be checked and maintained regularly.

(a) The schedules presented in this section are those that Detroit Edison originally assumed in its ER Revision 2 (Detroit Edison 2011a). However, as of June 2012, no building-related activities related to development of Fermi 3 or associated facilities have occurred on the Fermi site, and a schedule for preconstruction and construction activities is not known at this time. Depending on the actual schedule, peak emission rates might vary.

Table 4-19. Estimated Maximum Annual Emissions of $PM_{2.5}$, NO_x, VOCs, SO_2, and CO_2 Associated with Preconstruction and Construction of Fermi 3[a, b]

	Annual Emissions (tons)				
Source Category	**$PM_{2.5}$**	**NO_x**	**VOCs**	**SO_2**	**CO_2**
Mobile equipment[c]	4.5	123.2	53.4	0.4	26,231
Fugitive dust[d]	66.0	NA[e]	NA	NA	NA
Total	**70.5**	**123.2**	**53.4**	**0.4**	**26,231**

Source: Detroit Edison 2012b

(a) The peak year is 2011 for NO_x and VOCs, while the peak year is 2013 for $PM_{2.5}$, SO_2, and carbon dioxide (CO_2).

(b) Notation for air pollutants: CO_2 = carbon dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

(c) Includes emissions from on-road vehicles, worker vehicles, nonroad engines, marine engines, and locomotive engines. It is assumed that construction workers would travel through the nonattainment/maintenance area to and from the Fermi site with a roundtrip distance of 57.2 mi.

(d) Includes emissions from material transfer, bulldozing, grading, blasting, cement production, wind erosion from active piles and the construction area, paved roads, and unpaved roads.

(e) NA = Not applicable.

Preconstruction and construction activities including on-road construction vehicles, worker vehicles, off-road construction equipment, marine engines, and locomotive engines will result in emissions of greenhouse gases (GHGs), primarily carbon dioxide (CO_2). As a site-specific estimate, during the 6-year building period, the highest CO_2 emissions of 26,231 tons/yr (23,796 metric tons/yr) are estimated in the third year, 2013 (Detroit Edison 2012b). This amounts to about 0.009 percent of the total projected GHG emissions in Michigan at 253,800,000 metric tons (MT) of gross[a] CO_2 equivalent (CO_2e)[b] in 2010 (CCS 2008). This also equates to about 0.0004 percent of total CO_2 emissions in the United States at about 5.5 billion MT in 2009 (EPA 2011).

Another estimate of the relative size of the Fermi 3 building emissions can be made based on the information in Appendix L, which provides the review team's estimate of emissions for a generic 1000 MW(e) nuclear power plant. If conservatively assuming that building emissions are proportional to design electric output, the scaled building equipment and workforce emissions for Fermi 3 equate to about 313,000 tons (284,000 MT) over 7 years, which is an

(a) Excluding GHG emissions removed due to forestry and other land uses and excluding GHG emissions associated with exported electricity.

(b) A measure to compare the emissions from various GHGs on the basis of their global warming potential (GWP), defined as the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specific time period.

average of about 45,000 tons/yr (41,000 MT/yr). This also amounts to a small percentage of projected GHG emissions for Michigan and the United States.

As noted in Section 4.7.2, the site-specific estimate shows transportation accounts for about 50 percent of building CO_2 emissions, and there are measures that could be implemented to reduce traffic emissions. Detroit Edison has committed to developing and implementing a traffic management plan and controlling vehicle emissions through regularly scheduled maintenance. Implementing such measures could reduce the percentages of the projected Michigan and U.S. GHG emissions constituted by emissions related to building Fermi 3.

Based on these two analyses, the review team concludes that the potential impacts of GHG emissions from construction and preconstruction activities would not be noticeable, and thus, additional mitigation measures would not be warranted.

In general, emissions from construction and preconstruction activities (including GHG emissions) would vary based on the level and duration of a specific activity, but the overall impact is expected to be temporary and limited in magnitude. Considering the information provided by Detroit Edison and its commitments to implement a fugitive dust control program in accordance with MDEQ regulations and control vehicle emissions through regularly scheduled maintenance, the review team concludes that the impacts from Fermi 3 construction and preconstruction activities on air quality would not be noticeable because appropriate mitigation measures would be adopted. Additional mitigation may be warranted, depending on the outcome of conformity applicability analyses being performed by the NRC and USACE pursuant to the Clean Air Act Section 176 (42 USC Section 7506) and 40 CFR Part 93, Subpart B.

4.7.2 Transportation

The construction workforce at Fermi 3 will vary significantly over the building period. In the ER, Detroit Edison estimated that the maximum construction workforce would be about 2900 (Detroit Edison 2011a). Combined with the workers and deliveries for the existing Fermi 2 and maintenance workers for Fermi 2 refueling, the total onsite workforce could temporarily reach a maximum of more than 5000 workers. With up to 5000 workers commuting to and from the Fermi site at the time of peak Fermi 3 building activity, there is the potential for large traffic impacts around the major access roads to the site and along Enrico Fermi Drive, the main plant entrance road (see Section 4.4.4.1 of this EIS).

The primary access roads to the Fermi site could experience a significant increase in traffic during shift changes that could lead to periods of congestion. Stopped vehicles with idling engines would lead to increased emissions beyond what would occur from normal vehicle operation alone. However, the overall impact caused by increased traffic volume and congestion is difficult to estimate because exact worker residence locations, the time of

building activities and shift changes, and local weather conditions (such as wind speed and direction, atmospheric stability, and ambient temperature) are largely unknown.

As discussed in Section 4.4.4.1 of this EIS, potential transportation-related impacts could be mitigated by implementing improvements, including signal installations and signal modifications; staggering worker shifts for operating staff, outage workers, and construction workers; busing and carpooling employees from off site; and minor lane additions and/or a second entrance to the site.

Emissions related to transportation are also included in Table 4-19, but are not presented separately from other building-related emissions. During the peak year for transportation emissions, annual transportation emissions would be about 18.5 tons per year for NO_x. This emission estimate corresponds to about 19 percent of total building emissions for that year. Annual emissions for $PM_{2.5}$ and SO_2 would be far less than 1 ton per year, while those for VOCs range from 1.3 to 27.3 tons per year. Emissions from the increase in vehicular traffic associated with construction and preconstruction activities would be temporary in nature.

Fermi 3 construction workforce transportation would also result in GHG emissions, principally CO_2. During the peak year for transportation emissions, annual CO_2 emissions from transportation would be about 13,384 tons (12,142 MT) CO_2, which corresponds to about 50 percent of total building emissions. The building workforce for the generic 1000 MW(e) reference plant in Appendix L would produce on average about 23,620 tons per year (21,430 MT per year) of CO_2. Both of these estimates are small fractions of the total projected GHG emissions in Michigan at 253,800,000 MT CO_2e in 2010 (CCS 2008) and of total CO_2 emissions in the United States at 5.5 billion MT CO_2 in 2009 (EPA 2011).

Based on Detroit Edison's commitment to developing and implementing a traffic management plan and control construction vehicle emissions through regulatory scheduled maintenance, information provided by Detroit Edison, and the review team's independent evaluation, the review team concludes that potential transportation impacts of construction and preconstruction activities on ambient air quality would be temporary and would not be noticeable because appropriate mitigation measures would be adopted. Based on its assessment of the relatively small construction workforce carbon footprint as compared to the Michigan and U.S. annual GHG emissions, the review team concluded that the atmospheric impacts of GHG from construction workforce transportation would not be noticeable and additional mitigation would not be warranted.

4.7.3 Summary of Meteorological and Air Quality Impacts

The review team evaluated potential impacts on air quality associated with criteria pollutants and greenhouse gas emissions during Fermi 3 site preconstruction and construction activities. The review team concludes that the impacts of Fermi 3 site development on air quality from

emissions of criteria pollutants and CO_2 emissions are SMALL. Because NRC-authorized construction activities represent only a portion of the analyzed activities, the NRC staff concludes that the air quality impacts of NRC-authorized construction activities would also be SMALL. Nonetheless, some mitigation measures beyond those the applicant has committed to implement may be warranted, depending on the outcome of conformity applicability analyses being performed by the NRC and USACE pursuant to the Clean Air Act Section 176 (42 USC Section 7506) and 40 CFR Part 93, Subpart B.

4.8 Nonradiological Health Impacts

Nonradiological health impacts on the public and workers from preconstruction and construction activities include exposure to dust and vehicle exhaust, occupational injuries, and noise, as well as the transport of materials and personnel to and from the site. Detroit Edison discussed these impacts qualitatively in Sections 4.4.1, 4.4.2, and 4.7.6 of the ER (Detroit Edison 2011a) and determined that for Fermi 3, these health impacts would be small.

The area around the Fermi site is predominantly rural, with a population of approximately 89,198 people within 10 mi of the site (Detroit Edison 2011a). This area is mostly used for agricultural production (Detroit Edison 2011a). The western basin of Lake Erie is adjacent to the Fermi site on the east (Detroit Edison 2011a). People who would be vulnerable to nonradiological health impacts from preconstruction and construction activities include construction workers and personnel working at the proposed Fermi 3 site; people working or living in the vicinity or adjacent to the site; and transient populations in the vicinity (e.g., temporary employees, recreational visitors, tourists).

The nonradiological impacts on health are described in the following sections: impacts on public and occupational health (Section 4.8.1), impacts of noise (Section 4.8.2), and impacts of transporting construction materials and personnel to and from the proposed site (Section 4.8.3). A summary of nonradiological health impacts is provided in Section 4.8.4.

4.8.1 Public and Occupational Health

This section includes a discussion of the impacts of site preparation and construction on public health and worker health.

4.8.1.1 Public Health

The physical impacts on the public from the building of Fermi 3 would include air pollution from dust and vehicle exhaust during site preparation (Detroit Edison 2011a). Detroit Edison stated that operational controls would be imposed to mitigate dust emissions to meet State requirements. Methods employed could include putting a dust-control system on the concrete batch plant, stabilizing construction roads and spoils piles, periodically spraying work areas with

water or dust-suppressant compound, and revegetating unneeded disturbed areas (Detroit Edison 2011a).

Engine exhaust would be minimized by maintaining equipment in good mechanical order. Detroit Edison stated that open burning or the operation of vehicles and other combustion-engine equipment will comply with applicable standards, regulations, and requirements (Detroit Edison 2011a). The exhausts from the vehicles and operation of machinery during construction would comply with the Clean Air Act and the National Emission Standards for Hazardous Air Pollutants (NESHAP). Detroit Edison would obtain all necessary air quality permits from the MDEQ.

Preconstruction and construction activities would occur away from the public. The nearest accessible public area is approximately 0.48 mi from the Fermi 3 construction site (Detroit Edison 2011a), and the nearest residence is approximately 0.60 mi from preconstruction and construction areas (Detroit Edison 2011a). On the basis of the dust suppression and vehicle exhaust mitigation measures discussed above and the general public's distance from the Fermi site, the staff concludes that the nonradiological health impacts on the public from construction activities would be minimal. As discussed in Section 4.7, additional mitigation may be warranted, depending on the outcome of conformity applicability analyses being performed by the NRC and USACE pursuant to the Clean Air Act Section 176 (42 USC 7506) and 40 CFR Part 93, Subpart B.

4.8.1.2 Construction Worker Health

In general, human health risks to construction workers and other personnel working onsite are dominated by occupational injuries (e.g., falls, electrocution, asphyxiation, burns). Prior to the start of preconstruction and construction activities, Detroit Edison proposes to develop and implement a safety plan that adheres to all OSHA safety and health regulations for construction (Detroit Edison 2011a).

In addition to onsite preconstruction and construction activities, three new transmission lines and a separate switchyard would be needed for Fermi 3 (Detroit Edison 2011a). Most of the transmission lines would be built within or adjacent to existing transmission line corridors, but 10.8 mi of the proposed line would be built within a new ROW (Section 2.4.2.9). The transmission system in southeastern Michigan is owned and operated by ITC*Transmission*. The transmission lines and associated switchyards would be built in accordance with the National Electrical Safety Code and applicable construction standards and codes (Detroit Edison 2011a).

National nonfatal injury and illness recordable rate in 2009 for construction workers, including specialty trade contractors, averaged 4.3 percent (USBLS 2010a). The recordable rate for construction workers in Michigan was 3.2 percent (USBLS 2010b). The recordable rate takes

into account occupational injuries and illnesses as total recordable cases, which includes the cases that result in death, loss of consciousness, days away from work, restricted work activity or job transfer, or medical treatment beyond first aid. The average and maximum onsite preconstruction and construction workforce for Fermi 3 during the 8-year construction period would be 1000 and 2900 workers, respectively (Detroit Edison 2011a).

The estimated yearly average and maximum occupational injuries and illnesses associated with construction activities based on the National recordable rate would be 43 and 125, respectively. When interpreting these results, it is especially important to recall that they are gross (total) injury estimates. If the workers are not employed building Fermi 3, they would be doing other work or would be unemployed. As noted above, the injury rate for construction activities in Michigan was even lower. Thus, the estimates developed above are conservative worst-case estimates of the net impact of Fermi 3 construction activities on workplace injuries.

Other nonradiological impacts on workers who would be clearing land or building the facility would include noise, fugitive dust, and gaseous emissions resulting from site preparation and development activities. Mitigation measures discussed in this section for the public, such as operational controls and practices, would also help limit impacts on workers. Onsite impacts on workers also would be mitigated through training and use of personal protective equipment to minimize the risk of potentially harmful exposure. First-aid stations would be available in the Fermi 3 construction area (Detroit Edison 2011a). The NRC staff assumes that Detroit Edison would adhere to all applicable NRC, OSHA, and State safety standards, practices, and procedures during building activities.

4.8.1.3 Summary of Public and Construction Worker Health Impacts

On the basis of mitigation measures identified by Detroit Edison in its ER, permits and authorizations required by State and local agencies, and the review team's independent review, the review team concludes that the nonradiological health impacts on the public and workers from preconstruction and construction activities would be minimal, and additional mitigation beyond the actions stated above would not be warranted.

4.8.2 Noise Impacts

Development of a nuclear power plant is similar to that of other large industrial projects and involves many noise-generating activities. Regulations governing noise from construction activities are generally limited to worker health. Federal regulations governing construction noise are found in 29 CFR Part 1910 and 40 CFR Part 204. The regulations in 29 CFR Part 1910 deal with noise exposure in the construction environment, and the regulations in 40 CFR Part 204 generally govern the noise levels of compressors. The Fermi site is located in unincorporated Frenchtown Township in Monroe County. Currently, there are no county or State noise regulations for Monroe County or Michigan (Detroit Edison 2011a). The only local

noise regulation applicable to the Fermi site is Frenchtown Charter Township Noise Ordinance No. 184, which generally prohibits construction noise "unreasonably annoying to other persons, other than between the hours of 7:00 a.m. and 7:00 p.m." No violations of this ordinance are expected because of the distance from the construction site to the nearest residence and the anticipation that good noise control practices (including limiting the noisiest construction activities to daytime hours) will be used.

In general, noise emissions vary with each phase of construction, depending on the level of activity, the mix of construction equipment for each phase, and site-specific conditions. Noise propagation to receptors is affected by several important factors, including source-receptor configuration, land cover, meteorological conditions (temperature, relative humidity, and vertical wind and temperature profiles), and screening (such as topography, and natural or man-made barriers). In the ER (Detroit Edison 2011a), Detroit Edison indicated that typical construction equipment, such as dump trucks, loaders, bulldozers, graders, scrapers, air compressors, and mobile cranes would be used, and that pile driving and blasting activities would take place, during the building of Fermi 3. This construction equipment would have average noise levels ranging from 67 dBA for a concrete vibrator to 89 dBA for a pile driver at a distance of 50 ft (Table 4-20).

As shown in Figure 4-7, the nearest sensitive receptor (residence) is about 1900 ft north-northeast of the construction area for the proposed Fermi 3 switchyard, which will be located near the main security gate, and more than 3200 ft northwest and north-northwest, respectively, of the proposed reactor building and natural draft cooling tower (NDCT). Under the conservative assumption that all construction equipment operates simultaneously and if only geometric spreading of noise is considered, the ER (Detroit Edison 2011a) indicates that the noise level at 1000 ft from the power block construction area would be less than 64 dBA without pile driving and 67 dBA with pile driving, as indicated in Table 4-20. For building activities at the reactor building or NDCT, noise levels at the nearest residence would be about 54 dBA without pile-driving and 57 dBA with pile-driving, based on the Detroit Edison's estimate. For switchyard construction, it was conservatively assumed that four noisiest pieces of equipment (other than the pile-driver) would be operating simultaneously. The switchyard construction noise level at the nearest residence would be about 57 dBA. These estimates probably overestimate actual sound levels, in that all construction equipment is unlikely to operate simultaneously at the same location. For comparison, Tipler (1991) lists the sound level of a quiet office as 50 dBA, normal conversation (at 1 m) as 60 dBA, busy traffic as 70 dBA, a noisy office with machines or an average factory as 80 dBA, and construction noise (at 3 m) as 110 dBA. Tipler (1991) lists hearing and pain thresholds as 0 dBA and 120 dBA, respectively.

For a work schedule of 24 hr per day, noise levels from reactor and NDCT building activities at the nearest residence, which is more than 3200 ft from these areas, would be about 61 dBA

Table 4-20. Estimated Overall Average and Maximum Construction Equipment Noise Levels

Equipment	L_{eq} at 50 ft (dBA)[a, b]	L_{eq} at 1000 ft (dBA)[c]	L_{eq} at Nearest Receptor from Switchyard (1900 ft) (dBA)[c, d]	L_{eq} at Nearest Receptor from Power Block (3200 ft) (dBA)[c, e]
Backhoe[d]	80	54	48	44
Grader[d]	82	56	50	46
Dozer[d]	83	57	51	47
Front End Loader[d]	83	57	51	47
Compactor	80	54		44
Trencher	74	48		38
Pile-Driver	89	63		53
Large Truck	77	51		41
Concrete Vibrator	67	41		31
Concrete Saw	68	42		32
Mobile Crane	70	44		34
Stationary Crane	68	42		32
Diesel Generator	79	53		43
Air Compressor	76	50		40
Welder	68	42		32
Grinder	75	49		39
Forklift	76	50		40
Manlift	76	50		40
Overall Average Noise Level[f]	**90**	**64**	**57 (63, 66)[g]**	**54 (61, 64)[g]**
Maximum Noise Level [h]	**93**	**67**	**57 (63, 66)[i]**	**57 (63, 66)[g]**

Source: Adapted from Detroit Edison 2011a

(a) Energy average sound pressure level at 50 ft horizontal distance from the equipment for work shift of 7–10 hr.
(b) Based on information provided in Barnes et al. (1977) and information available from previous similar projects.
(c) Noise levels calculated with the conservative assumption that geometric spreading is the only noise attenuation factor.
(d) Noise level at the nearest residence from the switchyard under the conservative assumption that the four noisiest pieces of equipment (other than the pile driver) would be operating simultaneously for construction of a proposed Fermi 3 switchyard.
(e) Noise level at the nearest residence from the power block area.
(f) Assuming only geometric spreading of noise and simultaneous operation of all construction equipment except pile driver.
(g) First and second values in the parenthesis are day-night average noise levels (L_{dn}) from construction only and construction combined with background level of 62 dBA L_{dn}, respectively.
(h) Assumptions in footnote (f) plus pile-driving noise (pile drivers would not be used during building of switchyard).
(i) Maximum noise level at the nearest receptor for the switchyard is the same as the overall average noise level because no pile-driving is needed for building activities at the switchyard.

Figure 4-7. Major Noise Sources and Nearby Sensitive Receptors during Building of Fermi 3

day-night average (L_{dn}) without pile-driving and 63 dBA L_{dn} with pile-driving (L_{dn} is defined in more detail in Section 2.10.2). Considering a background level of 62 dBA L_{dn} at the nearest residence, the calculated combined, or total (including background), noise level from either of these activities would be 64 dBA L_{dn} without pile-driving, and 66 dBA L_{dn} with pile-driving. For switchyard building activities, the background noise level at the nearest residence, which is about 1900 ft from this area, would be about 63 dBA L_{dn} and the combined noise level would be about 66 dBA L_{dn}.

Preconstruction and construction activities would be expected to occur 24 hr per day, 7 days per week during the peak construction period. However, as mentioned previously, simultaneous operation of all construction equipment is highly unlikely. Moreover, noisier activities, such as pile-driving, are anticipated to be limited to daytime hours to minimize potential noise impacts. In addition, if other noise attenuation mechanisms, such as ground effects or atmospheric absorption, are considered, noise levels from building Fermi 3 would be lower than the aforementioned values.

Detroit Edison has stated that it will comply with NRC and EPA guidance for implementing the Noise Control Act of 1972, together with subsequent amendments (Quiet Communities Act of 1978). In addition, the ER (Detroit Edison 2011a) lists various standard noise control measures and administrative measures that could be undertaken to reduce potential adverse effects of noise, including the following:

- Using silencers on construction equipment exhausts;
- Limiting the types of construction activities during nighttime or weekend hours;
- Notifying all affected neighborhoods of planned activities; and
- Establishing a construction noise monitoring program.

NUREG-1437 (NRC 1996) states that noise levels below 60 to 65 dBA L_{dn} are considered to be of small significance. More recently, the impacts of noise were considered in NUREG-0586, Supplement 1 (NRC 2002). The criterion for assessing the level of significance was not expressed in terms of sound levels but based on the effect of noise on human activities. The criterion in NUREG-0586, Supplement 1, is stated as follows:

> The noise impacts…are considered detectable if sound levels are sufficiently high to disrupt normal human activities on a regular basis. The noise impacts…are considered destabilizing if sound levels are sufficiently high that the affected area is essentially unsuitable for normal human activities, or if the behavior or breeding of a threatened and endangered species is affected.

In addition to the above activities, blasting may also occur during construction. Blasts would be designed and coordinated by a qualified blasting professional and vibration control specialist to ensure protection of adjacent structures (Detroit Edison 2012f). Controlled blasting techniques including cushion blasting, pre-splitting, and line drilling may be used. Blasting techniques are designed and controlled to prevent damage to structures, equipment, and freshly poured concrete (Detroit Edison 2011a). These controls also attenuate blasting noise. Distances to offsite buildings make additional mitigation unnecessary (Detroit Edison 2011a). However, given the impulsive nature of blasting noise, it is critical that blasting activities be avoided at night and on weekends and that affected neighborhoods be notified in advance of scheduled blasts.

Based on the temporary nature of peak construction and preconstruction activities, the distance to the nearest residence from the locations where construction and preconstruction activities would take place, the location and characteristics (i.e., ground cover) of the Fermi site, and good noise control practices, the review team concludes that the potential noise impacts of construction and preconstruction activities would be small, and no further mitigation measures would be warranted. However, should noise thresholds be exceeded for the listed receptors or the Frenchtown Charter Township Noise Ordinance be violated, the applicant would develop and implement an adaptive management plan to minimize potential noise impacts at nearby receptors.

4.8.3 Transporting Building Materials and Personnel to the Fermi 3 Site

This EIS assesses the impact of transporting workers and materials to and from the Fermi site from three perspectives: socioeconomic impacts, air quality impacts resulting from the dust and particulate matter emitted by vehicle traffic, and potential health impacts caused by additional traffic-related accidents. The socioeconomic impacts are addressed in Sections 4.4.1.5 and 4.4.4.1. The air quality impacts are addressed in Section 4.7, and human health impacts are addressed here and in Section 4.9. The general approach used to calculate nonradiological impacts of fuel and waste shipments is the same as that used to calculate impacts from transportation of construction materials and construction personnel to and from the Fermi 3 site. However, the only data available to estimate the demand for these transportation services were preliminary estimates. The assumptions that were made to determine reasonable estimates of the data needed to calculate nonradiological impacts are discussed below.

Building material requirements are based on information taken from the ER (Detroit Edison 2011a). The Detroit Edison ER estimates that building a new 1605-MW(e) reactor requires up to 460,000 yd^3 of concrete and 71,000 tons of structural steel and rebar, in addition to 6.8 million ft of power cable and control wire and up to 260,000 ft of piping that is more than 2.5 in. in diameter.

- The review team assumed that shipment capacities are about 13 yd^3 of concrete, 11 tons of structural steel, and 3300 ft of piping and cable per shipment. It was assumed that these materials would be transported to the site in a levelized manner over an 8-year period on the basis of the construction schedule given in the ER (Detroit Edison 2011a).
- Detroit Edison estimated that the number of workers would peak at 2900, with a daily average of approximately 1000 onsite workers over the 8-year construction period (Detroit Edison 2011a). With approximately 10 percent of the workforce expected to carpool (Detroit Edison 2011a), there would be about 950 vehicle roundtrips per day if, of those who carpooled, two persons shared a ride. It was assumed that each person would travel to and from the Fermi 3 site 250 days per year.
- On the basis of the approximate one-way shipping distance from Detroit, Michigan, the review team assumed that the average shipping distance for building materials would be 40 mi one way. The team assumed that the average commute distance for workers would be 37 mi one way (Detroit Edison 2011a).
- Accident, injury, and fatality rates for building materials were taken from Table 4 in ANL/ESD/TM-150, *State-Level Accident Rates for Surface Freight Transportation: A Reexamination* (Saricks and Tompkins 1999). Rates for the State of Michigan were used for construction material shipments, typically conducted in heavy-combination trucks. The data in Saricks and Tompkins (1999) are representative of heavy-truck accident rates and do not specifically address the impacts associated with commuter traffic (i.e., workers traveling to and from the site). For commuter traffic, accident, injury, and fatality rates were estimated by using data provided by the Michigan Department of State Police (MDSP 2005, 2006, 2007, 2008, 2009). A 5-year average for each rate was estimated by using data for Lenawee, Monroe, Washtenaw, and Wayne Counties.
- The U.S. Department of Transportation (DOT) Federal Motor Carrier Safety Administration evaluated the data underlying the Saricks and Tompkins (1999) rates, which had been taken from the Motor Carrier Management Information System. It determined that the rates were underreported. Therefore, the accident, injury, and fatality rates in Saricks and Tompkins (1999) were adjusted by using factors derived from data provided by the University of Michigan Transportation Research Institute (UMTRI 2003). The UMTRI data indicate that accident rates for 1994 to 1996 – the same data used by Saricks and Tompkins (1999) – were underreported by about 39 percent. Injury rates were underreported by 16 percent, fatality rates by 36 percent. As a result, the accident, injury, and fatality rates were increased by factors of 1.64, 1.20, and 1.57, respectively, to account for the underreporting. These adjustments were applied to the materials that are transported by heavy truck shipments, similar to those evaluated by Saricks and Tompkins (1999), but not to commuter traffic accidents.

The estimated nonradiological impacts of transporting materials to the proposed Fermi 3 site and of transporting workers to and from the site are shown in Table 4-21. The nonradiological impacts are dominated by transport of workers to and from the proposed Fermi site. The total annual construction fatalities represent an increase of about 0.8 percent above the average of 23 traffic fatalities per year that occurred in Monroe County from 2004 to 2008 (MDSP 2005, 2006, 2007, 2008, 2009). This represents a small increase relative to the current traffic fatality risks in the area surrounding the proposed Fermi 3 site.

Table 4-21. Impacts of Transporting Workers and Construction Materials to and from the Fermi 3 Site

Items Transported	Accidents per Year	Injuries per Year	Fatalities per Year
Workers	5.2×10^{1}	1.5×10^{1}	1.6×10^{-1}
Materials			
Concrete	2.0×10^{-1}	1.5×10^{-1}	9.6×10^{-3}
Structural steel/rebar	3.7×10^{-2}	2.7×10^{-2}	1.8×10^{-3}
Cable	1.2×10^{-2}	8.8×10^{-3}	5.6×10^{-4}
Piping	4.5×10^{-4}	3.4×10^{-4}	2.2×10^{-5}
Total	**5.2×10^{1}**	**1.5×10^{1}**	**1.8×10^{-1}**

On the basis of information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the transportation impacts of preconstruction and construction activities would be minimal and that no further mitigation is warranted. On the basis of the above analysis, and because NRC-authorized construction activities represent only a portion of the analyzed activities, the NRC staff concludes that the impacts of NRC-authorized construction activities would be minimal. The NRC staff also concludes that no further mitigation measures would be warranted.

4.8.4 Summary of Nonradiological Health Impacts

The review team evaluated the mitigation measures identified by Detroit Edison in its ER, relevant permits and authorizations required by State and local agencies, and permits and authorizations required by local agencies to build the proposed Fermi 3. The review team also evaluated impacts on public health and on construction workers from fugitive dust, occupational injuries, noise, and the transport of materials and personnel. No significant impacts related to the nonradiological health of staff or personnel were identified during the course of this review.

On the basis of information provided by Detroit Edison in its ER (Detroit Edison 2011a) and the review team's independent evaluation, the review team concludes that the impacts of preconstruction and construction activities on nonradiological health from proposed Fermi 3 would be SMALL, and no further mitigation would be warranted. Based on the above analysis, and because NRC-authorized construction activities represent only a portion of the analyzed

activities, the NRC staff concludes that the nonradiological health impacts of NRC-authorized activities would be SMALL.

4.9 Radiation Exposure to Construction Workers

The sources of radiation exposure for construction workers during the construction phase of Fermi 3 include direct radiation exposure, exposure from discharges of liquid radioactive waste, and exposure from gaseous radioactive effluents from the existing Fermi 2. In addition, there would be potential exposure from the residual radioactive material contamination after the decommissioning of Fermi 1. The impacts of radiation exposure are described in the following sections and are summarized in Section 4.9.6. For the purposes of this discussion, construction workers are assumed to be members of the public rather than occupational workers; therefore, the dose estimates are compared to the dose limits for the public, pursuant to 10 CFR Part 20, Subpart D. Detroit Edison (Detroit Edison 2011a) noted that all major construction and preconstruction activities are expected to occur outside the current Fermi 2 protected area boundary but inside the exclusion area boundary.

4.9.1 Direct Radiation Exposures

In its ER (Detroit Edison 2011a), Detroit Edison identified four sources of direct radiation exposure from the Fermi site: (1) "skyshine"[(a)] from the nitrogen-16 (N-16) source present in the operating Fermi 2 main turbine steam cycle, (2) condensate storage tanks, (3) the onsite low-level waste storage facility, and (4) the Independent Spent Fuel Storage Installation (ISFSI). The ISFSI for Fermi 2 is located west of Fermi 2 about 820 ft away from the nearest construction area for Fermi 3. As of June 2012, construction of the ISFSI pad was complete and the preoperational dry run activities had begun. However, normal operations at the ISFSI had not yet started.

The doses from skyshine and the planned ISFSI are identified as the primary sources of direct radiation exposure to proposed Fermi 3 construction workers. The doses from direct radiation from condensate storage tanks and the onsite low-level waste storage facility are negligible when compared to the skyshine and ISFSI doses, because of the minimal activity in the storage tanks and the concrete shielding at the low-level waste storage facility. At certain times during construction, Detroit Edison would also receive, possess, and use specific radioactive byproduct, source, and special nuclear material in support of construction and preparations for operation. These sources of low-level radiation are required to be controlled by the applicant's radiation protection program and have very specific uses under controlled conditions. The Detroit Edison staff did not identify any additional sources of direct radiation during the site audit or during document reviews.

(a) Skyshine is the scattered radiation of a primary gamma radiation source generated by aerial dispersion.

Detroit Edison used onsite thermoluminescent dosimeters (TLDs) and environmental TLDs to measure direct radiation levels at locations in and around the Fermi site protected area (Detroit Edison 2011a). Environmental TLDs are located in multiple rings around the Fermi site, in an inner ring near the site boundary, and in additional rings at locations approximately 2, 5, and 10 mi from the plant (Detroit Edison 2009c, Table 3.12.1-1). All of these TLDs are read quarterly and measure the contribution to dose from any direct radiation source, including natural background, skyshine, the condensate storage tanks, and the low-level waste storage facility.

Detroit Edison estimated the total direct radiation exposure to construction workers by adding the measured TLD dose to the estimated dose from the planned ISFSI. The dose from the ISFSI was estimated by using the radiological data from other ISFSIs that have a facility design similar to that proposed for the Fermi site. The location with the highest direct radiation dose rate that a construction worker could receive from the ISFSI is located 820 ft from the ISFSI. At this distance, a construction worker would receive a maximum estimated dose of about 13.8 mrem/yr from the ISFSI, assuming a 2080-hr occupancy (i.e., a 2000-hr work year plus 4 percent overtime; Detroit Edison 2011a).

In estimating the direct radiation exposure to construction workers from sources other than the ISFSI, Detroit Edison evaluated 10 years of measured TLD data and selected the maximum annual TLD doses from the two locations that were closest to the expected construction site for Fermi 3 (Detroit Edison 2011a). The estimated dose using an average of two locations for a 2080-hr work year would be 56.3 mrem after the background radiation is subtracted (Detroit Edison 2011a). This calculation conservatively assumes that the construction worker is at this location for the entire work year. The dose to construction workers from byproduct, source, and special nuclear material is expected to have a negligible contribution to this value.

4.9.2 Radiation Exposures from Gaseous Effluents

The Fermi 2 site releases gaseous effluents via the radwaste building vent, reactor building vent, and turbine building vent (Detroit Edison 2011a). The Fermi 2 Visitors Center is near (within 0.5 mi of) the Fermi 3 construction site; therefore, it is assumed that the dose rates calculated from gaseous effluents at the Visitors' Center approximate the dose rates from gaseous effluents to the construction worker. Detroit Edison estimated the gaseous effluents component of the construction worker dose by using release data for the year 2001 (the year that resulted in the highest public exposure for the period from 1999 to 2008) (Detroit Edison 2011a). The estimated annual total effective dose equivalent to a construction worker from gaseous effluents would be 1.6 mrem/yr (assuming an occupancy of 2080 hr per year) (Detroit Edison 2011a). The dose to construction workers from gaseous effluent releases would be small when compared to the dose from direct radiation exposure.

4.9.3 Radiation Exposures from Liquid Effluents

Prior to 1995, Fermi 2 radioactive liquid effluent was released directly to Lake Erie through the circulating water reservoir blowdown line (Detroit Edison 2011a). The Fermi 2 discharge is located along the shoreline of Lake Erie, north of Fermi 2 (Detroit Edison 2011a); however, there has been no liquid radioactive effluent discharge reported from Fermi 2 since 1994 (Detroit Edison 2011a). Because Fermi 2 is currently a zero-liquid-radwaste-discharge plant (Detroit Edison 2011a), and because construction activities would occur away (at least 0.5 mi) from the liquid effluent release points (Detroit Edison 2011a), it is likely that construction workers would not receive any significant dose from liquid effluents.

4.9.4 Radiation Exposures from Decommissioned Fermi 1

Fermi 1 is scheduled to be decommissioned before the construction of Fermi 3. Construction activities for Fermi 3 would occur near the Fermi 1 site, and the construction workers would be exposed to any residual contamination from Fermi 1 (Detroit Edison 2009a). The residual levels of radioactive material that would be authorized to remain after Fermi 1 decommissioning would result in a dose of less than 25 mrem/yr to an average member of the critical group[(a)] (10 CFR 20.1402). The construction workers would not be exposed to all exposure pathways applicable to an average member of the critical group – represented by a hypothetical resident farmer after Fermi 1 is decommissioned. However, Detroit Edison used 25 mrem/yr as the bounding estimate of the dose to the construction worker from the decommissioned Fermi 1. The actual dose to the construction worker would be expected to be much less than 25 mrem/yr.

4.9.5 Total Dose to Construction Workers

The maximum annual dose to a construction worker was estimated to be 96.6 mrem, which is the sum of the four components described above: (1) direct radiation from existing sources (56.3 mrem), (2) direct radiation from the planned ISFSI (13.8 mrem), (3) exposure from gaseous effluents (1.6 mrem), and (4) exposure from the decommissioned Fermi 1 (25 mrem). The dose would primarily be the result of direct radiation. The maximum annual dose to a construction worker is overestimated because of the conservatism included in the four components of the dose discussed above. This maximum individual construction worker dose rate is much smaller than the approximately 311 mrem/yr that each worker would receive from natural background radiation (NCRP 2009). The estimated annual dose of 96.6 mrem is also less than the 100 mrem/yr annual dose limit to an individual member of the public found in 10 CFR 20.1301.

(a) The critical group is the group of individuals reasonably expected to receive the greatest exposure to residual activity for any applicable set of circumstances.

4.9.6 Summary of Radiological Health Impacts

The NRC staff concludes that the estimate of doses to construction workers during building of the proposed Fermi 3 are within NRC annual exposure limits (i.e., 100 mrem) designed to protect the public health. Based on information provided by Detroit Edison and the NRC staff's independent evaluation, the NRC staff concludes that the radiological health impacts on workers for Fermi 3 would be SMALL, and no further mitigation would be warranted. Radiation exposure from all NRC-licensed activities, including operation of Fermi 2, is regulated by the NRC. Therefore, the NRC staff concludes the radiological health impacts for NRC-authorized construction activities would be SMALL, and no further mitigation would be warranted.

4.10 Nonradioactive Waste Impacts

This section describes the environmental impacts that could result from the generation, handling, and disposal of nonradioactive waste during the building of Fermi 3. The types of nonradioactive waste that would be generated, handled, and disposed of during building activities would include construction debris, municipal waste, excavation spoils, and sanitary waste. The potential impacts from these different types of waste are assessed in the following subsections.

4.10.1 Impacts on Land

Building activities related to Fermi 3 would generate wastes, such as construction debris and spoils. The Fermi site has a recycling and waste minimization program in place for Fermi 2, and this program would be implemented for the building of Fermi 3 (Detroit Edison 2011a). Detroit Edison would not allow open burning of refuse, garbage, or any other waste material onsite. The solid waste would be taken to the nearest suitable landfill for disposal (Detroit Edison 2011a). Hazardous and nonhazardous solid wastes would be managed according to county and State handling and transportation regulations.

Suitable excavated materials from the power block and circulating water pipe trenches would be reused as backfill and structural fill. It is estimated that excess excavated material would amount to about 265,000 yd^3 and be disposed of in onsite construction laydown and parking areas and for filling in canals (Detroit Edison 2011a). Dredged materials removed during construction of the intake and discharge structure and barge slip in Lake Erie would be disposed of in the existing spoils disposal pond (Detroit Edison 2011a).

Wastes generated from building Fermi 3 would be handled according to county, State, and Federal regulations. County and State permits and regulations for the handling and disposal of solids and USACE permits for the disposal of dredged spoils would be obtained and implemented. The review team expects that solid waste impacts would be minimal and that additional mitigation would not be warranted.

4.10.2 Impacts on Water

Surface water runoff from site development activities would be controlled under the development and implementation of a SESC Plan (Detroit Edison 2011a). Water collected in this manner may then be discharged under an NPDES permit. As discussed in Section 4.2.3.1, stormwater runoff generated by site development activities could increase turbidity and sedimentation to North Lagoon, South Lagoon, the Quarry Lakes, and Lake Erie. The impacts would be minimized through the use of settling ponds and other BMPs that would be implemented under the SESC Plan. There would be an increase in the generation of sanitary wastewater at the Fermi site as a result of the presence of construction workers, but the additional sanitary wastewater could be managed in existing onsite sewage treatment facilities and through provision of portable toilets.

Based on the regulated practices for managing liquid discharges, including wastewater, and the plans for managing stormwater, the review team expects that impacts on water from nonradioactive effluents when building Fermi 3 would be minimal, and additional mitigation would not be warranted.

4.10.3 Impacts on Air

As discussed in Sections 4.4.1.3 and 4.7.1, fugitive dust generated during preconstruction and construction activities would need to be managed. Detroit Edison would develop a dust-control program in accordance with the State of Michigan's regulatory code prior to beginning construction and preconstruction activities (Detroit Edison 2011a).

The Construction Environmental Controls Plan would include air quality protection procedures to be used to minimize the generation of fugitive dust and the release of emissions from equipment and vehicles. These actions would include managing the use of unpaved roads (speed limits, use of dust suppression, and minimization of dirt tracking onto paved roads); covering haul trucks; phasing grading activities to minimize the exposed amount of disturbed soils; stabilizing roads and excavated areas with coarse material covers or vegetation; and performing proper maintenance of vehicles, generators, and other equipment.

Based on the regulated practices for managing air emissions from construction equipment and temporary stationary sources, best management practices for controlling fugitive dust, and vehicle inspection and traffic management plans, the review team expects that impacts on air from nonradioactive emissions from building Fermi 3 would be minimal. As discussed in Section 4.7, additional mitigation may be warranted, depending on the outcome of conformity applicability analyses being performed by the NRC and USACE pursuant to the Clean Air Act Section 176 (42 USC Section 7506) and 40 CFR Part 93, Subpart B.

4.10.4 Summary of Nonradioactive Waste Impacts

Solid, liquid, and gaseous wastes generated when building Fermi 3 would be handled according to county, State, and Federal regulations. Solid waste would be recycled or disposed of in existing, permitted landfills.

Sanitary wastes would be removed to an existing licensed sewage-treatment facility or discharged locally after being treated to the levels stipulated in the NPDES permit. A Storm Water Pollution Prevention Plan would specify the mitigation measures to be put in place to manage stormwater runoff.

To avoid any noticeable offsite air quality impacts, the use of BMPs to control dust and minimize vehicle emissions would be expected.

Based on information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that nonradioactive waste impacts on land, water, and air would be SMALL and that additional mitigation would not be warranted. Because NRC-authorized construction activities represent only a portion of the analyzed activities, the NRC staff concludes that the nonradioactive waste impacts of NRC-authorized construction activities also would be SMALL and that no further mitigation would be warranted.

4.11 Measures and Controls to Limit Adverse Impacts during Preconstruction and Construction

In its evaluation of the environmental impacts of building the proposed Fermi 3 reactor, the review team relied on Detroit Edison's compliance with the following measures and controls that would limit adverse environmental impacts:

- Compliance with applicable Federal, State, and local laws, ordinances, and regulations intended to prevent or minimize adverse environmental impacts (e.g., solid waste management, erosion and sediment control, air emissions, noise control, stormwater management, spill response and cleanup, hazardous material management);
- Compliance with applicable requirements of permits or licenses required for construction of Fermi 3 (e.g., USACE Section 404 Permit, NPDES permit);
- Compliance with existing Fermi 2 processes and/or procedures applicable to Fermi 3 construction environmental compliance activities for the Fermi site (e.g., solid waste management, hazardous waste management, and spill prevention and response);
- Incorporation of environmental requirements into construction contracts; and
- Identification of environmental resources and potential impacts during the development of the ER and the COL process.

Table 4-22 summarizes the measures and controls to limit adverse impacts when building Fermi 3 at the Fermi site based on a table supplied by Detroit Edison (2011a), as adjusted by the review team when considered to be appropriate. Some measures apply to more than one impact category.

4.12 Summary of Preconstruction and Construction Impacts

Impact category levels for construction and preconstruction activities associated with building Fermi 3 are summarized in Table 4-23. The impact category levels for NRC-authorized construction, and combined construction and preconstruction are denoted in the table as SMALL, MODERATE, or LARGE as a measure of their expected adverse environmental impacts. The bases for these determinations are provided in detail in Sections 4.1 through 4.10 of this EIS; a brief statement explaining the basis for the impact level for each major resource category is provided in the table. Some impacts, such as the addition of tax revenue from Detroit Edison for the local economies, are likely to be beneficial impacts on the community.

Table 4-22. Summary of Measures and Controls Proposed by Detroit Edison to Limit Adverse Impacts When Building Fermi 3

Affected Environment/Resource Area	Specific Measures and Control
Land Use Impacts	
Site and vicinity	• Conduct ground-disturbing activities in accordance with permit requirements. Implement erosion control measures described in the SESC Plan. • Limit vegetation removal to those areas designated for construction activities. Restore temporarily disturbed areas. • Remove hazardous wastes/spills in compliance with applicable regulations. Implement PIPP measures. • Restrict soil stockpiling and reuse to designated areas within the construction footprint on the Fermi site. • Use BMPs listed in the SESC Plan and minimize footprint of the designated construction area. Place dredged materials in the designated dredge spoils area. • Detroit Edison has obtained a Coastal Zone Consistency Determination for work in coastal zone.
Transmission line corridors and offsite areas	• The 345-kV transmission system and associated corridors are exclusively owned and operated by ITC*Transmission*. Detroit Edison has no control over the building or operation of the transmission system. The building impacts are based on publicly available information and reasonable expectations on the configurations and practices that ITC*Transmission* is likely to use based on standard industry practice. Such efforts are assumed to include transmission design considerations and industry-standard BMPs that would minimize the effects on land use.
Water-Related Impacts	
Hydrologic alterations	• Develop and implement the SESC Plan. This plan may require use of silt fences, straw bales, slope breakers, and other erosion prevention measures. • Obtain and adhere to all applicable Federal, State, and local permits regulating hydrological alterations.

Table 4-22. (contd)

Impact Category	Specific Measures and Control
Water use and quality	• Implement the construction SESC Plan to limit sedimentation of drainage to Lake Erie. • Implement dewatering plan to minimize the amount of water discharged. • Develop and implement a PIPP. • Comply with requirements of CWA Section 404 permit, Section 402(p) NPDES permit, Section 10 of the RHAA permit, and MDEQ Act 451 Parts 303 and 325 permit. • Comply with requirements of Clean Water Act Section 401 Water Quality Certification and Coastal Zone Management Act (CZMA) Certification.
Ecological Impacts	
Terrestrial and wetland resources	• Follow MDNR construction limitation recommendations for bald eagle nests. • Control fugitive dust through construction watering, and vehicle emissions by regularly scheduled maintenance. • Detroit Edison has developed its proposed Fermi 3 site layout to maximize use of developed and previously disturbed grounds where possible. Limit clearing to the smallest practicable quantity of land. Revegetate temporarily disturbed areas after facilities are built. • Comply with requirements of permits for RHAA Section 10, CWA Section 404, and MDEQ Act 451 Parts 303 and 325 to minimize and mitigate impacts on aquatic resources, including jurisdictional wetlands. Wetland mitigation would be developed in coordination with MDEQ (Detroit Edison 2012d) and USACE (Appendix K). • Detroit Edison has proposed to transplant American lotus out of areas of proposed disturbance. • Implement Habitat and Species Conservation Plan to mitigate building impacts on the eastern fox snake. • Develop NDCT lighting plans in consultation with the Federal Aviation Administration (FAA) and FWS to minimize avian impacts.
Aquatic resources	• Implement measures in the SESC permit and NPDES permit. • Implement measures in the PIPP. • Implement measures outlined in the RHAA Section 10 permit, CWA Section 404 permit, and MDEQ Act 451 Parts 303 and 325 permit.
Socioeconomic Impacts	
	• Implement standard noise control measures for construction equipment (silencers). • Limit the types of construction activities during nighttime and weekend hours.

Table 4-22. (contd)

Impact Category	Specific Measures and Control
	• Notify all affected neighbors of planned activities. • Establish a construction noise monitoring program. • Control fugitive dust through construction watering. • Control vehicle emissions by regularly scheduled maintenance. • Add surfacing on local roadways to prevent deterioration from construction vehicles. • Traffic control and management measures would reduce traffic congestion impacts. These would be developed in conjunction with MDOT, MCRC, and other appropriate agencies.
Environmental Justice	• No mitigating measures or controls required.
Historic Properties and Cultural Resources	• ITC*Transmission* would be expected to conform to regulatory requirements pertaining to historic and cultural resources that could be impacted by transmission line development. • Adverse effect of demolition of the one onsite historic property, NRHP-eligible Fermi 1, would be mitigated according to measures and plans developed during NRC's consultation with the Michigan SHPO and Detroit Edison. • The closest offsite above-ground historic resource within the indirect APE is located 0.5 mi from the construction site boundary, and all others are located 1 to 3.5 mi away. Visual impacts are not substantial, and no measures or controls are warranted.
Air Quality	• Implement BMPs to reduce vehicle and equipment exhaust emissions and fugitive dust in accordance with all applicable State and Federal permits and regulations.
Nonradiological Health	• 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.
Radiation Exposure to Construction Workers	• Doses to construction workers would be maintained below NRC public dose limits (10 CFR Part 20).
Nonradioactive Wastes	• Hazardous and nonhazardous solid wastes would be managed according to county, State, and Federal handling and transportation regulations. Implement recycling and BMPs to minimize waste generation.

Source: Detroit Edison 2011a

Table 4-23. Summary of Preconstruction and Construction Impacts for Proposed Fermi 3

Resource Area	Comments	NRC-Authorized Construction Impact Level	Construction and Preconstruction Impact Level
Land Use			
Site and vicinity	Building activities would take place within the existing boundaries of the Fermi site owned by Detroit Edison.	SMALL	SMALL
Offsite transmission line corridors	Approximately 10.8 mi of a 29.4-mi transmission line corridor would be along an undeveloped ROW.	Not applicable	SMALL
Water Resources			
Water use			
Surface water	Lake Erie water would be used for concrete batch plant operation, temporary fire protection, dust control, and sanitary needs.	SMALL	SMALL
Groundwater	Dewatering systems would depress the water table in the general vicinity, but the impacts would be localized and temporary.	SMALL	SMALL
Water quality			
Surface water	Hydrological alterations associated with building on and near the Fermi site include dredging, bedding placement, and cover material for the intake and discharge structures, altering the surface topography and hydrology (e.g., site grading, laydown areas, filling of onsite water bodies), culverting the south canal, and dewatering the excavation for construction of the nuclear facilities. Offsite alterations are associated with the proposed new or expanded transmission line corridors where they cross streams and wetlands. BMPs will be used to limit construction stormwater impacts and address potential spills or leaks of petroleum and other chemicals into surface water bodies.	SMALL	SMALL

Table 4-23. (contd)

Resource Area	Comments	NRC-Authorized Construction Impact Level	Construction and Preconstruction Impact Level
Groundwater	BMPs will prevent or mitigate the impacts of spills on groundwater.	SMALL	SMALL
Ecological Resources			
Terrestrial and wetlands resources	Loss or disturbance of upland and wetland habitat and associated plant and animal species onsite and along the transmission line corridor. Proposed wetland and wildlife habitat mitigation would offset some impacts. Potential impact on eastern fox snake (State-listed as threatened) and its habitat mitigated with implementation of Habitat and Species Conservation Plan.	SMALL to MODERATE (potential for MODERATE limited to eastern fox snake)	SMALL to MODERATE (potential for MODERATE limited to eastern fox snake)
Aquatic resources	Loss or disturbance of aquatic habitat and associated plant and animal species onsite and along the transmission line corridor. Increased runoff and sedimentation from the addition of impervious surfaces. BMPs will be used to limit construction stormwater impacts.	SMALL	SMALL
Socioeconomics			
Physical impacts	Small increases in noise and air emissions. Small impact on condition of road surfaces during construction period.	SMALL	SMALL
Demography	Minor increase in population resulting from in-migrating construction workforce.	SMALL beneficial	SMALL beneficial
Economy	Economic impact would be beneficial to local economies in the 50-mi region, especially in Monroe County.	SMALL beneficial in the region to LARGE beneficial in Monroe County	SMALL beneficial in the region to LARGE beneficial in Monroe County

Table 4-23. (contd)

Resource Area	Comments	NRC-Authorized Construction Impact Level	Construction and Preconstruction Impact Level
Taxes	Entire 50-mi region would receive beneficial changes to tax revenues, especially in Monroe County, where the impacts would be greatest (from Fermi 3 property taxes).	SMALL and beneficial in the region to LARGE and beneficial in Monroe County	SMALL and beneficial in the region to LARGE and beneficial in Monroe County
Infrastructure and community services	Recreation, housing, public services, and education are generally adequate for the influx of construction workers. Local traffic would increase during construction, resulting in increased congestion during the peak building employment period, when the traffic-related impact would be short-term and MODERATE.	SMALL (all categories except traffic) to short-term MODERATE traffic impacts during peak building employment	SMALL (all categories except traffic) to short-term MODERATE traffic impacts during peak building employment
Environmental Justice	No environmental pathways or preconditions exist that could lead to disproportionately high and adverse impacts on minorities or low-income populations.	SMALL	SMALL
Historic and Cultural Resources	Onsite preconstruction and construction activities would result in the demolition of recommended NRHP-eligible Fermi 1. Because new Fermi 3 facilities would be consistent with the landscape features within the existing setting of offsite historic resources, there would be no new significant visual (i.e., indirect) impacts on these resources. However, the approximately 11-mi portion of the proposed offsite transmission line route from the Sumpter-Post Road junction to the Milan Substation will require a new transmission line route and may result in direct and visual impacts on offsite historic and/or cultural resources. In the absence of more detailed information, these impacts cannot be evaluated with certainty.	MODERATE	MODERATE

Table 4-23. (contd)

Resource Area	Comments	NRC-Authorized Construction Impact Level	Construction and Preconstruction Impact Level
Air Quality	Vehicle and equipment exhaust emissions and fugitive dust emissions from operation of earthmoving equipment are sources of air pollution, but impacts would be temporary.	SMALL	SMALL
Nonradiological Health	Temporary public health impacts from exposure to fugitive dust and vehicular emissions, noise, and increased occupational injuries and traffic fatalities during the building phase.	SMALL	SMALL
Radiological Health	Doses to construction workers would be maintained below NRC public dose limits (10 CFR Part 20).	SMALL	SMALL
Nonradioactive Wastes	Hazardous and nonhazardous solid wastes would be managed according to county and State handling and transportation regulations. Implement recycling and waste minimization program.	SMALL	SMALL

4.13 References

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5.0 Operational Impacts at the Proposed Site

This chapter examines environmental impacts associated with operation of the proposed new Enrico Fermi Unit 3 (Fermi 3) at the Enrico Fermi Atomic Power Plant (Fermi) site for an initial 40-year period, as described in the application for a combined license (COL) submitted by Detroit Edison Company (Detroit Edison). As part of its COL application, Detroit Edison submitted an Environmental Report (ER) that discussed the environmental impacts of station operation (Detroit Edison 2011a). In its evaluation of operational impacts, the review team, composed of U.S. Nuclear Regulatory Commission (NRC) staff, its contractor staff, and U.S. Army Corps of Engineers (USACE) staff, relied on operational details supplied by Detroit Edison in its ER and its responses to NRC Requests for Additional Information (RAIs), and the review team's own independent review. Also consulted were permitting correspondences between Detroit Edison and the USACE, a cooperating agency in this action.

This chapter is divided into 14 sections. Sections 5.1 through 5.12 discuss the potential operational impacts related to land use, water, terrestrial and aquatic resources, socioeconomics, environmental justice, historic and cultural resources, meteorology and air quality, nonradiological and radiological health effects, nonradioactive waste impacts, postulated accidents, and applicable measures and controls, respectively, that would limit the adverse impacts of station operation during the 40-year operating period. In accordance with Title 10 of the Code of Federal Regulations (CFR) Part 51, impacts have been analyzed and a significance level of potential adverse impacts (i.e., SMALL, MODERATE, or LARGE) has been assigned to each impact category. In the area of socioeconomics related to taxes, the impacts may be considered beneficial and are stated as such. The review team's determination of significance levels is based on the assumption that the mitigation measures identified in the ER or activities planned by various State and county governments, such as infrastructure upgrades, as discussed throughout this chapter, are implemented. Failure to implement these mitigation measures and upgrades might result in a change in significance level. Possible additional mitigation to further reduce adverse impacts is also presented, where appropriate. A summary of these impacts is presented in Section 5.13. The references cited in this chapter are listed in Section 5.14.

5.1 Land Use Impacts

Sections 5.1.1 and 5.1.2 contain information regarding land use impacts associated with operation of Fermi 3. Section 5.1.1 discusses land use impacts at the site and in the vicinity of the site. For the purposes of the analysis, the vicinity is defined as the area encompassed by a 7.5-mi radius around the existing Fermi site. Section 5.1.2 discusses land use impacts resulting from the proposed offsite transmission line corridors and other offsite areas.

5.1.1 The Site and Vicinity

Although approximately 301 ac of land onsite would be disturbed to build Fermi 3, only about 155 ac would be permanently occupied by the Fermi 3 facilities for the duration of the operational period (Detroit Edison 2011a). Operation of the facilities would be compatible with existing and readily foreseeable adjacent land uses. No additional land of the Fermi site would be occupied due to Fermi 3 operations. While there is the potential for icing, salt drift deposition, fogging, and noise from cooling tower operations to affect land areas close to an operating reactor (NRC 1996), review of the application for Fermi 3 suggests that these impacts would be negligible (see Sections 5.3.1.1 and 5.7.1) and therefore not adversely affect nearby land uses. Ambient noise level impacts from transformer operation would also be minimal (see Section 5.8.2). Operations are therefore expected to have only minimal impacts on forest, wetland, floodplain, maintained grassland, and developed land uses on or near the Fermi site. Although some prime farmland may remain onsite following initial development of Fermi 3, no crop production is expected to occur anywhere on the Fermi site during plant operation. Any alteration of prime farmland soils would take place while the proposed Fermi 3 facilities were being built, not during operations.

Although development of Fermi 3 would permanently remove approximately 19 ac of land from the Detroit River International Wildlife Refuge (DRIWR), operation of Fermi 3 is not expected to noticeably affect management of the remaining DRIWR lands on or near the Fermi site.

Spoils from maintenance dredging of the Fermi 3 intake and barge slip area would be disposed of in the existing Spoils Disposal Pond. Dredging for the Fermi 2 intake embayment has been performed every 4 years and has resulted in the removal of approximately 22,000 yd^3 of material (Detroit Edison 2011a). Based on Detroit Edison's experience with Fermi 2 spoils disposal, dredging to operate Fermi 3 is not expected to require any additional land outside of the existing Spoils Disposal Pond.

Soil erosion impacts on the site or the surrounding vicinity are unlikely during operation of Fermi 3. Vegetation stabilization measures would be in place to prevent erosion and sedimentation impacts on the site and vicinity, and erosion would be prevented through the use of erosion control measures identified in the existing Stormwater Pollution Prevention Plan (Detroit Edison 2011a).

Land throughout the Fermi site is designated as "industrial" by Monroe County and zoned as "public service" by Frenchtown Charter Township (Monroe County Planning Department and Commission 2010; James D. Anulewicz Associates, Inc. and McKenna Associates, Inc. 2003). No impacts on land use planning in Monroe County or Frenchtown Charter Township are expected as a result of the operation of Fermi 3. Operation of the facility is expected to be consistent with and comply with all applicable land use and zoning regulations of Monroe County and Frenchtown Charter Township, respectively. Regional and State land use plans do

not contain measures that apply specifically to the Fermi site, and these plans would not be affected by Fermi 3 operation. Detroit Edison has not indicated that operation of Fermi 3 would interfere with any future land uses that it anticipates for the Fermi site.

The Fermi site and some areas in the vicinity of the site fall under the Coastal Zone Management Act, which is designed to ensure the reasonable use of coastal areas (see Section 3.1). As stated in Section 4.1.1, on January 24, 2012, the Michigan Department of Environmental Quality (MDEQ) issued Permit Number 10-58-0011-P to Detroit Edison (MDEQ 2012b). Issuance of this permit constitutes a coastal zone consistency determination from MDEQ. That consistency determination encompasses the entire anticipated operational life of the proposed Fermi 3 facilities.

As is true during the building of Fermi 3, some offsite land use changes could indirectly result from operation of Fermi 3. As discussed in Section 4.1.1, possible impacts include the conversion of some land in surrounding areas to housing developments (e.g., recreational vehicle parks, apartment buildings, single-family condominiums and homes, and manufactured home parks) and retail development to accommodate workers. Property tax revenue from the addition of Fermi 3 could induce additional growth in Monroe County as a result of infrastructure improvements (e.g., new roads and utility services). However, the employment offered during operations would generally be lower and less rapidly changing than during the building phase. Additional information on roads, housing, and construction-related infrastructure impacts is presented in Section 4.4.

Based on information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the land use impacts of operation of Fermi 3 would be SMALL, and additional mitigation would not be warranted.

5.1.2 Transmission Line Corridors and Other Offsite Facilities

The activities associated with transmission line operations that could affect land use include maintenance, inspection, and vegetation management in the corridors and at the Milan Substation. Impacts would be seasonal and would occur within a 500-ft onsite corridor (included in the scope of the analysis in Section 5.1.1 above), a 300-ft-wide offsite corridor, and the Milan Substation. Occasional access to the transmission line corridors by maintenance vehicles may cause some temporary erosion and compaction along certain areas, especially if heavy vehicles are used in wet weather conditions and on any access roads that have gravel or other unpaved surfaces (Detroit Edison 2011a). Siltation of streams and wetlands and the disturbance of wildlife and wildlife habitat may also occur during maintenance activities where the corridor crosses floodplains and wetlands. Vegetative cover would be seeded to stabilize the soil exposed by corridor maintenance activities and prevent erosion, and water diversion measures would be used to direct water off the sides of the access roads and prevent erosion impacts (Detroit Edison 2011a). The review team expects that Detroit Edison and the

International Transmission Company (ITC*Transmission*) would be required in their operations to use best management practices (BMPs) outlined in a soil erosion and sedimentation control (SESC) plan or right-of-way (ROW) maintenance manual used by Detroit Edison and/or ITC*Transmission*.

Operation of the transmission facilities is not expected to interfere with adjacent land uses or with agricultural use of farmland spanned by transmission conductors.

It is expected that ITC*Transmission* would continue maintenance activities currently conducted on the existing transmission line corridors extending out from the Fermi site. It is expected that ITC*Transmission* would extend these same practices to the new corridor and substation facilities. These activities include periodic removal and trimming of trees, mowing of herbaceous and low woody vegetation and cutting of large shrubs, and the use of pesticides and herbicides applied with either ground or aerial spraying methods. The corridors would be periodically inspected by helicopter or ground-patrolled to ensure that they are in proper condition for safe operation of the transmission line (Detroit Edison 2011a). Vegetation clearing would be limited to the minimum needed to allow access for maintenance vehicles and to prevent the growth of trees and other vegetation that could interfere with the operation of the lines (Detroit Edison 2011a). Vegetation management on transmission line corridors is discussed in more detail in Section 5.3.

ITC*Transmission* is expected to implement BMPs involving minimal use of maintenance vehicles and access roads to the extent possible and limiting transmission line maintenance work during wet weather conditions (ITC*Transmission* 2010). Other BMPs would be outlined in a SESC plan or ROW maintenance manual used by ITC*Transmission*. Herbicides would be applied by licensed personnel in accordance with their labels, and only herbicides labeled for aquatic environments would be used in wetlands.

The review team concludes that the offsite land use impacts of operating Fermi 3 and its associated transmission lines would be SMALL, and additional mitigation would not be warranted.

5.2 Water-Related Impacts

This section discusses water-related impacts on the surrounding environment from operation of the proposed Fermi 3. The primary water-related impacts would be associated with Fermi 3's cooling water system. Details of the operational modes and cooling water systems associated with operation of the plant are presented in Section 3.2.2.

Managing water resources requires understanding and balancing the trade-offs between various, often conflicting, objectives. At the Fermi site, these objectives include navigation, recreation, visual aesthetics, a fishery, and a variety of beneficial consumptive uses of water.

The responsibility for regulating any structures or work in or affecting navigable waters of the United States is delegated to the USACE. The responsibility for regulating water use and water quality is delegated to MDEQ.

Water use and water quality impacts involved with operation of a nuclear plant are similar to the impacts associated with any large thermoelectric power generation facility, and Detroit Edison must obtain the same water-related permits and certifications as these other facilities. Permits and certifications needed would include the following:

- CWA Section 401 Certification. This water quality certification would be issued by MDEQ and would ensure that operation of the plant would not conflict with State water quality management programs. Permit Number 10-58-0011-P was issued to Detroit Edison on January 24, 2012 (MDEQ 2012b). Issuance of this permit constitutes the required State of Michigan 401 Water Quality Certification.
- CWA Section 402(p) National Pollutant Discharge Elimination System (NPDES) Discharge Permit. MDEQ administers the NPDES program for the U.S. Environmental Protection Agency (EPA) Construction General Permit and industrial discharge permits. These permits regulate point source stormwater and wastewater discharges. Permit Number MI0058892 was issued to Detroit Edison on February 6, 2012 (MDEQ 2012a). Issuance of this permit constitutes the required State of Michigan NPDES permit for operational discharges.
- CWA Section 404 Permit. This permit would be required for the discharge of any dredged and/or fill material into waters of the United States.
- CWA Section 316(a). This section regulates the cooling water discharges to protect the health of the aquatic environment. The scope will be covered under the NPDES permit with MDEQ.
- CWA Section 316(b). This section regulates cooling water intake structures to minimize the environmental impacts associated with their location, design, construction, and capacity. The scope will be covered under the NPDES permit with MDEQ.
- MDEQ Water Quality Standards Certification (Administrative Rule R 323.1041 *et seq.*). The regulations define the water quality standards in Lake Erie, the mixing zones, and the applicability of the standards. The standards include two temperature criteria for thermal discharge into Lake Erie.
- MDEQ Large Quantity Water Withdrawal Permit, issued under Part 327 of the Safe Drinking Water Act. This permit is required for water withdrawals of more than 5 million gallons per day (MGD) from the Great Lakes per MCL 324.32723(1)(a)-(b).
- MDEQ Water Withdrawal Registration. This permit is required for development of withdrawal capacities exceeding 100,000 gal per day under MCL 324.32705.

- MDEQ Natural Resources and Environmental Protection Act 451, Natural Resources and Environmental Protection Act, Part 325, Great Lakes Submerged Lands Permit. This permit is required for maintenance dredging activities in the Great Lakes. Permit Number 11-58-0055-P was issued to Detroit Edison on April 25, 2012, and authorizes activities under Part 325.
- Section 10 of the Rivers and Harbors Appropriation Act of 1899 Permit. This permit would be issued by USACE to regulate any structure or work in, over, under, or affecting waters of the United States, such as Lake Erie. Permit Number LRE-1988-10408 was issued to Detroit Edison on April 30, 2004, and authorizes maintenance dredging activities under Section 10 for the Fermi 2 water intake canal.
- Federal Coastal Zone Management Act of 1972 Certification. This concurrence of consistency with the State coastal program's policies would be issued by MDEQ. It applies to any activity that is on land or in water or that affects land use, water use, or any natural resource in the coastal zone, if the activity requires a Federal license or permit. Permit Number 10-58-0011-P (MDEQ 2012b) was issued to Detroit Edison on January 24, 2012 (see Section 4.1.2), and constitutes a coastal zone consistency determination from the MDEQ.

Section 5.2.1 discusses the hydrologic alterations in surface water and groundwater related to operation of Fermi 3. Water use impacts for surface water are discussed in Section 5.2.2.1 and for groundwater in Section 5.2.2.2. Water quality impacts for surface water are discussed in Section 5.2.3.1 and for groundwater in Section 5.2.3.2. Water monitoring for surface water is discussed in Section 5.2.4.1 and for groundwater in Section 5.2.4.2. Potential mitigation measures for operations-related water impacts are discussed in Section 5.2.5. The combined impacts of operating the proposed Fermi 3 along with the existing Fermi 2, as well as other activities in the surrounding environment, are discussed in Chapter 7 (Cumulative Impacts).

5.2.1 Hydrological Alterations

This section discusses the hydrological alterations and the resulting effects from operation of the proposed Fermi 3. Fermi site hydrological alterations would include a change in the local landscape and drainage patterns, which could cause increased runoff or erosion. Hydrological alterations to Lake Erie from operation of Fermi 3 would include increased water use, discharge of cooling water (thermal and chemical impacts), and maintenance dredging of the intake canal.

The proposed Fermi 3 power block would be placed on an elevated area, with drainage directed away from the facilities. Modifications of the land surface made during preconstruction and construction activities would alter the local hydrology. The proposed location of Fermi 3 is mostly within the Swan Creek watershed, and water running off of the Fermi 3 developed area would drain primarily to Swan Creek before entering Lake Erie. Drop inlets on the nuclear island will collect the stormwater runoff resulting from storm events and route it to Swan Creek

via the North Lagoon. If storm drains on the nuclear island were blocked, runoff would drain off the elevated area in all directions, and some water would drain directly to Lake Erie. A Stormwater Pollution Prevention Plan (SWPPP) is contained in Fermi 3 NPDES Permit Number MI0058892 to manage stormwater runoff and prevent erosion (MDEQ 2012a). Specifically, surface water would be routed away from the nuclear plant through subgrade storm drains and off the slopes of the elevated area as needed.

In addition, groundwater infiltration areas would be reduced because of the increase in the amount of impervious surfaces at the site and the filling of some onsite water bodies. The aquifer beneath the Fermi site would be affected by the new hydrological conditions resulting from dewatering operations and the increased impervious surfaces for a period shortly after preconstruction and construction, but since the changes are limited to the site and dewatering is temporary, the effects would also be limited and temporary and water levels within the aquifer should stabilize at or near current conditions.

Discharge of cooling water blowdown into Lake Erie would occur approximately 1300 ft east of the shore. The discharge pipe would discharge approximately 1.5 ft above the bottom of the lake and would contain a three-port diffuser. The maximum velocity of the discharge water would be approximately 8.5 fps. The flow would be divided among the three ports to reduce possible scour. The diffuser would also mix the discharge, increasing the thermal and chemical mixing of the discharge into Lake Erie. Thermal plume modeling indicated that the Fermi 3 discharge would not reach the shoreline (Section 5.2.3). The existing Fermi 2 power plant has a restricted area that prohibits recreational activity and navigation. Consequently, the additional discharge of another reactor would not directly affect recreational uses, because recreation will not be allowed within the zone.

The intake structure for Fermi 3 would use the intake bay between the existing rock groins that extend 600 ft into the lake from the facility shoreline. Since the existing intake bay is being utilized, erosion and deposition in Lake Erie during operation would be relatively unchanged from the current condition. Maintenance dredging of the intake bay would be required periodically during operation of Fermi 3, and dredging would be within the same footprint and also be of similar volume and frequency to that done during operation of Fermi 2. Therefore, there is no change in impact from maintenance dredging.

Water use impacts on Lake Erie are evaluated in terms of total water use within the Lake Erie basin; these impacts are discussed in Section 5.2.2.

Groundwater would not be used during operation of Fermi 3. The hydrologic alterations of groundwater due to preconstruction and construction activities (e.g., site grading, changes in recharge, fill materials, excavation dewatering) are discussed in Section 4.2 of this environmental impact statement (EIS).

In summary, the hydrological alterations applicable to operations are limited to the intake of Lake Erie water, the discharge of blowdown water and associated waste streams to the lake, altered drainage patterns from landscape changes, and periodic dredging of the intake canal.

5.2.2 Water Use Impacts

A description of water use impacts on surface water and groundwater resources is presented in this section. The primary cooling-water source for Fermi 3 would be Lake Erie. Potable water used for drinking water and sanitary purposes at the plant would come from the Frenchtown Water Plant, which uses water from Lake Erie. Groundwater is not anticipated to be used for the operation of Fermi 3.

5.2.2.1 Surface Water Use Impacts

Lake Erie would be the only source of makeup water for the operation of the proposed Fermi 3. Almost all makeup water is supplied back to the cooling water system, where most consumptive losses occur due to evaporation and drift from the cooling towers. Maximum water use and loss during normal power operation would occur during the hottest summer months. Minimum usage and loss would occur during the winter months (January), and average usage and loss would occur during the spring and fall. Figure 5-1 presents a diagram of the water use for the proposed Fermi 3. Table 5-1 presents a summary of the water use for the proposed Fermi 3.

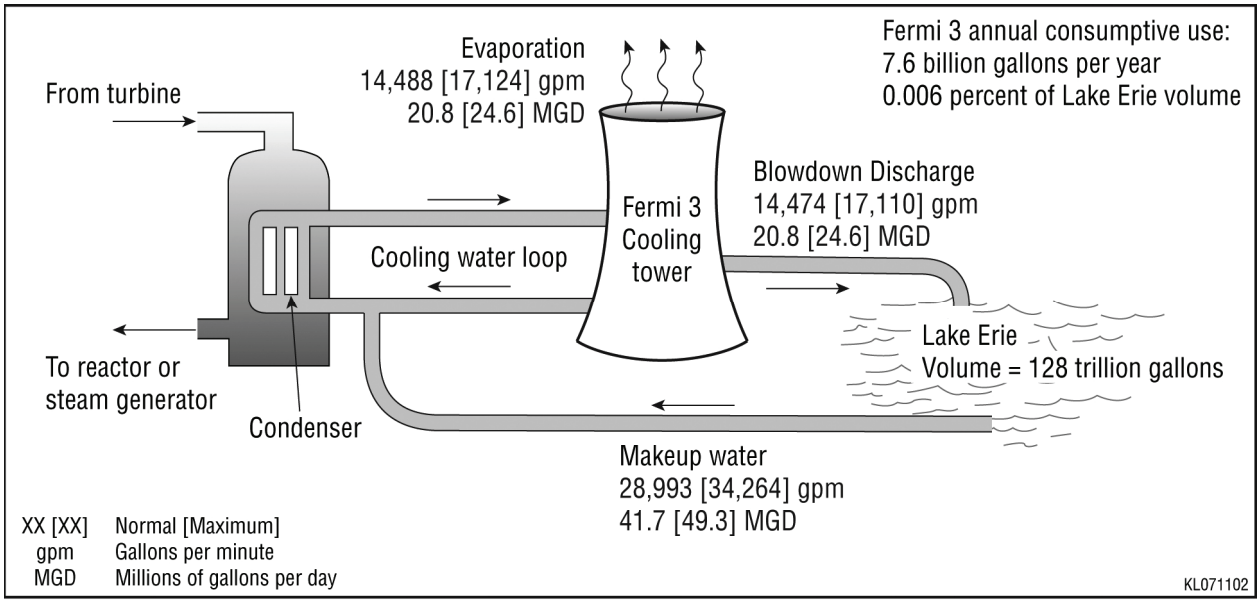

Figure 5-1. Fermi 3 Water Use Diagram

Table 5-1. Fermi 3 Water Use

Use	Average (gpm)	Maximum (gpm)
Intake	28,993	34,264
Discharge	14,474	17,110
Evaporation and Drift	14,488	17,124

Source: Detroit Edison 2011a

During the summer, Fermi 3 would withdraw a maximum of approximately 34,264 gpm from Lake Erie. Approximately 17,124 gpm of this inflow would be lost, and approximately 17,110 gpm would be returned to Lake Erie through the discharge pipe. Total water withdrawn would be a maximum of 49.3 MGD, and consumptive use would be a maximum of 24.6 MGD (Detroit Edison 2011a). During the spring and fall, the average water withdrawn would be 28,993 gpm (41.7 MGD); consumptive use would be about 14,488 gpm (20.8 MGD); and approximately 14,474 gpm (20.8 MGD) would be returned to Lake Erie. In the winter, the minimum water withdrawn from Lake Erie for makeup to the plant systems would be about 23,780 gpm (34.2 MGD); consumptive use would be about 11,882 gpm (17.1 MGD); and 11,868 gpm (17.1 MG) would be returned to the lake (Detroit Edison 2011a). The Great Lakes Compact of 2008 requires that any new water use of more than 5 MGD be subjected to a regional review, so Fermi 3 would be subject to such a review by the other Great Lakes States and provinces.

The Frenchtown Water Plant would be the source for potable, sanitary, and demineralized makeup water during operations. It is estimated that the monthly average potable water use by Fermi 3 would be approximately 35 gpm (Detroit Edison 2011a). The Frenchtown Water Plant has the capacity to supply Fermi 3 with the required water (Detroit Edison 2009a), as it has recently expanded its capacity from 4 MGD to 8 MGD. This expanded capacity is expected to be sufficient for Fermi 3 needs for at least 20 years (Detroit Edison 2011a).

The volume of Lake Erie is approximately 116 mi^3, or about 128 trillion gal (EPA 1995). The average annual consumptive use of water within the Lake Erie basin from all users is about 183 billion gal (GLC 2005a, b, c; 2006a, b; 2009a, b), and Fermi 3 would have an average consumptive use of approximately 7.6 billion gal per year. The incremental annual average withdrawal associated with operation of Fermi 3 would be approximately 0.006 percent of the volume of water in Lake Erie and 4.2 percent of the average consumptive water use in Lake Erie between 2000 and 2006; thus, it would represent a relatively minor change in lake water availability and cumulative consumption and result in no measurable effect on other users. The western basin of Lake Erie has a volume of approximately 6 mi^3, or about 6.6 trillion gal (Lee et al. 1996). The annual average withdrawal associated with operation of Fermi 3 would be approximately 0.115 percent of the volume of water in the western basin of Lake Erie. The

review team concludes that there would be a SMALL impact on surface water resources in Lake Erie, and mitigation is not warranted.

5.2.2.2 Groundwater Use Impacts

No groundwater is planned to be used for operation of the proposed Fermi 3 (Detroit Edison 2011a). In addition, no dewatering-related pumping is planned to occur during the operation of Fermi 3. Therefore, the review team concludes that the impact on groundwater and groundwater users from operating Fermi 3 is SMALL, and mitigation is not warranted.

5.2.3 Water Quality Impacts

This section discusses the impacts on water quality that could result from the operation of proposed Fermi 3. Surface water impacts include thermal, chemical, and radiological wastes and physical changes in Lake Erie resulting from stormwater runoff and effluents discharged by the proposed plant. Section 5.2.3.1 discusses the impacts on surface water quality, and Section 5.2.3.2 discusses the impact on groundwater quality. The impacts of radiological liquid effluents are discussed in Section 5.9.

5.2.3.1 Surface Water Quality Impacts

During operation of Fermi 3, stormwater runoff to the receiving water bodies, the Quarry Lakes, Swan Creek, and Lake Erie, will be controlled by adherence to the SWPPP and design features as required by the NPDES permit. Adherence to the NPDES permit will reduce the impacts on the quality of surface water near the plant from stormwater runoff.

During normal operation of Fermi 3, cooling water blowdown from the natural draft cooling tower would be discharged to Lake Erie through a multi-port diffuser located approximately 1300 ft east of the shore. Surface water impacts associated with cooling tower blowdown include the chemical, thermal, and radiological effluents that would be discharged by the plant. Cooling water returned to Lake Erie would have higher chemical (mineral) content than the water withdrawn from Lake Erie for the cooling. Cooling towers concentrate solids and solutes from the raw makeup water during the process of evaporative heat loss. Cooling water is also treated prior to use to inhibit scale, growth of plant and animal life, and corrosion. These solids and solutes are contained in blowdown.

Makeup water to the station water system (SWS) would be treated with the biocide/algaecide sodium hypochlorite before it entered the pumps at the intake from Lake Erie (Detroit Edison 2011a). The SWS would supply water to the circulating water system (CIRC), plant service water system (PSWS), and fire protection system (FPS) (Detroit Edison 2011a). Biocide injection would remove plant and animal life, including the invasive zebra mussels, from the water (Detroit Edison 2011a). If mussels did reach the SWS, they could be removed through

either additional chlorination or thermal shock treatment (Detroit Edison 2011a). Additional chemicals injected into the CIRC water would include sodium silicate (a corrosion inhibitor) and a scale inhibitor (Detroit Edison 2011a). An additional chemical to disperse suspended solids would be injected into the PSWS when the water from Lake Erie was highly turbid (Detroit Edison 2011a). Before the water would be discharged into Lake Erie, sodium bisulfite would be added to the CIRC blowdown to remove chlorination from (dehalogenate) the water. Table 3.3-1 of the ER presents the estimated quantities of each chemical to be injected into the CIRC and PSWS (Detroit Edison 2011a).

Estimated concentrations of chemicals in Fermi 3 discharge are presented in ER Table 3.6-2 (Detroit Edison 2011a). The NPDES permit for Fermi 3 does not include approval to discharge any treatment additives. Prior to discharge of any treatment additives, Detroit Edison would be required to obtain written approval from the MDEQ, which would specify the allowable concentrations of chemicals in the Fermi 3 discharge (MDEQ 2012a). MDEQ may require Detroit Edison to perform regular monitoring and reporting of the concentrations of these chemicals in the Fermi 3 discharge to evaluate compliance with the effluent limitations (Detroit Edison 2011a; MDEQ 2012a). As a result, the estimated impacts on water quality of Lake Erie from the proposed Fermi 3 discharges are expected to be minor.

Cooling water would be returned to Lake Erie at higher temperatures than it is withdrawn. Estimated monthly discharge temperatures and flow rates are presented in Table 5-2. These temperature values and discharge rates are referred to in the ER as the anticipated maximum

Table 5-2. Fermi 3 Monthly Discharge Rates and Temperatures

Month	Discharge Rate (gpm)	Discharge Temperature (°F)
January	12,035	55.0
February	12,360	55.3
March	13,260	59.4
April	14,460	66.0
May	15,560	72.7
June	16,640	78.4
July	16,910	81.5
August	16,860	80.8
September	16,260	76.3
October	14,960	68.8
November	13,910	62.7
December	12,660	56.6

Source: Detroit Edison 2011a

values (Detroit Edison 2011a). MDEQ enforces two standards related to thermal impacts in Lake Erie under Michigan Water Quality Standards Section R 323.1070. One of these standards is related to the change from ambient temperature, and the other is an absolute maximum temperature. Water that is 3°F above the ambient temperature of the lake is considered part of a thermal plume. Table 5-3 presents the estimated mean monthly ambient temperatures in Lake Erie in the vicinity of the discharge port and the difference between the ambient temperature and the discharge temperature. In addition, there are maximum monthly water temperatures that, when exceeded in Lake Erie, are considered part of a thermal plume; these are also presented in Table 5-3 along with the amount that these standards will be exceeded during each month. MDEQ allows the water quality standards to be exceeded within mixing zones per Michigan Water Quality Standards Section R 323.1041 *et seq*. The MDEQ defines the allowable size of a mixing zone within Lake Erie on a case-by-case basis. The allowable size for Fermi 3 would be determined during the permitting process. As described below, the simulated size of the maximum thermal plume was very small when compared to the area of the entire western basin of Lake Erie, and impacts from the thermal plume are expected to be minor.

Table 5-3. Temperature Increases within the Thermal Plume for Fermi 3

Month	Mean Ambient Lake Temperature (°F)[(a)]	Increase in Temperature (above Ambient) within Thermal Plume (°F)[(b)]	MDEQ Maximum Allowable Temperature (°F)[(c)]	Degrees Exceedance of MDEQ Maximum Allowable Temperature (°F)[(d)]
January	35.5	19.5	45.0	10.0
February	32.9	22.4	45.0	10.3
March	35.8	23.6	45.0	14.4
April	43.2	22.8	60.0	6.0
May	53.6	19.1	70.0	2.7
June	64.1	14.3	75.0	3.4
July	68.6	12.9	80.0	1.5
August	73.1	7.4	85.0	–
September	70.0	6.3	80.0	–
October	61.5	7.3	70.0	–
November	49.7	13	60.0	2.7
December	39.6	17	50.0	6.6

(a) Detroit Edison (2011a).
(b) Discharge that is over 3ºF above the mean ambient lake temperature is considered part of a thermal plume and defines the MDEQ-approved mixing zone.
(c) Michigan Water Quality Standards Section R 323.1041 *et seq*.
(d) Discharges above the MDEQ Maximum Allowable Temperature are considered part of a thermal plume and are required to be included within a MDEQ-approved mixing zone.

To investigate the potential impacts of discharged cooling water with elevated temperatures on Lake Erie, Detroit Edison used CORMIX, a hydrodynamic model that simulates mixing processes, to evaluate the impact and size of discharge thermal plumes (Detroit Edison 2011a). Detroit Edison performed a suite of steady-state simulations based on both of the MDEQ water quality standards to examine the size of thermal plumes. These scenarios evaluated the following:

- Compliance with MDEQ Water Quality Standards for Lake Temperature: The first set of simulations, described in the ER as Model Set 1, evaluated (1) monthly variations in the size of the plume that was 3°F or more than ambient lake water temperature and (2) monthly variations in the size of the thermal plume that exceeded the maximum allowable temperature (presented in Table 5-3).
- Sensitivity of Maximum Plume to Changes in Water Depth: A second set of simulations, described in the ER as Model Set 2, evaluated the sensitivity of the size of the thermal plume caused by a rise in ambient lake temperatures higher than 3°F to lake depth. This scenario was performed to evaluate the effects of extremely low water conditions caused by a wind-driven seiche. To be conservative, this analysis used the largest plume determined in the first set of simulations. This plume occurred in the month of May.
- Potential Impact of Plume on Cooling Water Intake Temperatures: A final simulation was performed to investigate the potential for a thermal plume to reach the shore and affect the temperature of water withdrawn from Lake Erie for cooling Fermi 3.

These scenarios are described in greater detail below and summarized in Table 5-4.

Compliance with MDEQ Water Quality Standards for Lake Temperature

The monthly simulations in Model Set 1 were performed to characterize the timing and size of potential thermal plumes created by Fermi 3 at different times of the year using conservative input parameters. Input data for the CORMIX simulations included discharge rate, discharge temperature, water depth, ambient lake temperature, and ambient lake current velocity and direction. Data were derived from the several sources shown in Table 5.3-3 of the ER (Detroit Edison 2011a). Both the ambient lake temperature and the ambient lake current inputs were derived from Lake Erie Operational Forecast System (LEOFS) model estimates. LEOFS is a National Oceanic and Atmospheric Administration (NOAA) project and is a part of the Great Lakes Operational Forecast System (GLOFS). Detroit Edison analyzed LEOFS results to determine the mean high and low monthly values of lake temperature and lake currents in the vicinity of the Fermi site (Detroit Edison 2011a). Ambient mean monthly lake depth was derived by using data from a NOAA gage located on a buoy offshore from Fermi 2 (Detroit Edison 2011a). Detroit Edison used the mean monthly wind velocity measured at the airport in Grosse Ile, Michigan, which is approximately 11 mi from the Fermi site (Detroit Edison 2011a). Wind speed data were also available from two heights at the Fermi site. The wind velocity data

Table 5-4. Summary of Model Scenarios, Parameters, and Results

Scenario Name and Description	Important Input Parameters		Results
	Parameter	**Value**	
Model Set 1:			
Compliance with MDEQ Water Quality Temperature Standards (3°F above ambient limit)	Lake temperature	10th percentile monthly temperature predicted by LEOFS NOAA model	Largest plume of water greater than 3°F above ambient lake temperature occurs during May assuming maximum current velocity (29,500 ft^2).
	Fermi 3 discharge rate	Maximum discharge (Table 5-1)	
	Fermi 3 discharge temperature	Maximum discharge temperature (Table 5.2-2)	
	Water depth	Monthly averages measured at Fermi Power Plant	
	Current velocity	High (maximum) and low (10th percentile) values from LEOFS model	
Model Set 1:			
Compliance with MDEQ Water Quality Temperature Standards (total allowable maximum temperature)	Lake temperature	90th percentile monthly temperature predicted by LEOFS NOAA model	11 of 12 months exceeded the MDEQ maximum allowable temperature standard and would require a mixing zone.
	Fermi 3 discharge rate	Maximum discharge (Table 5.2-2)	
	Fermi 3 discharge temperature	Maximum discharge temperature (Table 5.2-2)	
	Water depth	Monthly averages measured at Fermi Power Plant	
	Current velocity	High (maximum) and low (10th percentile) values from LEOFS model	
Model Set 2:			
Sensitivity of Maximum Plume to Changes in Water Depth	Fermi 3 discharge temperature	Maximum discharge temperature (Table 5.2-2)	Use of 1st percentile depth (7 ft) increases plume size relative to May mean depth (8.5 ft) by 46 percent (from 29,500 ft^2 to 55,300 ft^2).
	Fermi 3 discharge rate	Maximum discharge (Table 5.2-2)	
	Current velocity	High (maximum current velocity near discharge output by LEOFS model)	
	Lake temperature	10th percentile monthly temperature predicted by LEOFS NOAA model	
	Water depths evaluated	8.5 ft (May mean from Model Set 1)	
		8 ft (20th percentile; once in 5-year depth for May)	
		7.6 ft (5th percentile; once in 20-year depth for May)	
		7 ft (1st percentile; once in 100-year depth for May)	

Table 5-4. (contd)

Scenario Name and Description	Important Input Parameters		Results
	Parameter	Value	
Model Set 3:			
Potential Impact of the Plume on Cooling Water Intake Temperature	Water depth	8.5 ft	Plume dissipates 1300 ft from shore. No impact on intake temperature or shoreline.
	Direction of discharge	Single-port diffuser angled toward Fermi 3 intake	
	Current speed	High (1.5 times the maximum observed current velocity)	
	Current direction	West, toward the plant	
	Discharge temperature	Maximum discharge temperature (Table 5.2-2)	
	Discharge rate	Maximum discharge (Table 5.2-2)	
	Lake temperature	10th percentile monthly temperature predicted by LEOFS NOAA model	

from the Gross-Ile Michigan Airport presents average monthly wind velocity values that are between the average monthly values measured at the Fermi site at 10-m and 60-m heights. The review team found these to be acceptably conservative values for use in the CORMIX simulations. Within the CORMIX model, wind speed is a nondirectional quantity that only affects the thermal plume in the far-field zone, where the plume behaves as a positively buoyant surface density current. The wind velocity can affect the degree of heat transfer to the atmosphere in this zone, and it can affect the turbulence at the surface to cause increased mixing. In many cases, the thermal plume simulated to occur from Fermi 3 discharge was found to meet the regulatory criteria within the near-field zone, the region where wind speed is not factored into calculation of the size of the plume. In those cases, the wind speed has no effect on the size of the plume as defined by MDEQ regulations.

Detroit Edison first evaluated plumes caused by a rise in ambient temperature greater than 3°F. It investigated two scenarios: one with a low ambient current velocity and one with a high ambient current velocity. Detroit Edison assumed that the ambient temperature of Lake Erie for each month was in the 10th percentile of values simulated by LEOFS for that month (model simulated values used for temperature). The use of a low ambient temperature allowed for a conservative analysis of the impacts of high-temperature discharge on plume size for the maximum change in temperature simulations. The results of these simulations are presented in Table 5.3-12 of the ER (Detroit Edison 2011a).

Next, plumes that exceeded the maximum allowable temperature for each month were simulated. For these simulations, Detroit Edison assumed that the ambient temperature of Lake Erie for each month was in the 90th percentile of values simulated by LEOFS for that month. The use of a high ambient temperature allowed for a conservative analysis of the impacts of high-temperature discharge on plume size for the maximum allowable temperature simulations.

Two monthly scenarios were investigated: one with a low ambient current velocity and one with a high ambient current velocity. The results of these simulations are presented in Table 5.3-13 of the ER (Detroit Edison 2011a). Detroit Edison estimated that the largest plume would occur during the month of May as a result of the change in ambient temperature and high ambient current velocity, with an area of approximately 29,500 ft^2.

The technical review team reviewed and verified the model input values. The model results are presented in the text of the ER (Detroit Edison 2011a) and were provided to the technical review team as electronic files. The technical review team reviewed the files and found them to be acceptable.

Results of the thermal plume simulation were presented as rectangular areas in the ER (Detroit Edison 2011a). However, the plume would be shaped more like a triangle than a rectangle, so the values of the plume area would be lower than those calculated by multiplying the plume length and the plume width at the edge of the mixing zone. The values for the simulated plume were found to be smaller than the values presented by Detroit Edison (2011a); therefore, the review team found Detroit Edison's analysis to be conservative and acceptable.

Sensitivity of Maximum Plume to Changes in Water Depth

Detroit Edison examined the impacts of shallower water depths on the largest plume for Model Set 2. Detroit Edison examined the plume size that resulted from four alternate depth scenarios for the month of May (Detroit Edison 2011a). The depths used were the May mean depth of 8.5 ft (also used in the monthly simulations in Model Set 1), the 20th percentile depth of 8.0 ft (once-in-5-year depth for May), the 5th percentile depth of 7.6 ft (once-in-20-year depth for May), and the 1st percentile depth of 7.0 ft (once-in-100-year depth for May). Detroit Edison found that the largest plume covered an area of approximately 55,300 ft^2 and resulted from the shallowest simulated water depth of 7.0 ft.

Potential Impact of Plume on Cooling Water Intake Temperature

The final simulation was performed to investigate the potential for Fermi 3 thermal discharges to travel back toward the shore and affect the temperature of the intake cooling water. For this simulation, a high-velocity wind was assumed to blow in a westerly direction toward the Fermi site during the month of May. In addition, the problem was simulated in CORMIX by using only a single-port diffuser pointed toward Fermi 3. A water depth of 8.5 ft and a wind velocity of 1 fps were assumed. Detroit Edison calculated that the thermal plume would pose no threat to the shoreline, because it was estimated to dissipate 1300 ft east of the shoreline (Detroit Edison 2011a). The review team verified the simulations and determined that this analysis is conservative and acceptable.

Summary of Surface Water Quality Impacts

In summary, because the cooling water discharges have relatively low projected contaminant levels, which would be controlled through the permitting process and would be similar to an already permitted discharge, and given the review team's independent analysis of the thermal and chemical constituents in plant discharges to Lake Erie, the review team concludes that the impacts of the proposed Fermi 3 discharges on the water quality of Lake Erie would be SMALL, and additional mitigation is not warranted.

5.2.3.2 Groundwater Quality Impacts

The proposed Fermi 3 would not use groundwater during operations and would not discharge any liquids to groundwater during operations. Therefore, the review team concludes that the impacts on groundwater quality from operation of Fermi 3 would be SMALL, and mitigation is not warranted.

5.2.4 Water Monitoring

There are no water use or nonradiological water quality monitoring requirements imposed by the NRC. However, daily hydrological, thermal, and chemical monitoring of the proposed new discharge will be required by MDEQ as a part of NPDES Permit Number MI0058892 (MDEQ 2012a). Also, it is anticipated that measurements at the NOAA gauging station (ID 9063090) on Lake Erie in the vicinity of the Fermi 2 intake structure would continue to provide hourly Lake Erie water level measurements. Detroit Edison (2011a) has committed to following NRC guidance (NRC 2007a) for groundwater monitoring at the site. Section 2.3.1.2.4 of the ER (Detroit Edison 2011a) describes the current and planned groundwater monitoring programs. Groundwater elevations and radionuclide concentrations would be measured quarterly at upgradient and downgradient locations as part of the Radiological Environmental Monitoring Program (REMP) (Detroit Edison 2011a). Additional monitoring would be triggered by an accidental liquid release from Fermi 3, including monthly sampling both upgradient and downgradient from the release point (Detroit Edison 2011a). Monitoring during operations would establish the impacts from the plant and would detect any impacts that would result during operations.

5.3 Ecological Impacts

This section describes the potential impacts on ecological resources (terrestrial and aquatic ecosystems, including threatened and endangered species) from operation of Fermi 3 at the Fermi site, operation of the associated transmission line, and maintenance of the associated transmission line corridor. Evaluation of potential impacts on terrestrial and aquatic biota from radiological sources is discussed in Section 5.9.

5.3.1 Terrestrial and Wetland Impacts Related to Operation

Concern for possible impacts on terrestrial communities and species from operation of the proposed Fermi 3 facilities is mostly attributable to cooling system operations and transmission line operation and maintenance. Operation of cooling systems can potentially result in deposition of dissolved solids; increased local fogging, precipitation, or icing; increased noise levels; a greater risk of avian collision mortality; and shoreline alteration of Lake Erie (Detroit Edison 2011b; NRC 1996). Operation of Fermi 3 would also result in increased automotive traffic from additional employees at the site, which can result in the loss of wildlife. Possible impacts on terrestrial biota from operation and maintenance of a transmission line system include collision mortality and electrocution, electromagnetic fields, and the maintenance of vegetation within transmission line corridors.

5.3.1.1 Terrestrial Resources – Site and Vicinity

Cooling System Impacts on Vegetation

Concern for possible vegetation impacts from operation of Fermi 3 would be primarily associated with operation of the cooling system. As described in Chapter 3, the proposed cooling system for Fermi 3 consists of two primary components: the Normal Power Heat Sink and the Auxiliary Heat Sink (AHS). The Normal Power Heat Sink would be a hyperbolic natural draft cooling tower (NDCT). The AHS would consist of two linear mechanical draft cooling towers. The NDCT would be approximately 600 ft high (Detroit Edison 2011a). The heat would be transferred to the atmosphere in the form of water vapor and drift. In some cases, vapor plumes and drift from cooling towers can affect crops, ornamental vegetation, and native plants; water losses from cooling tower operation can affect shoreline habitat. In addition, bird collisions with tall structures, such as the NDCT, and noise-related impacts are possible (NRC 1996). The auxiliary towers would be much shorter than the NDCT, and the heat they would release would be orders of magnitude less. Because their impacts would be far smaller than impacts from the NDCT, discussion of potential impacts from operation of the cooling system is limited to the impacts of the NDCT.

Under certain conditions, native plants, ornamental plants, and agricultural crops can be affected by cooling tower drift, fogging, and increased humidity. Total dissolved solids (TDS), including salt, can stress vegetation after being deposited directly onto foliage or indirectly from accumulation in the soil (NRC 1996). The NDCT emits solids that are dissolved in the water droplets that are carried out of the cooling tower with the exhaust air. The guidance in NUREG-1555, Section 5.3.3.2 (NRC 2000a) indicates that deposition of salt drift from operation of cooling towers at rates of 1 to 2 kg/ha/mo is generally not damaging to plants. Conversely, deposition rates approaching or exceeding 10 kg/ha/mo in any month during the growing season could cause leaf damage in many species. Detroit Edison's analysis of solids deposition conservatively assumed that all TDSs were salt. The analysis indicated that the

maximum predicted annual salt deposition rate at any receiving location would be approximately 1 kg/ha/mo (Detroit Edison 2011a). This value is within the range that NUREG-1555 considers to be generally not damaging to plants. Therefore, cooling tower operation impacts on vegetation are expected to be negligible both on the Fermi site and in the vicinity.

Detroit Edison's modeling of the operation of the NDCT predicts that no increased fogging would result from operation (Detroit Edison 2011a). Any event that may occur is likely to be coincident with a natural fog event and be transient, similar to what is seen with the existing NDCTs used by Fermi 2, and would result in less than 18 hr of fog per year. Any impact would be aesthetic and unlikely to affect ecological resources. Therefore, the impacts of cooling tower plume-induced fogging are anticipated to be minimal and to not warrant mitigation. Likewise, Detroit Edison's modeling also predicts that substantial ground-level icing from the NDCT would not occur (Detroit Edison 2011a). Localized icing may be possible from the operation of the AHS, but impacts are expected to be minimal and contained onsite and would therefore not warrant mitigation.

According to the ER (Detroit Edison 2011a), modeling results indicate the average hours per year of plume shadowing beyond the nearest property boundary (2765 ft) is predicted to be 92 hr per year (2.1 percent of the daylight hours per year) from the NDCT, considering all plume directions. The resulting hours per year of shadowing (especially at the nearest property boundary) are predicted to be an insignificant fraction of the total daylight hours needed for agricultural production. Additionally, shadowing events are not expected to occur at downwind agricultural or residential areas (Detroit Edison 2011a). Thus, the plume shadowing impacts are expected to be minimal and to not warrant mitigation.

Bird Collisions with Power Plant Structures

There is a risk for potential avian mortality from birds colliding with the proposed nuclear power plant structures. Typically, the cooling tower and the meteorological tower are the structures likely to pose the greatest risk. The potential for avian collisions increases as structure height increases (NRC 1996). The mechanical draft cooling towers are of little concern because of their relatively low height compared to existing and proposed structures onsite. The NDCT, however, would be 600 ft high. Avian collisions at existing Fermi facilities are not currently monitored by Detroit Edison, but dead birds are occasionally found around the Fermi 2 NDCTs (Detroit Edison 2011a). Typically, only a few birds are observed at any one time, but events during which more than a few birds have been killed by collisions with the cooling towers have been recorded infrequently. In September 1973, 15 dead birds were found (with as many as 50 potentially killed) at the Fermi 2 south cooling tower. More recently, 45 dead birds were found at the Fermi 2 south cooling tower, all occurring during a one-week period in October 2007 (Detroit Edison 2011a).

Because tower lighting design can affect the flight behavior of birds, Detroit Edison has consulted with the Federal Aviation Administration (FAA) about aviation safety requirements and will consult with the U.S. Fish and Wildlife Service (FWS) on the latest recommendations for obstruction lighting (Detroit Edison 2012a). According to consultations with FWS and FAA concerning structures requiring obstruction lighting, Detroit Edison (2012a) expects to implement lighting design features to minimize avian impacts, including the following:

- Using the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA.
- Using only white (preferable) or red strobe lights at night unless otherwise required by the FAA.
- Employing the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) permitted by the FAA.
- Avoiding solid red or pulsating (beacon) red warning lights at night.

Design features specifically appropriate for Fermi 3 structures would be developed during consultations with the FAA and FWS, as discussed in the ER Section 1.2, prior to construction (Detroit Edison 2011a). As a result, the final design would incorporate the most up-to-date research and recommendations, minimizing impacts on migrating birds and other fauna while meeting aviation safety requirements.

In 10 CFR 51, Appendix B to Subpart A, Table B-1, it is stated that for nuclear power plant license renewal, bird collisions with cooling towers have not been found to be a frequent occurrence at operating nuclear power plants. Table B-1 further states that avian mortality resulting from collisions with cooling towers is of small significance. While acknowledging that some bird collisions with cooling towers take place, the NRC concluded in the generic environmental impact statement (GEIS) for license renewal (NRC 1996) 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." Thus, the impacts at Fermi 3 are expected to be minimal and would not warrant mitigation.

Cooling System Impacts on Waterfowl

Although some species of waterfowl are known to feed on quagga mussels (*Dreissena rostriformis bugensis*) and zebra mussels (*Dreissena polymorpha*), which can grow on water intake structures, there are few documented cases of impingement or entrainment of waterfowl feeding near the cooling system water intake (Nieder 2012). An episode of impingement of greater scaup (*Aythya marila*) and lesser scaup (*Aythya affinis*) in January of 2000 at the water intake for the Nine Mile Point Nuclear Station in Lycoming, New York was documented by the Niagara Mohawk Power Corporation (2000). The report stated that the maximum water velocity

at the intake opening was 2 ft per second. The EPA (2011a) has proposed regulations to establish requirements for cooling water intake structures at existing facilities that allow for alternative measures to minimize impingement and entrainment. One alternative is to limit the through-screen velocity to 0.5 ft per second or less. According to the EPA, that velocity should allow most fish to swim away from the cooling water intake of the facility. The review team concludes that, given the relatively few documented cases of impingement of waterfowl and Detroit Edison's proposed maximum intake velocity, the likelihood that waterfowl would become impinged or entrained is low.

Shoreline Alteration

Periodic maintenance dredging of the intake bay is expected to potentially result in erosion and shoreline scouring. To offset this effect, rock groins extend into the lake, limiting the turbidity to the intake bay and protecting the shoreline from the zone of influence associated with the pumping activities. As a result, physical impacts on the shoreline area in the vicinity of the intake structure are anticipated to be minimal.

Noise

The predicted noise emissions from normal operation of the cooling tower would conform to NRC and EPA sound-level guidelines for minimizing noise impacts (see Section 5.8.2). During nighttime hours, the predicted noise increases at nearby noise-sensitive receptors over existing background (L_{90}) levels would be lower than about 3 dB, which is a barely discernible increase (NWCC 2002; Detroit Edison 2011a). One exception is a 6-dB increase at the nearest noise-sensitive receptor over the existing L_{90} values during a small portion of nighttime hours. The potential noise impacts due to the operation of Fermi 3 are, therefore, expected to be similar to background and current noise levels, to which local species have adapted. Accordingly, noise impacts on terrestrial ecosystems are expected to be minimal.

Impacts of Increased Vehicle Traffic

Increased traffic associated with operation of Fermi 3 has the potential to increase wildlife mortality caused by collisions (road kills). Detroit Edison (2011a) has estimated the Fermi 3 workforce to number approximately 900, which would approximately double the number of employees at the Fermi site. Additional work trips during peak hours would occur on the rural roads and highways in the vicinity. Local wildlife could decline if road-kill rates were to exceed the rates of reproduction and immigration. However, although roadkills occur frequently in the United States, they reportedly have minimal effect on wildlife populations (Forman and Alexander 1998). The review team concludes that these impacts would not be detectable beyond the local vicinity and would not destabilize regional wildlife populations.

The review team completed an individualized evaluation of the possibility of vehicular collisions with the eastern fox snake, a Michigan State-listed threatened species known to inhabit terrestrial habitats on and near the Fermi site. Since the eastern fox snake's preferred habitat is emergent wetlands, open areas not shaded by trees are not barriers to their movement (Hoving 2010). This species has been observed in developed and undeveloped sections of the Fermi site (Detroit Edison 2011a). It is reasonable to conclude, therefore, that the snakes would be likely to cross roads as they move about the Fermi site, possibly for thermoregulation, and that the increased traffic anticipated from operation of Fermi 3 could increase the risk of mortality for the eastern fox snake. However, Detroit Edison has proposed monitoring and mitigation efforts to reduce the risks to the eastern fox snake posed from operations (Detroit Edison 2012c). See Section 5.3.1.3 for additional discussion, including a discussion of proposed mitigation measures.

5.3.1.2 Terrestrial Resources – Transmission Lines

Electricity transmission systems have the potential to affect terrestrial ecological resources through corridor maintenance, bird collisions with transmission lines and towers, and electromagnetic fields (EMFs) (NRC 1996).

Vegetation

Operations impacts in the transmission line corridor, including the western 10.6 mi, would be mainly limited to vegetation maintenance. Maintenance of the corridor would be conducted in accordance with ITC*Transmission's* Transmission Vegetation Management Plan, which was developed in compliance with the North American Electric Reliability Council Reliability Standard FAC-003-1 – Transmission Vegetation Management Program. The work would likely consist of periodic removal of trees from uplands and wetlands to provide adequate clearance from the lines. Pesticides and herbicides may also be used selectively as needed to maintain the corridor. Selective removal of undesirable species through cutting by hand and/or by mowing, as needed, would likely be the practice routinely used; this would encourage the growth of vegetation types that provide low-growing ground cover, erosion control, treatment of invasive species, and wildlife habitat. Vegetation management in wetlands, including cutting or removal of woody vegetation, would indefinitely maintain the wetland in a shrub/scrub or emergent state.

The corridor would typically be inspected by helicopter and ground-patrolled periodically to ensure that the corridor is in proper condition for safe operation of the transmission line (Detroit Edison 2011a). There would be occasional vehicular traffic in the corridor for maintenance purposes, which could result in only minimal impacts on vegetation and soils and minor amounts of soil erosion within the immediate area of the transmission line corridor. Impacts on natural vegetation during maintenance of the Milan Substation would be minimal. Where

access is needed to sensitive areas along the corridor, such as wetlands, matting would be used to avoid soil disturbance and minimize damage to plants.

Wildlife

Impacts of operating the transmission line system on wildlife (e.g., bird collisions and habitat loss) are expected to be minor. 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 do not typically cause long-term reductions in bird populations. The same document also concludes that the impacts on wildlife populations from continued ROW maintenance are not typically significant (NRC 1996).

The overall effect of operation of the new line on wildlife is expected to be minor because maintenance activities would be limited and because most of the corridor has been previously developed and, in less-maintained areas, there are existing disturbances such as farming, neighboring residences, and roadways. Because of these local conditions, it is expected that ITC*Transmission* would not implement any new wildlife management practices within the corridor.

Operation of the expanded substation at Milan would be expected to have minimal effect on wildlife in the area because area wildlife has adjusted to the existing substation, the substation expansion is confined to a relatively small area, and maintained grass and cropland habitat in the surrounding vicinity are already of low quality. The review team concludes that the overall impacts of transmission line maintenance, including maintence activities in the corridor, on terrestrial resources would be minimal.

Impact of Electromagnetic Fields on Flora and Fauna

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle, according to the NRC's GEIS conclusions (NRC 1996). As discussed in the GEIS, a careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures. Thus, the conclusion presented in the GEIS was that the impacts of EMFs on terrestrial flora and fauna were not significant at operating nuclear power plants, including transmission line systems with variable numbers of power lines. On this basis, the review team concluded that the incremental EMF impacts posed by possible additions of new power lines for Fermi 3 would be minimal.

5.3.1.3 Important Terrestrial Species and Habitats

This section discusses the potential impacts of operating Fermi 3 on Federally and State-listed species and on other important species and/or habitats (including wetlands) as defined by the

NRC (NRC 2000a). To meet responsibilities under Section 7 of the U.S. Endangered Species Act of 1973 (ESA), the review team prepared a Biological Assessment (BA) that evaluated potential impacts of preconstruction, construction, and operations on Federally listed threatened or endangered aquatic and terrestrial species (Appendix F).

Important Terrestrial Species – Fermi Site and Vicinity

The Federally and State-listed species that could occur on the Fermi site and nearby in Monroe County are described in Section 2.4.1.3 (Table 2-8). None of the Federally listed species identified by FWS are likely to be affected by operation of the Fermi facility. Operation of Fermi 3 would result in effects on wildlife similar to operation of Fermi 2, although the effects would occur over a wider area. The bald eagle (*Haliaeetus leucocephalus)* has adapted to the presence and operation of Fermi 2. Fermi 3 would be located farther from the lakeshore from where eagle nests had been located prior to January 2011. Operation of the Fermi 3 project is not expected to have impacts on Indiana bats (*Myotis sodalis*). The American lotus (*Nelumbo lutea*) appears to be thriving on wetlands on the Fermi site, but operation of Fermi 3 would not alter conditions for that species.

The eastern fox snake is State-listed as threatened and has been observed on the Fermi site in several locations at several times in recent years (Detroit Edison 2009b, 2011a). During operation of Fermi 3, increased traffic from a larger workforce would present the potential for increased impacts on this species. Detroit Edison has prepared Habitat and Species Conservation Plans addressing mitigation for possible eastern fox snake impacts during building and operations (Detroit Edison 2012b, c). The plans make provisions for mitigating impacts from initial development of the Fermi 3-related facilities and for mitigating potential impacts from operations, such as higher rates of mortality due to increased traffic.

An Endangered Species Specialist for the Michigan Department of Natural Resources (MDNR) reviewed Detroit Edison's proposed Fermi 3 Construction Habitat and Species Conservation Plan and Fermi 3 Operational Conservation and Monitoring Plan for the eastern fox snake. MDNR issued a letter to Detroit Edison on April 6, 2012, stating that the plans adequately address concerns for potential threatened and endangered species at the Fermi site (Sargent 2012). The plans include provisions for monitoring of the eastern fox snake population during and after building of Fermi 3, which would help determine whether the impacts from increased traffic warranted additional mitigation measures. An example of proposed mitigation for traffic mortality impacts is installing fences along roads to serve as barriers to the snake and reduce the likelihood of snakes being hit by vehicles. Monitoring and implementing any mitigation measures required by MDNR, as discussed in Section 5.3.1.1, could potentially reduce the effects on the eastern fox snake from project operation to minimal levels.

Operation of Fermi 3 would subject habitat and individual animals on the site to impacts similar to those that currently result from operation of Fermi 2 and related facilities, with the exception that onsite automotive traffic from employees would approximately double over current levels

when Fermi 3 goes into operation. With implementation of the Operational Conservation and Monitoring Plan for the eastern fox snake, increased traffic would not cause new impacts on Federally or State-listed species. Game species such as white-tailed deer (*Odocoileus virginianus*) and a variety of waterfowl species are common inhabitants of the Fermi site. Increased noise levels near the cooling towers might cause these wildlife species to avoid the immediate area, and increased activity and traffic might also cause wildlife to avoid the habitats immediately adjacent to Fermi 3. Drift, fogging, and icing are expected to cause at most negligible impacts on terrestrial habitats and would not be expected to affect important game species. Although game might avoid habitats adjacent to the new facilities during operation, the Fermi property and surrounding landscape contain large expanses of terrestrial habitat to which these species could relocate. Thus, operational impacts on commercially and recreationally important species would be minimal and no mitigation would be warranted.

Important Terrestrial Habitats – Fermi Site and Vicinity

No areas of the Fermi property are designated as critical habitat for listed wildlife species. Other important habitats present on the property are discussed below.

The Fermi site includes wetlands, including emergent, forested, and shrub/scrub wetlands. Impacts on wetlands by preconstruction and construction are addressed in Section 4.3.1.3. Wetlands would not be adversely affected by Fermi 3 operations. One other important habitat on the Fermi site is a 29-ac restored prairie area in the onsite transmission line corridor along the north side of the existing facility approach road. As noted in Section 4.3.1.3, the restored prairie area would be permanently converted to use by Fermi facilities, and hence would not remain at the time of Fermi operations. The plan to convert the prairie restoration area resulted from the need to minimize impacts on high-quality forested wetlands.

Approximately 656 ac of the Fermi site is managed as part of the DRIWR. Much of DRIWR land consists of coastal wetlands, which are common in the areas surrounding the Great Lakes. Great Lakes coastal wetland systems contain morphological components of both riverine and lacustrine systems and can be described as “freshwater estuaries” (Detroit Edison 2011a). Much of the area included in the DRIWR is forested, emergent, or scrub/shrub wetland. Building the Fermi project would permanently convert approximately 19 ac of the refuge (see Section 4.3.1), which would reduce the refuge area on the Fermi site to approximately 637 ac.

Operation of Fermi 3 is not anticipated to create conditions that would negatively affect the DRIWR or other important habitats on the Fermi site or offsite. Stormwater runoff may increase due to an increase in impervious surfaces, but increased flows would be directed primarily to Lake Erie (see Section 5.2). Stormwater flows would be adequately controlled by design considerations and by the SWPPP contained within the NPDES permit. Adherence to the NPDES permit will ensure that any increase in sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts. Only Lake Erie would be used for source water (Detroit Edison 2011a). Other sources of surface water and groundwater

would not be used. As discussed in Section 5.3.1.1, salt deposition would be far below the levels that could cause damage to plants or soils. Operation of Fermi 3 is expected to have only minimal impact on any of these important habitats.

Important Terrestrial Species – Transmission Lines

Detroit Edison contacted the FWS and MDNR requesting information on known occurrences of Federally and State-listed protected species in the project vicinity (Detroit Edison 2011a). The review team has also researched Federal and State Web sites for information on Federal and State threatened and endangered species. Information available to the review team is summarized in Section 2.4.1.3. Based on information obtained from Web sites maintained by the FWS, there is currently no designated critical habitat for species listed under the ESA along the transmission line route (FWS 2010). According to information provided by ITC*Transmission* to Detroit Edison (Detroit Edison 2010b), ITC*Transmission* maintains access to a database of known occurrences of Federal and State threatened and endangered species obtained from the Michigan Natural Features Inventory (MNFI) to identify locations where seasonal constraints or other regulatory conditions affect vegetation management activities in habitats occupied by rare species. ITC*Transmission* also informed Detroit Edison that it operates in accordance with these seasonal constraints to the degree practicable.

Federally Listed Species

The FWS has identified four terrestrial species that are Federally listed as threatened or endangered with the potential to occur in Monroe, Washtenaw, and Wayne Counties, the counties through which where the new transmission line would be constructed. The species include the Indiana bat, the Karner blue butterfly (*Lycaeides melissa samuelis*), Mitchell's satyr butterfly (*Neonympha mitchellii mitchellii*), and the eastern prairie fringed orchid (*Platanthera leucophaea*) (FWS 2009). Although the impacts of transmission line operation on Federally listed species are likely to be minimal, final corridor location information would have to be provided to FWS prior to ground disturbance for the transmission line in support of ITC*Transmission's* application for a CWA Section 404 wetlands permit. Site-specific biological surveys may also need to be conducted in coordination with threatened and endangered species review by the FWS.

State-Listed Species

The MNFI lists nearly 100 terrestrial plant and animal species listed by the State of Michigan as either endangered or threatened (see Table 2-9). As discussed above with respect to Federally listed species, however, final corridor location information would have to be provided to the MDNR prior to building the transmission line. Site-specific biological surveys would also need to be conducted in coordination with the state species review by the MDNR. Impacts of transmission line operation on State-listed species are likely to be minimal as long as

ITC*Transmission* adheres to all conditions that USACE and/or MDEQ may place on operations and management in the wetland permitting process.

Wetlands and Floodplains

Only minimal impacts on wetlands and floodplains are anticipated from operation of the new transmission lines and Milan Substation. Vegetation management actions may include, but are not limited to, pruning, wall trimming, tree removal, mowing, and herbicide application. Work would be conducted under the direct supervision of appropriately qualified personnel. Wetlands within the corridor that have the potential to regenerate in forest vegetation are expected to be manually cleared of woody vegetation periodically for line safety clearance, thereby being kept in a low-growing scrub/shrub or emergent wetland state. Access to these areas for maintenance would likely be on foot or by the use of matting for vehicle equipment, so as not to disturb the soil. Detroit Edison expects that ITC*Transmission* would minimize the use of pesticides in wetland portions of the transmission corridor (Detroit Edison 2010b). The review team therefore expects potential impacts on wetlands from the operation of the transmission line system to be minimal.

5.3.1.4 Terrestrial Monitoring during Operations

The Conservation and Monitoring Plan for operations proposed by Detroit Edison and accepted by MDNR (Detroit Edison 2012c) calls for periodic monitoring for eastern fox snake mortality during the operations period. There appears to be no need for other terrestrial monitoring activities related to operation of Fermi 3.

5.3.1.5 Potential Mitigation Measures for Operation-Related Terrestrial Impacts

Except for impacts on eastern fox snake habitat, impacts on terrestrial ecosystems resulting from operation of the proposed Fermi 3 facilities are expected to be minor, and no mitigation appears to be warranted. As for impacts to the eastern fox snake, Detroit Edison has developed a Conservation and Monitoring Plan for operations that has been approved by MDNR (Detroit Edison 2012c). The staff expects that the risk of possible mortality of eastern fox snakes would be mitigated according to Detroit Edison's Conservation and Monitoring Plan (Detroit Edison 2012c), as incorporated into a State endangered species permit issued by the MDNR.

5.3.1.6 Summary of Operational Impacts on Terrestrial Resources

Given the information provided in the ER (Detroit Edison 2011a), the Habitat and Species Conservation Plans for operating activities (Detroit Edison 2012b), Detroit Edison's responses to RAIs, interactions with State and Federal agencies, the public scoping process, and the review team's independent assessment, the review team has concluded that impacts from operations on terrestrial resources would be SMALL to MODERATE. The potential for MODERATE

impacts is limited to possible adverse effects on the eastern fox snake resulting from increased traffic on site roadways during operations. The staff's evaluation of the potential impacts on the eastern fox snake recognizes the potential for mitigation measures proposed by Detroit Edison (Detroit Edison 2012c) and approved by the MDNR to significantly reduce impacts on that species, thereby leading to SMALL impacts, but acknowledges the possibility of MODERATE impacts if proposed mitigation is not implemented as described in their plan. Additional mitigation measures beyond those identified in Section 5.3.1.5 would not be warranted.

5.3.2 Aquatic Impacts Related to Operation

This section discusses the potential impacts of operation of the proposed Fermi 3 on the aquatic ecosystems in water bodies on or adjacent to the Fermi site, including Lake Erie, and potential impacts on aquatic ecosystems from the operation and maintenance of associated transmission lines. Impacts on aquatic resources from operation of Fermi 3 would primarily be associated with withdrawal and consumption of water for cooling, discharge of cooling water, maintenance dredging, discharge of wastewater, and stormwater runoff. Transmission line impacts would primarily be associated with erosion from maintenance vehicles and other equipment and the effects of vegetation management activities on nearby water bodies.

5.3.2.1 Aquatic Resources – Site and Vicinity

This subsection evaluates impacts on aquatic resources that could occur on or in the vicinity of the Fermi site during operation of Fermi 3, including those in Lake Erie, the overflow canals, the Quarry Lakes, Swan Creek, and Stony Creek.

Lake Erie

During the operation of Fermi 3, aquatic habitats and biota in Lake Erie could be affected by cooling water withdrawal and consumption, discharge of heated effluent from the cooling water system, maintenance dredging, discharge of wastewater, and stormwater runoff at the Fermi site.

Water Withdrawal and Consumption

All cooling water for the operation of Fermi 3 would be withdrawn from Lake Erie, and impacts associated with operation of the water intake system would be limited to aquatic resources within Lake Erie. For aquatic resources, the primary concerns are related to the amount of water withdrawn and the amount of water consumed through evaporation and the potential for organisms to be impinged on the intake screens or entrained into the cooling water system. Impingement occurs when organisms are trapped against the intake screens by the force of the water withdrawn by the Cooling Water Intake Structure (CWIS) (NRC 1996). Impingement can result in starvation and exhaustion, asphyxiation (water velocity forces may prevent proper gill movement or organisms may be removed from the water for prolonged periods of time), and

physical damage (NRC 1996). Entrainment occurs when organisms are small enough or fragile enough to be drawn through the intake screens into the proposed Fermi 3 cooling system. Organisms that become entrained are normally relatively small benthic, planktonic, and nektonic (organisms in the water column) forms, including early life stages of fish and shellfish, which often serve as prey for larger organisms (NRC 1996). As entrained organisms pass through the CWIS into the proposed plant's cooling system, they would be subject to mechanical, thermal, and toxic stresses, and survival is unlikely.

A number of factors, such as the type of cooling system, the design and location of the intake structure, and the amount of water withdrawn from the source water body greatly influence the degree to which impingement and entrainment affect aquatic biota. Detroit Edison has proposed that a closed cycle recirculating cooling system comprising a cooling basin and natural draft cooling tower be used for Fermi 3. Water loss from the cooling towers through evaporation, drift, and blowdown would be made up by water from Lake Erie. Closed-cycle recirculating cooling water systems can, depending on the quality of the makeup water, reduce water use by 96 to 98 percent of the amount that the facility would use if it employed a once-through cooling system (NRC 1996). This significant reduction in water withdrawal rate results in a substantial reduction in impingement and entrainment.

The intake design through-screen velocity is another factor that greatly influences the rate of impingement of fish and shellfish at a facility. In general, the higher the through-screen velocity, the greater the number of fish impinged. The EPA has established a national standard for the maximum design through-screen velocity of no more than 0.5 fps (66 FR 65256). The EPA determined that species and life stages evaluated in various studies could endure a velocity of 1.0 fps and then applied a safety factor of two to derive the threshold of 0.5 fps. Detroit Edison has stated that the proposed intake structure would be designed to have a through-screen velocity of 0.5 ft/s or less under all operating conditions (Detroit Edison 2011a). The resulting low through-screen velocity would reduce the probability of impingement because most fish can swim against such low flows to avoid or swim off of intake screens. Fish that enter the intake bay would be able return to the lake the same way they entered.

Under the proposed design, the cooling water intake for Fermi 3 would include a trash rack, travelling screens, and a fish return system. The trash rack, equipped with a trash rake, would be positioned at the inlet to the pump house structure to capture larger debris; trash collected from the trash racks would be disposed of. Three dual-flow traveling screens (mesh size 3/8 in.) would be arranged side by side behind the trash rack to further prevent debris from entering the pump house and to collect aquatic organisms large enough to be caught on the screens. Aquatic organisms would first be washed from the traveling screens using a low-pressure water spray followed by a high-pressure wash to remove remaining debris. Strainers would be in place to collect the organisms washed from the screens, and a strainer backwash would then be used to direct those organisms back to Lake Erie via a fish return system in a manner compatible with the limits of the applicable NPDES permit (Detroit Edison 2011a). With such a

system in operation, most impinged fish would be returned alive to Lake Erie. The point of return for the fish return system would be outside the zone of influence of the intake bay (Detroit Edison 2011a).

The EPA indicated (66 FR 65256) that the optimal design requirement for the intake location is to place the inlet of the CWIS in an area of the source water body where impingement and entrainment of organisms are minimized by locating intakes away from areas with the potential for high productivity. The existing intake bay for Fermi 2 is formed by two rock groins that extend approximately 600 ft into Lake Erie. The intake bay is periodically dredged to maintain appropriate operating conditions; such dredging would limit the potential for the intake bay to support high-productivity habitat. The intake bay faces the open waters of Lake Erie; substrate outside the intake bay area consists of packed clay and sand, along with areas of soft sediments that would provide limited structure that could be used for cover or spawning by fish (AECOM 2009a; Detroit Edison 2010c). During surveys conducted from 2008 to 2009, fish numbers, fish species counts, and the density of benthic macroinvertebrates were found to be lower in the vicinity of the intake bay than in another nearby Lake Erie sampling location (AECOM 2009a). On this basis, the area of Lake Erie in the vicinity of the intake bay is unlikely to provide habitat with high levels of productivity. The intake structure for Fermi 3 would be located within the existing Fermi 2 intake bay.

Historical impingement and entrainment data were collected at the Fermi 2 intake over a 1-year period from October 1991 to September 1992 (Lawler, Matusky, and Skelly Engineers 1993). During the study, a total of 1944 fish representing 23 fish species and 9 families were collected during 53 sampling events. This resulted in an estimated annual impingement of 13,699 fish with a total biomass of approximately 725 lb. The dominant species impinged was gizzard shad (*Dorosoma cepedianum*), accounting for 71 percent of the total numbers of fish observed. Other prevalent species in the impingement samples included white perch (*Morone americana*, 7.1 percent), rock bass (*Ambloplites rupestris*, 3.3 percent), and freshwater drum (*Aplodinotus grunniens*, 3.2 percent). Ten of the 23 species impinged were considered sport fish species. Impingement rates varied seasonally, with greater numbers of fish impinged during the winter and fall and lesser numbers during the summer. The greater numbers of fish during the winter were represented primarily by gizzard shad (Lawler, Matusky, and Skelly Engineers 1993), which experience increased mortality when exposed to cold water temperatures (Bolsenga and Herdendorf 1993).

Entrainment of fish eggs and larvae was sampled at two different locations downstream of the two traveling screens for Fermi 2. A total of 13,547 eggs and larvae representing 15 fish species and 10 families were collected and it was estimated that approximately 2.9 million larvae and 72,000 eggs were entrained annually by Fermi 2 operations (Lawler, Matusky, and Skelly Engineers 1993). The dominant species collected were gizzard shad (59 percent), spottail shiner (*Notropis hudsonius*, 18 percent), yellow perch (*Perca flavescens*, 7 percent), and emerald shiner (*Notropis atherinoides*, 5 percent). Entrainment rates varied seasonally,

with greater numbers collected during June and July and lesser numbers collected from October through February. Gizzard shad eggs and larvae made up the highest proportion of the entrained specimens during the summer, which corresponds with their peak spawning periods (Lawler, Matusky, and Skelly Engineers 1993).

A second impingement study, conducted from 2008 to 2009 at the Fermi 2 intake (AECOM 2009a), was summarized in Section 2.4.2.1 (Tables 2-10 and 2-11). Overall, it was estimated that 3102 individual fish representing 15 species were impinged in the study. Impingement information was not collected in April 2009 because of a large amount of debris in the sampling area. Thus the total number of fish impinged during the year may have been underestimated by several hundred individuals (AECOM 2009a). Similar to the previous study, samples collected from the 2008–2009 impingement study also contained high proportions of gizzard shad (35 percent) and white perch (10 percent) (Table 2-11). However, the recent study had a higher proportion of emerald shiner than the 1991–1992 study (34 percent versus 3 percent). In addition, the recent study identified the round goby (*Neogobius melanostomus*), a nonnative invasive species (Section 2.4.2.3) not collected during the earlier study. Based on the similarities in operational water withdrawal rates, locations of the intakes, intake designs, and flow-through velocities for Fermi 2 and Fermi 3, impingement rates are expected to be similar. The applicant determined the number of fish impinged per unit volume of water for Fermi 2 based on the impingement study and operational flow rates (AECOM 2009a). They then scaled the impingement losses to the expected flow rates for Fermi 3. The results of this analysis are presented in Table 5-5.

Entrainment sampling conducted from 2008 to 2009 (AECOM 2009a) at the Fermi 2 intake identified eggs and larvae from 13 fish species (Table 2-10). In comparison, studies conducted from 1991 to 1992 identified eggs and larvae of 28 species (Lawler, Matusky, and Skelly Engineers 1993). Overall, it was estimated that 62,566,649 fish (3,940,823 eggs and 58,625,825 larvae) were entrained at the Fermi 2 intake during the 2008–2009 study (AECOM 2009a). Compared to the 1991–1992 study, a comparable proportion of gizzard shad eggs and larvae, but a smaller proportion of white perch larvae, were entrained during the 2008–2009 study period. In addition, the 2008–2009 study found higher proportions of emerald shiner, bluntnose minnow (*Pimephales notatus*) and yellow perch in entrainment samples. From 1991 to 1992, lake whitefish (*Coregonus clupeaformis*; 2 percent of total entrainment) were collected during late March and April 1992, but no lake whitefish eggs or larvae were collected in the 2008–2009 study. The round goby was not collected during the 1991–1992 entrainment study, but accounted for more than 2 percent of the individual fish entrained by Fermi 2 from 2008 to 2009. Based on the entrainment rates for Fermi 2 from the AECOM (2009a) study and the maximum estimated intake water volume for Fermi 3, it was estimated that approximately 55 million fish eggs and larvae would be entrained annually by Fermi 3 (Table 5-6). Many of the species observed during entrainment studies are species that exhibit high fecundity and produce large numbers of eggs and larvae (Table 5-7) or that are common

forage species (e.g., gizzard shad, emerald shiner, bluntnose minnow, brook silverside [*Labidesthes sicculus*]).

Table 5-5. Estimated Numbers of Fish that Would Have Been Impinged by the Proposed Fermi 3 Cooling Water Intake with the Intake Pumps at Maximum Capacity Based on Sampling at the Fermi 2 Intake from August 2008 through July 2009[(a)]

Common Name	Scientific Name	Jan	Feb	Mar	Apr[(b)]	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Percentage of Total
Gizzard shad	*Dorosoma cepedianum*	65									61	159	962	1247	35.0
Emerald shiner	*Notropis atherinoides*	97	87	589	295				25	24	30		64	1211	33.9
White perch	*Morone americana*		29	98	49				49	24	30	32	32	343	9.6
Bluegill	*Lepomis macrochirus*	32	29	131	66								32	290	8.1
Round goby	*Neogobius melanostomus*	32			15	30			25	24				126	3.5
Smallmouth bass	*Micropterus dolomieu*			33	17				25					75	2.1
Spottail shiner	*Notropis hudsonius*				15	30		26						71	2.0
Banded killifish	*Fundulus diaphanous*										30			30	0.8
Largemouth bass	*Micropterus salmoides*										30			30	0.8
Brook silverside	*Labidesthes sicculus*								25					25	0.7
Bluntnose minnow	*Pimephales notatus*									24				24	0.7
Channel catfish	*Ictalurus puctatus*									24				24	0.7
Freshwater drum	*Aplodinotus grunniens*						24							24	0.7
Green sunfish	*Lepomis cyanellus*									24				24	0.7
Rock bass	*Ambloplites rupestris*									24				24	0.7
Total		**226**	**145**	**851**	**456**	**60**	**24**	**26**	**149**	**168**	**181**	**191**	**1090**	**3567**	**100.0**

(a) Calculations based on measured impingement rates from August 2008 through July 2009 at the Fermi 2 intake (AECOM 2009a). Impingement rates for each species computed for unit volume of water and then estimated for Fermi 3 based on projected maximum withdrawal capacity of 32,264 gpm.

(b) Measured impingement values for April were unavailable because heavy debris prevented sample collection. April impingement values were estimated by averaging the estimates for March and May.

Table 5-6. Estimated Numbers of Fish Eggs and Larvae (in Millions) that Would Have Been Entrained by the Proposed Fermi 3 Cooling Water Intake with the Intake Pumps at Maximum Capacity Based on Sampling at the Fermi 2 Intake from August 2008 through July 2009[(a)]

		2008						2009								
Common Name	**Scientific Name**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec[(b)]**	**Jan[(b)]**	**Feb[(b)]**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Total**	**% of Total**
Gizzard shad	*Dorosoma cepedianum*	0.05										1.42	0.95	22.69	25.11	45.7
Emerald shiner	*Notropis atherinoides*	0.87	1.51								0.20	2.92	0.73	3.24	9.46	17.3
Bluntnose minnow	*Pimephales notatus*		0.06								0.03	4.77	0.45		5.31	9.7
Yellow perch	*Perca flavescens*										0.25	4.02	0.45		4.72	8.6
Unidentified spp.	–				4.23										4.23	7.7
Freshwater drum	*Aplodinotus grunniens*													1.91	1.91	3.5
Round goby	*Neogobius melanostomus*	0.05	0.41	0.11								0.75	0.17	0.06	1.55	2.8
Bigmouth buffalo	*Ictiobus cyprinellus*											1.24	0.34		1.58	2.9
Channel catfish	*Ictalurus punctatus*	0.36													0.36	0.7
Largemouth bass	*Micropterus salmoides*										0.11	0.09			0.20	0.4
Sunfish sp.	*Lepomis* spp.											0.14			0.14	0.3
White perch	*Morone americana*	0.10													0.10	0.2
Unknown Centrarchids	Family Centrarchidae												0.06		0.06	0.1
Brook silverside	*Labidesthes sicculus*											0.06			0.06	0.1
Total		**1.4**	**2.0**	**0.1**	**4.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.6**	**15.4**	**3.1**	**27.9**	**54.7**	**100.0**

(a) Calculations based upon entrainment rates measured from July 2008 through July 2009 at the Fermi 2 intake (AECOM 2009a) and a projected maximum withdrawal capacity of 32,264 gpm for Fermi 3.

(b) Entrainment sampling was not conducted during December, January, and February. Estimates are based on samples collected during November and March. The numbers of eggs and larvae are expected to be low during these months because it is outside the normal spawning period for most Lake Erie fish species (AECOM 2009a).

Table 5-7. Reported Fecundity of Fish Species Identified during the 2008–2009 Entrainment Study

Common Name	Estimated Annual Entrainment[(a)]	Reported Fecundity (eggs per female)	Source
Gizzard shad	25,106,522	22,000–544,000	Bodola (1965)
Emerald shiner	9,461,244	868–8733	Texas State University (2010)
Bluntnose minnow	5,306,690	1112–4195	Gale (1983)
Yellow perch	4,720,370	12,641–135,848	Sztramko and Teleki (1977)
Freshwater drum	1,909,922	127,000	Bur (1984)
Round goby	1,546,530	84–606	MacInnis and Corkum (2000)
Bigmouth buffalo	1,579,402	Up to 400,000	ODNR (2007)
Channel catfish	357,910	4000–100,000	Bolsenga and Herdendorf (1993)
Largemouth bass	198,706	5000–43,000[(b)]	MDNR (2004)
White perch	102,260	64,480–388,736	Bur (1986)
Brook silverside	57,862	73–785	Eakins (2010)

(a) Estimated entrainment based on measured impingement rates from August 2008 through July 2009 at the Fermi 2 intake and a projected maximum withdrawal capacity of 32,264 gpm for Fermi 3 (AECOM 2009a).

(b) Based on the numbers of eggs per nest (MDNR 2004).

Based on the planned low through-screen intake velocity, the use of closed-cycle cooling, the location and design of the intake bay, and the historic low impingement rates during operations of the existing Fermi 2, the review team concludes that impacts on fish populations from impingement during Fermi 3 operations would be minor. Removing impinged biota from the screens and operating the fish return system would further reduce this impingement impact by returning most impinged fish alive to Lake Erie. Based on the small proportion of water that would be withdrawn from Lake Erie relative to the volume of water in the western basin, the use of closed-cycle cooling to reduce water withdrawals, the location of the intake bay away from sensitive or productive habitats, the historic entrainment rates for Fermi 2, and the relatively high fecundities exhibited by the species that experience the highest entrainment rates, the review team concludes that impacts on fish populations from entrainment for Fermi 3 would also be minor. The EPA 316(b) Phase I regulations established location- and capacity-based limits on proportional intake flow. The regulation states that "for lakes or reservoirs, intake flow may not disrupt natural thermal stratification or turnover patterns (where present) of the source water body." Because of the large quantity of water in the western basin of Lake Erie and the relatively small hydraulic zone of influence of the intake withdrawal, the review team has determined that the operation of Fermi 3 would have no detectable effect on thermal stratification in Lake Erie.

Cooling Water Discharge System

Cooling tower blowdown from Fermi 3 would be discharged directly into Lake Erie via a three-port diffuser system located approximately 1300 ft from shore. The preliminary design of the diffuser assumes that the ports would be elevated 1.6 ft above the lake bed and angled at 20 degrees above the horizontal pointing to the east away from shore. Sections 3.2.2.2 and 5.2.3.1 discuss the location, design, and operation parameters for the discharge structure. This section evaluates potential thermal, chemical, and physical impacts on the Lake Erie aquatic ecosystem from the operation of the cooling water discharge system.

Thermal Impacts. Potential thermal impacts on aquatic organisms could include heat stress, cold shock, and the creation of favorable conditions for invasive species.

Heat Stress. Thermal conditions influence the health of aquatic ecosystems by influencing water chemistry (e.g., dissolved oxygen levels) and an array of ecological processes such as feeding rate, metabolic rate, growth, reproduction, development, distribution, and survival. Aquatic biota are often able to persist (e.g., grow, reproduce, and survive) under a range of thermal conditions. While many species have similar temperature tolerances, optimal growth and survival are linked to optimal thermal conditions that are driven by species-specific requirements (Kellogg and Gift 1983).

The thermal tolerance for aquatic organisms is defined in different ways. Some definitions relate to the temperature that causes fish to avoid the thermal plume; other definitions relate to the temperature that fish prefer for spawning; and others relate to the temperatures (upper and lower) that may cause mortality. Spatially, thermal pollution may exist at the local site level, or it may include larger extents (i.e., lake or watershed). Temporally, conditions resulting in water temperatures that exceed ambient levels may be more pronounced during certain time periods (i.e., winter). Finally, the consequences of thermal pollution within aquatic ecosystems may be confined to individual species and, depending on ecosystem conditions, may include a population-level response (Coutant 1976).

Section 5.2.3.1 describes the estimated cooling water discharge rates and temperatures that would occur as a result of the operation of Fermi 3 and evaluates the characteristics of the thermal plume that would result, including the likely increases in ambient water temperature and the dimensions of the thermal plume. As described in Section 5.2.3.1, MDEQ would specify allowable characteristics of the thermal plume through the NPDES permitting process. Thermal plume simulation modeling was conducted by Detroit Edison (2011a) and independently confirmed by the review team. Based on the expected volumes and water temperatures of cooling water blowdown discharged from Fermi 3, the estimated maximum extent of the thermal plume (i.e., where ambient water temperatures would be increased by 3°F or more) would encompass an area of no more than approximately 55,300 ft^2 (1.3 ac) during any period of the year (Detroit Edison 2011a). It was also estimated that the portion of the plume that would be equal to or exceed the temperature standard established by MDEQ for Lake Erie for each month would encompass an area of 188 ft^2 or less during any period of the year (Detroit Edison 2011a). MDEQ would define the allowable area and characteristics of the thermal plume mixing zone in the NPDES permit based, in part, on the areas where temperatures would be elevated. Based on these results, it is concluded that the area of the thermal plume would be small relative to the large extent of similar open water habitat in the immediate area. Because of the small area affected by the thermal plume, it is unlikely that fish migration or spawning efforts would be significantly hindered; however, some fish species may avoid the area altogether in the summer when maximum lake temperatures are reached. During winter months, the thermal plume may act as an aggregation point for some species that prefer warmer water temperatures (e.g., gizzard shad).

The largest increases in ambient water temperatures would occur during wintertime when ambient lake water temperatures decline. Maximum absolute lake water temperatures would occur in summer months and could result in water temperatures approaching the reported critical thermal maximum for some cool or coldwater fish species in the immediate vicinity of the discharge diffusers. Ambient water temperatures during summer months have been documented to exceed 76°F (Detroit Edison 2011a). However, even during such periods, it is estimated that the area that would exceed ambient temperatures by 3°F or more would be 188 ft^2 or less based on modeling for the thermal plume (Detroit Edison 2011a), and most fish

species would be capable of detecting and avoiding the affected area; consequently, it is concluded that impacts on populations of aquatic organisms would be minor.

Based on the foregoing evaluation, the review team concludes that the impacts of heat stress on Lake Erie fish populations from the discharge of cooling water blowdown from Fermi 3 would be minor and additional mitigation, aside from compliance with conditions established in NPDES permits developed by MDEQ, would not be warranted.

Cold Shock. Another factor related to thermal discharges that may affect aquatic biota is cold shock. Cold shock occurs when aquatic organisms that have been acclimated to warm water, such as fish in a power plant's thermal plume, are exposed to a sudden temperature decrease that exceeds their ability to acclimate and results in mortality. This sometimes occurs when power plants shut down suddenly in winter. As described above, some species with particular temperature preferences (e.g., gizzard shad) would be likely to aggregate in the areas of warmer water near the Fermi 3 discharge in Lake Erie. Overall, it is anticipated that cold shock mortality would be rare because sudden power plant shutdowns are infrequent, and because the thermal plume would encompass a relatively small area, the numbers of individual fish that could be affected by such events would not significantly affect populations of fish species in Lake Erie. In the NPDES permit for Fermi 3 (or a combined NPDES permit for the Fermi site), MDEQ could require gradual reduction of effluent discharge to Lake Erie during winter months to reduce the potential for fish mortality due to cold shock. The existing NPDES permit for the Fermi site requires that cessation of cooling water inputs to Lake Erie occur gradually during the winter months in order to avoid fish mortality from cold shock, and Detroit Edison reported that there have been no observations of fish kills during wintertime shutdowns for Fermi 2. Based on the foregoing, the review team recommends that if a shutdown of Fermi 3 were planned during the winter months, the discharge of cooling water should be gradually reduced as mitigation. Assuming the implementation of this mitigation measure, the review team concludes that the thermal impacts on fish populations due to cold shock would be minor

Chemical Impacts. Section 5.2.3.1 describes the chemical additions that would be made to the cooling system water both prior to and after use for cooling. Sodium hypochlorite would be added to the intake water as a biocide/algaecide to control the proliferation of organisms in the cooling system, including zebra and quagga mussels. Additional treatment, including chlorination or thermal shock, could be used to control invasive mussels if deemed necessary. Additional chemicals would be used to control corrosion and scale deposits, and to disperse sediment (if needed). Chlorine would be removed from cooling water (i.e., dehalogenated) with sodium bisulfate before the water is discharged into Lake Erie. The use of sodium bisulfate for dehalogenation avoids the use of phosphorus-containing compounds (e.g., phosphoric acid) that could contribute to nutrient enrichment and development of algal blooms in Lake Erie (Detroit Edison 2011a).

The concentrations of chemicals in the effluent from Fermi 2 are regulated by an existing NPDES permit from MDEQ. The chemical concentrations at the thermal discharge outfall for Fermi 2 have consistently complied with the permitted NPDES limits, and no impacts on the aquatic ecology of Lake Erie from Fermi 2 discharges have been reported. Effluent limits identified in the NPDES permit for Fermi 3 will be developed in accordance with EPA ambient water quality criteria. Ambient water quality criteria were developed on the basis of numerous toxicity studies to aid in determining appropriate limit levels to prevent facility effluents from harming natural resources, including aquatic biota. The levels identified in the existing NPDES permit for Fermi 2 are set well below documented lethal levels for indicator organisms to ensure protection of organisms in the receiving water body (Detroit Edison 2011a).

The chemical concentrations in Fermi 3 discharges (1) would be expected to be relatively low, (2) would be similar to those in Fermi 2 discharges, and (3) would be established and controlled through the NPDES permitting process. In addition, Detroit Edison has stated that it would not use phosphorus-containing corrosion and scale inhibitors for Fermi 3, replacing them with two non-phosphorus-containing water treatment chemicals (Detroit Edison 2010c). On this basis, the review team concludes in Section 5.2.3.1 that the impacts of Fermi 3 discharges on water quality would be SMALL. Similarly, it is concluded that the impacts on aquatic biota from the chemical concentrations in the proposed Fermi 3 discharge would be minor, and no additional mitigation is warranted.

Physical Impacts. Physical impacts associated with discharge from the Fermi 3 site could include shoreline erosion, effects on lake stratification, and bottom scour in the location of the diffuser, which could result in increased turbidity and siltation.

There is likely no potential for benthic scouring in the immediate vicinity of the discharge outfall. 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). Given the small areal extent of the thermal plume from operation of Fermi 3, effects on existing stratification patterns in Lake Erie in the vicinity of the Fermi site would be negligible. Consequently, physical changes in aquatic habitat and impacts on aquatic organisms from scouring and thermal stratification would be minor. Because the discharge ports would be located at least 1300 ft from the shoreline and would direct water upward, shoreline erosion is not expected to result from the discharge of cooling water.

Based on the analysis of the potential for physical impacts on the aquatic ecosystem from the discharge of cooling water to Lake Erie, the review team concludes that the physical impacts from cooling water discharges from Fermi 3 would be minor, and no further mitigation would be warranted.

Maintenance Dredging

It is anticipated that maintenance dredging activities and the volume of dredged sediments at the Fermi site would remain similar after Fermi 3 operations commence because the intake areas for Fermi 2 and Fermi 3 would be collocated within the intake bay. Under existing operations at the Fermi site, the intake bay is dredged approximately every 4 years to maintain appropriate operating conditions. Such dredging, which is currently authorized under permits from the USACE and MDEQ (Section 5.2), results in the mortality of benthic invertebrates and other organisms associated with the accumulated sediments that are removed and a temporary localized increase in turbidity in the vicinity of the intake bay. Dredged material is expected to be disposed of in the Spoil Disposal Pond, where sediment would be allowed to 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, and no mitigation measures beyond those identified in the appropriate permits would be warranted.

Stormwater Drainage

During the period of operation, onsite streams and wetlands could be affected by stormwater drainage. Stormwater from the finished grade at Fermi 3 would be directed to a sump that would discharge to the north canal via an outlet pipe. The north canal would discharge to the North Lagoon, which is hydrologically connected to Swan Creek, and eventually to Lake Erie. Stormwater may also run off directly either to the North Lagoon or to the South Lagoon. The South Lagoon is hydrologically connected to Lake Erie. Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff and sediment loading to Lake Erie (Detroit Edison 2011a).

On the basis of the planned implementation of a SWPPP similar to that currently in place for Fermi 2, the review team concludes that impacts on aquatic resources from stormwater drainage to Lake Erie due to the operation of Fermi 3 would be minor.

North and South Canals and Swan Creek

During Fermi 3 operations, aquatic habitats in Swan Creek could be affected by stormwater drainage. Stormwater from the finished grade at Fermi 3 would be directed to a sump that would discharge to the north canal via an outlet pipe. The north canal discharges to Swan Creek via the North Lagoon; water draining into Swan Creek eventually reaches Lake Erie. Uncontrolled stormwater runoff may also travel directly either to the North Lagoon or to the South Lagoon. Water entering the south canal would be discharged to the South Lagoon and eventually would discharge to Lake Erie through an outfall near the southern boundary of the Fermi site. Historically, stormwater runoff to these areas has been managed and controlled

through Detroit Edison's existing SWPPP, and diverse aquatic communities have been maintained in these areas.

On the basis of the planned implementation of a SWPPP similar to that currently in place for Fermi 2, the review team concludes that impacts on aquatic resources in Swan Creek and the north and south canals from stormwater runoff due to the operation of Fermi 3 would be minor and no mitigation measures beyond those identified in the SWPPP and in applicable NPDES permits would be warranted.

Quarry Lakes

There are no plans to withdraw water from the Quarry Lakes as part of Fermi 3 operations. Stormwater runoff from areas surrounding the Quarry Lakes will continue to drain into the Quarry Lakes via NPDES-permitted outfalls (Outfall 004, Outfall 005, and Outfall 007, as shown in Figure 2-6). This would include runoff originating from buildings and landscaping associated with the proposed multiple-level parking garage, Fermi 3 simulator facility, and the joint Fermi 2/Fermi 3 administration building, as shown in Figure 3-1. On the basis of the planned implementation of a SWPPP for the Fermi site similar to that currently in place, the review team concludes that impacts on aquatic resources from permitted stormwater runoff drainage to the Quarry Lakes would be minor, and no additional mitigation beyond that required in the associated NPDES permits would be warranted.

Stony Creek

The Stony Creek watershed is entirely outside the Fermi site. There are no plans to discharge stormwater runoff from Fermi 3 facilities into the Stony Creek watershed, and no water withdrawals or releases associated with operation of Fermi 3 would affect water quantity or water quality in Stony Creek. Consequently, there would be no operation-related impacts on aquatic resources within Stony Creek, and no mitigation would be warranted.

5.3.2.2 Aquatic Resources – Transmission Lines

Transmission lines from Fermi 3 would be owned by Detroit Edison up to the point of their interconnection with the proposed Fermi 3 switchyard. Outward from interconnection with the Fermi 3 switchyard, ITC*Transmission* would own the lines and other transmission system equipment. Although Detroit Edison will maintain ownership and control of the land in the new onsite transmission corridor, Detroit Edison expects to contract with ITC*Transmission* to maintain the transmission towers and lines located on Detroit Edison property (Detroit Edison 2011a). Accordingly, the impacts from operation and maintenance of transmission lines discussed in this EIS are based on publicly available information and reasonable expectations of the configurations and practices that ITC*Transmission* would likely follow based on standard industry practice. The operation and maintenance of electricity transmission systems have the

potential to affect aquatic ecological resources primarily through corridor maintenance activities, such as vegetation management, which would affect shorelines or could introduce sediment from erosion or contaminants from vehicles or herbicide treatments into waterways. As identified in Section 4.3.2.2, the identified transmission line route crosses about 30 wetlands or other waters that may be regulated by MDEQ and/or USACE. The 18.6-mi existing eastern section of the transmission line route crosses 12 narrow agricultural drains and small streams, and the currently undeveloped 10.8-mi western section of the route crosses nine agricultural drains and small streams.

Maintenance activities along the proposed 345-kV transmission line corridor could lead to periodic temporary impacts on waterways crossed by the transmission lines. However, BMPs currently employed by ITC*Transmission* for the existing Fermi 2 facility transmission line corridors would likely be applied to the proposed transmission line corridor to limit the potential for impacts (Detroit Edison 2011a). As described in Section 5.3.1.3 for wetlands and floodplains, it is anticipated that vegetation clearing in proximity to waterways would be limited to the minimum needed to allow access by maintenance vehicles and to keep the transmission lines free from intrusion of trees that could interfere with safe, reliable operation. To the extent practicable, existing access roads are expected to be used for ROW maintenance in the portion of the proposed corridor that already has existing transmission facilities and existing roads, and new access roads would be used for the currently undeveloped 10.4-mi segment of the proposed transmission line corridors. However, as described in Section 5.3.1.2, there would be occasional vehicular traffic in the corridor for maintenance purposes, which could result in minor amounts of soil erosion within the immediate area of the transmission line corridor.

ITC*Transmission* is a member of the EPA's voluntary Pesticide Environmental Stewardship Program (PESP). PESP members adopt risk reduction strategies and undertake specific steps toward reaching their goals of pesticide practices that reduce risks to humans and the environment (Detroit Edison 2011a). As described for wetlands and floodplains in Section 5.3.1.3, it is anticipated that the application of pesticides and herbicides in riparian areas near waterways would be minimized to the greatest extent possible to protect ecological resources (Detroit Edison 2011a).

Because of the periodic nature and typically small areas being maintained at any one time, the limited number of aquatic habitats that would be crossed by the proposed transmission corridor for Fermi 3, and the anticipated implementation of maintenance protocols similar to those in effect for the existing Fermi 2 transmission line corridor (Detroit Edison 2011a), the effects of ROW area maintenance on aquatic resources are expected to be minor during operation of Fermi 3, and additional mitigation beyond that described above would not be warranted.

5.3.2.3 Important Aquatic Species and Habitats

This section describes the potential impacts of the operation of Fermi 3 and associated 345-kV transmission lines on important aquatic species and habitats, including any species that have been listed under the ESA, species that are listed by the State, and commercially and recreationally important species. The general biology, status, and habitat requirements of important aquatic species, along with the potential for species to occur in the vicinity of the Fermi site are presented in Section 2.4.2. Potential impacts on important aquatic species from operation of Fermi 3 would primarily be associated with intake and consumption of water for cooling, discharge of cooling water, maintenance dredging, discharge of wastewater, and stormwater runoff. Transmission line impacts would primarily be associated with erosional effects from use of vehicles and other equipment and physical and chemical vegetation management activities that occur in the vicinity of aquatic habitats.

Operations of Fermi 3 have a potential to affect populations of important aquatic species due to impingement and entrainment mortality, as well as effect changes in water quality (including water temperatures) associated with the cooling water intake and discharge systems. The magnitude of impacts from operations of Fermi 3 would depend on the susceptibility of a species to impingement and entrainment at the intake structure, sensitivity of a species to water quality changes (including temperature changes) associated with the cooling water discharge structure and stormwater runoff, species-specific habitat requirements, critical time periods in a species' life cycle, and the intensity and duration of the disturbance.

Commercially and Recreationally Important Species

Commercially and recreationally important species that could occur in the vicinity of the Fermi site are identified in Section 2.4.2.3, along with information about their habitat requirements and life histories. In addition to the waters of Lake Erie, commercially and recreationally important species may also use nearshore ponds, marshes, and streams as spawning, nursery, or adult habitat. Consequently, the analysis of potential effects considered those species that could be present in aquatic habitats that could be reasonably affected by Fermi 3 operations including Lake Erie, the north and south canals, North and South Lagoons, Swan Creek, and streams that would be crossed by the proposed transmission line route. As identified in Section 5.3.2.1, impacts from Fermi 3 operations on aquatic resources present in the Quarry Lakes or other onsite aquatic habitats or on aquatic resources in Stony Creek are expected to be SMALL.

Eight fish species that are considered commercially or recreationally important in Lake Erie (bigmouth buffalo, channel catfish, freshwater drum, gizzard shad, largemouth bass, smallmouth bass, white perch, and yellow perch) were entrained or impinged during studies conducted at the Fermi 2 intake in 2008 and 2009 (Tables 5-5 and 5-6). Based on those studies, it is estimated that 24 to 1247 individuals of seven of these species (gizzard shad, white perch, bluegill, smallmouth bass, largemouth bass, channel catfish, and freshwater drum) would

be impinged (Table 5-5) and approximately 100,000 to 25 million eggs and larvae of these species (Table 5-6) would be entrained annually at the cooling water intake for Fermi 3 with the intake pumps at full capacity. Considering the large numbers of these species that are commercially and recreationally harvested each year in Michigan waters of the western basin of Lake Erie, impingement mortality at the estimated levels would represent a negligible impact on populations of these species. The commercially and recreationally important species observed during entrainment studies are species that exhibit high fecundity and produce large numbers of eggs and larvae (Table 5-7), and the gizzard shad is a common forage species in the western basin of Lake Erie. Based on the low proportion of water that would be withdrawn from Lake Erie relative to the volume of water in the western basin, the use of closed-cycle cooling to minimize water withdrawals, the location of the intake bay away from any known sensitive spawning or nursery habitats, the historic impingement and entrainment rates for the existing Fermi 2, and the relatively high fecundities exhibited by the commercially and recreationally important species that are likely to be impinged or entrained, the review team concludes that impacts on commercially and recreationally important fish populations from impingement and entrainment during Fermi 3 operations would be minor.

During operation of Fermi 3, aquatic habitat in Lake Erie near the discharge would be affected by altered water quality, especially increased water temperature, in the vicinity of the cooling water discharge. As described in Section 5.3.2.1, the thermal and chemical impacts on aquatic habitats and biota from cooling water discharge due to Fermi 3 operations would be SMALL, because the thermal impacts would be confined to a small mixing zone area (1.3 ac or less) where water temperatures would exceed ambient temperatures, and because MDEQ would regulate the allowable thermal and chemical characteristics of the discharged waters through the NPDES permitting process. Scouring or other physical impacts due to cooling water discharge would also be limited (see Section 5.3.2.1). For these reasons, the review team concludes that impacts on commercially and recreationally important fish populations from the discharge of cooling water by Fermi 3 would be negligible.

As identified in Section 5.3.2.1, periodic maintenance dredging of the intake bay and permitted discharges of effluent and stormwater at the Fermi site could temporarily alter water quality in the vicinity of the intake bay. These are areas that have been periodically dredged as part of the maintenance activities at the Fermi site. Although the presence of some commercially and recreationally important fish species has been documented within the intake bay and in the area that would be affected during periodic maintenance dredging for the Fermi site (AECOM 2009a), it is anticipated that most individuals of commercially and recreationally important species would temporarily move away during dredging activities because of noise and increased turbidity. While this would result in temporary short-term displacement of individuals, it is anticipated that population-level impacts on commercially and recreational fish species would be negligible.

Stormwater from the finished grade at Fermi 3 would be directed to a sump that would discharge to the north overflow canal via an outlet pipe. The overflow canal would discharge to the North Lagoon, which discharges to Swan Creek and eventually to Lake Erie. Stormwater may also travel directly either to the North Lagoon or to the South Lagoon. The South Lagoon also discharges to Lake Erie. Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff to the receiving water bodies to ensure that any increase in sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts (Detroit Edison 2011a). On the basis of the planned implementation of a SWPPP similar to that currently in place for Fermi 2, the review team concludes that impacts from Fermi 3 operations on commercially and recreationally important aquatic species due to stormwater runoff would be SMALL and that no additional mitigation would be warranted.

As described in Section 2.4.2.2, there are no important commercial or recreational fisheries present within the assumed transmission line route because of the small sizes of the drainages crossed by the transmission line corridor. However, some of the streams to be crossed by the proposed transmission lines support some commercially or recreationally important species. Maintenance of transmission lines could periodically and temporarily affect individuals in the vicinity of stream crossings because of erosion of soils and deposition of sediment via runoff, potential pollutant discharge from maintenance equipment, and temporary disturbance and/or displacement of aquatic biota. As described in Section 5.3.2.2, it is anticipated that the proposed transmission line corridor would be operated and maintained by ITC*Transmission* in the same fashion as the existing transmission line corridor for Fermi 2 (Detroit Edison 2011a). Vegetation clearing is expected to be limited to the minimum needed to allow access by maintenance vehicles and to keep the transmission lines free from intrusion of trees that could interfere with safe, reliable operation (Detroit Edison 2011a), thereby reducing the potential for impacts on commercially or recreationally important species resulting from erosion, sedimentation, and disturbance.

As described in Section 5.3.2, pesticides and herbicides are expected to be used selectively, in accordance with specified labeling, and only where needed, thus minimizing the potential for significant impact on aquatic resources. Because of the periodic nature and typically small areas being maintained at any one time and the limited number of aquatic habitats that would be crossed by the proposed transmission line corridor for Fermi 3, the effects of ROW maintenance on commercially and recreationally important aquatic resources are expected to be SMALL during operation of Fermi 3.

On the basis of an evaluation of information presented in the ER and other existing information, the review team concludes that impacts on commercially and recreationally important species due to the operation of Fermi 3 and the associated transmission line corridors would be minor,

and no additional mitigation would be warranted. Implementation of BMPs and other mitigation measures stipulated in required permits would further reduce impacts.

Federally and State-Listed Aquatic Species

This section evaluates the potential for Federally and State-listed aquatic species to be affected by operation of Fermi 3. Federally and State-listed species that could occur in the counties (Monroe, Wayne, and Washtenaw Counties) within which activities related to operation of Fermi 3 would occur were identified in Section 2.4.2.3, along with information about their habitat requirements and life histories.

Based on habitat requirements, current distributions, and survey data, aquatic species with a potential to occur in the vicinity of the Fermi site or the proposed transmission line route were identified in Section 2.4.2.3 (see Table 2-13). Three species of freshwater mussels that are Federally listed as endangered (northern riffleshell [*Epioblasma torulosarangiana*]; rayed bean [*Villosa fabilis*]; and snuffbox mussel [*E. triquetra*]) were identified as having the potential to occur in Monroe, Washtenaw, or Wayne Counties, Michigan. None of these species have ever been documented either on the Fermi site or along the proposed transmission line route, and only the rayed bean and the snuffbox mussel have a potential to occur on the Fermi site based on information about the current status of populations, records of occurrence, and habitat preferences (Section 2.4.2.3). The northern riffleshell is considered unlikely to occur on or adjacent to the Fermi site because of the lack of suitable stream habitat; it is unknown whether there could be suitable habitat for the northern riffleshell in portions of streams that would be crossed by the proposed transmission line route within Monroe or Wayne Counties, although the species has not been reported from the streams that would be crossed.

Including the Federally listed species identified above, all of which are also listed as endangered by the State of Michigan, State-listed species that have been observed or that have a potential to occur on or adjacent to the Fermi site include three mussel species (rayed bean, salamander mussel [*Simpsonaias ambiqua*], and snuffbox mussel) and three fish species (pugnose minnow [*Opsopoeodus emiliae*], sauger [*Sander canadensis*], and silver chub [*Macrhybopsis storeriana*]) (Section 2.4.2.3; Table 2-13). Of these species, only the silver chub is known to occur at the Fermi site (Table 2-13).

The only known existing population of the white catspaw (*Epioblasma obliquata perobliqua*), a freshwater mussel that is Federally and State-listed as endangered, occurs in one stream drainage in Ohio; the species is considered extirpated from Michigan. As a consequence, it is believed that this species would not be present near the Fermi site or in streams that would be crossed by the proposed transmission line corridor and that it would not be affected by operation of Fermi 3, and additional evaluation was not included in the FEIS or the BA.

There are other State-listed mussel and fish species (as shown in Table 2-13) that are considered unlikely to occur at the Fermi site but have a potential to occur in streams that would be crossed by the proposed transmission line corridor in Monroe, Wayne, or Washtenaw Counties. Currently there is insufficient information to determine whether any of those species are present in the streams that would be crossed.

Maintenance of transmission lines could affect listed organisms in the vicinity of stream crossings because of erosion of soils and deposition of sediment via runoff, potential for pollutant discharge from maintenance equipment and vehicles, and temporary disturbance and/or displacement of individuals. As described in Section 5.3.2.2, it is assumed that BMPs employed by ITC*Transmission* for the existing Fermi 2 facility transmission line corridors would also be applied to the proposed transmission line corridor (Detroit Edison 2011a) to limit the potential for impacts on aquatic species, including listed species. ITC*Transmission* maintains a database of known occurrences of threatened and endangered species obtained from the MNFI to identify locations where seasonal constraints or other regulatory conditions need to be considered for vegetation management activities in habitats occupied by rare species (Detroit Edison 2010b). Because of the periodic nature of maintenance, the typically small areas being maintained at any one time, and the limited number of aquatic habitats that would be crossed by the proposed transmission line corridor for Fermi 3, the effects of ROW area maintenance on Federally and State-listed species are expected to be small during operation of Fermi 3.

Potential impacts on Federally and State-listed species that were deemed to have a potential to occur in the waters on or in the immediate vicinity of the Fermi site or in streams that would be crossed by the proposed transmission line corridor are evaluated in more detail in the following subsections.

Northern Riffleshell (*Epioblasma torulosa rangiana*)

The northern riffleshell is Federally listed as endangered and is also listed as endangered by the State of Michigan. Because there is no suitable habitat for the northern riffleshell on the Fermi site or in adjacent waters of Lake Erie (Section 2.4.2.3), operation of Fermi 3 would have no impact on this species. Although suitable habitat for the northern riffleshell could be present in some of the streams that would be crossed by the proposed transmission line corridor, it is not expected to occur along the transmission line route because extant populations of this species in Michigan are known to be present only in the Black River in Sanilac County and the Detroit River in Wayne County (Carman and Goforth 2000). Even if the northern riffleshell is present in streams crossed by the transmission line corridors, impacts on it from maintenance of transmission lines are unlikely, provided that BMPs identified in permits for the transmission lines are implemented. Additional regulatory review and permitting of proposed plans for maintenance of the transmission lines (e.g., for annual vegetation management plans) would be required prior to implementation (Detroit Edison 2011a). On the basis of this information, the review team concludes that operation of Fermi 3 would have no effect on the northern riffleshell.

Pugnose Minnow (*Opsopoeodus emiliae*)

The pugnose minnow is listed as endangered by the State of Michigan and has the potential to occur in streams in Monroe and Wayne Counties. Although there is a potential for suitable habitat for the pugnose minnow to be present in the vicinity of the Fermi site, especially in weedy aquatic habitats such as those present in the North Lagoon or Swan Creek, no individuals were collected during recent surveys on the Fermi site and none were reported in past biological surveys of Stony Creek or the Swan Creek estuary near the Fermi site (AECOM 2009a; MDEQ 1996, 1998; Francis and Boase 2007). If individuals are occasionally present in the North Lagoon or near the mouth of Swan Creek, there is a potential for adverse effects due to water quality changes and increased turbidity from stormwater runoff during operation of Fermi 3. Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff to ensure that any increase in sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts (Detroit Edison 2011a). No suitable habitat is present for the pugnose minnow in the vicinity of the intake bay or the location of the outlet for the proposed cooling water discharge. Consequently, impacts from impingement, entrainment, thermal effects, or water quality changes associated with those structures are unlikely. On the basis of the planned implementation of a SWPPP similar to that currently in place for Fermi 2, the review team concludes that impacts from Fermi 3 operations on the pugnose minnow would be minor, and no additional mitigation would be required.

Rayed Bean (*Villosa fabalis*)

The rayed bean is Federally listed as endangered and is also listed as endangered by the State of Michigan. If present, threats to the survival of the rayed bean include siltation, dredging, and channelization of inhabited areas and the introduction of exotic species, such as Asian clams (*Corbicula fluminea*), quagga mussels (*Dreissena rostriformi*), and zebra mussels (*Driessena polymorpha*) (FWS 2002). As identified in Section 2.4.2.3, there are no streams on the Fermi site with conditions suitable for the rayed bean; no extant populations are known to occur in the stream drainages that would be crossed by the proposed transmission line route; and it is believed that the species is unlikely to be present in Lake Erie near the Fermi site. Because the intake bay would be periodically dredged, it is unlikely that the substrate would be suitable for the rayed bean to become established in this area.

As eggs, native unionid mussels are not likely to be affected by entrainment through the cooling water intake 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, may be indirectly vulnerable through impingement and entrainment of host species. Post-glochidial and adult stages are not likely to be susceptible to entrainment because they bury themselves in sediment. As identified in Section 2.4.2.3, fish hosts for the glochidia of the rayed bean could include the Tippecanoe darter (*Etheostoma tippecanoe*), greenside darter (*Etheostoma*

blennioides), rainbow darter (*Etheostoma caeruleum*), mottled sculpin (*Cottus bairdi*), and largemouth bass (*Micropterus salmoides*). Of these potential host species, only the largemouth bass was observed in fish collections in Lake Erie near the intake structure or near the discharge from the South Lagoon, and based on impingement studies conducted at the existing Fermi 2 intake in 2008 and 2009, it is estimated that small numbers of largemouth bass individuals (approximately 30) would be impinged annually with the intake pumps for Fermi 3 at full operating capacity (AECOM 2009a).

It is anticipated that operation of Fermi 3 would not result in water quality unsuitable for the rayed bean if a population were present in Lake Erie near the Fermi site. Thermal effects associated with cooling water discharge during operation of Fermi 3 would be unlikely to affect mussels, because the discharge ports would direct water upward and not toward the lake bottom. In addition, it is anticipated that suitable water quality would be maintained because (1) the NPDES permit for Fermi 3 would specify allowable concentrations of chemicals in the Fermi 3 discharge and would require regular testing to evaluate compliance, and (2) Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff to ensure that sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts (Detroit Edison 2011a).

The operation and maintenance of transmission lines for Fermi 3 are not expected to affect the rayed bean because the species has not been reported from the streams that would be crossed by the proposed transmission line corridor, because structures requiring maintenance (e.g., transmission towers) would not be placed in aquatic habitats that are crossed by the corridor, and because BMPs would be implemented to protect water quality in aquatic habitats during maintenance activities such as vegetation management (Detroit Edison 2011a). On the basis of the above information, the review team concludes that of the operation of Fermi 3 would have no effect on the rayed bean.

Salamander Mussel (*Simpsonaias ambigua*)

The salamander mussel is listed as endangered by the State of Michigan and has the potential to occur in Monroe and Wayne Counties. Although there are no suitable stream habitats for the species on the Fermi site, there is the potential for suitable habitat and the mudpuppy (*Necturus maculosus)* host required by this species to occur in Lake Erie near the Fermi site (see Section 2.4.2.3). Because no suitable habitat for this species (i.e., medium to large rivers or lakes) would be crossed by the proposed transmission line corridor, operation and maintenance of the proposed transmission lines would have a negligible impact on this species.

Salamander mussels are not known from areas on or near the site that would be affected by the cooling water intake or discharge, by periodic maintenance dredging during the operation of Fermi 3, or by stormwater runoff. Identified threats to the survival of the salamander mussel

include siltation and runoff from human activities and the introduction of exotic species such as Asian clams, quagga mussels, and zebra mussels (Section 2.4.2.3).

The areas in Lake Erie that would be disturbed by modification and dredging of the intake bay, development of a barge slip within the intake bay, and placement of the discharge structure for the facility either have been previously disturbed by periodic maintenance dredging (Detroit Edison 2011a) or have been identified as containing a clay hardpan substrate (Detroit Edison 2010c) and not the silt and sand substrate preferred by this species. Consequently, there is only a small potential for the species to be present in the area. Because the intake bay would be periodically dredged, it is unlikely that the substrate would be suitable for the salamander mussel to become established in this area.

As eggs, native unionid mussels are not likely to be affected by entrainment through the cooling water intake because they are not free-floating, but rather develop into larvae within the female mussel. The glochidial stage, during which juvenile mussels attach to a suitable host, may be indirectly vulnerable through impingement and entrainment of host species. Post-glochidial and adult stages are not likely to be susceptible to entrainment because they bury themselves in sediment. As identified in Section 2.4.2.3, the identified host for the glochidia of the salamander mussel is the mudpuppy. The mudpuppy was not observed during impingement studies conducted in 2008 and 2009 at the Fermi 2 intake, and it is considered highly unlikely that mudpuppies would occur within the intake bay because of the lack of suitable cover such as submerged rocks or logs.

It is anticipated that operations of Fermi 3 would not result in water quality unsuitable for the salamander mussel if a population was present in Lake Erie near the Fermi site. Thermal effects associated with cooling water discharge during operation of Fermi 3 would be unlikely to affect mussels because the discharge ports would direct water upward and not toward the lake bottom. In addition, it is anticipated that suitable water quality would be maintained because (1) the NPDES permit for Fermi 3 would specify allowable concentrations of chemicals in the Fermi 3 discharge and would require regular testing to evaluate compliance, and (2) Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff to ensure that sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts (Detroit Edison 2011a).

On the basis of the above information, the review team concludes that the impacts of Fermi 3 operations on the salamander mussel would be minor.

Sauger (*Sander canadensis*)

The sauger is considered a species of special concern by the State of Michigan and has the potential to occur in Lake Erie. However, the last reported occurrence of sauger in Monroe County was in 1996, and no individuals were collected during recent surveys on the Fermi site,

Stony Creek, or the Swan Creek estuary (AECOM 2009a; MDEQ 1996, 1998; Francis and Boase 2007). If present in nearshore areas of Lake Erie, sauger could be affected by Fermi 3 operations because of impingement or entrainment at the intake structure, by changes in water temperatures associated with the cooling water discharge, by maintenance dredging, or by water quality changes associated with discharges and stormwater runoff from Fermi 3. Because no sauger were observed during impingement and entrainment studies conducted during 1991 and 1992 (Lawler, Matusky, and Skelly Engineers 1993) or during 2008 and 2009 (AECOM 2009a) at the Fermi 2 intake, it is considered unlikely that significant numbers would be affected by the intake of cooling water for operation of Fermi 3. As with most fish, it is anticipated that sauger in the project area would temporarily move away during dredging activities because of increased noise and turbidity levels, resulting in temporary displacement but negligible levels of mortality. As described in Section 5.3.2.1, MDEQ would specify allowable characteristics of the thermal plume and chemical concentrations associated with the cooling water discharge for Fermi 3 through the NPDES permitting process and Detroit Edison would implement a SWPPP to control stormwater runoff, thereby limiting the potential for water quality impacts on the sauger if individuals were to be present in the vicinity of the Fermi site. The small streams that would be crossed by the proposed transmission line corridor do not provide suitable habitat for sauger, and this species would not be affected by operation and maintenance of the transmission lines for Fermi 3. On the basis of this information, the review team concludes that impacts on the sauger from Fermi 3 operations would be minor, and no additional mitigation is warranted.

Silver Chub (*Macrhybopsis storeriana*)

The silver chub is considered a species of special concern by the State of Michigan. A single silver chub specimen was collected in July 2009 during monthly fish surveys conducted near the mouth of Swan Creek from 2008 to 2009 (AECOM 2009a). This species is typically found in deep waters of low-gradient streams and rivers and also in lakes. Little is known about the life history of the silver chub, especially its tolerance of siltation and turbidity (Derosier 2004). While some researchers have suggested that silver chub are intolerant of turbidity and silt, others note that silver chubs are found in silty rivers (Derosier 2004). If present in nearshore areas of Lake Erie, silver chubs could be affected by Fermi 3 operations because of impingement or entrainment at the intake structure, by changes in water temperatures associated with the cooling water discharge, by maintenance dredging, or by water quality changes associated with discharges and stormwater runoff from Fermi 3. Because no silver chubs were observed during impingement and entrainment studies conducted during 1991 and 1992 (Lawler, Matusky, and Skelly Engineers 1993) or during 2008 and 2009 (AECOM 2009a) at the Fermi 2 intake, it is considered unlikely that significant numbers would be affected by the intake of cooling water for operation of Fermi 3. It is anticipated that silver chub in the project area would temporarily move away during maintenance dredging activities because of increased noise and turbidity levels, resulting in temporary displacement but negligible levels of mortality. As described in

Section 5.3.2.1, MDEQ would specify allowable characteristics of the thermal plume and chemical concentrations associated with the cooling water discharge for Fermi 3 through the NPDES permitting process, and Detroit Edison would implement a SWPPP to control stormwater runoff to Swan Creek and Lake Erie, thereby limiting the potential for water quality impacts on silver chub if individuals were present in the vicinity of the Fermi site.

Although suitable habitat for the silver chub could be present in some of the streams that would be crossed by the proposed transmission line corridor, it is currently unknown whether any populations are present. Even if the silver chub is present, impacts on it from the operation and maintenance of transmission lines for Fermi 3 are not anticipated because structures requiring maintenance (e.g., transmission towers) would not be placed in aquatic habitats that are crossed by the corridor and because BMPs would be implemented to protect water quality in aquatic habitats during maintenance activities such as vegetation management (Detroit Edison 2011a). On the basis of the available information, the review team concludes that impacts on the silver chub from Fermi 3 operations would be minor, and no additional mitigation is warranted.

Snuffbox Mussel (*Epioblasma triquetra*)

The snuffbox mussel, which is Federally listed as endangered and is also listed as endangered by the State of Michigan, has the potential to occur in Monroe, Wayne, and Washtenaw Counties. Although there are no suitable stream habitats on the Fermi site, there is potential for suitable habitats in Lake Erie, and the host required by this species (logperch, *Percina caprodes*) has been collected from the Fermi site at sampling locations in Swan Creek and in Lake Erie near the South Lagoon (see Section 2.4.2.3). The intake bay would be periodically dredged, and it is unlikely that the substrate would be suitable for the snuffbox mussel to become established in this area.

As eggs, native unionid mussels are not likely to be affected by entrainment through the cooling water intake 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, may be indirectly vulnerable through impingement and entrainment of host species. Post-glochidial and adult stages are not likely to be susceptible to entrainment because they bury themselves in sediment. As identified in Section 2.4.2.3, fish hosts for the snuffbox mussel include the logperch, which was observed in fish collections in Lake Erie near the discharge from the South Lagoon and in Swan Creek. Based on impingement studies conducted during 1991 and 1992, Lawler, Matusky, and Skelly Engineers (1993) estimated that approximately 31 logperch were impinged annually by the Fermi 2 cooling water intake. However, impingement studies conducted during 2008 and 2009 at the Fermi 2 intake did not observe impingement of any logperch (AECOM 2009a). Together, these two impingement studies suggest that small numbers of logperch could be impinged by the operation of the cooling water intake for Fermi 3.

It is anticipated that operation of Fermi 3 would not result in water quality unsuitable for the snuffbox mussel if a population were present in Lake Erie near the Fermi site. Thermal effects associated with cooling water discharge during operation of Fermi 3 would be unlikely to affect mussels, because the discharge ports would direct water upward and not toward the lake bottom. In addition, it is anticipated that suitable water quality would be maintained because (1) the NPDES permit for Fermi 3 would specify allowable concentrations of chemicals in the Fermi 3 discharge and would require regular testing to evaluate compliance, and (2) Detroit Edison has stated that the Fermi 3 SWPPP and design features would be used to control stormwater runoff to ensure that sediment loading to Swan Creek and/or Lake Erie is adequately controlled to minimize water quality impacts (Detroit Edison 2011a).

It is not known whether suitable stream habitats for, or populations of, the snuffbox mussel occur along the proposed transmission line corridor. Even if the species were present, impacts on the snuffbox mussel from the operation and maintenance of transmission lines for Fermi 3 are not anticipated because structures requiring maintenance (e.g., transmission towers) would not be placed in aquatic habitats that are crossed by the corridor, and BMPs would be implemented to protect water quality in aquatic habitats during maintenance activities such as vegetation management (Detroit Edison 2011a). On the basis of the above information, the review team concludes that the operation of Fermi 3 would have no effect on the snuffbox mussel.

Summary of Operational Impacts on Federally and State-Listed Aquatic Species

Based on information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that impacts of Fermi 3 operation on aquatic threatened and endangered species would be minor. For the three Federally listed mussel species, the review team determines that there would be no effect from operation of Fermi 3. Impacts on listed aquatic species from degradation of water quality would be limited by the implementation of BMPs that would be identified in the required NPDES discharge permit to be issued by MDEQ and in the SWPPP to be developed by Detroit Edison.

In compliance with Section 7 of the ESA, the NRC began informal consultation with the FWS in a letter dated December 23, 2008 (NRC 2008). The review team completed a BA assessing how building and operating Fermi 3 would impact three Federally protected freshwater mussel species potentially or historically known from the geographic area of interest. The BA's conclusions on potential impacts are provided above. A copy of the BA is included in Appendix F of this FEIS. The BA was forwarded to the FWS on March 30, 2012 (NRC 2012a). In a letter dated June 8, 2012 (FWS 2012), the FWS concurred with the review team's determination that operating Fermi 3 would have no effect on the three freshwater mussel species that are Federally protected as endangered species.

Critical Habitats

There are no areas designated as critical habitat for aquatic species in the vicinity of the Fermi site or along the route of the proposed transmission line.

Invasive Nuisance Organisms

Invasive nuisance organisms that have been found or are presumed to occur in Lake Erie in the vicinity of the Fermi site include lyngbya (*Lyngbya wollei*), fishhook water flea (*Cercopagis pengoi*), spiny water flea (*Bythotrephes longimanus*), quagga mussel, zebra mussel, sea lamprey (*Petromyzon marinus*), and round goby (*Neogobius melanostomus*) (Section 2.4.2.3). None of these species are considered abundant in the vicinity of the Fermi site. While it is not clear that any of these species rely upon thermal refuge to tolerate the ambient wintertime water temperatures in Lake Erie, it is anticipated that the area of the thermal plume from Fermi 3 would not be large enough to provide substantial thermal refuge for invasive nuisance organisms. Detroit Edison reported that there has been no excessive growth of algae observed in the vicinity of the water discharge for Fermi 2.

The review team specifically evaluated the potential for algal blooms caused by species such as *Microcystis* spp., *Anabaena* spp., *Aphanisomenon* spp., and more recently, lyngbya. In addition, there have been extensive growths of *Cladophora* spp., an attached green alga, in the western basin of Lake Erie. The principal contributor to the development of algal blooms has long been attributed to increased nutrient levels (especially phosphorus concentrations) resulting from changes in land use practices, altered hydrology, and food web changes.

Large shoreline mats of lyngbya were first seen in western Lake Erie in Maumee Bay in 2006 (Bridgeman and Penamon 2010). Life history information for lyngbya is provided in Section 2.4.2.3. The review team considered the effects of temperature, nutrients, substrate type, and irradiance on lyngbya blooms and examined the history of algal blooms associated with the discharge for Fermi 2. Overall, it appears that the potential for excessive growth of lyngbya is related to the amount of light penetration into the water column (a function of water turbidity), water depth, nutrient availability, and the type of substrate that is present (Bridgeman and Penamon 2010; LaMP Work Group 2008). Additionally, it is thought that increased water temperatures could exacerbate the potential for algal blooms to occur.

Operation of Fermi 3 is not expected to alter turbidity levels or light penetration in the vicinity of the site compared to existing conditions. Although maintenance dredging activities could result in infrequent, temporary, and localized increases in turbidity, the frequency of dredging and the areas affected by dredging would be the same as for Fermi 2. Therefore, maintenance dredging during Fermi 3 operations would not alter the potential for algal blooms to occur.

As stated above, algal blooms have long thought to be controlled by the concentrations of specific nutrients in Lake Erie. Phosphorus has been identified as a nutrient that can affect the frequency and occurrence of algal blooms. Blooms of lyngbya in Maumee Bay have been primarily attributed to increased nutrient loading due to agricultural runoff and urbanization. The principal limiting nutrient responsible for controlling algal blooms in Lake Erie is phosphorus, although nitrogen is also important as one of the limiting nutrients. The review team examined historic water quality information for Maumee Bay and recent water quality information for Lake Erie near the Fermi site and found that levels of nutrients such as nitrate, orthophosphate, and total phosphorus reported from Maumee Bay (Moorhead et al. 2007) were substantially higher than those reported for the Fermi site (AECOM 2009b). Detroit Edison has stated that it would not use phosphorus-containing corrosion and scale inhibitors for Fermi 3, replacing them with two non-phosphorus-containing water treatment chemicals (Detroit Edison 2010c). Therefore, operation of Fermi 3 is not expected to measurably increase nutrient levels that could affect algal blooms in the vicinity of the site.

Lake Erie already retains relatively high concentrations of calcium due to natural basin characteristics, and its levels of dissolved calcium are normally at or near the saturation point. Even though the concentration of calcium in the water from the Fermi 3 discharge will be higher than in ambient Lake Erie water due to evaporative losses during cooling, this would not result in any mass addition of calcium to Lake Erie. The design of the diffusers for the proposed Fermi 3 discharge would result in rapid mixing of the effluent with ambient water. Because of this, the dissolved calcium levels outside the area delineated by the discharge plume would be unlikely to be measurably higher than dissolved calcium levels that would be present without operation of the discharge, and the levels of calcium would not be measurably altered in Lake Erie near the Fermi site, in the Western Basin of Lake Erie, or in Lake Erie as a whole. Therefore, calcium in the effluent of the Fermi 3 discharge would not have a measurable effect on the growth of algae in the general vicinity of the proposed Fermi 3 discharge or in the western basin of Lake Erie.

The review team concluded that the substrate in the vicinity of the Fermi site is, in general, similar to the substrates upon which lyngbya was found growing in the vicinity of Maumee Bay and other areas of the western basin of Lake Erie (Bridgeman and Penamon 2010). Although the substrate may be suitable for algae growth, no algal blooms of lyngbya or other species have been reported from the Fermi site. The nearest reported observation of lyngbya in the western basin was near Sterling State Park, approximately 5 mi south-southwest of the Fermi site.

The review team also considered the possibility that thermal discharge from Fermi 3 could affect the frequency of algal blooms, including lyngbya, at the Fermi site. Because Fermi 3 would use a closed cycle cooling system, the amount of heated effluent is significantly reduced compared to a once-through plant, such as the plants located near the mouth of the Maumee River. Additionally, the heated effluent would be discharged offshore through a three-port diffuser with

the flow directed upwards toward the surface. Such a system facilitates rapid mixing of the thermal plume and minimizes the effects on the benthic environment. Therefore, the review team concludes that the heated discharge from Fermi 3 would not significantly increase the potential for development of algal blooms.

In addition, no significant algal blooms have been reported in the vicinity of the discharge from Fermi 2, which has been operating commercially since 1988.

NOAA has been developing an experimental tool for predicting the potential for *Microcystis* spp. blooms in Lake Erie based upon satellite imagery and has been issuing experimental forecasts of potential harmful algal blooms since July of 2009 (NOAA 2012a). Those forecasts have periodically identified a potential for blooms of *Microcystis* spp. in the western basin of Lake Erie during summer months. Generally, the areas with the highest predicted potential for algal blooms tend to occur in the southwestern portion of the western basin in the vicinity of Maumee Bay. However, areas with elevated predicted potential occasionally extend northward along the shoreline of Lake Erie as far as the mouth of the Detroit River (located approximately 7.5 mi northwest of the Fermi site) for short periods of time (NOAA 2012a). When areas with elevated predicted potential (based upon the experimental forecasting procedure) extend this far northward along the western shoreline of Lake Erie, areas near the Fermi site are occasionally included. However, although the forecasting system indicates where there may be an elevated potential for algal blooms, the actual presence or formation of algal blooms has not been confirmed by water sampling at the Fermi 3 site. Water sampling to confirm the presence of harmful algal species in areas where a high potential for occurrence has been predicted by the experimental system has generally not been conducted northward of Brest Bay, near Sterling State Park (approximately 5 mi south-southwest of the Fermi site) (NOAA 2012b). Given the absence of reported blooms in the vicinity of the proposed Fermi 3 discharge, and that Fermi 3 is not expected to measurably increase nutrient levels or calcium concentrations in the site vicinity, the NOAA experimental forecasts do not indicate that Fermi 3 operations would result in any significant increase in the potential for *Microcystis* spp. blooms in Lake Erie.

Based on the analysis of the potential for impacts on the aquatic ecosystem of Lake Erie and an independent assessment of the discharge from Fermi 3, the review team concludes that the impacts of the operation of Fermi 3 would not appreciably increase the potential for establishment or survival of nuisance species in Lake Erie.

5.3.2.4 Aquatic Monitoring during Operation

No monitoring of water quality or aquatic ecosystems is imposed by the NRC. However, hydrological, thermal, and chemical monitoring of the proposed new discharge would likely be required by MDEQ as a part of the NPDES permit. Detroit Edison has not identified any plans to conduct formal monitoring of aquatic ecosystems during operations (Detroit Edison 2011a). Ecological monitoring of aquatic resources during operations could be required as a condition of

permits issued by various regulatory agencies. For example, MDEQ could request monitoring of specific ecological attributes as part of the NPDES permit (although such monitoring is not required by the existing NPDES permits for Fermi 2) or its permit authorizing dredging. In addition, USACE could, as a condition of a permit authorizing dredging, require a silt containment system during dredging and no excessive turbidity outside the system. Water quality monitoring may be conducted voluntarily by Detroit Edison to ensure permit condition compliance.

5.3.2.5 Potential Mitigation Measures for Operation-Related Aquatic Impacts

The review team recommends that if a shutdown of the proposed Fermi 3 were to be planned during the winter months, the discharge of cooling water should be gradually reduced to prevent cold shock.

5.3.2.6 Summary of Operational Impacts on Aquatic Resources

Based on information provided in the ER (Detroit Edison 2011a), Detroit Edison's responses to requests for additional information, interactions with State and Federal agencies, the public scoping process, and the review team's independent assessment, the review team concludes that impacts from operation of Fermi 3 and associated transmission lines on aquatic resources would be SMALL and additional mitigation measures beyond those identified in Section 5.3.2.5 and any potential permit conditions would not be warranted.

5.4 Socioeconomic Impacts

This section describes the socioeconomic impacts that may occur as a result of the operation of Fermi 3. Detroit Edison plans to begin commercial operation in 2021, and its operating license would extend for 40 years. Detroit Edison estimates the workforce needed to operate Fermi 3 to be 900 full-time and contract employees. Workers would be employed in multiple shifts in order to operate the plant 24 hr per day, all days of the year (Detroit Edison 2011a).

In addition to the full-time and contract workforce of 900, an estimated 1200 to 1500 additional workers would be employed at Fermi 3 during scheduled outages. During these scheduled outages, contract labor would be hired by Detroit Edison to carry out fuel-reloading activities, equipment maintenance, and other projects associated with the outage. These workers would increase the transient population in the local area approximately every 24 months for a period of 30 days (Detroit Edison 2011a). Workers who do not currently reside in the region would be housed in temporary, short-term accommodations for the duration of the scheduled outage.

The review team expects most of the socioeconomic impacts related to demographics, economy and taxes, and infrastructure and community services to occur in the general vicinity of Fermi 3 and in the communities in which the majority of the new workers recruited for

operation of Fermi 3 (i.e., in-migrating workers) reside. The review team expects that characteristics of the workers recruited from outside the region with respect to choices and preferences (e.g., commute distance, available amenities) to be similar to those of the current workforce and that they will reside primarily in Monroe and Wayne Counties, Michigan, and Lucas County, Ohio. More than 87 percent of the current Fermi 2 workforce resides in these three counties. Therefore, the review team expects that most of the operations workforce relocating into the area for employment at Fermi 3 would also reside in these three counties.

As discussed in Chapter 2.5, no more than 3.2 percent of the current Fermi 2 workforce resides in any one county outside Monroe, Wayne, and Lucas Counties. In addition, the current and projected populations of the regional area are so large that the current workforce at the Fermi site represents less than 1 percent of the total population in any of the counties or locations where these employees reside. Therefore, the review team expects that impacts beyond the three counties will be minor. The following discussion focuses on the three-county area.

Section 5.4.1 presents a summary of the physical impacts of the project. Section 5.4.2 provides a description of the demographic impacts. Section 5.4.3 describes the economic impacts, including impacts on the economy and tax revenue, and Section 5.4.4 describes the impacts on the infrastructure and community services. Section 5.4.5 summarizes the socioeconomic impacts.

5.4.1 Physical Impacts

Operation of Fermi 3 will cause physical impacts, including noise, odors, exhausts, thermal emissions, and visual intrusions. The review team believes these impacts would be mitigated but not eliminated through operation of the facility in accordance with all applicable Federal, State, and local environmental regulations and site-specific permit conditions. This section addresses potential physical impacts that may affect people, buildings, and roads.

5.4.1.1 Workers and the Local Public

The Fermi site is located along the relatively straight Lake Erie coastline, which extends from the Fermi site approximately 20 mi southwest toward the Michigan-Ohio border and approximately 10 mi northeast toward the mouth of the Detroit River. To the east of this coastline lie the open waters of Lake Erie. To the west of the site, the land is used predominantly for agriculture. Development within a 10-mi radius of the Fermi site is concentrated in the City of Monroe, which is about 8 mi southwest of the site, and along the Lake Erie shoreline in several beachfront communities. The community nearest to the Fermi site, Stony Point, is located 2 mi south of the site. Residential areas are also located in portions of Berlin Township and Frenchtown Charter Township. Relatively recent housing developments are present just south of Pointe Aux Peaux Road (the Fermi site's southern boundary).

The nearest designated recreational areas are the beaches at Stony Point (2 mi south of the site) and Estral Beach (2 mi northeast of the site). Nearby State recreational areas include Point Mouillee State Game Area (3.1 mi to the northeast) and Sterling State Park (4.8 mi to the south-southwest). Scattered industrial facilities are located west and southwest of the Fermi site along the I-75 corridor and near the City of Monroe. Commercial development is present along major road corridors, including Dixie Highway, Telegraph Road, and I-75, and within the City of Monroe.

All activities related to operation of Fermi 3 would occur within the Fermi site boundary and would be performed in compliance with Occupational Safety and Health Administration (OSHA) standards, BMPs, and other applicable regulatory and permit requirements. While approximately 89,198 people live within 10 mi of the site, physical impacts attenuate rapidly with distance, intervening foliage, and terrain. Therefore, people who would be most exposed to noise, air emissions, and gaseous emissions resulting from operation of Fermi 3 would be the onsite workforce. People working or living immediately adjacent to the Fermi site, transient populations such as people using recreational facilities, or temporary employees of other businesses in the area would be minimally affected because of lack of access to the site and distance from the site, which would limit the effects of operational activities.

Operations workers would receive safety training and would be required to use personal protective equipment to minimize health and safety risks. Emergency first aid care would be available at the site, and regular health and safety monitoring would be conducted. People working onsite or living near the Fermi site would not experience any physical impacts greater than those that would be considered an annoyance or nuisance.

5.4.1.2 Noise

Primary noise sources associated with operation of Fermi 3 would be transformers, the cooling system, and transmission lines (Detroit Edison 2011a). Noise would be buffered by the distance between the plant and residences or recreational areas offsite, such that the ambient sound level should not increase appreciably. The review team expects average day-night noise levels from the Fermi 3 cooling towers will be less than 65 dBA at the nearest noise-sensitive receptor. Noise along the transmission lines would be very low, except possibly directly below the line on a quiet, humid day (Detroit Edison 2011a). Therefore, the review team concludes that physical impacts from noise will be minimal. Projected noise impacts from operation of Fermi 3 are discussed in further detail in Section 5.8.2.

5.4.1.3 Air Quality

Air emissions associated with operation of Fermi 3 would include stationary source emissions from two standby diesel generators (SDGs), two ancillary diesel generators (ADGs), an auxiliary boiler, and two diesel-driven fire pumps (FPs). These emissions sources would be small, would be used infrequently, and would be permitted for use by MDEQ. The cooling tower would emit

small amounts of particulate matter, which would be minimized further by drift eliminators. Emissions from worker vehicles, onsite support vehicles and heavy equipment, and vehicles used in delivery of materials and fuels would also occur (Detroit Edison 2011a). However, emissions from these sources would be expected to minimally affect nearby residences and recreational areas offsite. Therefore, the review team concludes that physical impacts on air quality will be minimal. Projected air emissions and impacts on air quality from operation of Fermi 3 are discussed in further detail in Section 5.7.

5.4.1.4 Buildings

Activities associated with operation of Fermi 3 would not affect offsite buildings. Noise levels would not increase appreciably and would not affect building structures offsite. Onsite buildings are designed to withstand any impact from operational activities. Consequently, the review team determines the operations impacts on onsite and offsite buildings would be minimal.

5.4.1.5 Roads

This EIS assesses the impact of workers commuting to and from the Fermi site from three perspectives: socioeconomic impacts resulting from congestion and reductions in levels of service (LOS),[(a)] the air quality impacts resulting from the emissions from vehicles used to transport workers to and from the site, and the potential health impacts caused by additional traffic-related accidents. Only the physical impacts are addressed here. The socioeconomic impacts are addressed here and in Section 5.4.4.1. The air quality impacts from vehicle emissions are addressed in Section 5.7, and human health impacts are addressed in Sections 5.8 and 5.9.

Use of area roadways by commuting workers could contribute to physical deterioration of roadway surfaces. However, some or all of the mitigation measures incorporated during the building phase will remain in place during the operation of the Fermi 3 plant. Given the much smaller volume of traffic on the roads during operations than during building, the review team determines that the overall impacts on road quality would be less than the impacts on road quality from building activities. Therefore, the operations-related impacts on road quality would be minimal.

5.4.1.6 Aesthetics

Fermi 3 would be located within the developed area of the Fermi site, along its eastern boundary by Lake Erie. Surrounding the developed area are 656 ac of wetlands, open water, and forested land that are included within the DRIWR and that buffer the view of the developed area from public roadways.

(a) LOS is a designation of operational conditions on a roadway or intersection, ranging from A (best) to F (worst). LOS categories as defined in the *Highway Capacity Manual* are listed on Table 2-40.

The review team expects visual impacts from grade-level operations activities to be limited. Surrounding land use is predominantly agricultural, with a few residential areas that are within the viewshed of the plant site. The area around the Fermi site is a security zone as defined in 33 CFR Part 165. In this security zone, boat traffic or other public use of the waters within a 1-mi circumference of the plant is prohibited. Views of the plant grade-level operational activities from the water would therefore also be limited. Therefore, the review team determines that aesthetics impacts from grade level activities would be minimal.

Two 400-ft-tall natural draft cooling towers are currently the predominant visible structures on the Fermi site, and these are visible from outside the site property boundaries in all directions. Several small beach communities are located along the Lake Erie shoreline within 5 mi of the Fermi site, including Estral Beach, Stony Point, Detroit Beach, and Woodland Beach. The proposed 600-ft cooling tower for Fermi 3 and a steam plume associated with operation of Fermi 3 would also be visible from locations within these communities and along the beaches and other recreational facilities (marinas, docks) along Lake Erie. Although taller than the existing cooling towers, the new 600-ft cooling tower would be consistent with the existing views of the Fermi site, and the review team expects a minor impact on visual aesthetics from operation of Fermi 3.

5.4.1.7 Summary of Physical Impacts

Based on the information provided by Detroit Edison, review team interviews with local public officials, and NRC's own independent review, the review team concludes that all the physical impacts of operation of Fermi 3 would be SMALL. Thus, additional mitigation measures beyond those identified by Detroit Edison are not warranted.

5.4.2 Demography

Detroit Edison expects the workforce needed to operate Fermi 3 to be 900 full-time and contract employees (Detroit Edison 2011a). Given the size of the labor force in the region (which includes portions of the Detroit and Toledo metropolitan areas), the range of operations jobs needed, and the specialized nature of nuclear power plant operations, the review team expects approximately 70 percent of the operations workforce, or approximately 630 workers, would be drawn from within a 50-mi radius of the Fermi site and the remaining 30 percent of the operations workforce, or approximately 270 workers, would need to be recruited from outside the region.

For the same reasons that formed the basis for the review team's anticipated residential distribution of building-related in-migrating workers in Section 4.4.2, the review team expects that characteristics of the workers recruited from outside the region with respect to choices and preferences (e.g., commute distance, available amenities, etc.) will be similar to those of the current workforce. Consequently, the review team could also assume the in-migrating

workforce would move into the 50-mi region in the same proportions as the current operations workforce; with 87 percent residing in the three-county economic impact area and the remaining 13 percent outside of Monroe, Wayne, and Lucas Counties, but within a 50-mi radius of Fermi 3. The settlement distribution of the in-migrating workers needed for operation of Fermi 3 is shown in Table 5-8.

Table 5-8. Counties Where In-Migrating Operations Workforce Would Reside

County	In-migrating Operations Workforce in 2020	Percentage of In-migrating Workforce	
		By County[(a)]	Cumulative
Monroe	155	57.5	57.5
Wayne	51	19.0	76.5
Lucas	29	10.7	87.2
All others within 50-mi region	35	12.8	100.0
Total	**270**		

(a) Percentage of workforce by county is based on the residential distribution of the current Fermi 2 workforce (Detroit Edison 2008a).

The review team also assumed that workers drawn from outside the region move with their families and that each worker would have an average household size of 2.6 persons, based on the national average household size in the U.S. Census Bureau's 2010 population estimate (USCB 2010). Based on this assumption and the proportional settlement pattern shown in Table 5-9, the review team estimates that approximately 403 persons (155 operations workers and 248 additional family members) would relocate to Monroe County, approximately 133 persons (51 operations workers and 82 family members) would relocate to Wayne County, and approximately 75 persons (29 operations workers and 46 family members) would relocate to Lucas County. Thirty-five operations workers and an additional 91 family members would move into the remainder of the 50-mi region. Projected population increases are shown in Table 5-9.

The projected increase in population in Monroe, Wayne, and Lucas Counties associated with in-migrating workers and their families is less than 1 percent of the projected 2020 population for any of these counties. As discussed in Section 2.5, Wayne and Lucas Counties are projected to experience population losses through 2020. Therefore, the projected increase in population associated with workers relocating for work at Fermi 3, would have a minor beneficial impact on the two counties, because the population loss currently being experienced in Wayne and Lucas Counties, primarily due to the economy, could be lessened. While Monroe County is projected to have a modest population increase through 2020, the additional increase associated with the in-migrating operations workforce would be minimal.

Table 5-9. Potential Increase in Population Associated with In-Migrating Operations Workforce

County	Workforce Relocating from Outside Region	As Percentage of Total Relocating Workforce	Estimated Increase in Population (number of workers × 2.6 persons per household)[(a)]	Projected 2020 Population[(b)]	Estimated Increase as Percentage of Projected 2020 Population
Monroe	155	57.4	403	159,461	0.3
Wayne	51	18.9	133	1,812,593	0.007
Lucas	29	10.7	75	434,650	0.02
All others within region	35	13.0	91	–	–
Total	**270**		**702**		

(a) National average household size as of 2010 population data (USCB 2010).

(b) Monroe and Wayne Counties 2020 and 2030 projections were provided by the Southeast Michigan Council of Governments (SEMCOG) in April 2008 (SEMCOG 2008). For Lucas County, projections are provided by the Ohio Department of Development (2003). Projected populations are not provided for other counties within the 50-mi region. Given the small number of workers in-migrating to counties outside of Monroe, Wayne, and Lucas Counties, the impact on projected populations for any one jurisdiction would not be noticeable.

Given the size of the regional population projected for 2020 of 6,130,056 persons within a 50-mi radius of the Fermi site (see Table 2-25), the projected increase associated with the in-migrating operations workforce would be minimal within the region or local area.

In addition to the full-time and contract workforce of 900, an estimated 1200 to 1500 additional workers would be employed at Fermi 3 during scheduled outages. These workers would increase the transient population in the local area approximately every 24 months for a period of 30 days (Detroit Edison 2011a). Workers who do not currently reside in the region would be housed in temporary, short-term accommodations for the duration of the scheduled outages. The size of the contract labor for the scheduled outages for Fermi 3 is similar to the size of the workforce for scheduled outages at Fermi 2. However, Detroit Edison would not schedule outages for Fermi 2 and Fermi 3 at the same time. Therefore, the projected increase in the transient population would not be greater with operation of Fermi 3, but would result in an increase in transient population occurring more frequently in the local communities around the Fermi plant site.

Based on the review team's analysis, the in-migrating workers and their families would increase the populations in Monroe, Wayne, and Lucas counties by less than 1 percent. As discussed in Section 2.5, Wayne and Lucas Counties are projected to experience population losses through 2020. Therefore, the projected increase in population associated with operations workforce would have a beneficial impact on the two counties, because the population loss currently being experienced in Wayne and Lucas Counties, primarily due to the economy, would be partially

offset by the in-migrating workers. While Monroe County is projected to have a modest population increase through 2020, the additional increase associated with the in-migrating operations workforce would be minimal. Therefore, the review team determines the three-county economic impact area would experience a SMALL and beneficial demographic impact from operations at Fermi 3.

In addition, a small number of operations workers would in-migrate to counties outside of Monroe, Wayne, and Lucas Counties. Therefore, their impact on any one jurisdiction would not be noticeable. The current and projected populations of the regional area are so large that the in-migrating operations workforce for Fermi 3 would represent less than 1 percent of the total population in any of the counties where these employees would reside. Therefore, the review team concludes that the demographic impacts of operation on the remainder of the region would also be SMALL and beneficial.

5.4.3 Economic Impacts on the Community

This section evaluates the economic impact of operation of Fermi 3 on the 50-mi region around the Fermi site, focusing primarily on Monroe, Wayne, and Lucas Counties. Detroit Edison plans to start commercial operation of Fermi 3 in 2021.

5.4.3.1 Economy

Operation of Fermi 3 would have a positive impact on the local and regional economy through direct employment of the operations workforce, purchase of materials and supplies for operation, and maintenance of the plant and any capital expenditures that occur within the region.

Detroit Edison estimates direct employment for Fermi 3 to be 900 full-time and contract employees (Detroit Edison 2011a). In addition, Detroit Edison would employ an estimated 1200 to 1500 workers at Fermi 3 during scheduled outages, which would occur every 24 months and require workers for a period of 30 days (Detroit Edison 2011a).

The types of workers that Detroit Edison expects to employ for Fermi 3 operations are shown in Table 2-31 and Table 5-10. As shown in Table 5-10, the average annual salary, based on 2008 U.S. Bureau of Labor Statistics (USBLS) data for the types of occupations that would be needed for Fermi 3, would range from $22,100 (security guard) to $111,340 (general or operations manager). For purposes of analysis, the review team estimated the overall payroll based on an average salary of approximately $63,625. For an annual workforce of 900 full-time and contract employees, Detroit Edison would expend an estimated $57.3 million on payroll each year during the 40-year operating license of Fermi 3. In addition, every 24 months, Detroit Edison would expend an additional $6.3 to $7.9 million in payroll for the outage workforce for Fermi 3.

Table 5-10. Wage Estimates for Occupations of the Operations Workforce in the Economic Impact Area[a] (2008)

Occupation Title	Mean Annual Wages[b]		
	Monroe, Michigan MSA	Detroit-Livonia-Dearborn, Michigan Metropolitan Division	Toledo, Ohio MSA
General and Operations Managers	$91,240	$111,340	$97,920
Accountants and Auditors	$52,420	$68,850	$65,020
Computer Software Engineers, Applications	–[c]	$88,420	$68,720
Computer Software Engineers, Systems Software	–	$82,250	$72,940
Network and Computer System Administrators	$55,390	$67,090	$57,970
Chemical Engineers	–	$79,940	$72,570
Civil Engineers	$64,270	$70,810	$68,330
Electrical Engineers	$79,960	$80,480	$61,180
Mechanical Engineers	$67,620	–	$68,380
Nuclear Technicians	$66,910[d]	$66,910[d]	$66,910[d]
Security Guards[e]	$22,100	$27,230	$23,420
Office and Administration Support	$30,190	$34,980	$30,440
Nuclear Power Reactor Operators[d]	$73,510[d]	73,510[d]	$73,510[d]
Power Distributors and Dispatchers	–	–	$61,410
Power Plant Operators	–	$58,350	$62,070
Stationary Engineers and Boiler Operators	–	$56,630	$50,160

Source: USBLS 2008

(a) Data are presented according to the USBLS metropolitan areas, which include the counties identified as the economic impact area.

(b) Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" figure of 2080 hours. Wages include base rate pay, cost-of-living allowances, guaranteed pay, hazardous-duty pay, incentive pays such as commissions and production bonuses, tips, and on-call pay. Wages do not include back pay, jury duty pay, overtime pay, severance pay, shift differentials, nonproduction bonuses, employer costs for supplementary benefits, and tuition reimbursements.

(c) "–" indicates this occupation is not reported in this metropolitan area.

(d) The mean annual wage for "Nuclear Technician" and for "Nuclear Power Reactor Operator" is a national mean annual wage; the mean annual wage for these occupations in the economic impact area was not available.

(e) The review team recognizes that the wages of security workers at nuclear power plants are higher than the average wage of all security workers.

Employees would also receive nonwage compensation, which would be for supplementary pay (i.e., premium pay for overtime and work on holidays and weekends), retirement benefits, insurance, and legally required benefits (i.e., worker's compensation, Social Security, etc.) A portion of the nonwage compensation (e.g., overtime pay) may also be expended in the local area.

The review team estimates that approximately 70 percent of the operations workforce, or approximately 630 workers, would be drawn from within a 50-mi radius of the Fermi site. The review team assumes that a portion of the workers drawn from the regional area would be unemployed. As discussed in Section 2.5, the overall rate of unemployment in Monroe, Wayne, and Lucas Counties in 2010 ranged between 11.3 percent (Lucas County) and 14.8 percent (Wayne County). Although employment in the local area is likely to change by the time building activities commence, the review team calculated an average of the 2010 unemployment rates for Monroe, Wayne, and Lucas Counties (13 percent) to estimate the number of workers that would likely be drawn from the ranks of the unemployed. The review team estimates that 13 percent of the 630 workers, or approximately 82 workers, would be drawn from the ranks of the unemployed. The review team expects approximately 30 percent of the annual workforce (approximately 270 workers) to relocate from outside the region.

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 by their spending on goods and services in other industries. A model developed by the DOC, Bureau of Economic Analysis (BEA), called the Regional Input-Output Modeling System (RIMS II), quantifies this "ripple" effect through the use of regional industrial multipliers specific to a local economy. Each new direct job in the "utility sector" stimulates employment and results in additional (indirect) job creation in other industry sectors, such as services. This stimulus reflects additional economic activity from interdependent suppliers and vendors. The ratio of total jobs (direct plus indirect) to the number of new direct jobs is called the "employment multiplier." Operations workers who already live and work in the local area are a part of the baseline and, therefore, are not included in the calculation of new indirect effects.

In the three-county economic impact area, BEA RIMS II estimates that for every new worker, an additional 1.4 jobs would be created (Detroit Edison 2011a). Based on the employment multiplier, the 352 new workers (i.e., in-migrating workers and those previously unemployed) would create an additional 493 new jobs, for a total of 1393 new direct and indirect jobs (Table 5-11).

As stated above, an estimated $57.3 million (2008 dollars) would be expended in wages annually over the 40-year licensing period, based on an average annual salary of $63,625 for 900 workers. A regional multiplier was applied to the earnings of new workers to determine the effect of the direct earnings on the local economy. For every dollar of wages earned by new

Table 5-11. Average Annual Direct and Indirect Employment for Fermi 3 during Operations

		Calculation	Number of Workers
A	Direct employment[(a)]		900
B	Reside in region	A × 70%	630
C	(Otherwise employed at time of hire for Fermi 3)	B × 87%	(548)
D	(Unemployed at time of hire for Fermi 3)	B × 13%	(82)
E	Relocate from outside region	A × 30%	270
F	Indirect employment	(D + E) × 1.4	492
G	**Total annual employment**	**A + F**	**1392**
	Total annual new employment	**D + E + F**	**844**

(a) Indirect impacts associated with the outage workforce have not been included.

operations workers on Fermi 3, BEA estimates that an additional $0.50 of wages would be created in the local economy (Detroit Edison 2011a). For an estimated $57.3 million in new direct wages, an estimated $28.7 million in indirect wages would be created, for an annual total of about $86 million.

Purchase of materials and supplies for operation and maintenance of the plant and any capital expenditures that occur within the region would also have direct and indirect effects on the regional economy. Detroit Edison estimates that purchases of material and supplies for operation and maintenance of Fermi 2 and capital expenditures averaged $60.4 million per year between the years 2002 to 2007, of which approximately 23 percent ($13.9 million) is purchased from local vendors and suppliers (Detroit Edison 2011a). The review team expects that purchases of material and supplies for operation and maintenance and any capital expenditures for Fermi 3 would be similar to those for Fermi 2, although some economies of scale may result in a reduction in total expenditures for the two operating plants.

The review team concludes, based on its own independent review of the likely economic effects of the proposed action, that minor beneficial economic impacts would be experienced throughout the 50-mi region during the 40-year licensing period, including (1) 1393 direct and indirect jobs, (2) $86 million in direct and indirect annual wages, (3) an additional $7.9 million in wages during scheduled refueling outages every 24 months, and (4) $13.9 million spending on purchases of materials and supplies from local vendors and suppliers.

5.4.3.2 Taxes

The tax structure of the region is discussed in Section 2.5 of this EIS. Several tax revenue categories would be affected by operation of Fermi 3. These include (a) State and local taxes on worker incomes, (b) State sales taxes on worker expenditures; (c) State sales taxes on the purchase of materials and supplies for operation and maintenance of the plant, (d) State sales

taxes on consumer purchases of electricity, (e) State business taxes, and (f) local property taxes.

State and Local Income Taxes

The States of Michigan and Ohio would receive additional income tax revenue from the income tax on wages of new workers. Table 5-12 summarizes the estimated new annual income tax revenue that would be received by each State. However, determining the exact amount of income tax revenue relies on a number of factors such as income tax rates, residency status, deductions taken, and other factors.

Table 5-12. Estimated New State Income and Sales Tax Revenue Associated with the Operations Workforce

New Workers and Revenue (in millions of US$)	Michigan	Ohio
New Operations Workers	232	38
Workers relocating from outside region		
Previously unemployed workers	71	11
Total new operations workers	**303**	**49**
Tax Revenue		
Estimated annual income (at $63,625 per year)	$19.3	$3.1
Estimated annual State income tax revenue	$0.8[(a)]	$0.1[(b)]
Estimated annual spending on goods and services[(c)]	$5.4	$0.9
Estimated annual sales tax revenue[(d)]	$0.3	$0.05
Total estimated annual new tax revenue	**$1.1**	**$0.15**

(a) As discussed in Section 2.2, the income tax rate in Michigan will be set at 3.9 percent in 2015.
(b) Ohio's tax rate for an income between $40,000 and $80,000 is $1056.40 plus 4.109 percent of excess over $40,000.
(c) Based on 28 percent of income before taxes (USBLS 2010).
(d) The Michigan sales tax rate is 6 percent, and the Ohio sales tax rate is 5.5 percent.

New workers are those drawn from the ranks of the unemployed and those who relocate from outside the States of Michigan or Ohio. As discussed in Section 5.4.2, approximately 70 percent of the annual workforce, or an average of 630 workers annually, are expected to be drawn from the region. Workers recruited for the operations workforce at Fermi 3 who already live and work in the region are already contributing to State income and sales tax revenue. However, approximately 13 percent of the 630 workers, or approximately 82 workers, would live in the area but would be unemployed. Those workers would contribute to new State tax revenue as they become employed at Fermi 3. Approximately 30 percent of the operations workforce, or approximately 270 workers, are expected to relocate from outside the region.

If all in-migrating workers move to the region from outside the States of Michigan and Ohio, they would also provide new tax revenue. To estimate the income tax revenue for the State of

Michigan and State of Ohio, the review team assumed a similar residential distribution to the current Fermi 2 workforce. Based on the current residential distribution of the Fermi 2 workforce, approximately 86 percent of the total workforce resides in Michigan and 14 percent resides in Ohio (both within and outside of the economic impact area) (fewer than 1 percent reside in Canada and are not included in this analysis). Assuming the in-migrating workers and previously unemployed workers are divided between Michigan and Ohio in the same proportion as the current Fermi 2 workforce, approximately 86 percent of the new workers would pay taxes in the State of Michigan and 14 percent would pay taxes in the State of Ohio. Therefore, the estimated new state income tax revenue would be approximately $0.8 million annually for the State of Michigan (2008 dollars) based on an average annual salary for the new workers of $63,625 and a 40-hour work week, and approximately $0.1 million annually for the State of Ohio.

As discussed in Section 2.5, several municipalities in Wayne and Lucas County impose taxes on income. Depending on the residential location of in-migrating workers, municipalities in Wayne County and Lucas County may also benefit from increased income associated with the operation of Fermi 3.

State and Local Sales Taxes on Worker Expenditures

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. An estimated $0.3 million ($300,000) in new sales tax revenue would be received by the State of Michigan and $0.05 million ($50,000) by the State of Ohio, based on national averages for consumer spending on goods and services.

In addition, Detroit Edison would employ an estimated 1200 to 1500 workers at Fermi 3 during scheduled outages, which would occur every 24 months and require workers for a period of 30 days (Detroit Edison 2011a). During the outages, these workers would purchase local goods and services, generating additional but minimal sales tax revenue for the State of Michigan.

The review team determined that the impact of additional income taxes at the State level would be positive but minimal – less than 1 percent of each State's total sales tax revenues.

In Michigan, local jurisdictions have taxing authority for selected sales revenue (i.e., hotel accommodations and stadium and convention facilities), and counties in Ohio may levy a general sales tax revenue. Therefore, local jurisdictions would also benefit from expenditures of goods and services.

State and Local Sales Taxes on Commercial (Non-Safety Related) Materials and Supplies

The States of Michigan and Ohio would receive sales tax revenue from the purchase of material and supplies for operation and maintenance of Fermi 3. Based on its reported average annual

operations expenditures for Fermi 2 between the years 2002 to 2007, Detroit Edison spent about $60.4 million annually for materials and supplies, of which approximately 23 percent ($13.9 million) was purchased from local vendors and suppliers (Detroit Edison 2011a). Assuming expenditures for Fermi 3 will be similar to those for Fermi 2, the review team has estimated that Detroit Edison would expend approximately $13.9 million annually for the local purchase of non-safety related material and supplies for operation and maintenance of Fermi 3. A detailed analysis of the sources for these materials and supplies has not been conducted.

For purposes of analysis, the review team assumed 60 percent of the locally purchased materials and supplies would be purchased from within the State of Michigan (e.g., $8.3 million) and 40 percent from within the State of Ohio (e.g., $5.6 million). Based on 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. Based on 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 of Ohio annually from the purchase of materials and supplies for operation and maintenance of Fermi 3.

The review team determined that the impact of additional sales tax revenue from the purchase of materials and supplies for operation and maintenance of Fermi 3 would be beneficial but minimal – less than 1 percent of each State's total annual sales tax revenue.

In Michigan, local jurisdictions have taxing authority for selected sales revenue (i.e., hotel accommodations and stadium and convention facilities), and counties in Ohio may levy a general sales tax revenue. Therefore, local jurisdictions would also benefit from purchases of good and supplies for operation and maintenance of Fermi 3.

State Sales Taxes on Purchases of Electricity

The State of Michigan would benefit from increased sales taxes on consumer purchases of electricity generated by Fermi 3. As discussed in Section 2.5, the State of Michigan receives an estimated $208 million in sales tax revenue based on 2009 residential, industrial, and commercial purchases of electricity from Detroit Edison's ten electrical generating facilities in Michigan (DOE/EIA 2009). The review team estimates that sales tax revenue from purchase of electricity from Fermi 3 would be proportional to one-tenth the total sales tax revenue of the ten operating facilities, which would be an estimated $21 million annually.

Business Taxes

In 2007, Detroit Edison paid $149 million in combined federal and state corporate income tax (Detroit Edison 2008b). With increased income from the sale of electricity from Fermi 3, the review team expects Detroit Edison to pay additional beneficial but minimal corporate income taxes.

Local Property Taxes

The assessed value of the Fermi plant site would increase in value with the completion of the Fermi 3 plant for operation. Local jurisdictions would benefit from the increased property value with the corresponding increased property tax revenue. 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 property owned by Detroit Edison in Monroe County was $821 million (Monroe County Finance Department 2009), approximately 13.3 percent of the total county taxable assessed value. Consequently, with completion of the construction of Fermi 3, 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 boundary 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.

The estimated annual property tax revenue in Table 5-13 is based on current millage rates and the full construction cost of Fermi 3. Therefore, the information in Table 5-13 should be considered an upper boundary to the actual property taxes that would be paid by Detroit Edison for Fermi 3.

Table 5-13. Estimated Annual Property Tax Revenue from Fermi 3 Assessed Property Value Based on 2009 Millage Rates

Jurisdiction	Millage (2009)	Total Estimated Annual Property Tax Revenue (in millions)
Monroe County – operation	4.8	$30.7
Monroe County – senior citizens	0.5	$3.2
Monroe County Community College	2.18	$14.0
Monroe County Library	1.0	$6.4
Monroe Intermediate School District	4.75	$30.4
Frenchtown Charter Township	6.8	$43.5
Jefferson schools	18.5	$118.4
State education tax	6.0	$38.4
Resort Authority	2.8	$17.9
Total millage	47.33	$302.9

5.4.3.3 Summary of Economic Impacts

Based on the information provided by Detroit Edison and the review team's evaluation, the review team concludes that the impact of operation of Fermi 3 on the economy would be SMALL and beneficial throughout the 50-mi region. For tax revenues, the review team determined the impacts of operations would be LARGE and beneficial in Monroe County and SMALL and beneficial elsewhere. An estimated 270 new workers would relocate into the area, and 82 unemployed workers would be employed. Tax revenue to local jurisdictions would accrue through personal income, sales, and property taxes and would have the largest benefit on the local jurisdictions within Monroe County.

5.4.4 Infrastructure and Community Services

Infrastructure and community services include traffic, recreation, housing, public services, and education. Operation of Fermi 3 would affect the transportation network as the additional workforce uses the local roads to commute to and from work, and possibly additional truck deliveries are made to support operation of the plant. These same commuters could also potentially affect recreation in the area. As the workforce in-migrates and settles in the region, there may be impacts on housing, education, and public sector services.

5.4.4.1 Traffic

Existing transportation routes would be affected by an increase in commuter traffic to and from the Fermi site associated with the operations workforce for Fermi 3.

The interstate highways and local roadways described in Section 2.5.2.3 would be used by operations workers to commute to and from work. Traffic associated with the operations workforce would be most concentrated on local roadways near the site, lessening as workers disperse in various directions on regional interconnecting roadways and highways.

Traffic volumes associated with the Fermi site are shown in Table 5-14. Operation of Fermi 3 would result in a near doubling of the workforce at the Fermi site, with operations workers for both Fermi 2 and Fermi 3. These workers would be divided into multiple shifts such that the plant would be staffed 24 hr per day, all days of the year. However, peak traffic volumes would occur during the morning commute to the site from 5:30 a.m. to 7:30 a.m. (0.49 vehicles per employee) and the afternoon commute from the site from 2:30 p.m. to 5:30 p.m. (0.44 vehicels per employee) (Mannik and Smith Group, Inc. 2009).

Table 5-14. Actual (2009) and Projected (2020) Peak Traffic Volumes – Fermi Site

Workforce	A.M. Peak (vehicles)	P.M. Peak (vehicles)
Current Fermi 2 workforce (2009)	466	418
Projected Fermi 3 workforce (2020)	441	396
Total Fermi 2 and Fermi 3 workforce	**907**	**814**
Outage workforce for Fermi 3 (2020)	732	436
Total Fermi 3 outage workforce + Fermi 2 workforce	**1198**	**854**

Source: Mannik and Smith Group, Inc. 2009

Detroit Edison conducted a traffic study to evaluate the effect of the operations workforce on the LOS of local roadways, incorporating a traffic projection growth rate for background traffic levels that was developed by SEMCOG in its traffic forecasting model. The analysis focused on seven local roadway intersections and three interstate (I-75) interchanges, which are listed below:

- N. Dixie Highway and Stony Creek Road
- N. Dixie Highway and Pointe Aux Peaux Road
- N. Dixie Highway and Leroux Road
- N. Dixie Highway and Enrico Fermi Drive
- N. Dixie Highway and Post Road
- Leroux Road and Toll Road
- Enrico Fermi Road and Leroux Road
- I-75 and N. Dixie Highway
- I-75 and Nadeau Road
- I-75 and Swan Creek Road/Newport Road

The LOS analysis was conducted in accordance with the Transportation Research Board's *Highway Capacity Manual* to evaluate the operational efficiency at each intersection and its approaching roadways.

The traffic analysis indicates that unsatisfactory traffic conditions (LOS of E or F) would occur at several intersections during both the peak-hour morning and afternoon commutes of the operations workforce. Some of these intersections are already operating under unsatisfactory conditions (see Tables 5-15 and 5-16) and were also determined to operate under unsatisfactory traffic conditions during the peak construction period (see Tables 4-12 and 4-13). These conditions could be alleviated primarily by roadway or traffic flow improvements, including signalization, lane use modification, and signal timing/phasing optimization, some of

Table 5-15. Impacts on Area Roadways during Peak Morning Operations Workforce Commute

Intersection	Approach/Movement	Existing (2009) Level of Service	Projected (2020) Level of Service	Potential Improvement Alternatives
Northbound I-75 ramps and Nadeau Rd.	Northbound ramp left turn	F	F	• Signalization • Lane use modification
Northbound I-75 ramps and Swan Creek Rd.	Northbound ramp left turn	D	D	
Southbound I-75 ramps and Newport Rd.	Southbound approach	C	D	
N. Dixie Hwy. and Stony Creek Rd.	Stony Creek Rd. eastbound	C	E	
N. Dixie Hwy. and Pointe Aux Peaux Rd.	N. Dixie Hwy. northeastbound	B	F	• Signal timing/phasing optimization
N. Dixie Hwy. and Enrico Fermi Dr.	N. Dixie Hwy. northbound	A	A	• Signal timing/phasing
	N. Dixie Hwy. southbound	A	F	• Northbound/southbound turn lanes on N. Dixie Hwy.
	Enrico Fermi Dr. westbound	C	B	• Additional access point • Westbound lane use/storage

Source: Mannik and Smith Group, Inc. 2009

Table 5-16. Impacts on Area Roadways during Peak Afternoon Operations Workforce Commute

Intersection	Approach/Movement	Existing (2009) Level of Service	Projected (2020) Level of Service	Potential Improvement Alternatives
Northbound I-75 ramps and Nadeau Rd.	Northbound ramp left turn	F	F	• Signalization • Lane use modification
Northbound I-75 ramps and Swan Creek Rd.	Northbound ramp left turn	E	E	• Signalization • Lane use modification
Southbound I-75 ramps and Newport Rd.	Southbound I-75 ramp northbound approach	E	F	• Signalization • Lane use modification
	southbound approach	D	E	
N. Dixie Hwy. and Stony Creek Rd.	Stony Creek Rd. eastbound	C	E	• Signalization • Eastbound Stony Creek left/right turn lanes
N. Dixie Hwy. and Pointe Aux Peaux Rd.	N. Dixie Hwy. southwestbound	C	F	• Signal timing/phasing optimization
N. Dixie Hwy. and Enrico Fermi Dr.	N. Dixie Hwy. northbound	A	B	• Signal timing/phasing optimization
	N. Dixie Hwy. southbound	B	B	
	Enrico Fermi Dr. westbound	B	E	• Northbound/southbound turn lanes on N. Dixie Hwy. • Additional access point • Westbound lane use/storage

Source: Mannik and Smith Group, Inc. 2009

which may be incorporated during the construction period. The Monroe County Road Commission (MCRC) and Michigan Department of Transportation (MDOT) will be responsible for reviewing and approving site plans because the plans affect area roadways during the site plan review and approval process for a building permit within Frenchtown Charter Township (Assenmacher 2011; Ramirez 2011). At that time, these agencies may require that a traffic impact study in accordance with Traffic and Safety Note 607C, "Traffic Impact Studies" (MDOT 2009) be conducted, and improvements to local roadways may focus on those roadways that are affected during both construction and operation. Recommendations for improvements to the I-75 interchanges will require approval of MDOT. All other roadway and intersection improvements will require the approval of MCRC.

During Fermi 2 or Fermi 3 scheduled outages, unsatisfactory traffic conditions would be further exacerbated. During scheduled outages, Detroit Edison hires contract labor to carry out fuel-reloading activities, equipment maintenance, and other projects associated with the outage. Detroit Edison employs approximately 1200 to 1500 workers for 30 days during every outage, which occurs every 18 months for Fermi 2 and would occur every 24 months for Fermi 3.

Estimated traffic generated by the Fermi site during scheduled outages is shown in Table 5.4-7. However, these conditions would exist only for the length of the outage (approximately 30 days); they would not represent normal conditions. Detroit Edison will not schedule an outage for Fermi 3 during the same time as an outage for Fermi 2.

Overall, with the exception of a few intersections/interchanges, impacts on area roadways associated with the operations workforce for Fermi 3 would be minor, because the existing traffic volumes on local roadways in the vicinity of the Fermi site are generally below the capacity of the roads, and beyond the local roadways, the traffic associated with the operations workforce would be widely dispersed on a widely developed regional roadway network.

During Fermi 3 outages an additional 1200–1500 workers would commute to the site, in addition to the 1627 operations workers (727 for Fermi 2 and 900 for Fermi 3), for a total of about 3127 workers on local roadways each day. This number is similar to the maximum number of workers on local roadways during the peak employment period of construction (3627), which formed the basis of the review team's MODERATE impact on traffic near the plant. Therefore, the review team concludes from the information provided by Detroit Edison, interviews with local planners and officials, and the review team's independent evaluation, that the offsite impacts on road traffic from operation of Fermi 3 would be minor during normal operations and noticeable but not destabilizing during outages. Detroit Edison has committed in the ER to working with MDOT and MCRC to determine possible mitigation measures closer to the time of operation (Detroit Edison 2011a).

5.4.4.2 Recreation

Recreational resources in Monroe, Wayne, and Lucas Counties may be affected by operations of Fermi 3. 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 steam plume, or access delays associated with increased traffic from the operations workforce on local roadways.

Impacts associated with the increased use of the recreational resources in the vicinity and region would be minimal. Based on the projected increase in population in Monroe, Wayne, and Lucas Counties, the review team determined the operations would not affect the availability and use of recreational resources in the area, especially considering that Wayne and Lucas Counties have experienced and are projected to continue to experience population losses through 2020.

Additional demand on recreational resources would occur during the scheduled outage periods that would occur every 24 months. Detroit Edison identified the number of short-term accommodations within 50 mi of the City of Monroe. These accommodations would be used by people using recreational areas and by other visitors/tourists to the region, and may also be used by a portion of the outage workforce over the 30 days during scheduled outage periods. More than 375 establishments, including hotels and motels, bed and breakfasts, cabins and cottages, condominiums, historic inns, and recreational vehicle (RV) parks and campgrounds, are located within 50 mi of the City of Monroe. With the large number of establishments and the expectations that only a portion of the outage workers would be from outside the region and that the need for housing would be short term, the review team expects that the availability and use of recreational accommodations for other visitors/tourists in the region would be minimally affected.

Users of recreational resources in the immediate vicinity of the Fermi site may have a diminished recreational experience due to the view of the 600-ft cooling tower and a steam plume that would exist during operation of Fermi 3. Several small beach communities are located along the Lake Erie shoreline within 5 mi of the Fermi site, including Estral Beach, Stony Point, Detroit Beach, and Woodland Beach. Several public and private beaches are located along the Lake Erie shoreline in Monroe and Wayne Counties. Many small marinas and docks also are located along the Lake Erie shoreline within the vicinity of the Fermi site. The cooling tower would also be visible from Point Mouillee State Game Area (3.1 mi to the northeast), Sterling State Park (4.8 mi to the south-southwest), and Lake Erie. Although taller than the existing cooling towers, the new 600-ft cooling tower and associated steam plume would be consistent with the existing views of the Fermi site, and the review team determines there would be no discernible adverse impacts on recreational users from the operation of the Fermi 3 cooling tower.

People using recreational facilities near the site may experience traffic congestion on the roads during the morning and afternoon commutes of the operations workforce and during the scheduled outages. However, measures to mitigate traffic delays at selected intersections and I-75 interchanges have been recommended following a traffic analysis of local roadways, which would alleviate impacts on users of recreational facilities as well as on members of the general public using local roadways. Given the high capacity of local roadways and the limited times when Fermi 3-related traffic would compete for access, along with the presence of traffic-mitigating measures implemented to facilitate building-related traffic during the construction phase, the review team expects that the accessibility of recreational accommodations for other visitors/tourists in the region would be minimally affected.

5.4.4.3 Housing

As discussed above, the review team expects 70 percent of the operations workforce would be local workers who currently reside within approximately 50 mi of the Fermi site and would not affect the housing market. The review team expects the remaining 30 percent of the operations workforce, or approximately 270 workers, to relocate into the region, 235 of whom would move into Monroe, Wayne, and Lucas Counties, and to rent or purchase housing. About 35 workers would choose to relocate elsewhere in the 50-mi region and would not affect housing availability because of the large metropolitan area from which housing could be selected. The review team expects that the residential distribution of the in-migrating workforce in the three-county economic impact area will be similar to the residential distribution of the current Fermi 2 workforce. Table 5-17 compares the available housing to the number of in-migrating operations workers.

Table 5-17. Impact on Housing Availability within Monroe, Wayne, and Lucas Counties

	Monroe	Wayne	Lucas
Workforce relocating from outside the region	155	51	29
Vacant housing units	4632	135,385	23,659
Estimated housing as a percentage of housing availability	3.3	0.04	0.1

Given the relatively large size of the regional housing market, the increased demand for housing by relocating workers and their families would have no noticeable impact on the availability or price of housing. As presented in Section 2.5, the U.S. Census Bureau (USCB) data indicated that more than 1 million housing units were located in Monroe, Wayne, and Lucas Counties in 2010, of which more than 300,000 were rental units. The vacancy rate within the three counties ranged from 2.4 percent to 4.4 percent for owner-occupied housing and from 9.1 percent to 11.3 percent for rental units; 146,048 housing units were vacant. SEMCOG reported 68 mobile home parks and 15,835 mobile home sites in Wayne County, and 29 mobile home parks and 7452 mobile home sites in Monroe County (SEMCOG 2008), of which 17.2 percent surveyed in Monroe County were vacant in 2006.

Substandard housing units are being demolished by Wayne and Monroe County, and this has resulted in a net loss of housing units in Wayne County. However, the review team has also considered that a large number of housing units are in foreclosure, population in the local area is declining, and additional housing units also are being approved for construction, and these factors have resulted in a net gain in housing units in Monroe County. Despite the changes that are expected to occur in the housing market, the review team expects that the overall number of housing units will be more than sufficient to accommodate workers relocating from outside the local area.

Given the large supply of housing and the size of the Detroit and Toledo metropolitan areas relative to the 270 in-migrating families, the review team expects sufficient housing to be available for workers relocating to the area without affecting the housing supply or prices in the local area or stimulating new housing construction.

Demand for short-term housing would occur during the scheduled outages that would occur every 24 months. Workers who do not currently reside in the region would be housed in temporary, short-term accommodations for the duration of the scheduled outages.

Detroit Edison identified the number of short-term accommodations within 50 mi of the City of Monroe. These accommodations would be occupied by people using recreational areas and by other visitors/tourists to the region (as discussed above) and also by a portion of the outage workforce over the 30 days when scheduled outages occur. More than 375 establishments, including hotels and motels, bed and breakfast establishments, cabins and cottages, condominiums, historic inns, and RV parks and campgrounds, are located within 50 mi of the City of Monroe. With the large number of establishments and the expectation that only a portion of the outage workers would be from outside the region and that the need for housing would be short term, the availability of short-term accommodations would be minimally affected.

The operation of Fermi 3 could affect housing values in the vicinity of the Fermi site. Based on previous studies that have been done (Bezdek and Wendling 2006; Clark et al. 1997; Farber 1998), and as discussed in Section 4.4.4.3, the review team determined that the impact on housing values from the operations of Fermi 3 would be minor.

5.4.4.4 Public Services

This section discusses the impacts on existing water supply and wastewater treatment and police, fire response, and health care services in Monroe, Wayne, and Lucas Counties.

Water Supply and Wastewater Treatment Services

The in-migrating operations workforce for Fermi 3 would increase the demand for water supply and wastewater treatment services within the communities where they choose to reside; the

size of the total operations workforce would increase the demand for water supply and wastewater treatment services at the Fermi site.

The review team expects that approximately 70 percent of the operations workforce would be local workers currently served by water supply and wastewater treatment services within the communities in which they reside.

The review expects the remaining 30 percent of the operations workforce, or approximately 270 workers, would increase demand on water supply and wastewater treatment services within the communities in which they choose to reside.

Given that 270 workers and their families would relocate from outside the area into a large housing market, the review team expects these workers would obtain housing within the existing housing market rather than stimulate new housing construction. Therefore the in-migrating operations workers would not expand existing water supply or wastewater treatment services to new areas. Potable water is available to the existing housing market through wells or municipal water supplies, as discussed in Section 2.5.2.6, and residents have access to municipal wastewater collection and treatment systems or have individually owned onsite wastewater disposal (septic) systems.

The estimated demand for water supply and wastewater treatment services in Monroe, Wayne, and Lucas Counties is shown in Table 5-18.

Table 5-18. Estimated Increase in Demand for Water Supply and Wastewater Treatment Services in Monroe, Wayne, and Lucas Counties from In-Migrating Operations Workforce

Factor	Monroe	Wayne	Lucas
Estimated increase in population[(a)]	403	133	75
Estimated increase in residential daily water demand[(b)]	0.05 MGD	0.02 MGD	0.01 MGD
Estimated increase in residential daily wastewater flow[(c)]	0.03 MGD	0.01 MGD	0.01 MGD

(a) Approximately 35 workers would choose to relocate elsewhere in the 50-mi region, which would result in a total increase of 91 persons in the population outside of Monroe, Wayne, and Lucas Counties. An increase of 91 persons is not expected to affect water supply or wastewater treatment services, because the metropolitan area in which these persons would settle is large.

(b) Average daily water use per person is estimated to be 135 gal per day, based on the planning criteria used by the Detroit Water and Sewerage Department (DWSD) in June 2004 (DWSD 2004).

(c) Average daily wastewater flow per person is estimated to be 77 gal per day based on the planning criteria used by the DWSD in October 2003 (DWSD 2003).

The review team expects the increase in demand for water supply from in-migrating workers and their families will have a minor impact on municipal water suppliers in the local area because the projected increase in population is small and the in-migrating population would be served by a number of municipalities and jurisdictions.

In Monroe County, the largest municipal water supplier is the City of Monroe. The treatment plant in the City of Monroe is designed to treat 18 MGD, and its average daily water demand is 7.8 MGD (Monroe County Planning Department and Commission 2010). Other municipal water suppliers in Monroe County may also provide water supply to the in-migrating population, including the Frenchtown Charter Township; the City of Milan, Michigan; the City of Toledo, Ohio; and the Detroit Water and Sewerage Department (DWSD), which also serves portions of Monroe County. Therefore, the estimated water demand of 0.05 MGD for the additional people choosing to reside in Monroe County would have a minor impact on water suppliers.

Wayne County is serviced by DWSD, which has a treatment capacity of 1720 MGD. The average daily water demand for DWSD is 622 MGD (Ellenwood 2010). Therefore, the estimated water demand of 0.02 MGD for the additional people choosing to reside in Wayne County would have a minor impact on DWSD.

The largest municipal water supplier in Lucas County is the City of Toledo, which also services the northeastern portion of the county, where workers are more likely to settle. Its plant has a treatment capacity of 120 MGD, with an average daily demand of 73 MGD (Leffler 2010). Therefore, the estimated water demand of 0.01 MGD for the additional people choosing to reside in Lucas County is expected to have a minor impact on the municipal water suppliers in Lucas County.

The review team expects the increase in demand for wastewater treatment to have a minor impact on wastewater treatment plants in the local area because of the number of jurisdictions providing wastewater collection and treatment services in the local area compares favorably to the size of the population increase associated with Fermi 3.

In Monroe County, the largest wastewater treatment plant is operated by the City of Monroe. It is designed to treat 24 MGD wastewater flows, and its average daily wastewater flow is 15.9 MGD (MDEQ 2011). In addition, wastewater treatment services are provided by a number of municipalities in Monroe County, including the townships of Bedford, Berlin, Ida and Raisinville; the cities of Milan, Petersburg, and Luna Pier; and the villages of Dundee, Carleton, and Maybee. Therefore, the review team expects that the estimated wastewater treatment flows of 0.03 MGD for the additional people choosing to reside in Monroe County would have a minor impact on wastewater treatment capability.

Wayne County is served by two large wastewater treatment facilities: the DWSD, which has a treatment capacity of 930 MGD and treats an average wastewater flow of 727 MGD (Ellenwood 2010), and the Downriver Treatment Plant, which has a treatment capacity of 125 MGD and treats an average wastewater flow of 52 MGD. In addition, Gross Ile Township, City of Rockwood, and City of Trenton maintain wastewater treatment facilities. Therefore, the estimated wastewater treatment flows of 0.01 MGD for the population choosing to reside in Wayne County would have a minor impact on wastewater treatment capability.

Operational Impacts at the Proposed Site

The City of Toledo's wastewater treatment plant is the largest in Lucas County. The plant has a treatment capacity of 195 MGD, with an average daily demand of 71 MGD (McGibbeny 2010). Therefore, the estimated wastewater treatment flows of 0.01 MGD for the population choosing to reside in Lucas County are expected to have a minor impact on wastewater treatment capability.

The operations workforce would place additional demands on the municipal potable water supply to the Fermi site and on wastewater treatment services provided for the site. Detroit Edison plans to connect to the City of Monroe Township municipal water system and to the Monroe Metropolitan Wastewater Treatment Facility.

Surface water withdrawn directly from Lake Erie would provide the water supply for cooling and other operational uses. Wastewater from operation of the plant would be treated at an onsite wastewater treatment facility, and treated nonradiological wastewater would be discharged to Lake Erie. Impacts associated with the surface water withdrawal and discharge are discussed in Section 5.2.

For a full-time and contract workforce of 900 at Fermi 3, the potable water demand onsite would increase by an estimated 0.09 MGD, based on a standard institutional water consumption planning rate of 100 gal/person/day (Metcalf and Eddy, Inc. 1972). During a scheduled outage, with a temporary workforce of 1200 to 1500, potable water demand onsite would increase by an estimated 0.12 to 0.15 MGD over the 30-day outage period. The average daily and maximum daily water demands for Frenchtown Charter Township in 2005 were 2.1 MGD and 3.9 MGD, respectively. The plant doubled its capacity from 4 MGD to 8 MGD in 2006, which is projected to be sufficient for a minimum of 20 years (Monroe County Planning Department and Commission 2010). Therefore, the review team expects operation of Fermi 3 to have a minimal impact on the Frenchtown Township municipal water supply service.

For a full-time and contract workforce of 900 at Fermi 3, the review team estimates the sanitary wastewater flow onsite would increase by 0.07 MGD, or 80 percent of the estimated water consumption (Metcalf and Eddy, Inc. 1972). The Monroe Metropolitan Wastewater Treatment Facility is designed to treat 24 MGD wastewater flows, and its average daily wastewater flow is 15.9 MGD (MDEQ 2011). Therefore, the review team expects that operation of Fermi 3 would have a minimal impact on the wastewater treatment capabilities of the Monroe Metropolitan Wastewater Treatment Facility.

The review team concludes from the information provided by Detroit Edison, interviews with local planners and officials, and the review team's independent evaluation that the operation of Fermi 3 would have minimal impacts on local water supply and wastewater treatment facilities.

Police, Fire Response, and Health Care Services

The operations workforce for Fermi 3 would increase the demand for police, fire response, and health care services within the communities where they reside and at the Fermi site.

The review team expects that approximately 70 percent of the operations workforce currently reside within an approximately 50-mi radius of the Fermi site and are currently served by the police, fire response, and health care services within their communities. Although the commute from residence to place of work would change, demand for police, fire response, or health care services would not be appreciably different from that of the baseline population served by any one jurisdiction.

The review team expects that the in-migrating operations workers would increase the demand on police, fire response, and health care services within the communities in which they chose to reside.

As discussed in Section 5.4.2, the projected population increase associated with in-migrating workers, based on an average household size of 2.6 persons, is 702 persons. Based on the existing distribution pattern of the Fermi 2 operational workforce, an estimated 403 persons would relocate to Monroe County; an estimated 133 persons would relocate to Wayne County; and an estimated 75 persons would relocate to Lucas County. Approximately 91 persons would relocate elsewhere in the region. As shown in Table 5-19, the projected increase in population would have no measurable effect on the ratio of police officers, firefighters, or health care workers per 1000 residents in Monroe, Wayne, or Lucas Counties, based on the 2010 population as presented in Section 2.5.

Fermi 3 operations may result in an increase in demand for police, fire response, or health care services onsite, especially in the event of workplace injury or accidents. Police, fire response, and other emergency response personnel may encounter traffic congestion on local roadways when responding to calls during the commutes of the operations workforce (and temporarily, during the scheduled outages) to the site. However, the area around the Fermi site is sparsely populated, and the review team does not expect that there would be a high demand for police, fire response, or other emergency response personnel. In addition, measures to mitigate traffic delays at selected intersections and I-75 interchanges that are being considered would reduce the impacts on emergency responders as well as members of the general public using local roadways. During the site plan review and approval process, Frenchtown Charter Township will require, as necessary, that the project be reviewed by MCRC and MDOT. These agencies may require that a traffic impact study in accordance with Traffic and Safety Note 607C (MDOT 2009) be conducted, and improvements to local roadways would be considered by Detroit Edison at that time.

Table 5-19. Changes Associated with Fermi 3 Operations in Population Served by Law Enforcement Personnel, Firefighters, and Health Care Workers in Monroe, Wayne, and Lucas Counties

Public Service	Number of Officers/Firefighters/ HealthCare Workers	Existing Conditions		Conditions with In-Migrating Operations Workers and Families	
		Population Served	Officers/Firefighters/ Health Care Workers per 1000 Residents	Population Served[(a)]	Officers/Firefighters/ Health Care Workers per 1000 Residents
County Sheriff and Municipal Law Enforcement Personnel					
Monroe	277	152,021	1.8	152,671	1.8
Wayne	6957	1,820,584	3.8	1,820,800	3.8
Lucas	973	441,815	2.2	441,937	2.2
Firefighters					
Monroe	606	152,021	4.0	1532,671	4.0
Wayne	3407	1,820,584	1.9	1,820,800	1.9
Lucas	1195	441,815	2.7	441,937	2.7
Health Care Workers					
Monroe, Michigan MSA	2770	152,021	18.2	152,527	18.2
Detroit-Livonia-Dearborn Metropolitan Division	69,030	4,296,250	16.1	4,296,533	16.1
Toledo, Ohio MSA	34,600	651,429	53.1	651,551	53.1

Sources: FBI 2009; FEMA 2010; USBLS 2008

(a) 2010 ACS population data plus the projected population increase associated with relocating workers and their families.

Fire suppression equipment and a first aid station are available onsite, and Detroit Edison has existing agreements with local emergency response organizations (Detroit Edison 2011a). Because of these offsite and onsite safety strategies, the review team expects the impact of operations on the demand for local emergency room service personnel would be minimal.

5.4.4.5 Education

The in-migrating operations workforce for Fermi 3 would increase the demand for educational services.

The review team expects that 70 percent of the operations workforce would currently reside within 50 mi of the Fermi site and would not make any additional demands on educational services in the region.

The review team expects the in-migrating operations workforce would increase school enrollments by about 82 in Monroe County, 27 in Wayne County, and 15 in Lucas County (Table 5-19).

During the 2008–2009 school year, enrollment in the nine public school districts in Monroe County was 23,283, and in Wayne County's 35 public school districts enrollment was 276,862. During the same year, enrollment in Lucas County's eight school districts was 57,263 (Table 5-20). The review team determined that the impact of the projected increase in population associated with the operations workforce for Fermi 3 on local schools would be negligible because the households associated with the relocated workers would be dispersed in numerous public schools throughout these school districts, as well as among numerous private, parochial, and alternative schools (Table 5-21).

Table 5-20. Estimated Number of School-Age Children Associated with In-Migrating Workforce for Fermi 3 Operations

Factor	Monroe	Wayne	Lucas
Estimated number of operations workers in-migrating to county	155	51	29
Estimated increase in population[(a)]	403	133	75
Estimated increase in number of school-age children[(b)]	82	27	15

(a) Based on 2.6 persons per household (USCB 2010).
(b) Based on the 2010 Census data for the country, which shows that 20.4 percent of the population is between the ages of 5 and 19 years (USCB 2010).

Table 5-21. Changes Associated with Fermi 3 Operations in Student/Teacher Ratio for School Districts in Monroe, Wayne, and Lucas Counties

	Existing Conditions			Conditions with In-Migrating Workers and Families	
County	Total Countywide Number of Teachers	Total Countywide Student Enrollment	Student/ Teacher Ratio throughout County	Total Countywide Student Enrollment[(a)]	Student/ Teacher Ratio throughout County
Monroe	1254	23,283	18.6	23,995	18.8
Wayne	15,853	276,862	17.5	292,552	17.8
Lucas	3716	57,263	15.4	58,883	15.8

Source: U.S. Department of Education 2010

(a) Population served includes the 2008–2009 countywide school enrollment plus the projected number of school-age children associated with in-migrating workers.

5.4.4.6 Summary of Infrastructure and Community Services

Based on information supplied by Detroit Edison, review team interviews conducted with and information solicited from public officials, and the review team evaluation of data concerning the current availability of services, the review team concludes that the impacts of Fermi 3 operations on regional infrastructure and community services, including recreation, housing, water and wastewater facilities, police, fire and medical facilities, and education, would be SMALL and mitigation would not be warranted (Peven 2010). Although the traffic associated with the operations workforce would result in a SMALL impact on area roadways, the traffic associated with Fermi 3 outages would result in a MODERATE impact.

5.4.5 Summary of Socioeconomic Impacts

The review team has assessed the activities related to operation of Fermi 3 and the potential socioeconomic impacts in the region and local area. Physical impacts on workers and the general public include those on noise levels, air quality, existing buildings, roads, and aesthetics. The review team concludes that all physical impacts from operation of Fermi 3 would be SMALL.

On the basis of information supplied by Detroit Edison and the review team interviews conducted with public officials, the review team concludes that impacts from operation of Fermi 3 on the demographics of the entire 50-mi region would be beneficial and SMALL. Economic impacts, including impacts on tax revenues, would be beneficial and LARGE in Monroe County and beneficial and SMALL elsewhere.

Infrastructure and community services impacts span issues associated with traffic, recreation, housing, public services, and education. Impacts from operation of Fermi 3 on recreation,

housing, public services, and education would be SMALL. Traffic-related impacts on local roadways near the Fermi site would be SMALL during normal operations and MODERATE during outages. Impacts on traffic would be mitigated by implementation of roadway improvements either during the construction period or as recommended by MCRC or MDOT following a review of the site development plan.

5.5 Environmental Justice Impacts

Environmental justice refers to a Federal policy under which each Federal agency identifies and addresses disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations of interest. On August 24, 2004, the Commission issued its policy statement on the treatment of environmental justice matters in licensing actions (69 FR 52040). Section 2.6 discusses the locations of minority or low-income populations of interest within 50 mi of the site.

The review team evaluated whether minority or low-income populations of interest could experience disproportionately high and adverse impacts from operation of a new reactor at the proposed site. To perform this assessment, the review team used the process described in Section 4.5.

5.5.1 Health Impacts

The results of normal operation dose assessments (see Section 5.9) indicate that the maximum individual radiation dose was found to be insignificant, that is, well below the NRC and EPA regulatory guidelines in Appendix I of 10 CFR Part 50 and the regulatory standards of 10 CFR Part 20.

Section 5.9 further concludes that radiological health impacts on the operational staff and the public for the proposed Fermi 3 would be SMALL. Section 5.8 of this EIS assesses the nonradiological health effects on the public from operation of the cooling system, noise generated by Fermi 3 operations, EMFs, and transporting of operations and outage workers. In Section 5.8, the review team concludes that the potential impacts of nonradiological effects resulting from the operation of the proposed Fermi 3 would be SMALL. The review team did not identify evidence of unique characteristics or practices in minority or low-income population that may result in different radiological or nonradiological health impacts compared to the general population. Therefore, there would be no disproportionately high and adverse impact on minority or low-income members of the operational staff or the general public as a result of operations.

5.5.2 Physical and Environmental Impacts

For the physical and environmental considerations described in Section 2.6.1, the review team determined through literature searches and consultations that (1) the impacts on the natural or physical environment would not be significant or result in any significant impacts on any population of interest; (2) there would be no disproportionately high and adverse impacts on minority or low-income populations of interest; and (3) the environmental effects would not occur on any minority or low-income populations that are already being affected by cumulative or multiple adverse exposures from environmental hazards. Sections 5.5.2.1 through 5.5.2.4 summarize the physical and environmental effects on the general population, and Section 5.5.2.5 provides an assessment of the potential for disproportionately high and adverse physical and environmental impacts on minority or low-income populations of interest.

The review team determined that the physical and environmental impacts from operation of Fermi 3 would attenuate rapidly with distance, intervening foliage, and terrain. There are four primary pathways in the environment: soil, water, air, and noise. The following four subsections discuss each of these pathways in greater detail.

5.5.2.1 Soil

The review team did not identify any pathway by which operations-related impacts on soils at the Fermi site would impose a disproportionately high and adverse impact on any population of interest. The review team considers the risk of soil salinization from cooling towers to be low and limited to a distance less than the nearest population of interest. Maintenance of the transmission lines would require some vehicular traffic in the transmission line corridor. However, impacts on soils along the transmission line corridors would be minimal and are not expected to affect any offsite communities. The review team identified no other environmental pathways related to soils.

5.5.2.2 Water

Operation of Fermi 3 would affect the water quality in Swan Creek and Lake Erie and water use of Lake Erie. Water quality impacts would result from increased stormwater runoff from the impervious surfaces of Fermi 3, thermal and chemical constituents in the cooling water discharges, and maintenance dredging of the intake canal. As discussed in Sections 5.2 and 5.3.2, operation of Fermi 3 would generate a small thermal plume from cooling water discharge piping into Lake Erie. Solutes in the effluent discharged would be diluted by the large water volume of the western basin of Lake Erie. In addition, discharges would be required to comply with limits imposed by permits. Consequently, the increase in temperature and concentration of these chemicals in Lake Erie would be negligible outside of the mixing zone of the discharge plume, and would have a negligible impact on aquatic biota or the general public (see

Section 5.3.2.1). The discharge would be in a restricted area that would not be used for recreational activities such as swimming, diving, and other water sports.

Operation of Fermi 3 would require a withdrawal of approximately 34,000 gpm from Lake Erie, and approximately 17,000 gpm would be discharged to Lake Erie. As discussed in Section 5.2, the consumptive losses of water during normal Fermi 3 plant operations would result in no measurable effect on other users.

5.5.2.3 Air

Air emissions sources associated with operation of Fermi 3 would include two SDGs, two ADGs, an auxiliary boiler, and two diesel-driven FPs. These emissions sources would be small, would be used infrequently, and would be permitted for use by MDEQ. The cooling tower would emit small amounts of particulate matter, which would be further minimized by drift eliminators. Emissions from worker vehicles, onsite support vehicles and heavy equipment, and vehicles used in delivery or materials and fuels would also occur (Detroit Edison 2011a). However, emissions from these sources would be expected to minimally affect ambient air quality in offsite communities in the region. Therefore, the review team determines there is no air-related pathway by which minority or low-income populations of interest could receive a disproportionately high and adverse impact.

5.5.2.4 Noise

Primary noise sources associated with operation of Fermi 3 would be the cooling towers, transformers, and transmission lines. As noted in Section 5.8.2, noise from the transformers and cooling tower would be buffered by the distance of the plant from residences such that the ambient sound level should not increase appreciably. Day-night noise levels from the Fermi 3 cooling towers are anticipated to be less than 65 dBA at the nearest noise-sensitive receptor. Noise along the transmission lines would be very low, except possibly directly below the line on a quiet, humid day (Detroit Edison 2011a).Therefore, the review team determines there is no noise-related pathway by which minority or low-income populations of interest could receive a disproportionately high and adverse impact.

5.5.2.5 Summary of Physical and Environmental Impacts on Minority or Low-Income Populations

The review team's investigation and outreach did not reveal any unique characteristics or practices among minority or low-income populations that could result in physical or environmental impacts different from impacts on the general population.

As discussed in Section 2.6, most of the census block groups classified as minority or low-income lie to the north and south of the Fermi site, in Wayne and Lucas Counties, within and

near Detroit and Toledo. One census block group located approximately 5 mi from the Fermi site within Monroe County qualifies as both a minority and a low-income population of interest. This census block group would not be affected by any physical or environmental impact because of the distance of this area from the site. No impacts would be expected on migrant farm workers if they were to be employed in transient farming activity near the Fermi site, and no subsistence activities are known to occur near the Fermi site.

Based on information provided by Detroit Edison and the review team's independent review, the review team finds no pathways from soil, water, air, and noise that would lead to disproportionately high and adverse impacts on minority or low-income populations of interest.

5.5.3 Socioeconomic Impacts

Socioeconomic impacts (discussed in Section 5.4) were reviewed to evaluate whether any operational activities could have a disproportionately high and adverse effect on minority or low-income populations of interest. With the exception of traffic, any adverse socioeconomic impacts associated with the operation of Fermi 3 are expected to be SMALL. While there likely would be adverse MODERATE impacts on traffic during outages, these impacts are not expected to be disproportionately high for low-income and minority populations of interest.

5.5.4 Subsistence and Special Conditions

The NRC's environmental justice evaluation methodology includes an assessment of populations of particular interest or unusual circumstances, such as minority communities exceptionally dependent on subsistence resources or identifiable in compact locations, such as Native American settlements.

As discussed in Section 2.6.3, access to the Fermi site is restricted, which reduces any impact on plant-gathering, hunting, and fishing activities at the site. Detroit Edison and the review team interviewed community leaders in Monroe County with regard to subsistence practices, and no such practices were identified in the vicinity of the Fermi site. There is no documented subsistence fishing in Lake Erie, Swan Creek, or Stony Creek, and no documented subsistence plant-gathering or hunting in the vicinity of the Fermi site. The review team determines there are no operational activities that would have a disproportionately high and adverse impact on minority or low-income populations of interest related to subsistence activities.

5.5.5 Summary of Environmental Justice Impacts

The review team has evaluated the proposed Fermi 3 operational activities and the potential environmental justice impacts in the vicinity and region. The review team determines there are no environmental pathways by which the identified minority or low-income populations in the 50-mi region would be likely to experience disproportionately high and adverse human health,

environmental, physical, or socioeconomic effects as a result of operation of Fermi 3; therefore, environmental justice impacts would be SMALL.

5.6 Historic and Cultural Resource Impacts from Operation

The National Environmental Policy Act of 1969 as amended (NEPA) requires Federal agencies to take into account the potential effects of their undertakings on the cultural environment, which includes archaeological sites, historic buildings, and traditional places important to local populations. The National Historic Preservation Act of 1966 as amended (NHPA) also requires Federal agencies to consider impacts on those resources if they are eligible for listing on the *National Register of Historic Places* (NRHP) (such resources are referred to as "Historic Properties" in NHPA). As outlined in 36 CFR 800.8, "Coordination with the National Environmental Policy Act of 1969," the NRC is coordinating compliance with Section 106 of the NHPA in meeting the requirements of NEPA. For specific historic and cultural resources on the Fermi site, see Section 2.7.

Operating a new nuclear unit can affect either known or undiscovered cultural resources and/or historic properties. In accordance with the provisions of NHPA and NEPA, the NRC and the USACE are required to make a reasonable and good faith effort to identify historic properties in the area of potential effects (APE) and permit area, respectively, and, if historic properties are present, determine whether significant impacts are likely to occur. Identification of historic properties is to occur in consultation with the State Historic Preservation Officer (SHPO), American Indian Tribes, interested parties, and the public. If significant impacts are possible, then efforts should be made to mitigate them. As part of the NEPA/NHPA integration, even if no historic properties (i.e., places listed or eligible for listing on the NRHP) are present or affected, the NRC and the USACE are still required to notify the SHPO before proceeding. If it is determined that historic properties are present, the NRC and the USACE are required to assess and resolve adverse effects of their respective authorized activities for the undertaking.

During the operation of Fermi 3, the cooling tower vapor plume would be visible within the visual setting of the other 21 architectural resources that have been determined or recommended eligible for listing in the NRHP. The existing visual setting of these properties, which are all located offsite but within the indirect APE, currently includes existing vapor 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. Therefore, 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 (Demeter et al. 2008). As such, indirect visual impacts resulting from operating Fermi 3 would be consistent with, and would not result in significant changes to, offsite historic properties within the indirect APE.

Operational Impacts at the Proposed Site

For the purposes of NHPA Section 106 consultation (36 CFR 800.8), based on (1) the measures that Detroit Edison would take to avoid or limit adverse impacts on significant cultural resources, (2) the review team's cultural resource analysis and consultation, and (3) Detroit Edison's commitment to follow its procedures should ground-disturbing activities discover cultural and historic resources, the review team concludes with a finding of no historic properties affected by operation. Section 4.6 concludes with a finding of historic properties affected from construction activities.

For the purposes of the review team's NEPA analysis of the operation of Fermi 3, based on information provided by Detroit Edison and the review team's independent evaluation, the review team concludes that the impacts of Fermi 3 operation on historic and cultural resources within the Fermi 3 APE would be SMALL, because indirect visual impacts resulting from operating Fermi 3 would be consistent with, and would not result in significant changes to, offsite historic properties within the indirect APE.

The review team has considered impacts related to operation of the proposed transmission lines. Detroit Edison has indicated that operation of the transmission lines would be the responsibility of ITC*Transmission*, an intrastate transmission company. As such, any further investigations to identify the presence of cultural and historic resources and to evaluate the NRHP eligibility of such resources would be the responsibility of ITC*Transmission*, which would conduct such investigations in accordance with applicable regulatory and industry standards to assess impacts of operation (Detroit Edison 2011a).

According to 10 CFR 50.10(a)(2)(vii), transmission lines are not included in NRC's definition of construction and are not an NRC-authorized activity. Therefore, the NRC considers the offsite proposed transmission lines to be outside the NRC's APE and therefore not part of the NRC's consultation.

For the purposes of the review team's NEPA analysis, based on the review team's cultural resources analysis, operational impacts associated with proposed transmission lines are likely to be limited to maintenance of transmission lines, corridors, and access roads, and are not likely to result in new significant impacts on cultural resources or historic properties, once the transmission lines have been built. Impacts from operating the proposed transmission lines would be SMALL if there are no new significant alterations to the cultural environment. If these operating activities result in significant alterations to the cultural environment, the impacts could be greater.

Section 2.7.3 contains a description of cultural resources in the transmission line corridors. Cultural resource impacts related to construction of the proposed transmission lines are discussed in Sections 4.6, 10.2.1, and 10.4.1.5. Operational impacts of the proposed transmission lines on cultural resources are also discussed in Section 10.2.2, and cumulative transmission line cultural resource impacts are discussed in Section 7.5.